State of Utah

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Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Interim Executive Director

DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL
Ty L. Howard
Director

August 15, 2019

Nathan Rich, Executive Director
Wasatch Integrated Waste Management District
P.O. Box 900
Layton, UT 84041-0900

RE: Wasatch Integrated Waste Management District – Davis Class I Landfill Permit Renewal Approval

Dear Mr. Rich:

The 30-day public comment period for the Wasatch Integrated Waste Management District – Davis Class I Landfill Permit renewal began on July 2, 2019 and ended July 31, 2019. The announcement of the public comment period appeared in the Salt Lake Tribune, Deseret News and the Ogden Standard Examiner. No comments were received. Accordingly, no changes were made to the draft permit.

Enclosed is the Permit #9419R3, which expires on August 14, 2029.

Representatives of the Division of Waste Management and Radiation Control and/or representatives of the Davis County Health Department will conduct periodic inspections. The inspections are to assess compliance with the conditions of the Permit and the Solid Waste Permitting and Management Rules.

If you have any questions, please contact Rob Powers at 801-536-0255.

Sincerely,

Ty L. Howard, Director
Division of Waste Management and Radiation Control

(Over)

DSHW-2019-008272

195 North 1950 West • Salt Lake City, UT
Mailing Address: P.O. Box 144880 • Salt Lake City, UT 84114-4880
Telephone (801) 536-0200 • Fax (801) 536-0222 • T.D.D. (801) 536-4284
www.deq.utah.gov

TLH/RP/kl

Enclosure: Permit (DSHW-2017-008091)
Attachment 1 Engineering Report (DSHW-2019-006062)
Attachment 2 Operations Plan (DSHW-2019-006061)
Attachment 3 Groundwater Monitoring Plan (DSHW-2019-006063)
Attachment 4 Landfill Gas Monitoring Plan (DSHW-2019-006064)
Attachment 5 Inspection Forms (DSHW-2019-006065)
Attachment 6 Closure and Post Closure Care Plan (DSHW-2019-006066)

c: Brian Hatch, Health Officer, Davis County Health Department
David W. Spence, Deputy Director, Davis County Health Department
Rachelle Blackham, Acting Environmental Health Director, Davis County Health Department

DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL SOLID WASTE LANDFILL PERMIT

DAVIS CLASS I LANDFILL

Pursuant to the provision of the Utah Solid and Hazardous Waste Act, Title 19, Chapter 6, Part 1, Utah Code Annotated (Utah Code Ann.) (the Act) and the Utah Solid Waste Permitting and Management Rules, R315-301 through 320 of the Utah Administrative Code adopted thereunder, a Permit is issued to:

Wasatch Integrated Waste Management District
as owner and operator,

to own, construct, and operate the Davis Class I landfill located in Davis County, Utah.

The Permittee is subject to the requirements of R315-301 through 320 of the Utah Administrative Code and the requirements set forth herein.

All references to R315-301 through 320 of the Utah Administrative Code are to regulations that are in effect on the date that this permit becomes effective.

This Permit shall become effective August 15, 2019.

This Permit shall expire at midnight August 14, 2029.

Closure Cost Revision Date: August 15, 2024.

Signed this 15 day of August, 2019.

Ty L. Howard, Director
Division of Waste Management and Radiation Control

FACILITY OWNER/OPERATOR INFORMATION

LANDFILL NAME:	Davis Class I Landfill
OWNER NAME:	Wasatch Integrated Waste Management District
OWNER ADDRESS:	P.O. Box 900, Layton, Utah 84041
OWNER PHONE NO.:	801-614-5600
OPERATOR NAME:	Wasatch Integrated Waste Management District
OPERATOR ADDRESS:	P.O. Box 900 Layton, Utah 84041
OPERATOR PHONE NO.:	801-614-5600
TYPE OF PERMIT:	Class I Landfill
LOCATION:	Sections 34, 35, 3 and 2, Township 4 north and 5 north, Range 1west,Salt Lake Base and Meridian
PERMIT NUMBER:	9419R3
PERMIT HISTORY:	Permit Renewal signed August 15, 2019

The term, "Permit," as used in this document is defined in R315-301-2(55) of the Utah Administrative Code. Director as used throughout this permit refers to the Director of the Division of Waste Management and Radiation Control.

The Permit renewal application, for the Wasatch Integrated Waste Management District Landfill is deemed complete on the date shown on the signature page of this Permit. This Permit consists of the signature page, Facility Owner/Operator Information section, sections I through V, and all attachments.

The facility as described in this Permit consists of the current disposal area, the maintenance shop, scale house, the green waste recycling, compost operations and the citizen's drop off pad and House hold Hazardous Waste facility. Compliance with this Permit does not constitute a defense to actions brought under any other local, state, or federal laws. This Permit does not exempt the Permittee from obtaining any other local, state or federal permits or approvals required for the facility operation.

The issuance of this Permit does not convey any property rights, other than the rights inherent in this Permit, in either real or personal property, or any exclusive privileges other than those inherent in this Permit. Nor does this Permit authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations, including zoning ordinances.

The provisions of this Permit are severable. If any provision of this Permit is held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this Permit to any circumstance is held invalid, its application to other circumstances shall not be affected.

By this Permit, the Permittee is subject to the following conditions.

PERMIT REQUIREMENTS

I. GENERAL COMPLIANCE RESPONSIBILITIES

I.A. General Operation

I.A.1. The Permittee shall operate the landfill in accordance with all applicable requirements of R315-301 through 320 of the Utah Administrative Code, for a Class I landfill, that are in effect as of the date of this Permit unless otherwise noted in this Permit. Any permit noncompliance or noncompliance with any applicable portions of Utah Code Ann. § 19-6-101 through 126 and applicable portions of R315-301 through 320 of the Utah Administrative Code constitutes a violation of the Permit or applicable statute or rule and is grounds for appropriate enforcement action, permit revocation, modification, or denial of a permit renewal application.

I.B. Acceptable Waste

I.B.1. This Permit is for the disposal of non-hazardous solid waste that may include:

I.B.1.a Municipal solid waste as defined by R315-301-2(47) of the Utah Administrative Code;

I.B.1.b Commercial waste as defined by R315-302-2(14) of the Utah Administrative Code;

I.B.1.c Industrial waste as defined by R315-302-2(35) of the Utah Administrative Code;

I.B.1.d Construction/demolition waste as defined by 19-6-102(4), Utah Code Annotated;

I.B.1.e Special waste as allowed by R315-315 of the Utah Administrative Code and authorized in section III-I of this Permit and limited by this section;

I.B.1.f Conditionally exempt small quantity generator hazardous waste as specified in R315-303-4(7)(a)(i)(B) of the Utah Administrative Code;

I.B.1.g Waste Tires may be accepted and managed as specified in R315-320 of the Utah Administrative Code; and

I.B.1.h Acceptable wastes are restricted to wastes that are received under sole contracts with local governments, within Utah, for waste generated within the boundaries of the local government. Each contract shall be approved by the Director prior to acceptance of the waste at the landfill.

I.C. Prohibited Waste

I.C.1. Hazardous waste as defined by R315-1 and R315-2 of the Utah Administrative Code except as allowed in permit condition I-B6 (Acceptable Waste) above;

I.C.2. Containers larger than household size (five gallons) holding any liquid; non-containerized material containing free liquids; or any waste containing free liquids in containers larger than five gallons; or

I.C.3. PCB's as defined by R315-301-2(53) of the Utah Administrative Code.

I.C.4. Regulated asbestos-containing material as defined by R315-301-2(5) of the Utah Administrative Code.

I.C.5. Any prohibited waste received and accepted for treatment, storage, or disposal at the facility shall constitute a violation of this Permit, of Utah Code Ann. § 19-6-101 through 126 and of R315-301 through 320 of the Utah Administrative Code.

I.D. Inspections and Inspection Access

I.D.1. The Permittee shall allow the Director or an authorized representative, or representatives from the Davis County Health Department, to enter at reasonable times and:

I.D.1.a Inspect the landfill or other premises, practices or operations regulated or required under the terms and conditions of this Permit or R315-301 through 320 of the Utah Administrative Code;

I.D.1.b Have access to and copy any records required to be kept under the terms and conditions of this Permit or R315-301 through 320 of the Utah Administrative Code;

I.D.1.c Inspect any loads of waste, treatment facilities or processes, pollution management facilities or processes, or control facilities or processes required under this Permit or regulated under R315-301 through 320 of the Utah Administrative Code; and

I.D.1.d Create a record of any inspection by photographic, video, electronic, or any other reasonable means.

I.E. Noncompliance

I.E.1. In the event of noncompliance with any permit condition or violation of an applicable rule, the Permittee shall promptly take any action reasonably necessary to correct the noncompliance or violation and mitigate any risk to the human health or the environment. Actions may include eliminating the activity causing the noncompliance or violation and containment of any waste or contamination using barriers or access restrictions, placing of warning signs, or permanently closing areas of the facility.

I.E.2. The Permittee shall:

I.E.2.a Document the noncompliance or violation in the daily operating record, on the day the event occurred or the day it was discovered;

I.E.2.b Notify the Director by telephone within 24 hours, or the next business day following documentation of the event; and

I.E.2.c Give written notice of the noncompliance or violation and measures taken to protect human health and the environment within seven days after Director notification.

I.E.3. Within thirty days after the documentation of the event, the Permittee shall submit to the Director a written report describing the nature and extent of the noncompliance or violation and the remedial measures taken or to be taken to protect human health and the environment and to eliminate the noncompliance or violation. Upon receipt and review of the assessment report, the Director may order the Permittee to perform appropriate remedial measures, including development of a site remediation plan for approval by the Director.

I.E.4. In an enforcement action, the Permittee may not claim as a defense that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with R315-301 through 320 of the Utah Administrative Code and this Permit.

I.F. Revocation

I.F.1. This Permit is subject to revocation if the Permittee fails to comply with any condition of the Permit. The Director will notify the Permittee in writing prior to any proposed revocation action and such action shall be subject to all applicable hearing procedures established under R305-7 of the Utah Administrative Code and the Utah Administrative Procedures Act.

I.G. Attachment Incorporation

I.G.1.a Attachments to the Permit Application are incorporated by reference into this Permit and are enforceable conditions of this Permit, as are documents incorporated by reference into the attachments. Language in this Permit supersedes any conflicting language in the attachments or documents incorporated into the attachments.

II. DESIGN AND CONSTRUCTION

II.A.1. Design and Construction

II.A.1.a The Permittee shall construct any landfill cell, sub-cell, run-on diversion system, runoff containment system, waste treatment facility, leachate handling system, or final cover in accordance with the design as defined in Attachment #1 and in accordance with the R315-301 thru 320 of the Utah Administrative Code.

II.A.1.b Prior to construction of any landfill cell, sub-cell, engineered control system, waste treatment facility, leachate handling system, or final cover, the Permittee shall submit construction design drawings and a Construction Quality Control and Construction Quality Assurance (CQC/CQA) Plans to the Director for approval. Approved design drawings and CQA/CQC plans will be incorporated into this permit through modification. Buildings do not require approval. The Permittee shall construct any landfill cell, sub-cell, cell liner, engineered control system, waste treatment facility, leachate handling system, and final cover in accordance with the design drawings and CQC/CQA Plans submitted to and approved by the Director.

II.A.1.c Subsequent to construction, the Permittee shall notify the Director of completion of construction of any landfill cell, sub-cell, engineered control system, waste treatment facility, or final cover. Landfill cells may not be used for treatment or disposal of waste until all CQC/CQA documents and construction-related documents, including as-built drawings, are approved by the Director and this permit has been modified to reflect these changes. The Permittee shall submit as-built drawings for each construction event that are stamped and approved by an engineer registered in the State of Utah.

II.A.1.d The Permittee shall notify the Director of any proposed incremental closure, placement of any part of the final cover, or placement of the full final cover. Design approval must be received from the Director and this permit modified prior to construction. The design shall be accompanied by a CQC/CQA Plan, for each construction season where incremental or final closure is performed.

II.A.1.e A qualified party, independent of the owner and the construction contractor, shall perform the quality assurance function on liner components, cover components, and other testing as required by the approved CQC/CQA Plan. The results shall be submitted to the Director as part of the as-built drawings.

II.A.1.f All engineering drawings submitted to the Director shall be stamped and approved by a professional engineer with a current registration in Utah.

II.A.1.g If ground water is encountered during excavation of the landfill, the Director shall be notified immediately, and a contingency plan implemented or alternative construction design developed and submitted for approval.

II.A.2. Run-On Control

II.A.2.a The Permittee shall construct drainage channels and diversions as specified in Attachment #2 and shall maintain them at all times to effectively prevent runoff from the surrounding area from entering the landfill.

II.A.3. Equivalent Design

The Permittee may propose a landfill liner design that uses a geosynthetic clay liner in place of the clay component of the liner required by R315-303-3(3)(a)(ii) of the Utah Administrative Code.

III. LANDFILL OPERATION

III.A. Operations Plan

III.A.1. The Permittee shall keep the Operations Plan included in Attachment #2 on site at the landfill or at the location designated in section III-H of this Permit. The Permittee shall operate the landfill in accordance with the operations plan. If necessary, the Permittee may modify the Operations Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code, is as protective of human health and the environment as the Operations Plan approved as part of this Permit, and is approved by the Director as a minor modification under R315-311-2(1)(a)(xiii) of the Utah Administrative Code. The Permittee shall note any modification to the Operations Plan in the daily operating record.

III.B. Security

III.B.1. The Permittee shall operate the Landfill so that unauthorized entry to the facility is restricted. The Permittee shall:

III.B.2. Lock all facility gates and other access routes during the time the landfill is closed.

III.B.3. Have at least one person required on site employed by the Permittee at the landfill during all hours that the landfill is open.

III.B.4. Construct all fencing and any other access controls as shown in the Permit Application to prevent access by persons or livestock by other routes.

III.C. Training

III.C.1. The Permittee shall provide training for on-site personnel in landfill operation, including waste load inspection, hazardous waste identification, and personal safety and protection.

III.D. Burning of Waste

III.D.1. Intentional burning of solid waste is prohibited and is a violation of R315-303-4(2)(b) of the Utah Administrative Code.

III.D.2. The Permittee shall extinguish all accidental fires as soon as reasonably possible.

III.E. Daily Cover

III.E.1. The Permittee shall completely cover the solid waste received at the landfill at the end of each working day with a minimum of six inches of earthen material. The Permittee may use an alternative daily cover material when the material and the application of the alternative daily cover meets the requirements of R315-303-4(4)(b) through (e) of the Utah Administrative Code.

III.E.2. The Director may rescind or amend the alternative daily cover approval if the requirements to prevent blowing debris, to minimize access to the waste by vectors, to minimize the threat of fires at the open face, to minimize odors, or to shed precipitation are not met, or if necessary to prevent nuisance conditions or adverse impacts to human health or the environment.

III.F. Ground Water Monitoring

III.F.1. The Permittee shall monitor the ground water underlying the landfill in accordance with the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan contained in Attachment #3. If necessary, the Permittee may modify the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code and is as protective of human health and the environment as the conditions approved in this Permit, and is approved by the Director as a minor modification under R315-311-2(1)(a) of the Utah Administrative Code. The Permittee shall note in the daily operating record any modification to the Ground Water Monitoring Plan and the Ground Water Monitoring Quality Assurance/Quality Control Plan. A plan change that the Director finds to be less protective of human health or the environment than the approved plan is a major modification and is subject to the requirements of R315-311 of the Utah Administrative Code.

III.G. Gas Monitoring

III.G.1. The Permittee shall monitor explosive gases at the landfill in accordance with the Gas Monitoring Plan contained in Attachment #4 and shall otherwise meet the requirements of R315-303-3(5) of the Utah Administrative Code. If necessary, the Permittee/s may modify the Gas Monitoring Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code and is as protective of human health and the environment as the conditions approved in this Permit, and is approved by the Director as a minor modification under R315-311-2(1) of the Utah Administrative Code. The Permittee shall note any modification to the Gas Monitoring Plan in the daily operating record. Plan changes that the Director finds to be less protective of human health or the environment than the approved plan are a major modification and are subject to the requirements of R315-311 of the Utah Administrative Code.

III.G.2. If the concentrations of explosive gases at any of the facility structures, at the property boundary, or beyond the property boundary ever exceed the standards set in R315-303-2(2)(a) of the Utah Administrative Code, the Permittee shall:

III.G.2.a Immediately take all necessary steps to ensure protection of human health and notify the Director;

III.G.2.b Within seven days of detection, place in the daily operating record the explosive gas levels detected and a description of the immediate steps taken to protect human health;

III.G.2.c Implement a remediation plan that meets the requirements of R315-303-3(5)(b) of the Utah Administrative Code; and

III.G.2.d Submit the plan to, and receive approval from, the Director prior to implementation.

III.G.2.e The Permittee shall operate and maintain the active landfill gas collection system to collect and treat the gas and any soil gas monitoring wells located along the facility boundary as necessary to meet the requirements of R315-303-3(5) of the Utah Administrative Code.

III.H. Waste Inspections

III.H.1. The Permittee shall visually inspect incoming waste loads to verify that no wastes other than those allowed by this permit are disposed in the landfill. The Permittee shall conduct a complete waste inspection at a minimum frequency of 1 % of incoming loads, but no less than one complete inspection per day. The Permittee shall select the loads to be inspected on a random basis.

III.H.2. The Permittee shall inspect all loads suspected or known to have one or more containers capable of holding more than five gallons of liquid to ensure that each container is empty.

III.H.3. The Permittee shall inspect all loads that the Permittee suspect may contain a waste not allowed for disposal at the landfill.

III.H.4. The Permittee shall conduct complete random inspections as follows:

III.H.4.a The Permittee shall conduct the random waste inspection at the working face or an area designated by the Permittee.

III.H.4.b The Permittee shall direct that loads subjected to complete inspection be unloaded at the designated area;

III.H.4.c Loads shall be spread by equipment or by hand tools;

III.H.4.d Personnel trained in hazardous waste recognition and recognition of other unacceptable waste shall conduct a visual inspection of the waste; and

III.H.4.e The personnel conducting the inspection shall record the results of the inspection on a waste inspection form as found in Attachment #5.

III.H.4.f The Permittee shall place the form in the daily operating record at the end of the operating day.

III.H.4.g The Permittee or the waste transporter shall properly dispose of any waste found that is not acceptable at the facility at an approved disposal site for the waste type and handle the waste according to the rules covering the waste type.

III.I. Disposal of Special Wastes

III.I.1. The Permittee may dispose of animal carcasses in the landfill working face and shall cover them with two feet of soil or material as outlined in R315-315-6. Alternatively, the Permittee may dispose of animal carcasses in a special trench or pit prepared for the acceptance of dead animals. If a special trench is used, the Permittee shall cover animals placed in the trench with six inches of earth by the end of each operating day.

III.J. Self-Inspections

III.J.1. The Permittee shall inspect the facility to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of wastes or contaminated materials to the environment or create a threat to human health or the environment. The Permittee shall complete these general inspections no less than quarterly and shall cover the following areas: Waste placement, compaction, cover; cell liner; leachate systems; fences and access controls; roads; run-on/run-off controls; ground water monitoring wells; final and intermediate cover; litter controls; and records. The Permittee shall place a record of the inspections in the daily operating record on the day of the inspection. The Permittee shall correct the problems identified in the inspections in a timely manner and document the corrective actions in the daily operating record.

III.K. Recordkeeping

III.K.1. The Permittee shall maintain and keep on file at the landfill office a daily operating record and other general records of landfill operation as required by R315-302-2(3) of the Utah Administrative Code. The landfill operator shall date and sign the daily operating record at the end of each operating day. Each record to be kept shall contain the signature of the appropriate operator and the date signed. The Daily operating record shall consist of the following two types of documents:

III.K.1.a Records related to the daily landfill operation or periodic events including:

III.K.1.a.(i) The number of loads of waste and the weights or estimates of weights or volume of waste received each day of operation and recorded at the end of each operating day;

III.K.1.a.(ii) Major deviations from the approved plan of operation, recorded at the end of the operating day the deviation occurred;

III.K.1.a.(iii) Results of monitoring required by this Permit, recorded in the daily operating record on the day of the event or the day the information is received;

III.K.1.a.(iv) Records of all inspections conducted by the Permittee, results of the inspections, and corrective actions taken, recorded in the record on the day of the event.

III.K.1.b Records of a general nature including:

III.K.1.b.(i) A copy of this Permit, including all attachments;

III.K.1.b.(ii) Results of inspections conducted by representatives of the Director, and of representatives of the local Health Department, when forwarded to the Permittee;

III.K.1.b.(iii) Closure and Post-closure care plans; and

III.K.1.b.(iv) Records of employee training.

III.L. Reporting

III.L.1. The Permittee shall prepare and submit to the Director an Annual Report as required by R315-302-2(4) of the Utah Administrative Code. The Annual Report shall include: the period covered by the report, the annual quantity of waste received, an annual update of the financial assurance mechanism, a re-application for approval of the financial assurance mechanism, any leachate analysis results, all ground water monitoring results, the statistical analysis of ground water monitoring results, the results of gas monitoring, the quantity of leachate pumped, and all training programs completed.

III.M. Roads

III.M.1. The Permittee shall improve and maintain all access roads within the landfill boundary that are used for transporting waste to the landfill for disposal shall be improved and maintained as necessary to assure safe and reliable all-weather access to the disposal area.

III.N. Litter Control

III.N.1. Litter resulting from operations of the landfill shall be minimized. In addition to the litter control plans found in Attachment #2, the Permittee shall implement the following procedures when high wind conditions are present:

III.N.1.a Reduce the size of the tipping face;

III.N.1.b Reduce the number of vehicles allowed to discharge at the tipping face at one time;

III.N.1.c Orient vehicles to reduce wind effects on unloading and waste compaction;

III.N.1.d Reconfigure tipping face to reduce wind effect;

III.N.1.e Use portable and permanent wind fencing as needed; and

III.N.1.f Should high winds present a situation that the windblown litter cannot be controlled, the Permittee shall cease operations of the landfill until the winds diminish.

IV. CLOSURE REQUIREMENTS

IV.A. Closure

IV.A.1. The Permittee shall install final cover of the landfill as shown in Attachment #1 The final cover shall meet, at a minimum, the standard design for closure as specified in the R315-303-3(4) of the Utah Administrative Code plus sufficient cover soil or equivalent material to protect the low permeability layer from the effects of frost, desiccation, and root penetration. The Permittee shall submit to the Director a quality assurance plan for construction of the final landfill cover, and approval of the plan shall be received from the Director prior to construction of any part of the final cover at the landfill. A qualified person not affiliated with the Permittee or the construction contractor shall perform permeability testing on the recompacted clay placed as part of the final cover.

IV.A.2. Title Recording

IV.A.2.a The Permittee shall meet the requirements of R315-302-2(6) of the Utah Administrative Code by recording a notice with the Davis County Recorder as part of the record of title that the property has been used as a landfill. The notice shall include waste disposal locations and types of waste disposed. The Permittee shall provide the Director the notice as recorded.

IV.B. Post-Closure Care

IV.B.1. The Permittee shall perform post-closure care at the closed landfill in accordance with the Post-Closure Care Plan contained in Attachment #6. Post-closure care shall continue until all waste disposal sites at the landfill have stabilized and the finding of R315-302-3(7)(c) of the Utah Administrative Code is made.

IV.C. Financial Assurance

IV.C.1. The Permittee shall adequately fund and maintain the financial assurance mechanism(s) to provide for the cost of closure at any stage or phase or anytime during the life of the landfill or the permit life, whichever is shorter. The Permittee shall keep the approved financial assurance mechanism in effect and active until closure and post-closure care activities are completed and the Director has released the facility from all post-closure care requirements.

IV.D. Financial Assurance Annual Update

IV.D.1. The Permittee shall submit an annual revision of closure and post-closure costs for inflation and financial assurance funding as required by R315-309-2(2) of the Utah Administrative Code, to the Director as part of the annual report. The Permittee shall submit the information as required in R315-309-8 of the Utah Administrative Code and shall meet the qualifications for the "Local Government Financial Test" or "Local Government Guarantee" each year.

IV.E. Closure Cost and Post-Closure Cost Revision

IV.E.1. The Permittee shall submit a complete revision of the closure and post-closure cost estimates by the Closure Cost Revision Date list-ed on the signature page of this Permit and any time the facility is expanded, any time a new cell is constructed, or any time a cell is expanded.

V. ADMINISTRATIVE REQUIREMENTS

V.A. Permit Modification

V.A.1. Modifications to this Permit may be made upon application by the Permittee or by the Director. The Permittee shall be given written notice of any permit modification initiated by the Director.

V.B. Permit Transfer

V.B.1. This Permit may be transferred to a new permittee or new permittees by complying with the permit transfer provisions specified in R315-310-11 of the Utah Administrative Code.

V.C. Expansion

V.C.1. This Permit is for a Class I Landfill. The permitted landfill shall operate according to the design and Operation Plan described and explained in this Permit. Any expansion of the current footprint designated in the description contained in Attachment #2, but within the property boundaries designated in Attachment #2, shall require submittal of plans and specifications to the Director. The plans and specifications shall be approved by the Director prior to construction.

V.C.2. Any expansion of the landfill facility beyond the property boundaries designated in the description contained in Attachment #2 shall require submittal of a new permit application in accordance with the requirements of R315-310 of the Utah Administrative Code.

V.D. Expiration

V.D.1. If the Permittee desires to continue operating this landfill after the expiration date of this Permit, the Permittee shall submit an application for permit renewal at least six months prior to the expiration date, as shown on the signature (cover) page of this Permit. If the Permittee timely submits a permit renewal application and the permit renewal is not complete by the expiration date, this Permit shall continue in force until renewal is completed or denied.

Attachment #1
Engineering Report

IIc. ENGINEERING REPORT – PLANS, SPECIFICATIONS, AND CALCULATIONS

IIc.1. Performance Standards of R315-303-2

The Davis Landfill meets the performance standards of R315-303-2. The leachate collection system was constructed as approved.

IIc.2. Engineering Reports Required to Meeting Location Standards

Wasatch and its predecessors have been in continuous occupancy at the site since the early 1950's. During that period, no archaeologically significant discoveries have been made at the site, nor are any known to exist. All areas to be landfilled or borrow sources have been heavily disturbed.

The Davis Landfill is not located within 1,000 feet of a national, state, or county park, monument, or recreation area; designated wilderness or wilderness study area; or wild and scenic river area.

Ecologically or scientifically significant natural areas have not been observed within or adjacent to the current site. This site is an active landfill and has been in continuous use as such since the early 1950's.

There are no soils within the landfill property boundaries that are classified prime soil types for farmland use per the Soil Conservation Service (SCS) maps of Davis County. There are no irrigation water sources generated on-site but pressured irrigation is available from local purveyors. Some of the borrow areas are currently being cultivated but are not classified as prime soil types or considered within a unique or important farmland zone.

There are no historic structures or properties eligible to be listed in the State or National Register of Historic Places currently located within one-quarter mile of the property line that encloses the area currently being operated as a landfill. There are residential dwellings, a church, and a school that have encroached within this one-quarter-mile zone since the landfill began operating. The landfill has been in continuous operation under the direction of various governmental authorities since the early 1950's. The properties that comprise the area of this permit application have been designated for landfill use for this same period. A Master Plan prepared for Wasatch in 1984 also identifies the precise location of anticipated filling operations. Construction of the dwelling units within one-quarter mile of the property boundary occurred after the development of the Master Plan. At the time of the Master Plan, no residences, church, or school were located within the one-quarter-mile buffer. Therefore, the location standard with respect to these structures has been substantively met by Wasatch and should not limit the use of its facility.

The Davis Landfill is not located within 10,000 feet of a public-use airport runway used by turbojet aircraft. However, the landfill is located within 10,000 feet of a runway at Hill Air Force Base (AFB), which is not under the jurisdiction of the FAA or UDEQ. Therefore, the Davis Landfill does comply with the specific airport runway restrictions.

The Utah State Regulations indicate "No new facility or lateral expansion of an existing facility shall be located in a subsidence area, a dam failure flood area, above an underground mine, above a salt dome, above a salt bed, or on or adjacent to geologic features which could compromise the structural integrity of the facility".

Neither the unlined landfill nor the lined landfill cells (all phases) are located in a subsidence area, a dam failure flood area, above an underground mine, above a salt dome, or above a salt bed as mentioned in the Utah State Regulations. However, the landfill area is located in the southeast portion of the Salt Lake Basin along the western side of the Wasatch Front Mountains and is built on and into a bluff overlooking the Weber River. This area may be considered to be geologically hazardous due to the steep side slopes and the associated potential for landslides and erosion. In order to address the concern for potential instability, site analyses were conducted to evaluate the slope stability and design criteria for the existing landfill and the proposed expansion. The analysis, conducted previously by others (Roy F. Weston, Inc. 1996, Bingham Environmental, Inc. 1997, and IGES 2005) represents the site conditions and has been so referenced. Based on this evaluation, the Davis Landfill is stable under static and seismic conditions.

The landfill site is not located over or within 200 feet of any known Holocene fault, however it is located about 1.5 miles from the Wasatch Fault Zone. This fault zone is considered active and capable of producing 7 to 7 ½ magnitude earthquake.

DWMRC has adopted Subtitle D location restrictions for floodplains and wetlands. The landfill site is not within a delineated 100-year flood zone. There are no known or designated wetlands within the limits of the landfill boundary. There are no known endangered or threatened species within the landfill area.

DWMRC location restrictions with respect to groundwater protection include the following:

- No new facility shall be located at a site where the bottom of the lowest liner is less than 5 feet above historical high level of groundwater in the uppermost aquifer.

- No new facility shall be located over a sole source aquifer as designated in 40 CFR 149.

- No new facility shall be located over groundwater classified as IB under Section R317-6-3.3 (an irreplaceable aquifer).

- A new facility located above any aquifer containing groundwater which has a total dissolved solids (TDSs) content below 1,000 milligrams per liter (mg/l) and does not exceed applicable groundwater quality standards for any contaminant is permitted only

where the depth to groundwater is greater than 100 feet. For a TDS content between 1,000 and 3,000 mg/l, the separation must be 50 feet or greater. These separation distance requirements are waived if the landfill is constructed with a composite liner.

- No new facility shall be located in designated drinking water source protection areas or, if no such protection area is designated, within a distance to existing drinking water wells or springs for public water supplies of 250-day groundwater travel time.

Phase IV liner construction is at least 5 feet above the highest observed groundwater elevation in the shallow perched groundwater and is approximately 300 feet above the highest usable aquifer. The bottom liner for all lined Phases will be the equivalent of a composite system, using a GCL overlain by a 60-mil HDPE membrane. Therefore, the future Phase IV meets the requirements of the groundwater protection location restrictions.

Groundwater beneath the landfill area is of Class I quality, with a TDS of less than 500 mg/l. It is not a sole source or Class IB (irreplaceable aquifer). Usable drinking water wells are generally drilled to greater than 400-foot depths within a 1-mile radius of the site.

IIc.3. Anticipated Facility Life.

The remaining capacity the Davis Landfill is 8,905,560 cy. Wasatch will have airspace for approximately 27 years of disposal based on available fill volume, expected daily waste disposal rates, and an in-place density of 1,633 pounds per cubic yard (pcy). The in-place density increase is a result of Wasatch's commitment to increased compaction and long term compaction studies. As Wasatch increases the in-place density the years of design capacity will also increase. Drawings in Appendix K and calculations in Appendix Q detail the waste, soil, and ash parameters along with consumption of airspace.

IIc.4. Cell Design

The Landfill was designed and constructed to meet or exceed current regulatory standards. As new technologies and standards have been developed the Davis Landfill has updated and upgraded their design. Landfill Design Drawings are attached in Appendix K.

The landfill is designed with environmental controls (both a composite liner and a leachate collection system) that are intended to protect surface water and groundwater from contamination. The previously approved composite liner system consists of:

- Prepared subbase foundation.
- A geosynthetic clay liner (GCL).
- A geomembrane liner (60-mil HDPE, or equivalent synthetic material).
- A geocomposite drainage layer.
- A 24-inch protective soil layer.

This configuration was selected to provide a composite liner system that closely resembles the standard synthetic-over-clay composite liner system required by State of Utah Regulations (R315-303-3). This liner is an alternative system to the standard design and was selected for the following reasons:

- No source of clay acceptable for use is known to be available within a reasonable distance from the site (e.g., within 10 miles).

- Bentonite amendments to the on-site soils are not likely to achieve the regulatory hydraulic conductivity requirements at reasonable amendment ratios (e.g., less than 10% bentonite addition). This is partly due to the sandy texture of the on-site soils and to the general alkaline nature of Great Basin soils. Bentonite amendments at these levels are both very difficult to achieve homogeneously and expensive.

- GCL utilization has been an available and acceptable technology. The performance and associated QA/QC of the GCL materials is superior to compacted clay liners in this application.

This alternative liner system has been previously approved by DWMRC and used in the Davis Landfill. The minimum vertical separation from the groundwater and the lowest point of liner of all constructed phases and future Phase IV is more than the minimum 5 feet as specified in R315-302-1.

The remaining liner in Phase IV will be constructed having a minimum slope of 2% as shown in the contours indicated on the Drawings (Appendix K). Phase IV will slope towards Phase II and III and due to the short distance will not require piping. All foundation soils underlying the GCL will be free of surface anomalies and uniformly graded. The alternate liner system will be installed per the manufacturer's recommendations and will be inspected to ensure continuity. Construction plans, specifications and QA/QC program will be submitted to the DWMRC for review and approval prior to any construction related activities.

The Davis Landfill uses an area fill method. In the area fill method, an area is excavated and prepared as a lined landfill phase with excavated construction and borrow source soils being utilized for daily, intermediate, and final cover.

At the beginning of each new phase, a 2-foot-thick layer of protective soil is placed over the leachate collection system for the entire phase and over side slopes to protect the entire liner system. The first solid waste and ash placed in a newly constructed landfill phase will be placed in a layer approximately 3 feet thick over the entire bottom of the active area. Large objects will be removed from the deposited waste and the solid waste and ash will be compacted as a single lift, with no intermediate compaction to provide a 5-foot-thick protective working surface over the liner and leachate collection systems.

Subsequent layers of solid waste and ash will be placed in lifts of 10 to 20 feet in thickness. The solid waste and ash is spread and compacted in no more than 24-inch-thick layers on a working face 50 to 75 feet in width. The working face is sloped no steeper than 3H:1V to facilitate the

compaction of the waste. The working face area is kept to the minimum size necessary for operations. This minimizes the area exposed for wind or vector related problems and also minimizes the quantity of daily cover material required.

To prevent bridging of surrounding waste, large, bulky wastes are typically placed at the toe of the working face and crushed thoroughly prior to placement of additional solid wastes.

Temporary berms may be constructed on lifts to control surface water and vehicular traffic. These berms are constructed using the soil stockpiled for daily cover. In addition, the working face and lifts are sloped to minimize ponding of water.

Waste is placed in the development area until the waste reaches the planned intermediate or final grade. When final grades are reached, the surface is prepared for final cover. The Davis Landfill has closed the area identified as Stage A which is shown as the closed area on the drawings contained in Appendix A. It is anticipated that final cover will be placed over the lined landfill areas in a series of stages as sufficient area is brought to final elevation. Each stage of final cover installation will consider the operation, maintenance, storm water management, landfill gas collection, odors, financials, constructability, weather, and other factors.

The engineered final cover system will minimize surface water infiltration (thereby minimizing leachate generation), control gas migration, maintain slope stability, control surface water and erosion, and be capable of supporting vegetative cover. The vegetative cover has been selected with shallow root systems to prevent penetration into the drainage layer or geocomposites. The cover will be constructed as indicated on the drawings (Appendix K) that are included with this permit application. The final cover design will have a minimum of 2.5 feet of soil protection and topsoil over the synthetic cover materials. The 3 feet of soil cover minimizes the effect of frost (typical depth of influence between 20 to 30 inches as determined by UDOT guidance for the site) but also provides enough soil to protect the final cover components from damage. Side slopes will be maintained at 4H:1V and will typically have 10- to 15-foot-wide benches every 30 to 40 vertical feet to aid in constructing and maintaining the landfill cap slopes while providing areas for storm water management. The benches will slope a minimum of 2% to 5% to provide a positive drainage allowing for the anticipated settlement of the MSW. Elevations of the final cover are showed in the drawings in Appendix K.

The landfill cover design allows for natural shedding of water during a normal rainfall or snowmelt with little infiltration into the drainage layer. However, in the case of unusually high rainfall event, water will infiltrate to the underlying drainage layer (geonet). The geonet geocomposite will terminate or daylight into a perimeter ditch at the edge of the landfill cover and in the ditches associated with the landfill benches. The perimeter ditch will route all storm water to the storm water retention ponds as shown in Appendix F.

The gas transmission layer will help to direct the landfill gases generated from the MSW to the gas collections system and ultimately to the landfill gas flare or to Hill Air Force Base for use in the landfill gas-to-energy system.

IIc.5. Leachate Collection System Design and Calculations

Leachate collection system (LCS) design has been approved and constructed during phases I, II, III, and V. A drawing of the constructed leachate collection system is provided in Appendix K. The LCS consists of a geocomposite drainage material to provide lateral drainage of leachate directly above the liner system. The geocomposite layer was placed over the entire bottom of each of the lined landfill phases. The LCS is designed to minimize physical and biological clogging. The piping, grades, and materials of the LCS was designed to operate during filling, closure, and post-closure periods. The geocomposite was designed to limit leachate depths on the liner to well less than one foot, even when clogged by sediments and biofouling that has been observed at similar facilities. Each leachate collection and header pipe was oversized to allow maintenance cleaning. The geocomposite was covered by a protective soil layer consisting of 24 inches of soil with an in-place permeability of between 10^{-3} and 10^{-5} centimeters/second. This material protects the liner system, including the LCS, from damage during the placement of the first layer of select solid waste. The protective layer was constructed of moderately permeable, sandy soils excavated from the landfill expansion and separately stockpiled during excavation. The protective soil layer was track packed with landfill equipment prior to the placement of select waste. Phase IV liner will be constructed in a similar manner.

The bottom of each of the landfill phases was graded to provide a minimum slope of 2% from the highest side of the graded bottom to the lowest side. Perforated drainage pipes will be installed to prevent the localized buildup of head (leachate) and to transport collected leachate. Within each constructed phase, the lateral pipes terminate at a leachate header pipe (installed in Phase I), which connects all leachate piping to Phase V and the outlet pipe which gravity drains to the publicly owned treatment works (Central Weber Sewer Improvement District). All leachate from current phases (I, II, III, and V) along with the future Phase IV will report into the outlet pipe for final disposal.

Design of the LCS was based on a series of HELP model runs that simulate the generation of leachate within the landfill. To determine the maximum amount of leachate that the LCS would be required to transport, several computer runs were performed to evaluate the sensitivity of the model parameters with the Davis Landfill site. Using multiple configurations of final, intermediate, daily, and no covers and adding 25-year, 24-hour rainstorms at various stages of construction, the maximum amount of expected leachate flow was obtained. The LCS was evaluated for this flow using its designed and “clogged” conditions. For all anticipated flows, the LCS has been shown to be more than adequate to meet the design requirement of less than 12 inches of head on the liner. The piping systems have been designed to allow long-term maintenance activities to be performed and are therefore oversized for the anticipated hydraulic flows.

The LCS, as designed, has been in operation within Phase I of the lined landfill cell for approximately 16 years with no operational problems being experienced. The volume of leachate is metered monthly and varies based on weather and construction activities. On average, the lined area produces just under 10 million gallons per year or 19 gallons per minute.

IIc.6. Equipment Requirements and Availability

Per the Solid Waste Organization of North America, the minimum equipment required to operate the Davis Landfill is one dozer, one compactor, and 2 loaders. The Davis Landfill uses considerably more equipment than the minimum to fulfill its commitment to excellence. Wasatch has operated this landfill for about 20 years and has maintained sufficient equipment to operate it efficiently and effectively. As projects and programs change, Wasatch will add and change equipment to meet those needs. Wasatch will meet all the equipment requirements to maintain the Davis Landfill in an environmental sound condition.

IIc.7. Identification of Borrow Sources

Volume of soil required for daily, intermediate, and final cover have been determined for each development area. Possible borrow source locations sufficient to provide adequate volume are identified on the drawings contained in Appendix K.

IIc.8. Run-on and Run-off Diversion Design

Run-On and run-off diversion designs are contained in Appendix F and a copy of the Storm Water Pollution Prevention Plan is Appendix G.

IIc.9. Leachate Collection, Treatment, and Disposal

The drawing for the LCS is attached in Appendix K. Leachate is disposed of through: 1) free surface evaporation, 2) surface application/dust control within the lined landfill cell and 3) discharge to Central Weber Sewer Improvement District. Davis landfill has an agreement with Central Weber Sewer Improvement District to accept and treat leachate. A copy of the treatment permit is contained in Appendix R.

IIc.10. Ground Water Monitoring Plan

The drawing in Appendix A and in the Groundwater Monitoring Plan for the Davis Landfill attached in Appendix N; show the ground water monitoring well locations, design, and construction. The Groundwater Monitoring Plan has already been approved by DWMRC.

IIc.11. Landfill Gas Monitoring and Control Plan

The drawing in Appendix A and in Explosive Landfill Gas Plan in Appendix H, show the landfill gas monitoring locations, buildings, well locations, design, and construction. This plan meets the requirements of DWMRC.

IIc.12. Slope Stability Analysis

The EPA and the DWMRC define a seismic impact zone as any location where the expected peak bedrock acceleration from earthquake activity exceeds 0.1 times the acceleration due to gravity (g).

The Maximum Horizontal Acceleration (MHA) in lithified earth material is defined in 40 CFR part 258.14 (EPA 1991) as the "maximum expected horizontal acceleration depicted on a seismic hazard map with a 90% or greater probability that the acceleration will not be exceeded in 250 years, or the maximum expected horizontal acceleration based on site specific seismic risk assessment." This definition was adopted in full by the DWMRC. This ground motion is often termed the Maximum Considered Earthquake (MCE) seismic hazard level and associated with a 2% chance of exceedance in 50 years. The acceleration value of approximately 0.6g was obtained from the United States Geologic Survey's (USGS) Earthquake Hazards Program – National Seismic Hazard Mapping Project. The value is an estimated ground surface acceleration of a "firm rock" site, which is identified as having a shear-wave velocity of 760 m/sec in the top 30 meters; sites with different soil types may amplify or de-amplify this value.

A seismic response analysis and a dynamic deformation analysis were performed by Roy F. Weston, Inc., 1996, Bingham Environmental, Inc. 1997, and IGES 2005. These firms used similar input values, the similar computer software and in general came up the same results. The analysis and results from these previous permit documents has been reviewed and agreed with by IGES and in their opinion no further analysis is required.

In summary, the seismic response at the site was evaluated by Roy F. Weston, Inc., using the computer program SHAKE91, with the Loma Prieta motion being scaled using the 0.6g MHA value obtained for the site. Four soil/refuse conditions for the site were modeled representing 0, 40, 60 and 80 feet of refuse overlying native soils. Acceleration time histories were then selected and used in the displacement analysis.

Displacement analysis was performed using the computer program DSPLMT. Weston and Bingham Environmental each performed a separate displacement analysis using the SHAKE91 time histories. The time histories, static factor of safety, and the yield acceleration were input to evaluate the potential displacement. Based on the results of their analysis, the predicted displacements were approximately equal to or less than 1.0 foot.

Additional slope stability and deformation analysis were performed by IGES to evaluate areas where modifications have been made to the final design. Input information for the stability analyses was evaluated and modified prior to performing additional evaluation. These values are discussed further below.

SOIL AND REFUSE STRENGTH PARAMETERS			
MATERIAL	COHESION (psf)	FRICTION ANGLE (degrees)	UNIT WEIGHT (pcf)
Foundation Soils (Sandy Silt, Silty Sand)	50	32	110
MSW	200	30	85
Final Cover Soils	50	32	110

The parameters for the MSW were obtained from published results as part of a seismic design review performed by IGES in February of 2005. Withiam et al. (1995) found a friction angle of 30 degrees and a cohesion of 209 based on large-scale in-situ direct shear tests. Kavazanjian et al. (1995) suggested a friction angle of 33 degrees based on the back-analysis of several landfills. Based on this review a friction angle of 30 degrees and a cohesion of 200 psf were selected to define the strength properties of the MSW. These values were also used for the stability evaluation pertinent to this permit application.

The strength values used for the foundation and cover materials have been used by IGES in several studies for the landfill site and substantiated with field and laboratory testing and observation. The strength parameters used in this assessment are considered slightly conservative based on the values obtained from laboratory tests, however the values are consistent with previous modeling.

Static and pseudo-static stability assessments on typical worst-case excavation and final cover areas were performed as part of this permit application. The analysis was performed with the software SLIDE version 5.016 using the option for the Bishop's method of slices for the computations. In general, excavation slopes for the landfill bottom are proposed to be 3H:1V (horizontal to vertical) and final cover slopes are proposed to be 4H:1V. The results of our stability analyses indicate the proposed slopes are stable under static and seismic conditions. A summary of the results is presented in the following table. Output for the analyses, including plots of the most critical failure surfaces is provided in Appendix S.

STATIC CONDITIONS		
SECTION	CONDITION	Minimum Factor of Safety
Phase Liners	Global stability with liner	2.27
Stage A Cover	Global stability with liner and cover	3.34
Stage C Cover	Global stability with liner and cover	2.91

The seismic parameters used in the analysis were the same as those presented and used by Weston in 1996, which were based on MHA of 0.6g. Weston performed an attenuation analysis to estimate the effects on the MHA as the motion propagates up through the soil profile to the surface. The results of the attenuation analysis indicated peak ground base accelerations ranging from 0.41g to 0.47g with an average of about 0.44g. IGES reviewed this analysis and agreed

with the findings. The deformation analysis performed as part of IGES's study used the average value (0.44g) in the deformation assessment.

The internal friction angle of the reinforced GCL liner and the interface friction angle of the GCL to the textured polyethylene liner were also reviewed. Bingham Environmental had compiled relatively extensive test results pertaining to parameters for the Bentomat ST product. These parameters are consistent with information obtained by IGES for the same product. This information is summarized below:

SHEAR STRENGTH DATA OF BENTOMAT ST AS A FUNCTION OF OVERBURDEN*		
OVERBURDEN STRESS (psf)	INTERNAL FRICTION ANGLE (degrees)	COHESION (psf)
<3000	34.9	280
>3000	24.5	450

* These values are an average of direct shear test data on hydrated bentonite.

INTERFACE SHEAR STRENGTH DATA OF BENTOMAT ST AGAINST A TEXTURED POLYETHYLENE LINER AS A FUNCTION OF OVERBURDEN*		
OVERBURDEN STRESS (psf)	INTERNAL FRICTION ANGLE (degrees)	COHESION (psf)
<1200	29.5	25
>1200	17.6	200

* These values are an average of direct shear test data on hydrated bentonite.

Bingham Environmental, Inc., used these values to analyze a shear failure within the geosynthetic clay liner (GCL) and along the interface using an infinite slope analysis. Based on a review of their analysis, IGES confirmed their factor of safety of 1.7 on a 3H:1V liner slope under low confining pressures.

IGES previously evaluated the interface between a textured polyethylene liner and a geonet (drain net) composite, which consists of a standard geonet sandwiched between two non-woven geotextile fabrics. An interface friction angle of 27 degrees was obtained from the manufacturer and was used in our slope stability evaluation. Using an infinite slope analysis, a factor of safety of 1.52 was obtained. Based on this evaluation IGES anticipates the interface to be stable under static conditions.

Previous studies performed by Weston and Bingham Environmental also contained a deformation evaluation of the landfill. Based on their findings, a yield acceleration of 0.29g or greater predicted a displacement of one foot or less. Per EPA guidance documents, a maximum permissible displacement of one foot is considered acceptable for liners and caps.

IGES also was retained to complete a pseudo-static analysis and determine the yield accelerations for the proposed sections (Phase IV Liner and Stage A and C Covers). Yield

accelerations for these sections ranged from 0.35 to 0.45. These yield accelerations were normalized by the anticipated average attenuated ground motion to obtain estimates of slope deformation. These normalized values were multiplied by an amplification factor to account for the increase in horizontal acceleration as the ground motion propagated up through the landfill slopes. Singh and Sun (2000) recommend using the amplification relationship given by Harder (1991) as an upper bound estimate for the seismic response of landfills. Using this relationship an amplification factor of 1.6 was obtained. This value was used to scale the normalized accelerations and the anticipated permanent displacements were obtained using the upper bound curve given by Hynes-Griffin and Franklin (1984). Based on this analysis, IGES anticipates permanent deformations less than 1.0 foot. The results of the deformation analysis are summarized below. Output for the analyses, including plots of the most critical failure yield acceleration and sliding surfaces are given in Appendix S.

PSEUDO-STATIC CONDITIONS					
SECTION	CONDITION	YIELD ACCELERATION (g)	AMPLIFICATION FACTOR	ANTICIPATED PERMANENT DISPLACEMENT (ft)	
				Upper bound	Lower bound
Phase Liners	Global stability with liner	0.35	1.6	0.7	0.2
Stage A Cover	Global stability with liner and cover	0.45	1.6	0.5	0.1
Stage C Cover	Global stability with liner and cover	0.41	1.6	0.6	0.2

Based on IGES's evaluation, the interface was stable under static conditions and the deformations associated with seismic event are anticipated to be less than 1.0 foot.

IIc.13. Design and Location of Run-On and Run-Off Control Systems

Design and location of run-on and run-off control systems are shown in Appendix F and a copy of the Storm Water Pollution Prevention Plan is contained in Appendix G.

Attachment #2
Operations Plan

I.d. OPERATIONS PLAN

On October 9, 1991, the U.S. Environmental Protection Agency (EPA) announced revisions to the Criteria for Classification of Solid Waste Disposal Facilities. These revisions were developed in response to Subtitle D of the 1984 Hazardous Waste Amendments to the Resource Conservation and Recovery Act (RCRA). The Subtitle D regulations set forth revised minimum federal criteria for Municipal Solid Waste Landfills (MSWLFs), including facility design and operating criteria. The Subtitle D regulations set forth differing requirements for existing and new units (e.g., existing units are not required to remove wastes to install liners).

Subtitle D established a framework for federal, state, and local government cooperation in controlling the management of non-hazardous solid waste. The federal role in this arrangement is to establish the regulatory direction by providing minimum nationwide standards for protection of human health and the environment and by providing technical assistance to States for planning and developing their own environmentally sound waste management practices. However, the actual planning, direct implementation, and enforcement of solid waste programs under Subtitle D remains largely a state and local function.

On November 5, 1995, the State of Utah Department of Environmental Quality (UDEQ) issued final Administrative Rules entitled Solid Waste Permitting and Management Rules (R315-301 through 320) implementing Subtitle D at the state level. UDEQ has received authorization from EPA to implement and enforce the solid waste program.

Wasatch has prepared this Landfill Operations Plan to guide the daily operations at the Davis Landfill. This document provides substantial discussion of operations at the landfill based on the operating criteria outlined in 40 CFR 258, Subpart C, and State of Utah Administrative Rules R315-301 through 310.

Portions of this Operations Plan are subdivided into separate discussions of the unlined landfill cell and the lined landfill cell. Since the unlined landfill accepted waste after October 9, 1993, its closure and post-closure care must follow more stringent state and federal regulations than those facilities which were closed prior to October 9, 1993. Subtitle D regulations apply fully to the lined landfill cell. Where separate discussions are made, the regulations differ regarding the required design, operation, or closure between the unlined and lined facilities.

I.d.1 Onsite Waste Handling

A waste control program designed to detect and deter attempts to dispose of hazardous and other unacceptable wastes will continue to be implemented at the Davis Landfill. The program is designed to protect the health and safety of employees, customers, and the general public, as well as to protect against contamination of the environment.

The Davis Landfill is open to the general public and commercial haulers for solid waste disposal typically Monday through Saturday from 7:00 a.m. to 5:00 p.m. (6:00 p.m. in summer), year-

round, excluding holidays. During special events (flooding, windstorms, etc.) the landfill can change hours under the consent of management. Wasatch controls public access to the landfill to prevent illegal dumping of wastes, public exposure to hazards, scavenging, and unauthorized traffic. Access control is a key element in preventing unauthorized scavenging or injury. Fences, locked gates, and natural barriers provide the basis of the site's access control system. During operating hours, Wasatch personnel monitor and control all access to facilities with at least two people on-site, one of which is at the active face.

The Davis Landfill is open for public and private disposal. Signs posted near the landfill entrance clearly indicate (1) name of facility; (2) hours of operation, (3) unacceptable waste; and (3) emergency contact telephone number.

All vehicles delivering wastes to the site must stop at the scale house. Commercial waste haulers are required to comply with the rules established by Wasatch and can lose the right to use their facilities if they violate the rules. Scale house personnel will obtain a weight and inquire as to the origins of the waste and the contents of each incoming load. Any vehicle suspected of carrying unacceptable materials (liquid waste, sludges, or hazardous waste) will be prevented from entering the disposal site unless the driver can provide evidence that the waste is acceptable for disposal at the site. Wasatch reserves the right to refuse service to any suspect load. Vehicles carrying unacceptable materials will be required to exit the site without discharging their loads. If a load is suspected of containing unacceptable materials, the following information will be recorded: date, time, name of the hauler, license plate, and source of waste. The scale house will then notify the tipping area attendants by radio that a load is suspect and that load will be further inspected at the landfill tipping area before final disposal is allowed.

After a vehicle leaves the scale house, the vehicle will be routed to the appropriate discharge location by site personnel. Loads will be regularly surveyed at the tipping area. If a discharged load contains inappropriate or unacceptable material, the discharger will be required to reload the material and remove it from the landfill site. If the discharger is not immediately identified, the area where the unacceptable material was discharged will be cordoned off if necessary. The unacceptable material will be moved to a designated area for identification and preparation for proper disposal.

The scale house ticket and other forms needed for the daily operating record are found in Appendix D.

I.d.2 Inspection Schedule

Groundwater	
Lined Landfill	Semi-annual
Unlined Landfill	Quarterly
Surface Water Drainage System	Quarterly
Leachate Collection Operation	Quarterly
Landfill Gas	Quarterly

Examples of the forms that will be used to record the results of the inspections and monitoring are found in Appendix E. The inspections are discussed in greater detail as follows.

I.d.2.A Groundwater

Wasatch will continue to monitor groundwater in conformance with Ground Water Quality Standards of the DWMRC, Administrative Rules, Section R315-308. Groundwater sampling, analysis and statistical evaluation are done in strict accordance with the approved groundwater monitoring plan. Currently, the groundwater monitor well network for the lined landfill is in detection monitoring and is sampled on a semi-annual basis. The groundwater monitor well network for the unlined landfill cell is currently in assessment monitoring and is sampled in accordance to R315-308.

I.d.2.B Surface Water

Drawings in Appendix F illustrate the location of the surface water drainage control system designed to incorporate both existing topographical features as well as changes to the overall site layout. A copy of the Storm Water Pollutions Prevention Plan is attached in Appendix G. Wasatch staff will inspect the drainage system no less than quarterly. Wasatch or a licensed general contractor will repair drainage facilities as required.

I.d.2.C Leachate Collection

The leachate collection and recovery system (LCRS), installed in the lined landfill, must be maintained so that it operates during the post-closure maintenance period. The operation of the system will be observed no less than quarterly by Wasatch staff. Wasatch or a licensed contractor will make repairs as required. Cleanouts have been provided to aid Wasatch in maintaining continuous flow. The location and distance to cleanout ports have been designed to facilitate inspection and cleaning operations.

I.d.2.D Landfill Gas

Explosive Landfill Gas Monitoring Plan (Plan) for the Davis Landfill is attach in Appendix H. The landfill gas collection system will be inspected no less than quarterly according to those specifications and parameters listed in Utah Administrative Rules R315-303-2, Standards for Performance. The system will be inspected and maintained to ensure system capabilities throughout operations and the post-closure maintenance period.

I.d.2.F Inspection Documentation

The results of all routine inspections of site facilities will be recorded on inspection forms. The inspection forms will be submitted to the Landfill Manager for inclusion in the landfill operating records as required in Section R315-302-2(5) of the Utah Administrative Rules. Examples of forms utilized in the documentation of the landfill operations are included in Appendix D. Davis Landfill will maintain and keep, on-site the following permanent records:

1. A daily operating record, that includes: the weights and type of received, the number of vehicles.
2. Any deviations from the approved plan of operation.
3. Training and notification procedures.
4. The results of ground water, leachate, gas, and other environmental monitoring.
5. All inspection logs.

I.d.3 Contingency Plans

Contingency operations will be implemented should specific or unusual situations occur. The following subsections discuss such contingencies as fire, explosion, release of explosive gases, and failure of run-off containment. The Landfill Manager has a cellular phone and radio which serve as the on-site mobile communications system for use in an emergency to communicate with the management offices and off-site personnel. Additional available communication is the telephone located in the scale house, which will serve as the back-up communication system.

Emergency Action Plan

Wasatch will follow the procedures in the Emergency Action Plan Attached in Appendix I. The following procedures will be initiated when conditions become evident or as notification is received.

a. Fire.
b. Explosion.
c. Trauma/Medical Emergency.
d. Hazardous Material Release.
e. Earthquake.
f. Severe Weather.
g. Violent or Criminal Activity/Behavior.
h. Bomb Threat.
i. Civil Disturbance/Demonstration.
j. Military/Commercial Downed Aircraft.

A. Fire

Wasatch policies and procedures require that all persons in a facility evacuate that facility any time the fire alarm is activated. Wasatch protocol for response to a general fire is as follows:

a. Activate the nearest fire alarm.

b. If alarm is not available - notify via voice, radio, or phone paging system.
c. Consideration for use of a fire extinguisher:
   i. Fire is small – containing no explosives or flammable liquids.
   ii. Have a clear escape route away from fire source.
   iii. Have been trained in use of extinguisher.
   iv. Have confidence in skill to use an extinguisher.
d Leave facility by designated escape routes:
   i. Don't run.
   ii. Do not use elevators – use clear stairways.
   iii. Close doors when all personnel have cleared area.
   iv. Assist others in need of evacuation help.
e. Assemble in designated evacuation points to await head count.
f. Notify Evacuation Point Contact of any processes that were left on or are of a critical nature.
g. Do not re-enter facility until instructed.

Evacuation for Personnel Requiring Assistance and Disability Guidelines

Persons with a special need for assistance during an evacuation should inform another person that assistance may be required during an evacuation; a survey identifying this need will be conducted on an annual basis and results will be kept on file at the Wasatch Safety/Training and Human Resources office with information to be disseminated to designated on a need to know basis.

- Buddy System Option
  When a fire alarm sounds or an evacuation is ordered, the "buddy" or designated assistant will make sure of the location of the person requiring assistance, then go outside and inform emergency personnel that a person in that location needs assistance living the building. Emergency personnel will then enter the building and evacuate that person.
- Vertical (Stairway) Evacuation
  Persons with sight disabilities may require the assistance of a sighted person. Persons who must use crutches or other devices as walking aids will need to use their own discretion, especially where several flights of stairs maybe present.
- Mobility Impaired (Wheelchair)
  Persons using wheelchairs should evacuate horizontally to evacuation points. If the person with disability is alone and unable to evacuate unassisted, they should phone 911 and give their present location, need of assistance, or area which they are headed.
- Mobility Impaired (Non-Wheelchair)
  Persons with mobility impairments, who are able to walk independently, may be able to negotiate stairs in an emergency with minor assistance. If there is no immediate danger, the person with disability may choose to stay in building, using other options, or until emergency personnel arrive.
- Hearing Impaired
  Most facilities are equipped with fire alarm horns/bells/strobe lights that sound the alarm and flash lights. The lights are for hearing impaired persons.
- Visually Impaired

Most Facilities are equipped with fire alarm horns/bells/strobe lights that sound the alarm and flash lights. The horn is for sight impaired persons. People who are visually impaired may need assistance evacuating facilities. Personnel assisting visually impaired persons should offer to guide them to the evacuation point.

Landfill Operations

The Site foreman or designated Operator/Lead is the designated Incident Commander (IC) in the event of a fire emergency and will conduct the following fire response:

i. Landfill face: isolate from other waste, push dirt over, smother fire, or call for water truck and suppress with minimum amount of water.
ii. Landfill brush: push dirt over, smother fire, call for water truck, or call 911 request a Fire Department Brush Truck.
iii. Landfill General Response, Citizen Drop-Off Pad, and Green Waste Facility.

Warm Weather:

- Notify Foreman and/or other operators by radio.
- Use on board fire extinguisher to initially contain propagation of fire.
- Water Pull Tanker will be brought to the scene to extinguish fire – both are to take the higher ground.
- attack posture.
- Tow canister to open area to allow to burn out or continue to extinguish.
- Having proper PPE donned, open door of canister; finish suppression with Water Pull Tanker and/or Excavator – to pull out contents and expose flames/hotspots.

Cold Weather:

- Notify Foreman and/or other operators by radio.
- Use on board fire extinguisher to initially contain propagation of fire.
- Front End Loader to obtain a bucket of dirt to be brought to the scene to extinguish fire. Both are to take the higher ground attack posture.
- Water Pull Tanker is to be filled with water from the Machine shop southwest fire hydrant by using the fire hose stored in cabinet directly outside of Machine shop's south-east bay.
- During Water Pull Tanker preparation, tow canister to open area and either allow fire to burn out or continue to extinguish. Having proper PPE donned, open door of canister; finish suppression with Water Pull Tanker – water.
- Front End Loader – dirt, and/or Excavator – to pull out contents and expose flames/hotspots.

iv. Equipment Fire: Notify Foreman and/or other operators by radio: use on board fire extinguisher. For your knowledge, there is no motor compartment suppression unit on equipment.
v. Administration Building: Evacuate building and call 911.

Emergency Gathering Points

Davis Landfill:

Administrative office and Machine Shop emergency evacuation assembly points are: West side of the Main Building – at posted Evacuation sign - Parking lot and East side of shop building – on berm.

Personnel are to remain in area until both area supervision and Safety verify an accurate head count.

Immediately following any fire, the following protocol will be followed:

Facility Building:

- All fire protection systems/equipment will be replaced and/or reset, fused sprinkler heads replaced.
- Lead Operator will secure the scene by cordoning off effected area with barrier tape or other appropriate media to restrict unauthorized traffic into area.
- Lead Operator, Safety, Maintenance Supervisor, and Landfill Management will constitute the initial investigation team and will be notified within the first hour and convened within the first two hours following the incident
- Accurate documentation of the event to include, but not limited to, circumstances, scene location, probable cause, equipment involved, personnel involved, detailed documentation of injuries, associated deaths, dismemberments, estimation of damage with estimation of associated cost, witness statements, machinery instrument logs, computer data history, digital imagery or equivalent technology.
- Site Foreman, Safety, Purchasing Manager, Landfill Management, and Wasatch Management will formulate a written salvage operation plan based on the documented findings of the initial investigation team.
- Immediate notification of State Fire Marshall Office if incident is suspected to be suspicious in nature.
- Immediate notification of State Medical Examiner Office if incident involves loss of life.
- Notification of insurance courier will occur during the initial 8 hours of the event.
- Notification requirements of Occupational Safety and Health Administration (OSHA)

  Within 8 hours after death of any employee as a result of a work-related incident.

  Within 24 hours after the in-patient hospitalization of one or more employees or an employee's amputation or an employee's loss of an eye, as a result of a work-related incident.
- Special Procedures – Landfill Active Face Refuse Fire – Do Not use water, Dirt must be used to smother the fire.
- Special Procedures – Landfill Foliage Fire – Call 911- Use water and earth moving equipment to extinguish.

B. Explosion

In the event a mishap occurs such as an explosion at the facilities, take the following actions:

a. Immediately take cover under tables, desk, and other objects that will give protection against falling glass or debris.
b. After the effects of the explosion and/or fire have subsided, notify Layton City Police or Davis County Sheriff Bomb Technician at 911; give your name and describe the location and nature of the emergency.
c. If necessary, or when directed to do so, activate the building alarm.
d. When the building evacuation alarm is sounded or when told to leave by Wasatch Management or designate, walk quickly to the nearest marked exit and ask others to do the same.
e. Assist the handicapped in exiting the building, do not use elevators in case of fire and/or potential for power loss, do not panic or create panic in other.
f. Once outside, move to a clear area that is at least 1000 feet away from the affected building, keep streets and walkways clear for emergency vehicles and crews, know your assembly points.
g. If requested, assist Emergency crews as necessary.
h. Do not return to an evacuated building unless told to do so by an authorized Wasatch Management or designate.

<u>Explosive/Pipe Bombs</u>

If unscheduled waste articles, such as ammunition, explosives, pipe bombs, etc., that are brought into or discovered at the facilities, take the following actions:

Explosives/Pipe Bombs:

a. Don't disturb the material/substance and notify Facility Supervision/Management or Wasatch Safety: NOTE – Do Not use Cellular Phone or Radio and No Smoking in the same area as the material/ substance.
b. Evacuate area or deny entry to transient personnel to a distance of 100 yards in all directions.
c. Cordon off immediate area with cones or tape.
d. Record description of article/material substance, e.g., type of container, material color, any oily/dusty appearance on container, etc.
e. Facility Supervision/Management or Wasatch Safety will notify law enforcement at 911 and report the following:
    i. A suspicious article has been found at –Wasatch Integrated Waste Management District facilities, give name of person reporting, give address of facility, give contact phone number (Do Not Hang up until told to do so).
    ii. Request On-Call Bomb Technician and other appropriate units to respond.

<u>Ammunitions</u>

As general policy, ammunition, explosives, gun powder and like substances are not to be left at the facilities; however, if said material is discovered during waste screening or during the disposal process the following actions will be taken:

Ammunition Container/Casing Material (Stable/Good Shape)

a. Take and secure ammunition in cool dry place.
b. Notify Facility Supervision/Management or Wasatch Safety.

Ammunition Container/Casing Material (Unstable/Poor, Questionable Shape)

a. Don't disturb the material/substance and notify Facility Supervision/Management or Wasatch Safety: NOTE – Do Not use Cellular Phone or Radio and No Smoking in the same area as the material/ substance.
b. Evacuate area denying entry to transient personnel a distance of 100 yards in all directions.
c. Cordon off immediate area with cones or tape.
d. Record description of article/material substance, e.g., type of container, material color, any oily/dusty appearance on container, etc.

Military/Commercial Aircraft Crash

In the event a downed aircraft (crash) on facility property, take the following actions:

a. Immediately take cover by/under objects that will give protection against falling glass or debris.
b. After the effects of the crash have subsided, notify 911; give your name and describe the location and nature of the emergency.
c. If required to evacuate facilities, assist the handicapped in exiting the building, do not use elevators in case of fire and/or potential for power loss, do not panic.
d. Once outside, move to a clear area that is at least 1000 feet away from the affected area. Keep streets and walkways clear for emergency vehicles and crews. Know your assembly points.
e. Do not touch any debris, e.g., cargo, armament, ammunition, fuselage parts, nuts, bolts, equipment, etc., that potentially was from the craft.
f. Do not use water to control fire stemming from crash site, use ABC fire extinguishers, foam fog, or dirt/sand.
g. If requested, assist Emergency crews as necessary.
h. Keep clear of the disaster site unless your services have been requested.
i. Do not return to an evacuated building or area unless told to do so by a by an authorized Wasatch Management or designate.

C. Trauma or Medical Emergency

In the event of a trauma/medical emergency, the first person to respond will:

a. Take the appropriate measure to notify the proper contact point (DERF - Control Room: Davis Landfill – scale house).
b. By declaring an emergency either by phone or Wasatch facility radio; if contact is by radio, "Emergency, Emergency, Emergency" will be stated; all other radio traffic will yield to declared emergency, name of person declaring, location of incident, what the problem is, type of assistance required will be transmitted.
c. Wasatch Emergency Response will consist of:

i. Shift Engineer/Site Foreman, Emergency Medical Technician (EMT) or First Responders will report to incident scene with trauma/medical kit and automated external defibrillator (if required).
ii. Shift Engineer/Site Foreman, first person to respond, First Responder, or EMT will request rescue or ambulance upon assessment findings.
iii. Basic first aid, cardiopulmonary resuscitation (CPR), or use of automated external defibrillator (AED) procedures will be initiated based on assessment findings.
iv. Upon arrival of Municipal or County Emergency Response Personnel, patient care and all relevant patient information will be transferred to the responding agency.
v. Any equipment or supplies will be restocked or replaced after the event.

d. The appropriate facility supervision or Wasatch Safety/Training Coordinator will transmit an "All Clear/Return to Operational Status" message over the radio to indicate return to normal operations after the incident.
e. Accurate documentation of the event to include, but not limited to, circumstances, scene location, probable cause, equipment involved, personnel involved, detailed documentation of injuries, associated deaths, dismemberments, estimation of damage with estimation of associated cost, witness statements, instrument logs, computer data history, digital imagery or equivalent technology.
f. Site Foreman, Safety, Purchasing Manager, Landfill Management, and Wasatch Management will formulate a written salvage operation plan based on the documented findings of the initial investigation team.
g. Immediate notification of local law enforcement if incident is suspected to be suspicious in nature.
h. Immediate notification of State Medical Examiner Office if incident involves loss of life
i. Immediate notification to OSHA if incident involves a fatality within 8 hours of the event.
   - 801-530-6901
j. Notification of insurance courier will occur during the initial 8 hours of the event.

D. Hazardous Material Release

General Response

In the event of a hazardous material release, consideration to the following must be given priority:

a. Consult product material safety data sheet information before proceeding to any type of remedial action.
b. Safety of employee, i.e., employee shall be properly trained to handle hazardous material release, possess and use proper personal protective equipment, have adequate assistance – manpower and material to remediate the situation.
c. All efforts will be taken to contain the spill as soon as it occurs: the use of blue absorbent clothes, speedy dry, or other approved absorbent material; also, sand and dirt dams may be utilized.
d. Consideration of additional hazardous material resources.
   i. Davis County Health Department – 1(801) 451-3296
   ii. North Davis Sewer District – 1(801) 825-0712

(J.E. Macfarlane – 1(801) 430-3286)

iii. Layton City Fire Department – HAZMAT Response - 911

Davis Landfill - Acid/Caustic Release

a. Upon recognition of either acid or caustic release – appearance of white cloud, stinging of the eyes, throat, burning sensation upon inhalation – immediately notify other personnel in area and isolate section with safety cones or block entry with equipment.
b. Notify scale house, site foreman, facility management, and/or Safety of situation by phone, radio, or verbally.
c. Do Not re-enter area. Allow entry only to those properly trained and wearing appropriate level of personal protective equipment, and with adequate manpower and remediation material to handle the situation.
d. Consult product material safety data sheet information before proceeding further – if product is known.
e. Take appropriate action to contain the spread of material by diking with dirt, sand, mulch or similar material.
f. Determine if material is acidic or caustic by means of litmus indicator paper. Use appropriate neutralizing agent to bring material to a pH of ~7.0 (neutral). When material is neutralized, push material into canister.
i. Wash down concrete surface with copious amount of water and then determine if surface requires further decontamination by means of litmus indicator paper.
j. Properly decontaminate personnel, equipment, and tooling.
k. If amount of material overwhelms Wasatch resources immediately contact Layton City Fire Department-HAZMAT Response and Davis County Health Department.

Davis Landfill - Diesel Fuel

a. In the event of a fuel spill — immediately notify other personnel in area of the hazard and extinguish all sources of ignition.
b. Notify Site Foreman of situation by phone, radio, or verbally.
c. Do Not re-enter and deny entry into area unless properly trained, have and donned appropriate level of personal protective equipment, have adequate manpower and remediation material.
d. Consult product material safety data sheet information before proceeding further.
e. All efforts will be taken to contain the spill as soon as it occurs: the use of blue absorbent clothes, speedy dry, or other approved absorbent material; also, sand and dirt dams may be utilized.
f. After spilt fuel is contained and absorbed, cleanup will consist of shoveling fuel laden absorbent into containers for disposal in trash pit or landfill and an application of a layer of fresh absorbent to surface dry effected area – to be cleaned up after reasonable amount of time.
g. Request additional resources if not able to contain the spill due to lack of manpower or materials.

Davis Landfill - Lubricant/Hydrocarbon Base Material

a. Upon recognition of lubricant release – immediately notify other personnel in area and extinguish all sources of ignition.
b. Notify Site Foreman of situation by phone, radio, or verbally.
c. Do Not re-enter and deny entry into area unless properly trained, have and donned appropriate level of personal protective equipment, have adequate manpower and remediation material.
d. Consult product material safety data sheet information before proceeding further.
e. Every effort must be taken to contain the spill as soon as it occurs: the use of blue absorbent clothes, speedy dry, or other approved absorbent material; also, sand and dirt dams may be utilized.
f. After spilt lubricant is contained and absorbed, cleanup will consist of shoveling fuel laden absorbent into containers for disposal in trash pit or landfill and an application of a layer of fresh absorbent to surface dry effected area – to be cleaned up after reasonable amount of time.
g. Consideration to request additional resources if not able to contain nor possessing adequate amount of manpower or materials.

E. Earthquake

During an earthquake, remain calm and quickly follow the steps outlined below:

a. If INDOORS, seek refuge in a doorway or under a desk or table. Stay away from glass windows.
b. If OUTDOORS, move quickly away from buildings, utility poles, electrical generators, bulk fuel storage tanks, and other structures. CAUTION: Always avoid power or utility lines as they may be energized.
c. If in an automobile, heavy equipment, large trucks, stop in the safest place available, preferably away from power lines and trees. Stop as quickly as safety permits, but stay in your vehicle for it offers shelter.
d. After the initial shock, evaluate the situation and if emergency help is needed, call Wasatch Administrative Office or Wasatch Safety. Protect yourself always and be prepared for aftershocks.
e. Damaged facilities should be reported to Wasatch Administrative Office or Wasatch Safety. NOTE: Gas leaks and power failures create specific hazards.

If an emergency exists, activate the building alarm, and evacuate to assembly areas.

F. Severe Weather

The Wasatch Executive Director, applicable facility management, Wasatch Safety, or designate will monitor the National Weather Service radio and will initiate notifications when severe weather bulletins are issued for the immediate area:

1) Tornado/Thunderstorm/Wind Watch—indicates that atmospheric conditions are conducive for the development of the stated warning. Normal operations will continue. Employees should keep a close eye on changing weather conditions and be prepared to act if necessary.
2) Tornado/Thunderstorm/Wind Warning—indicates that the hazardous condition stated has been spotted or identified on radar. When these conditions immediately threaten

the Wasatch facilities, the Wasatch Executive Director, applicable facility management, Wasatch Safety, or designate will issue notification through e-mail messages and/or telephone communications to the respective Wasatch facility management/supervision.

i) NOTE: Hazardous weather conditions can develop in seconds and will not allow for formal means of communication. In the event an employee feels that weather is immediately threatening, they will initiate the following actions:
   a) TAKE COVER. Instruct employees and others nearby to a wall near the interior of the building away from windows and exterior doors. Individuals should curl up in a "ball" or fetal position, place their hands over their head and remain in that position until the severe weather passes.
   b) Landfill Operations: if in an open area - seek the lowest surface point possible, avoid berm ridges, high spots, touching metal, seek surface depressions, e.g., irrigation ditch, culvert, etc.

      (1) DO NOT LEAVE THE BUILDING OR INITIATE A BUILDING EVACUATION DURING THESE CIRCUMSTANCES. WHEN SEVERE WEATHER STRIKES, POWER MAY BE INTERRUPTED CAUSING ALARMS TO SOUND. IF FIRE IS NOT IMMEDIATELY PRESENT AND A CLEAR EXIT IS MAINTAINED, EVERYONE SHOULD REMAIN UNTIL THE SEVERE WEATHER PASSES.

3) Snow, Ice, Or Flooding

Snow, ice and/or flood can make travel to and from Wasatch facilities hazardous. When the potential or conditions develop that would make travel to and from the facilities a hazard, the following steps will be followed:

i. Wasatch facilities, the Wasatch Executive Director, applicable facility management, Wasatch Safety, or designate will monitor the National Weather Service broadcasts, local reports, and/or contact the Utah Highway Patrol or Utah Department of Transportation Website for road condition updates. Upon receipt of information that would make travel hazardous, the appropriate level of management will be contacted.
ii. If weather conditions threaten Wasatch operations, the Executive Director will determine if Wasatch operations are to be suspended. If they are to be suspended, proper level of management will be notified.

4) Emergency Closing Information

In the event of weather conditions that might cause any interruption in work flow or events at Wasatch facilities, personnel and staff are advised to contact their respective Facility Manager, Wasatch Safety/Training Coordinator, Scale Manager, or Wasatch Executive for reports on operation status:

Wasatch Human Resource Office and Safety will serve as the primary source of information for Wasatch Operations status during inclement weather, and will be contacted first by the Wasatch Executive Director.

Among the actions that might be taken by Wasatch are:

1. Closure of Wasatch facilities.
2. Delay opening the Wasatch facility operations.
3. Remain open with no changes in schedule.

If inclement weather conditions occur overnight, the decision to close or remain open will be made as soon as possible, ideally prior to 5 a.m., and will be communicated to the Wasatch points of contact as soon as possible.

If weather conditions that may affect the operation occur during normal hours of operation (7 a.m. to 5/7 p.m., Monday through Saturday), the decision will be communicated on the effected facility via the points of contact as noted above.

G. Violent or Criminal Activity

Immediately contact Layton City Police or Davis County Sheriff Department by telephoning 911 if hostile or violent behavior, actual or potential, is witnessed.

a. Initiate immediate contact with law enforcement to ensure that a timely response has begun before a situation becomes uncontrollable.
b. Leave the immediate area whenever possible and direct others to do so.
c. Should gunfire or an explosion occur on the facilities, seek protective cover immediately using all available concealments. Close and lock doors when possible to separate yourself and others from the armed suspect or perpetrator.
d. Hostage Situation:
   If taken hostage:
   i. Be patient, time is on your side, avoid drastic action.
   ii. The initial 45 minutes are the most dangerous, follow instructions, be alert, and stay alive; captors are emotionally unbalanced, don't make mistakes that could jeopardize your wellbeing.
   iii. Don't speak unless spoken to and then only when necessary; don't talk down or attempt to rationalize with the captor; avoid appearing hostile; maintain eye contact with the captor always, if possible, but do not stare.
   iv. Try to rest, avoid speculating; comply with instructions as best as you can, avoid arguments; expect the unexpected, severe mood swings, irrational actions, etc.; displaying a certain amount of fear can possibly work to your advantage.
   v. Do not make quick or sudden moves; if you must go to the bathroom, need medications, or first aid, ask your captors.
   vi. Be observant, when you are released, or if you escape, the personal safety of others may depend on what details you remember about the situation.

<u>Civil Disturbance or Demonstration</u>

Demonstrations will not be classified as disruptive unless one or more of the following conditions exist because of the demonstration.

a. Interference with normal operations of the Wasatch.

b. Prevention of access to offices, buildings, or other Wasatch facilities.
c. Threat of physical harm to persons or damage to Wasatch facilities.

If any of these conditions exist, immediately contact local law enforcement.

Peaceful, Non-Obstructive Demonstration

a. Generally, demonstrations of this kind should not be interrupted, obstructed, or provoked and efforts should be made to conduct Wasatch business as normally as possible.
b. If demonstrators are asked to leave, but refuse to leave by regular facility closing time, arrangements will be made by the Wasatch Executive Director or designate to monitor the situation during non- business hours.
c. Determination will be made to treat the violation of regular closing hours as a disruptive demonstration.

Non-Violent, Disruptive Demonstrations

If a demonstration blocks access to the facility or interferes with the operation of the facilities:

a. Demonstrators will be asked to terminate the disruptive activity by respective Facility Manager, Wasatch Safety/Training Coordinator, Wasatch Executive Director or designate.
b. If deemed appropriate, digital images/photographs will be taken to document the proceedings.
c. Efforts should be made to secure positive identification (including photographs if deemed advisable) of demonstrators who are in violation to facilitate later testimony.
d. If court injunction is obtained, the demonstrators will be so informed. Those demonstrators who refuse to comply will be warned of the intention to arrest.
e. If the demonstrators persist in the disruptive activity, they will be advised that failure to discontinue the specified action within a determined length of time may result in law enforcement action. Except in extreme emergencies, the Wasatch Executive Director will be consulted before such actions are taken.

Violent Disruptive Demonstrations

During regular office hours:

a. Respective facility management, safety, Executive Director or designate, and law enforcement will be summoned to the scene.
b. Respective facility management, safety, Executive Director or designate will call for digital images or photographs to report to an advantageous location to photograph the demonstrators.

After Regular Office Hours

Respective facility management and safety will investigate the disruption and report findings to the Executive Director or designate.

The Executive Director or designate will:

Notify key Board Administrators.

NOTE: The Facility Management, Wasatch Safety or the respective on-duty Facility Supervision reserves the right to order law enforcement intervention without counsel from others if it is deemed to be of paramount importance to the safety and security of persons and/or property.

H. Bomb Threat

Wasatch does not require employees to place themselves nor fellow employees in danger by searching for suspicious materials or reported placement of explosives; however, it is required for employees to perform the following functions prior to evacuating:

If you observe a suspicious object or potential bomb on campus, DO NOT HANDLE THE OBJECT! Clear the area immediately and call Public Safety. Any person receiving a bomb threat by telephone should attempt to ask the caller:

When is the bomb going to explode?
Where is the bomb located?
What kind of bomb is it?
What does it look like?
Why did you place the bomb?
What is your name?

Normally the caller will not answer these questions, but may make comments. During this time, the person answering the phone should attempt to listen to background noises, the accent of the caller, or gather any information from noises of sounds heard during the conversation.

Keep talking to the caller if possible and record the following:

Time of call
Age and sex of caller
Speech pattern, accent, possible nationality, etc.
Emotional state of caller, e.g., angry, frantic, calm, etc.
Background noise.

Report the incident immediately to law enforcement, on-duty supervisor, Wasatch Safety, respective Facility Management who will notify the Executive Director and Scale Manager.

A decision will be made between the person in charge of the area, Wasatch Safety, and respective Facility Management as to whether the building or area will be evacuated.

EVACUATION ORDERED - The responding law enforcement departments will conduct a search of the area. Wasatch employees in the affected area will be required to evacuate and re-group at the evacuation assembly points.

EVACUATION NOT ORDERED - The responding law enforcement departments, in concert with employees in the affected area, may be required to conduct a Covert Search. Employees will be asked to discreetly check their immediate work areas for any suspicious packages, devices, etc.

Bomb/Suspicious Device/Package Located
Wasatch Safety, respective Facility Management or designate will order the immediate evacuation of the area.
TWO-WAY RADIOS, CELL PHONES OR OTHER ELECTRONIC COMMUNICATION DEVICES WILL NOT BE USED WITHIN 1500 FEET OF THE SUSPECTED DEVICE!

Law enforcement, Wasatch Executive Director immediately will be contacted as well as applicable members of the Emergency Action Board.

I.d.4 Groundwater Corrective Action Programs

Assessment Monitoring Program
This Assessment Monitoring Program (AMP) will continue to be utilized whenever a statistically significant contaminant concentration, with respect to background levels has been detected for one or more of the constituents listed in R315-308-4 that has an associated groundwater protection standard during detection monitoring. If Wasatch determines that there has been a statistically significant increase in a contaminant concentration with respect to background, Wasatch will:

- Notify DWMRC, in writing, within 14 days of the completion of the statistical analysis of the sample results and within 30 days of the receipt of the sample results within 14 days of obtaining laboratory results at:
  UDEQ - Division of Waste Management and Radiation Control
  195 North 1950 West
  Salt Lake City, Utah 84114-4880
- Identify the parameters that have shown statistically significant changes. This information will be included in the notification.
- Enter sampling analysis results into the operating record.
- Immediately re-sample the groundwater in all wells, or a subset of the wells as specified by the Director, for all constituents listed in R315-308 and determine whether a statistically significant change has occurred such that the groundwater protection level has been exceeded. If a statistically significant change has occurred, Wasatch will report the sample analysis results, in writing, within 7 days of their receipt to the above-noted address.

Wasatch may demonstrate that a source other than the solid waste disposal facility caused the contamination per R315-308. A demonstration report must be prepared by a qualified groundwater scientist and be approved by the Director. If approved, Wasatch may continue to monitor per the approved groundwater monitoring plan.

If, after 90 days, a demonstration has not been made that a source other than the facility caused the contamination, Wasatch will initiate the following:

- Within 14 days of the determination that a successful demonstration is not made, take one sample from each downgradient well and analyze for all constituents listed in Appendix II in 40 CFR Part 258, 20011991 edition.
- For any constituent from Appendix II, 40 CFR Part 258, detected in the downgradient wells, four samples from the up-gradient wells and four samples from the downgradient wells must be collected and statistically evaluated to establish background concentration levels for the constituents and analyzed to determine background levels.
- Within 14 days of the completion of the statistical analysis of the sample results and within 30 days of the receipt of the sample results, place a notice in the operation record and notify the Director in writing.
- Wasatch will then re-sample all wells on a quarterly basis for the constituents listed in R315-308 and the detected constituents from Appendix II of 40 CFR Part 258.
- Wasatch will also sample all downgradient wells on an annual basis for all 40 CFR Part 258 Appendix II constituents.

If, after two consecutive sampling events, the concentrations of all constituents are shown to be at or below established background levels, Wasatch must notify the Director, in writing, within 14 days. After which, upon approval by the Director, Wasatch may return to assessment monitoring under the approved groundwater monitoring plan.

If one or more of the constituents from R315-308-4 or Appendix II are detected at statistically significant levels above the groundwater protection standard in any sampling event, Wasatch must:

- Within 14 days of the receipt of this finding of this finding, notify the Director, the appropriate local governing agencies, and the local health department that groundwater quality standards have been exceeded.
- Place a notice in the operating record identifying the constituents that have exceeded the groundwater protection standard and their concentrations.
- Characterize the nature and extent of the release by installing additional monitoring wells, as necessary.
- Install at least one well on the downgradient property line and sample and analyze for constituents in R315-308 and the detected constituents from Appendix II.
- Notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site as indicated by sampling of wells.

If Wasatch can demonstrate that a source other than the solid waste disposal facility caused the contamination or that the statistically significant change resulted from error in sampling, analysis, statistical evaluation or groundwater quality, they may continue monitoring as specified in R315-308-2(12)(d) or Subsection R315-308-2(12)(e) when applicableR315-308. To demonstrate this, Wasatch must prepare a report that is certified by a qualified groundwater

scientist, must enter the report into the operating record, and must obtain approval of the report from the Director.

Corrective Action Program

If a successful demonstration per R315-308 has not been made within 90 days, indicating that a source other than the solid waste disposal facility may be the cause of contamination, a Corrective Action Program (CAP) (R315-308-3) will be required. The CAP requires Wasatch to:

- Continue to monitor as required in R315-308.
- Take any interim measures as required by the Director to ensure the protection of human health and the environment.
- Prepare a Corrective Action Plan to assess the current conditions and circumstances of the solid waste disposal facilities.
- Select a remedial action based on the Corrective Action Plan and public comments.
- Continue remedial action until Wasatch notifies the Director, in writing, that the contaminant concentrations have been reduced to levels below the established background concentrations for a period of 3 years or an approved alternative length of time. Wasatch and a qualified groundwater scientist must sign and certify the report demonstrating the successful completion of remedial action. Upon Director approval, Wasatch will terminate corrective action measures and continue to monitor per R315-308.

The Corrective Action Plan will address the following specific items at a minimum:

- Description of selected remedy.
- Time required to begin and complete the remedy.
- Cost of remedial action.
- Public health and environmental requirements that may substantially affect the implementation of the remedy.
- Comments from a public meeting held to discuss the corrective action.
- Performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control exposure to any residual contamination.

The Corrective Action Plan will be submitted within 14 days after the selection of a final remedy. Wasatch must:

- Amend the Corrective Action Plan, as necessary, and submit a report to the Director for approval describing the remedy and providing a schedule for implementation and estimated time of completion.
- Put into place the financial assurance mechanisms as required by R315-309 and notify the Director of the financial assurance mechanism and its effective date.

In selecting a remedy, Wasatch will consider:

- Nature and extent of contamination.
- Resource value of the groundwater.
- Long-term and short-term effectiveness and protectiveness of the remedy.
- Effectiveness of the remedy in controlling the source to reduce or eliminate further releases.
- Ease or difficulty of implementation.
- Practicable capability of owner or operator including technical or economic capability.
- Degree to which community concerns are addressed.
- Any other relevant factors.
- Attain the established ground water quality standard.

All possible remedies will be evaluated including the no-action alternatives. Evaluation of the technical and economic items listed above will be demonstrated to the satisfaction of the Director.

I.d.5 Release of Explosive Gases and Run Off System Failure

Release of Explosive Gases

If a release of explosive gases should occur at the landfill or in any structure associated with the landfill site:

- All personnel in the area, including those in surrounding buildings, will be evacuated immediately. In addition, site equipment will be moved away from the scene, if possible.
- All landfill personnel will be accounted for.
- Local emergency personnel (fire, police) will be contacted and informed of the situation.
- The Landfill Manager will be informed of the situation.
- The release area and surrounding area will be monitored with a combustible gas indicator (CGI) by landfill personnel and readings documented for placement into the operating record.
- The release area will be restricted to both landfill personnel and residents until cleared for re-entry by local emergency personnel.
- Fire prevention precautions will be taken throughout the entire emergency response operation.
- Wasatch Executive Director will provide the necessary notices to the Director.
- Wasatch Executive Director or his designated representative will act as the Public Spokesman and will be the only employee authorized to make statements to the media.

Failure of Run-Off Containment

In the event of failure of the run-off containment system that has been designed to minimize the off-site release of surface water that contacts operational portions of the landfill:

- If containment failure is in an active fill area, landfill personnel will immediately suspend filling operations.

- Landfill personnel will use earth-moving equipment to construct temporary earthen berms to divert the flow of surface water away from the failure area and toward a holding area.
- The Landfill Manager will conduct damage assessment. If the damaged area cannot be reconstructed by on-site personnel, Wasatch will contact a contractor to initiate repairs.
- Wasatch Executive Director will provide the necessary notices to DWMRC.
- Wasatch Executive Director or his designated representative will act as the Public Spokesman and will be the only employee authorized to make statements to the media.

I.d.6 Fugitive Dust Plan

Wasatch's Fugitive Dust Control Plan (FDCP) was developed to minimize fugitive dust emissions at the Davis Landfill. This FDCP identifies control measures to be applied by Wasatch to minimize fugitive dust emissions resulting from operations at the Davis Landfill. This FDCP covers only those operations performed by Wasatch. The intent of this FDCP is to ensure compliance with the opacity standards specified in the Utah Air Quality Rules. Wasatch has identified control options for each operation, and these options have been ordered according to their ease of implementation and effectiveness. Level 1 describes the minimum level of control for each operation that will be used at a site. If Level 1 is not sufficient to meet the opacity standards, Level 2 controls will be applied. If Level 2 is not sufficient, Level 3 controls will be applied. Finally, if Level 3 is not sufficient, Level 4 controls will be applied (if they are available). For each operation, the final method of control is to stop operation until weather conditions allow the opacity standards to be maintained.

The requirements of an Approval Order (AO) take precedence over the control options of this FDCP.

<u>Material Handling (front-end loaders, etc.)</u>

Level 1	No action is required due to material constitution and weather conditions.
Level 2	Minimize drop heights and reduce operating speeds as necessary.
Level 3	Water and dust suppression sprays will be applied to the material prior to handling and transfer, as required.
Level 4	Operations will cease until weather conditions improve to the point that the opacity standards can be maintained.

<u>Unpaved Roads and Work Areas</u>

Level 1	Road surfaces will be adequately maintained.
Level 2	Water suppression sprays will be applied to the unpaved roads and work areas, as required. *Exceptions:* Water will not be applied to roads or work areas on days when the rainfall exceeds 0.10 inches, when the road or work areas are muddy, when the roads or work areas are covered with snow or ice, or when the temperature drops below freezing.

Level 3 Operators will reduce vehicle speeds, as required. Chemical dust suppression may be applied.

Level 4 Operations will cease until weather conditions improve to the point that the opacity standards can be maintained.

Paved Roads and Work Areas

Level 1 No action is required due to optimum weather and/or material conditions.

Level 2 The roads and work areas will be swept or flushed with water to remove material, as required. If large amounts of material get on the surfaces, to the point where a water spray would be inefficient, the material will be manually removed or a sweeper will be used. Transition Zones may be established.

Exceptions:

Water will not be applied when the roads or work areas are covered with snow or ice or when the temperature drops below freezing.

Level 3 Operators will reduce vehicle speeds, as required.

Level 4 Operations will cease until weather conditions improve to the point that the opacity standards can be maintained.

Exposed Surfaces

Level 1 No action required, due to material moisture content or weather conditions.

Level 2 Water suppression sprays will be applied to the surfaces, as required.

Level 3 Operations will cease until weather conditions improve to the point that the opacity standards can be maintained.

Earthmoving and Excavation

Level 1 No action required, due to material moisture content or weather conditions.

Level 2 Water suppression sprays will be applied to the material, and work areas as required.

Level 3 Operations will cease until weather conditions improve to the point that the opacity standards can be maintained.

Grading

Level 1 No action required, due to material moisture content or weather conditions.

Level 2 Water suppression sprays will be applied to the material, and work areas as required.

Level 3 Operations will cease until weather conditions improve to the point that the opacity standards can be maintained.

I.d.7 Litter Control Plan

The Landfill Manager will continue the ongoing litter collection program to minimize the impacts of litter on and surrounding the site. This program consists of various activities designed to reduce windblown litter, as well as other site features and operations that help to reduce windblown litter. Activities specifically designed to reduce amounts of windblown litter include minimizing the size of the active face, thereby reducing the area of wastes exposed to wind, and erecting temporary litter fences downwind from the active face. The height and length of the fences can be adjusted to maximize their effectiveness in trapping windblown litter.

Other features and operating techniques that reduce windblown litter include perimeter fencing around the landfill site to back up the temporary litter fences; applying daily and intermediate soil or ash cover; and compacting refuse layers at a maximum thickness of 2 feet to hold freshly deposited refuse to underlying landfill layers. Site and surrounding area inspections will be conducted routinely and any windblown litter found will be collected.

I.d.8 Installed Equipment Maintenance Plan

The following subsections offer a description of the maintenance of installed equipment including groundwater monitoring systems and leachate and gas collection systems.

Groundwater Monitoring System

All groundwater monitoring wells will be inspected for signs of failure or deterioration during each sampling event. If damage is discovered, the nature and extent of the problem will be recorded. A decision will be made to replace or repair the well. Possible repairs include pump repair or replacement, redevelopment, chemical treatment, partial casing replacement or repair, sealing the annulus, or pumping and testing. If a well needs to be replaced, it will be properly decommissioned. Damaged wells will be scheduled for repair or replacement.

Leachate Collection and Recovery System

The LCRS, installed as part of the lined landfill design, must be maintained so that it operates during the operational life and closure and post-closure period. The system will be inspected no less than quarterly by Wasatch staff for signs of deterioration. Wasatch or a licensed contractor will make required repairs. Cleanouts can be used to internally inspect the main collection pipe using in-line camera equipment. If necessary, these cleanouts can also be used to jet the pipe clean to re-establish flow.

Gas Monitoring System

The landfill gas monitoring system will be inspected no less than quarterly. The system will be repaired and parts replaced as required to maintain system capabilities. The program

described below for inspecting and maintaining the gas monitoring system will be followed during the post-closure maintenance period.

Preventive maintenance will be performed on all mechanical equipment at manufacturer-recommended intervals. These tasks include cleaning, lubrication, and replacement of worn parts.

I.d.9 Hazardous Waste Exclusion Plan

A waste control program designed to detect and deter attempts to dispose of hazardous and other unacceptable wastes will continue to be implemented at the Davis Landfill. The program is designed to protect the health and safety of employees, customers, and the general public, as well as to protect against contamination of the environment.

The Davis Landfill is open for public and private disposal. Signs posted near the landfill entrance clearly indicate (1) name of facility; (2) hours of operation, (3) unacceptable waste; and (3) emergency phone number.

All vehicles delivering wastes to the site must stop at the scale house. Commercial waste haulers are required to comply with the rules established by Wasatch and can lose the right to use the facilities if they violate these rules. Scale house personnel will inquire as to the contents and source location of each incoming load to screen for unacceptable materials. Any vehicle suspected of carrying unacceptable materials (liquid waste, sludges, or hazardous waste) will be prevented from entering the disposal site unless the driver can provide evidence that the waste is acceptable for disposal at the site. Wasatch reserves the right to refuse service to any suspect load. Vehicles carrying unacceptable materials will be required to exit the site without discharging their loads. If a load is suspected of containing unacceptable materials, the following information will be recorded: date, time, name of the hauler, license plate, and source of waste. The scale house will then notify the tipping area attendants by radio that a load is suspect and that load will be further inspected at the landfill tipping area before final disposal is allowed.

After a vehicle leaves the scale house, site personnel will route the vehicle to the appropriate discharge location. Loads will be regularly surveyed at the tipping area. If a discharged load contains inappropriate or unacceptable material, the discharger will be required to reload the material and remove it from the landfill facility. If the discharger is not immediately identified, the area where the unacceptable material was discharged will be cordoned off if necessary. The unacceptable material will be moved to a designated area for identification and preparation for proper disposal. If landfill personnel discover regulated hazardous or PCB waste, Wasatch will ensure that the wastes are treated, stored, or disposed of in accordance with Resource Conservation and Recovery Act, Toxic Substances Control Act, and/or applicable State of Utah requirements.

Wasatch will also conduct detailed inspections of loads delivered to the Davis Landfill. The detailed inspections will be conducted on a random basis designed to detect illegal or inadvertent

disposal of unacceptable wastes. Loads will be inspected at a frequency of no less than one load out of every 100 (1% of loads). The scale house attendant notifies the tipping face attendant and the driver of the selected load that an inspection of the load is required. The tipping face attendant will direct the driver to the proper location to dump the load and perform a detailed inspection of the contents.

The selected load will be spread to a maximum thickness of 1 foot. Wasatch personnel trained in waste screening will perform a detailed inspection of the load to determine if unacceptable materials are present in the waste.

If there are unacceptable wastes in a load, the inspector will determine whether the driver should have been aware of the unacceptable wastes. If the driver could or should have recognized the unacceptable wastes, the inspector (through the Executive Director) will issue a violation notice to the hauler; if the driver could not reasonably have been aware of the unacceptable wastes no violation notice will be prepared; however, the driver will be consulted and the source of the waste determined. For commercial haulers, the first violation for unacceptable wastes will result in a warning to the hauler; the second violation will result in the imposition of a fine; the third violation will result in suspension of hauler privileges. Wasatch may suspend all disposal privileges of companies that violate rules. A suspended company may not use the Davis Landfill or DERF during the period of the suspension.

If the identity of unacceptable wastes is unknown and is placed in the landfill, the area where the unacceptable material was discharged would be cordoned off. The unacceptable wastes would be moved to a designated area for identification and preparation for proper disposal by appropriate personnel.

The DWMRC will be notified if an unacceptable waste is discovered at the facility. The Landfill Manager will be responsible for notifying the Executive Director of Wasatch who will then notify the Director of the DWMRC, and the transporter of the waste within 24 hours of discovery. This notification will include the date of discovery, type of unacceptable waste, approximate volume, and depth and location within the landfill. A copy of notification will be retained in the landfill operating record. Within thirty days of the documentation of the event, the Permittee shall submit a written report to the Director of the DWMRC describing the nature and extent of the noncompliance or violation and the remedial measures taken or to be taken to protect human health and the environment.

If hazardous or PCB-containing waste is discovered, the Landfill Manager will take appropriate steps to protect the public and landfill personnel and will assure proper cleanup, transport, and disposal of the waste.

Examples of hazardous waste, except wastes that are normally and reasonably associated with households or household activity that are in household containers (5 gallons or less), include:

- Lead acid batteries (automobile, boat, RV).
- Paint thinner, degreasing solvents, used oil or kerosene, or unrinsed container thereof.
- Pesticides, herbicides, or unrinsed containers thereof.

- Fluorescent light ballasts, electrical transformers, or fluids from these.
- Radioactive materials or materials contaminated by radioactive substances.
- Acutely hazardous waste, per 40 CFR 261.33.
- Wastes containing PCBs.
- Friable asbestos containing materials.

Household Hazardous Waste

Davis Landfill will provide a secure site for the collection of Household Hazardous Waste (HHW). The operations of the HHW are as follows:

- Used Oil Facility – Citizens drop off the containers of used oil. If the container is requested back they must wait until Wasatch personnel can properly empty the contents of the container. Each citizen is required to write their name and amount that is being dropped off. The sign-up sheet is picked up by the Davis County Health Department and delivered to the Utah Department of Environmental Quality for reimbursement to Wasatch.

  Used oil is stored in holding tanks which have a volume of approximately 500 gallons. The oil is then picked up by an approved Used Oil Transporter and hauled off for processing.

  Fuels and antifreeze are separated into holding tanks of approximately 500 gallons. These are also picked up by an approved Transporter for processing.

- Hazardous Waste – Hazardous waste is accepted at household quantities only (in 5 gallon containers or less). Anything that can be reused and is in an acceptable quantity and quality is placed in the reuse shed.

- E-Waste – Electronic Waste (E-Waste) is brought in and separated into wire, Monitors (Both TV and Computers), Household Electronics (Phones, Radios, etc.), computers. These items are then picked up for disposal by other qualified recycling companies.

- Reuse Shed – Items placed here can be removed at no charge by citizens if they sign a sign out sheet for them. Items are kept that are of a certain quality and have enough product left that make it desirable for the citizens. No flammables or harmful products are to be available for reuse.

I.d.10 Disease Vector Control Plan

Landfill personnel will use appropriate technologies to prevent or control on-site populations of disease vectors (e.g., rodents, insects) to protect human health and the environment. Landfill

personnel will be responsible for maintaining control of vectors at the Davis Landfill through continued use of appropriate daily cover procedures. Professional extermination personnel and services may be used to control vectors if it is found that daily operations are being impacted. The primary method of vector control is to eliminate conditions favorable for vectors through proper compaction and daily covering. Should the Wasatch personnel notice the presence of vectors, cover material will be applied more frequently.

As with vector control, the preliminary method of controlling birds is to eliminate conditions favorable to their existence. This can be accomplished by minimizing the size of the fill face, which is the most effective control method. This, along with more frequent and heavier compaction and frequent covering of the waste, will reduce the area available for the birds to feed.

Very strict control of birds is required at the Davis Landfill due to the proximity of Hill Air Force Base and the real threat that birds pose to aircraft. During times when the previously mentioned control methods are not adequate, Davis Landfill employees will use destructive methods of control. Davis Landfill employees are authorized to use destructive methods under a permit issued by the United States Department of the Interior, U.S. Fish and Wildlife Service. The current permit states:

> "Dead Birds, or any parts thereof (except Bald and Golden eagles, endangered and/or threatened species), shall be promptly destroyed by burial or incineration if they are unsuitable for donation. With approval from the issuing office, dead birds, or any parts thereof, may be deposited with a qualified public educational or scientific institution as defined in 50 CFR 10.12".

Employees of the Davis Landfill are trained on the proper protocols and procedures along with identifying conditions and requirements when to use destructive methods.

I.d.11 Alternative Waste Handling Plan

Based on historical operations, landfilling operations should not have to be suspended long term due to inclement weather conditions or interruption of service. The site soils, including those planned for daily cover, consist of silty fine sands; these soils are easily placed over a wide range of moisture and weather conditions. If the need does arise for alternate waste handling; Wasatch will redirect the waste from the Davis Landfill operations to the DERF. Wasatch believes that their past operating experience and cautious operating procedures will minimize the need for alternate waste handling plans. If DERF or Davis Landfill cannot meet the demand of incoming waste, then the landfill will send the incoming waste to another agreed upon landfill or transfer facility.

I.d.12 General Training Plan

Davis Landfill personnel will be trained on how to identify unacceptable waste including liquid wastes, sludge, potential regulated hazardous waste, and PCB wastes. A copy of an example

training roster is included in Appendix E. Personnel to be trained will include the Landfill Manager, equipment operators, spotters and scale house attendants. The training will emphasize methods of identifying containers and labels typical of hazardous and PCB waste. Training will also address the proper handling of unacceptable waste. All employees will receive on the job training in landfill operations and waste screening. This training will include operations and safety training. New employees will typically receive training during their first 3 months of employment. The Landfill Manager and at least one additional landfill employee will be trained and certified as a SWANA Manager of Landfill Operations. The Landfill Manager and all employees will be trained in waste screening using the Solid Waste Association of North America (SWANA) techniques or other equivalent training sources.

I.d.13 Recycling Programs

Davis Landfill maintains the E-Waste Recycling Center and actively segregates valuable recyclable materials from the waste stream. Wasatch currently maintains bins for segregation of steel, aluminum, tires, batteries and carpet pads. The bins are hauled off site for recycling.

The Green Waste Recycling Facility upcycles yard waste into compost and wood chips, creating a saleable product while saving valuable landfill space. Clean green waste is diverted to the Green Waste Recycling Facility and processed. The processed green waste is screened and either sold as a screened wood product or compost. A copy of the Green Waste Operation Plan is located in Appendix J.

PARC & Save Landfill Thrift Store efficiently process reusable materials removed from the waste stream. It is a Cooperative program provided by Wasatch and the Davis School District. PARC is an arm of the Davis School District that has been assisting people with disabilities to gain greater independence through employment for more than 40 years. The partnership between PARC and Wasatch Integrated benefits the community by providing jobs and increasing recycling through the reuse of items which might otherwise be landfilled.

I.d.14 Closure & Post - Closure Plan

This section describes the final cover construction, site capacity, schedule of closure implementation, estimated costs for closure, and final inspection procedures for the existing landfill operations and future closure stages of the Davis Landfill.

I.d.14.A Closure Strategy

The unlined landfill cell has been closed and was capped in the summer of 2000 except for the south-facing slope, which will be capped in conjunction with future closure stages of the lined landfill. Final cover will be placed over the lined landfill in a series of events. When sufficient area of the lined landfill cell has reached final elevation to allow for economical placement of

Attachment #3
Groundwater Monitoring Plan

FINAL

Groundwater Monitoring Plan for the Davis Landfill

Prepared for:

Wasatch Integrated Waste Management District
1997 East 3500 North
Layton, UT 84040

Prepared by:

CH2MHILL
215 South State Street, Suite 1000
Salt Lake City, Utah 84111

FINAL

Groundwater Monitoring Plan for the Davis Landfill

Prepared for:

Wasatch Integrated Waste Management District
1997 East 3500 North
Layton, UT 84040

Prepared by:

CH2MHILL
215 South State Street, Suite 1000
Salt Lake City, Utah 84111

SEPTEMBER 2011

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Acronyms and Abbreviations

^{o}C	Degree(s) Celsius
amsl	Above Mean Sea Level
bgs	Below Ground Surface
DSHW	Utah Department of Environmental Quality—Division of Solid and Hazardous Waste
EPA	U.S. Environmental Protection Agency
H_2SO_4	Sulfuric Acid
HCl	Hydrochloric Acid
HDPE	High-density Polyethylene
HNO_3	Nitric Acid
ID	Identification
kV	Kilovolt(s)
LDL	Laboratory Detection Limit
mg/L	Milligram(s) per Liter
mL/min	Milliliter(s) per Minute
N/A	Not Available
PVC	Polyvinyl Chloride
SCH	Schedule
QA	Quality Assurance
QC	Quality Control
UAC	Utah Administrative Code

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1.0 Introduction

This document presents an updated groundwater monitoring plan for the Davis Landfill, which is owned and operated by Wasatch Integrated Waste Management District (Wasatch) in Layton, Utah. The monitoring plan was developed in accordance with regulatory requirements established in Utah Administrative Code (UAC) R315–308. The previous groundwater monitoring plan was drafted in 1997 (Bingham Environmental Inc., 1997). The groundwater monitoring plan was updated to incorporate additional site information that has been gathered and site conditions that have changed since development of the original plan.

This updated monitoring plan provides (1) a site background and a conceptual site model of the hydrogeology underlying the facility; (2) the existing groundwater monitoring networks; (3) groundwater sampling processes and techniques; (4) groundwater sample analytical methods; (5) a quality assurance/quality control (QA/QC) plan; (6) data validation, analysis, and reporting procedures; and (7) a groundwater sampling health and safety plan.

1.1 Site Background

The Davis Landfill, located at 1997 East 3500 North in Layton, Utah, is a Class I Municipal Solid Waste Landfill. The facility consists of approximately 315 acres of land and contains two separate landfill cells, as shown in Figure 1-1. The unlined cell, which does not have a bottom liner other than the natural low-permeability clay layers below the cell, is approximately 25 acres in size and began accepting waste in the late 1940s or early 1950s. The unlined cell was capped in 2000 with a 40-mil low-linear density polyethylene geomembrane and no longer accepts waste. The lined cell, which has a bottom liner consisting of a geocomposite clay liner overlain with a 60-mil high-density polyethylene flexible membrane liner, was constructed in 1998 and is approximately 65 acres in size. Waste placement in the lined landfill cell began in August 1998. The lined cell currently accepts incinerator ash and municipal solid waste from the surrounding communities.

The Davis Landfill is located on a north-facing slope that overlooks the Weber Valley. The landfill is separated from the river valley below by a steep, north-to-northeast-facing escarpment with a relief of approximately 300 feet. The steep topography is an important factor in shallow groundwater movement at the site.

1.2 Conceptual Site Model

1.2.1 Regional Geology

The Davis Landfill is located on the Paleo-Weber River Delta, a major geologic feature that was formed as the Weber River deposited sediments into ancient Lake Bonneville during the late Pleistocene Epoch, approximately 11,000 to 26,000 years ago (Feth et al.,

1966). The sediments deposited during this period are divided into several components, including the Alpine Formation that underlies the site. The Alpine Formation was deposited in the deeper waters of Lake Bonneville when the lake was near maximum levels and consists of clays and silts interbedded with fine-grained sand layers that tend to be laterally discontinuous.

In the area, the relative depth to bedrock is controlled by the Basin and Range horst and graben structure, where bedrock lies buried beneath up to 5,000 feet of unconsolidated and semiconsolidated material (Lemons and Chan, 1999).

1.2.2 Regional Hydrogeology

Due to the interlayered nature of the Alpine Formation, groundwater within the Alpine Formation generally occurs in multiple hydraulically interconnected water-bearing zones and, depending on spatial location, is either semiconfined or unconfined.

Two regional aquifers are known to exist in the area of the Davis Landfill. The Sunset Aquifer is a secondary aquifer in the area but has not been identified beneath the site. The Sunset Aquifer is found just west of the Davis Landfill, extending from Hill Air Force Base to the Great Salt Lake (Anderson et al., 1994). Where present, the Sunset Aquifer is located between 250 and 400 feet below ground surface (bgs).

The Delta Aquifer has been identified beneath the site. In general, the Delta Aquifer is located between 500 and 700 feet bgs and underlies the Sunset Aquifer (where the Sunset is present). The Delta Aquifer extends from the Wasatch Range to the Great Salt Lake and is the primary source of drinking water in the region.

Regionally, groundwater moves from recharge zones located along the Wasatch Range to discharge areas west and southwest at topographic low points near the Great Salt Lake. Shallow groundwater in the Alpine Formation generally follows surface topography. The general direction of groundwater flow in the Sunset and Delta Aquifers is toward the west.

1.2.3 Site Hydrogeology

The following interpretations are based primarily on data collected from various exploration points performed at the site, including monitoring wells, soil borings, cone penetrometer tests, inclinometers, and gas probes. Available boring logs and construction details are included in Appendices A and B. Appendix A includes logs from the current compliance monitoring wells used to monitor the lined and unlined landfill cells (see Section 2.0), and Appendix B includes the logs from the other exploration points that have been performed at the site. Using data from these exploration points, five geologic cross sections have been created to develop the conceptual site model. Those cross sections are included in this document as Figures 1-2 through 1-6.

Two principal aquifers underlie the Davis Landfill. From the surface, the aquifers are (1) a shallow aquifer system within the Alpine Formation and (2) the Delta Aquifer. The shallow aquifer system is composed of multiple hydraulically interconnected

water-bearing zones and is not used as a source of drinking water in the region. The Delta Aquifer is the primary source of drinking water in the region.

The shallow aquifer system consists of three semi-independent water-bearing units, referred to as the Upper, Intermediate, and Lower Perched Zones. The zones are separated by aquitard units composed of silt and clay.

Upper Perched Zone (Zone A)

The uppermost water-bearing unit, located at approximately 4,800 feet above mean sea level (amsl) with a saturated thickness between 10 and 40 feet, is perched on a clay aquitard that dips slightly to the southwest (see Figures 1-2 through 1-6). West of the unlined landfill cell, the Upper Perched Zone is located 150 feet bgs, while east of the unlined landfill cell the zone is located near the ground surface due to erosion. Recharge to the perched zone is primarily through infiltration of precipitation and irrigation water used southwest of the site.

The Upper Perched Zone is monitored by wells DMW-2, MW-4, MW-11, and MW-16R. Water levels recorded in those wells between March 2001 and October 2008 have shown very little seasonal fluctuation. Figure 1-7 illustrates the potentiometric surface of groundwater in Zone A. The potentiometric surface shows that, beneath the facility, groundwater in the Upper Perched Zone flows from the southwest toward the northeast.

The Upper Perched Zone terminates in the northeast portion of the site as it is cut by the relatively steep slope of the Weber River valley (see Figures 1-4 through 1-6). Historically, some groundwater from the Upper Perched Zone discharged as seeps and springs on the slope face, but the slope has since been re-graded, and significant groundwater flow from seeps and springs has ceased. It is presumed that the majority of the groundwater from the Upper Perched Zone is now transported at shallow depths beneath the surface, parallel to the slope face, and ultimately migrates into the Lower Perched Zone.

Intermediate Perched Zone (Zone B)

The potentiometric surface of the Intermediate Perched Zone, Zone B, is located between 4,710 and 4,670 feet amsl (see Figure 1-8). The zone has a saturated thickness ranging between 10 and 50 feet and is perched on an interbedded clay, silt, and sand layer located between approximately 4,670 feet and 4,650 feet amsl (see Figures 1-2, 1-3, 1-4, 1-5, 1-6, and 1-8). The surface of the aquitard dips towards the east-northeast.

The Intermediate Perched Zone is currently monitored by seven wells: DMW-4, MW-7R, MW-8, MW-22, MW-23, MW-25, and MW-26 (see Figure 1-8). Water levels recorded in Zone B between March 2001 and October 2008 have shown little seasonal fluctuation. Groundwater elevation data from this zone indicate that the groundwater flow direction in Zone C is to the east-northeast. Based on the potentiometric surface map, monitoring well MW-22 is upgradient of the lined cell; DMW-4 is upgradient of the lined and unlined cells; monitoring wells MW-25 and MW-26 are downgradient of the lined cell; and monitoring wells MW-7R, MW-8, and MW-23 are downgradient of the unlined cell.

Similar to Zone A, the Intermediate Perched Zone terminates as it is cut by surface topography in the northeast portion of the site (see Figures 1-4 through 1-6). It is

presumed that groundwater from the Intermediate Perched Zone also migrates into the Lower Perched Zone (Zone C).

Lower Perched Zone (Zone C)

The Lower Perched Zone (Zone C) is a coarse gravel unit that is approximately 20 feet thick with a saturated thickness of between approximately 20 and 40 feet (see Figures 1-2 through 1-6). Underlying the gravel layer is a fine sand unit with some interbedded clays and silts. As observed in the boring log for MW-17 (see Figure 1-4 and Appendix A), the interbedded sand unit is unsaturated directly below the gravel layer, indicating that Zone D is perched above the regional Delta Aquifer. Given the composition of this unit, it is possible that Zone C is the upgradient portion of the Sunset Aquifer.

The groundwater flow direction in Zone C was estimated using a three-point solution (see Figure 1-9). The calculation indicates that the groundwater flow direction in the Lower Perched Zone is toward the east-northeast, similar to Intermediate Perched Zone.

Delta Aquifer (Zone D)

During drilling activities associated with the installation of monitoring well MW-17, a stiff clay unit was encountered beneath the interbedded sand unit that perches the Lower Perched Zone at an elevation of approximately 4,340 feet amsl (see Figures 1-4 through 1-6). This clay is assumed to be the unit that is confining the Delta Aquifer.

The Delta Aquifer regionally extends from the Wasatch Range to the Great Salt Lake and is the principal source of drinking water in the region. The top of the Delta Aquifer lies at an approximate elevation of 4,310 feet amsl below the site (see Figures 1-4 through 1-6). Regional groundwater flow in the Delta Aquifer is toward the west and discharges at topographic low points near the Great Salt Lake. The NDRD well (see Appendix B), which was abandoned during the construction of the lined cell, is believed to have been completed in the upper portion of the Delta Aquifer (see Figure 1-4).

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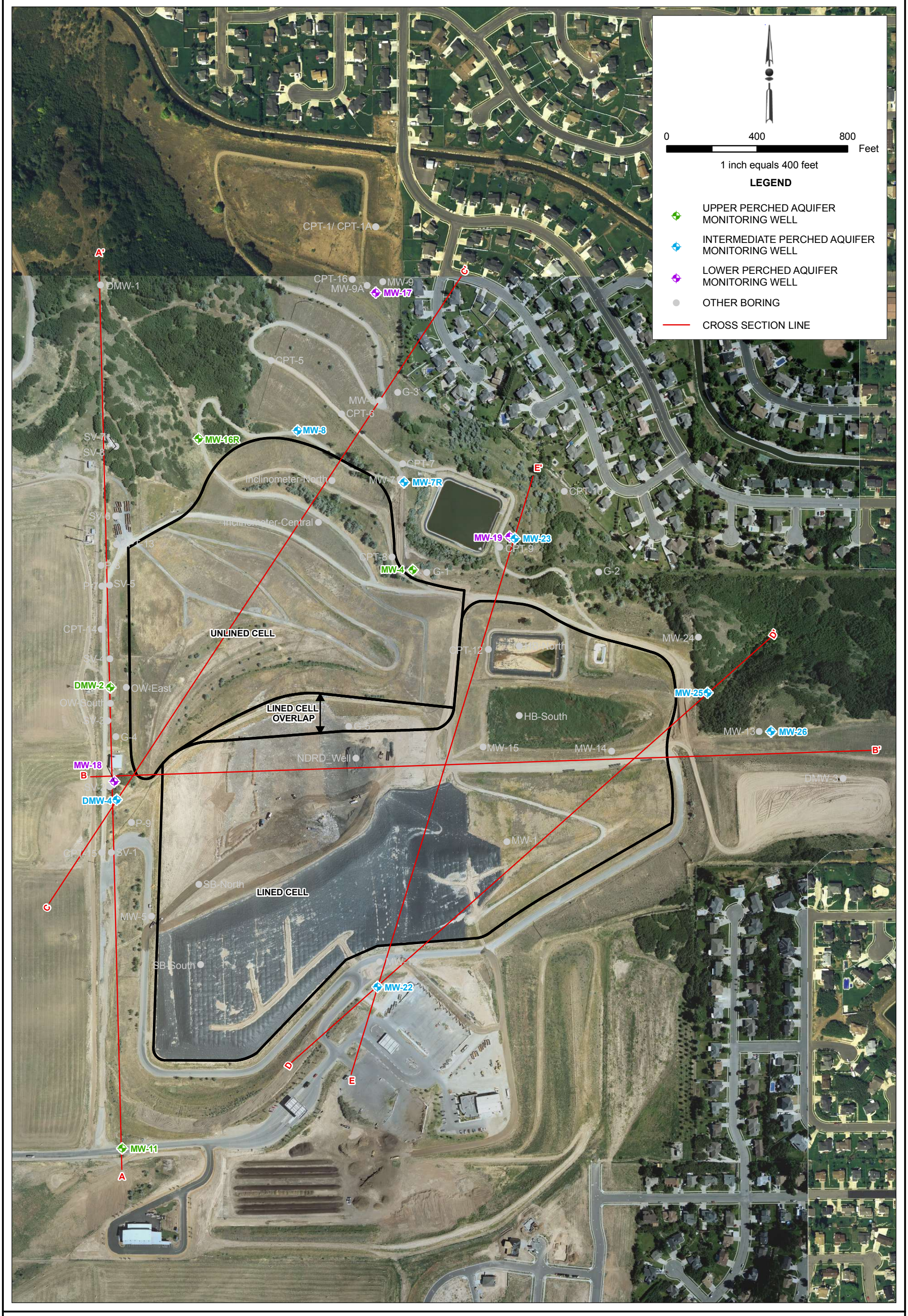
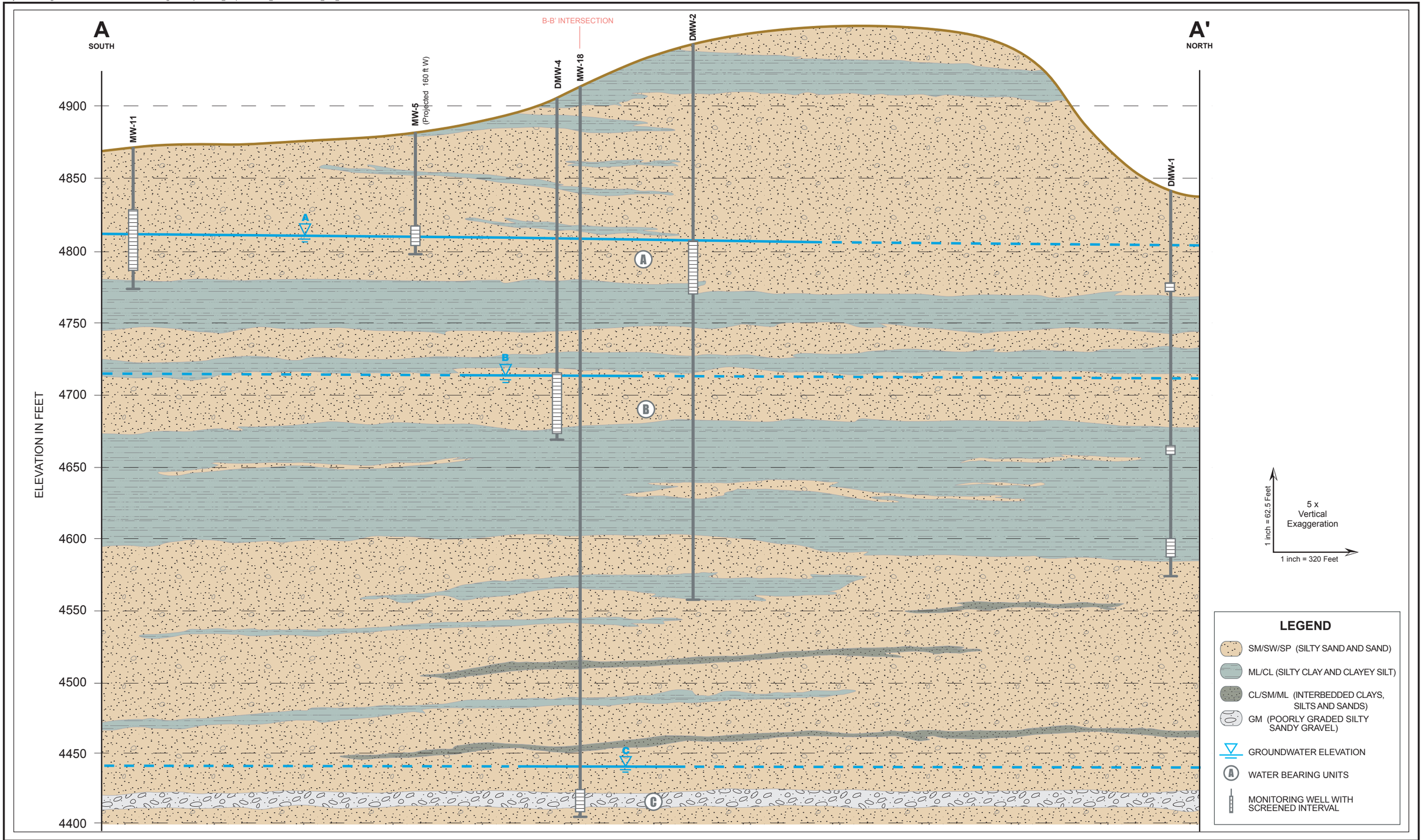


FIGURE 1-1
SITE MAP
DAVIS LANDFILL GROUNDWATER MONITORING PLAN
WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT

CH2MHILL



NOTE: WATER LEVELS MARCH 2011

FIGURE 1-2
CROSS SECTION A-A'
DAVIS LANDFILL GROUNDWATER MONITORING PLAN
WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT

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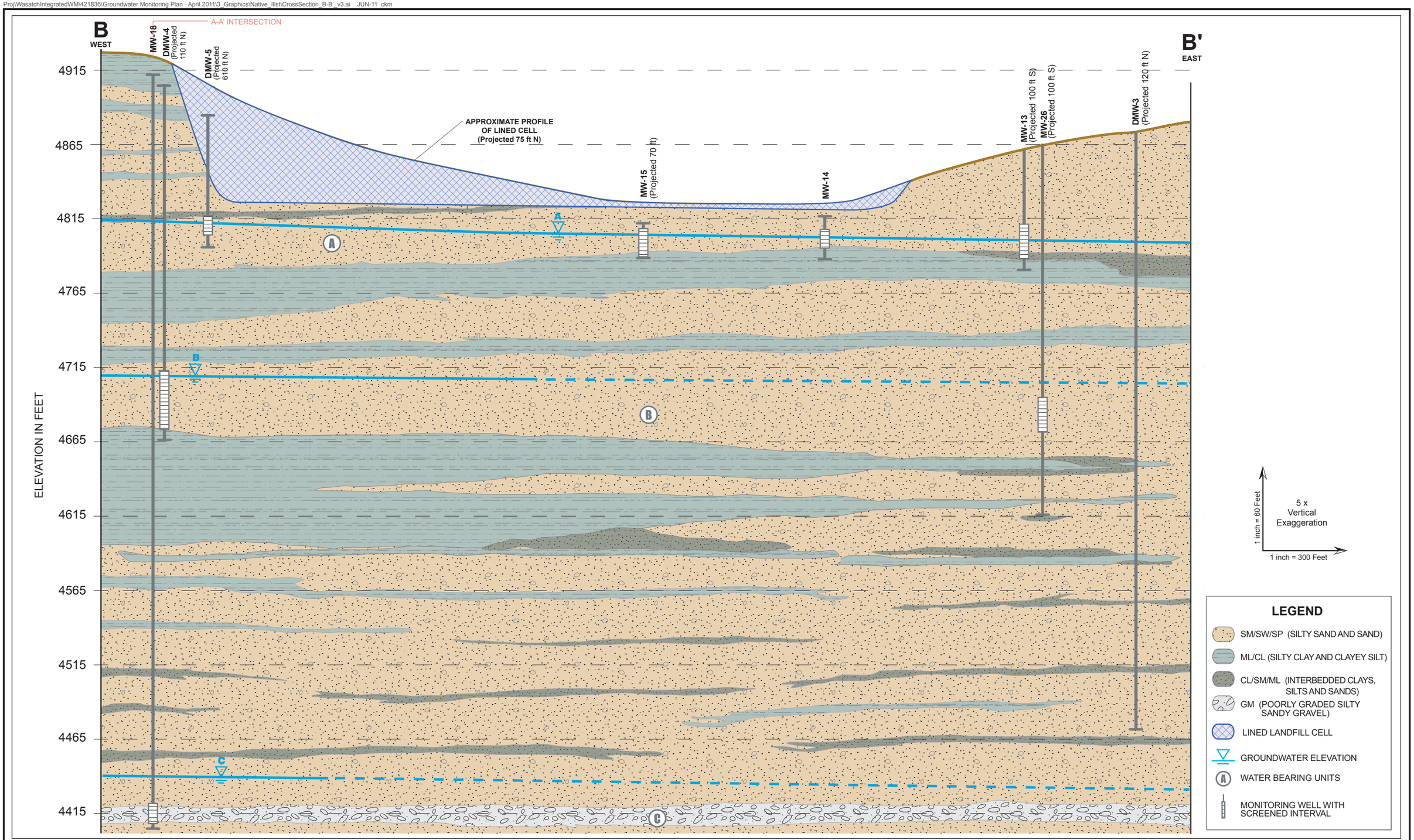
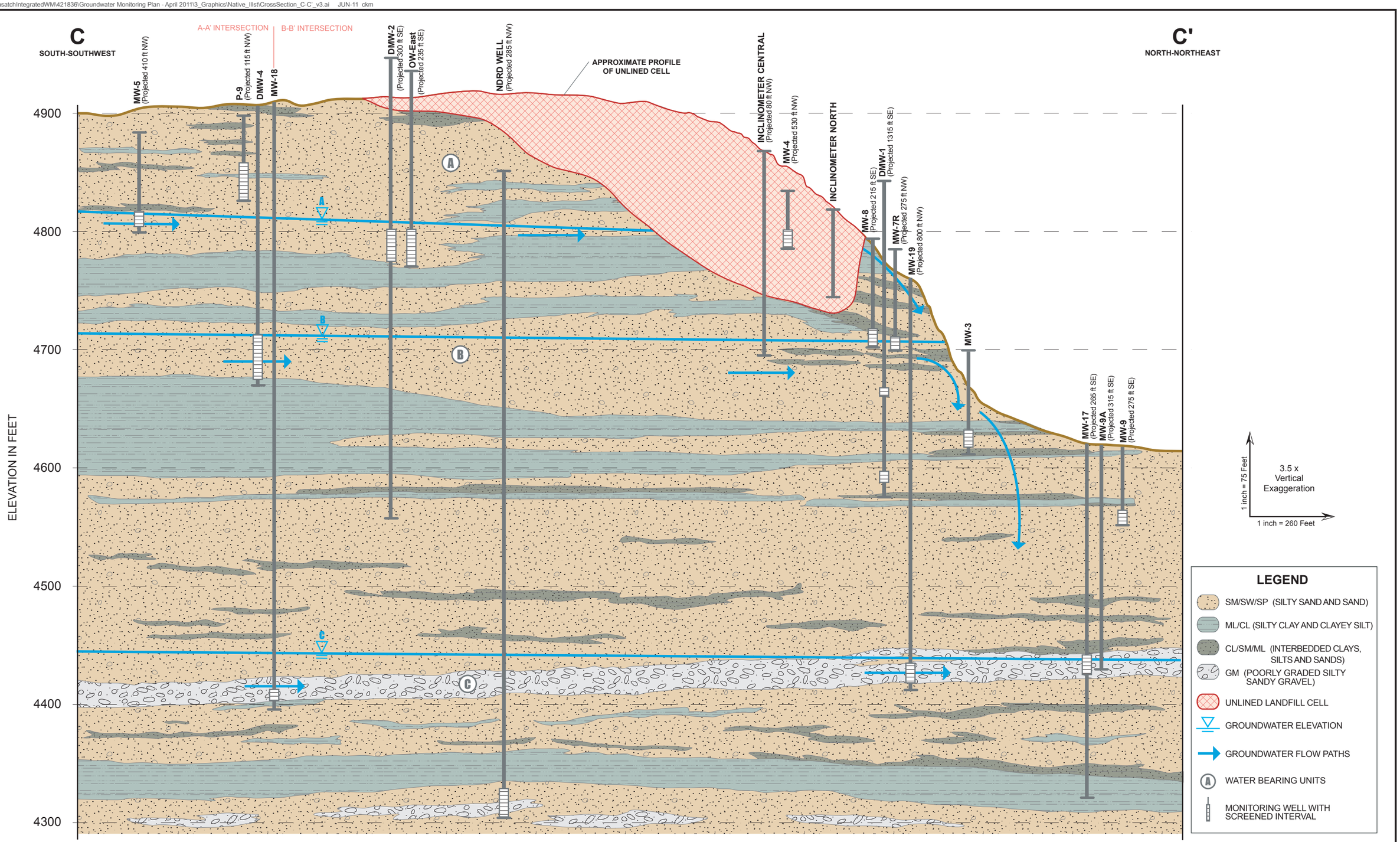


NOTE: WATER LEVELS MARCH 2011

FIGURE 1-3
CROSS SECTION B-B'
DAVIS LANDFILL GROUNDWATER MONITORING PLAN
WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT
CH2MHILL



NOTE: WATER LEVELS MARCH 2011

FIGURE 1-4
CROSS SECTION C-C'
DAVIS LANDFILL GROUNDWATER MONITORING PLAN
WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT

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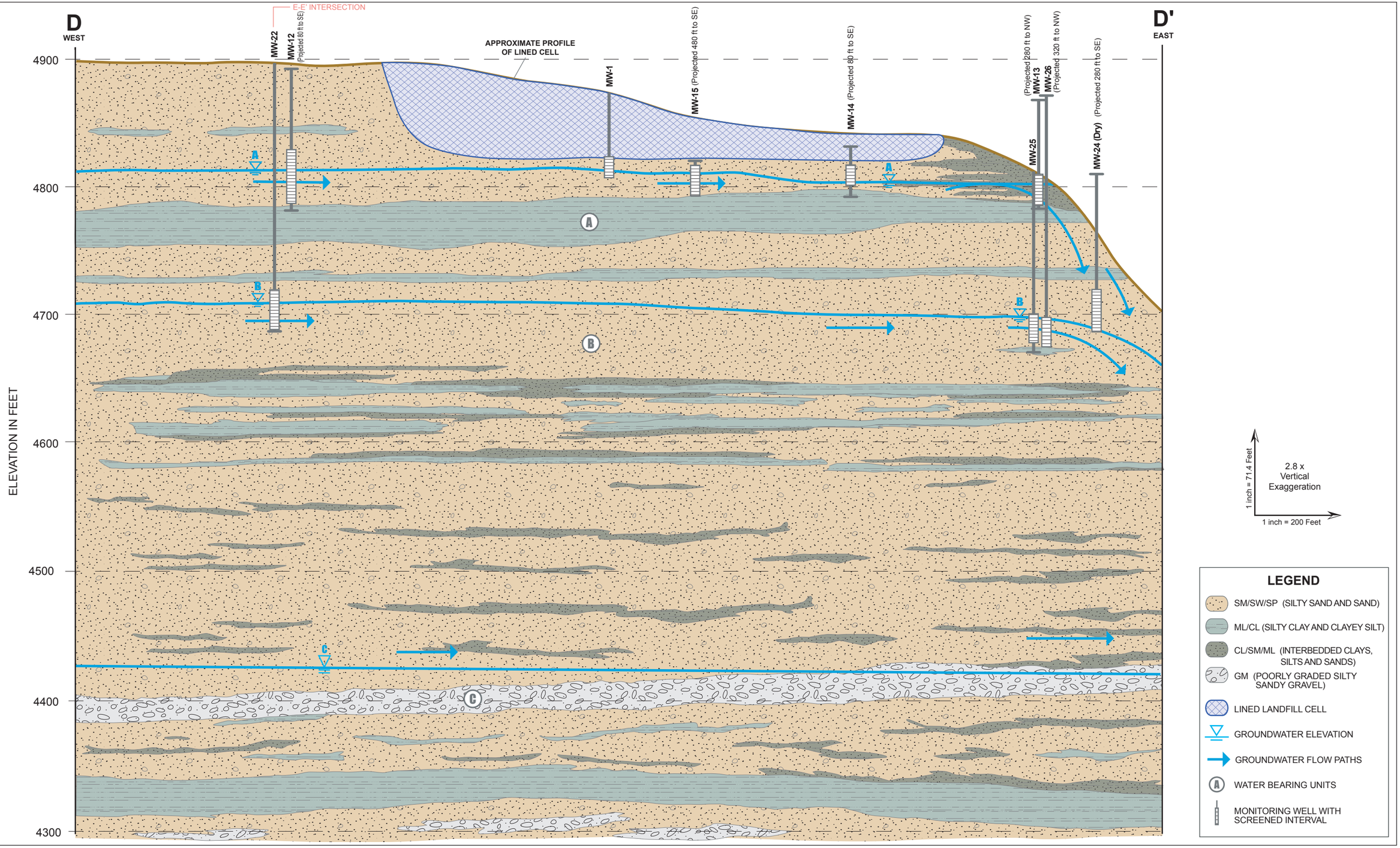

NOTE: WATER LEVELS MARCH 2011

FIGURE 1-5
CROSS SECTION D-D'
DAVIS LANDFILL GROUNDWATER MONITORING PLAN
WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT
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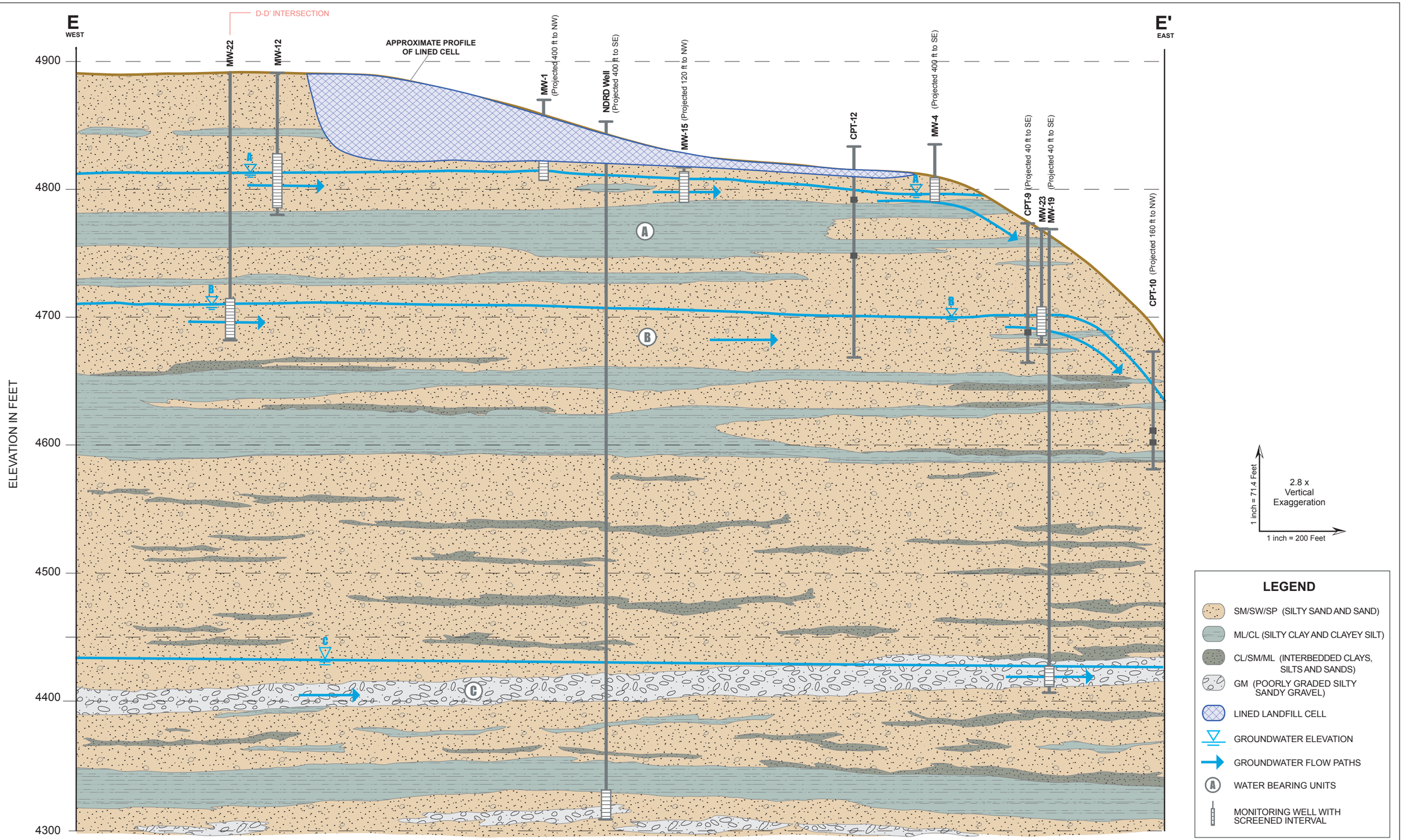

NOTE: WATER LEVELS MARCH 2011

FIGURE 1-6
CROSS SECTION E-E'
DAVIS LANDFILL GROUNDWATER MONITORING PLAN
WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT
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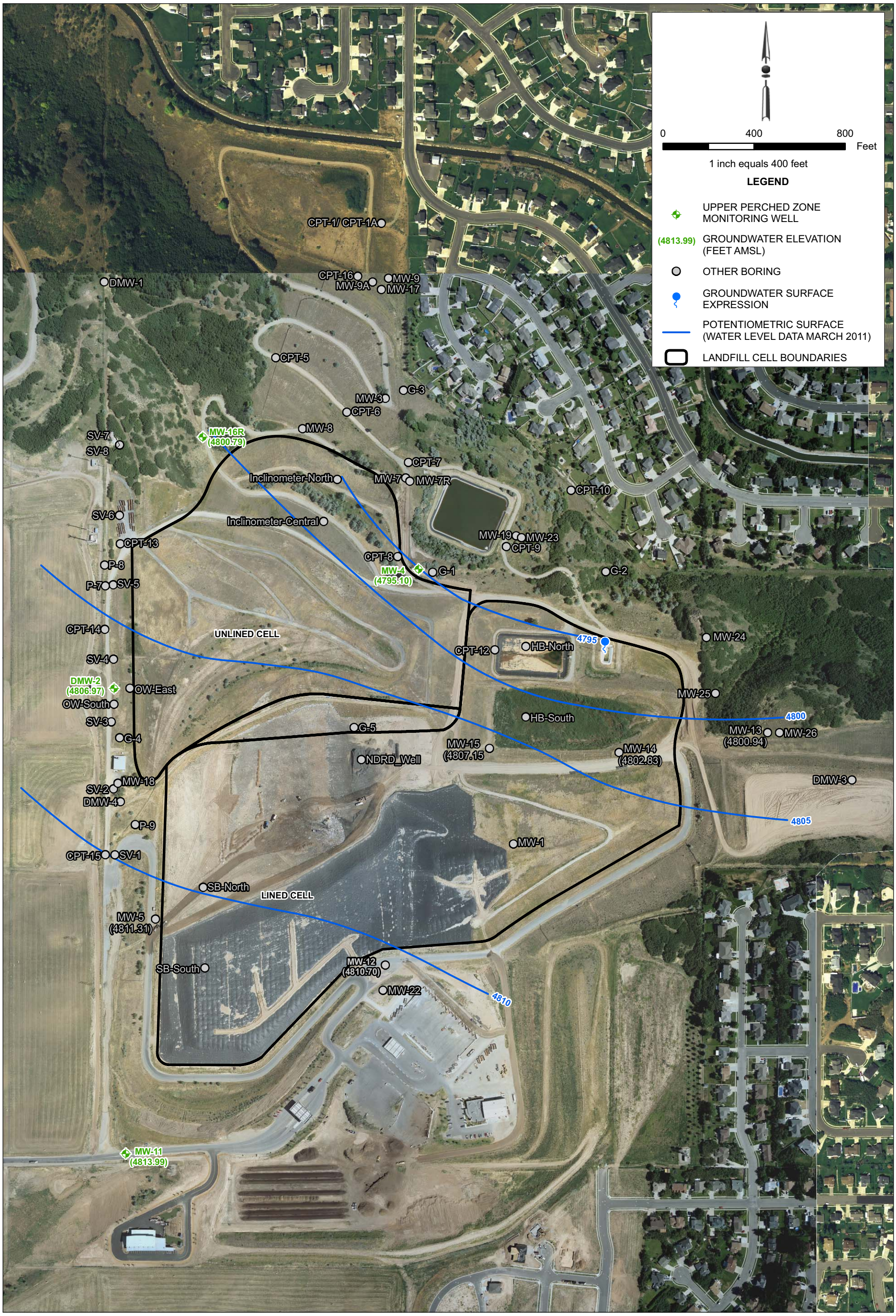

FIGURE 1-7

UPPER PERCHED ZONE POTENTIOMETRIC SURFACE

DAVIS LANDFILL GROUNDWATER MONITORING PLAN

WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT

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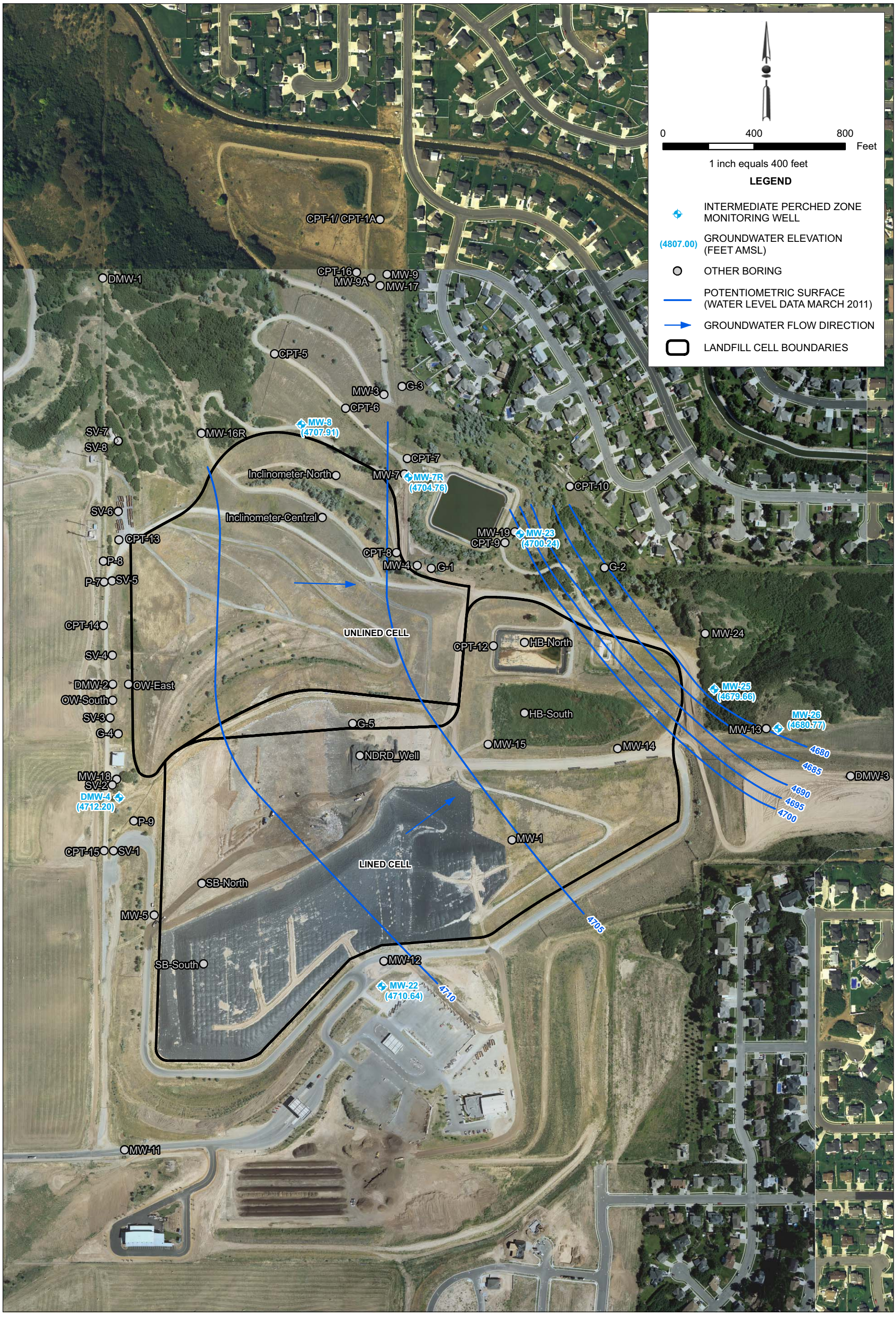

FIGURE 1-8

INTERMEDIATE PERCHED ZONE POTENTIOMETRIC SURFACE

DAVIS LANDFILL GROUNDWATER MONITORING PLAN

WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT

CH2MHILL

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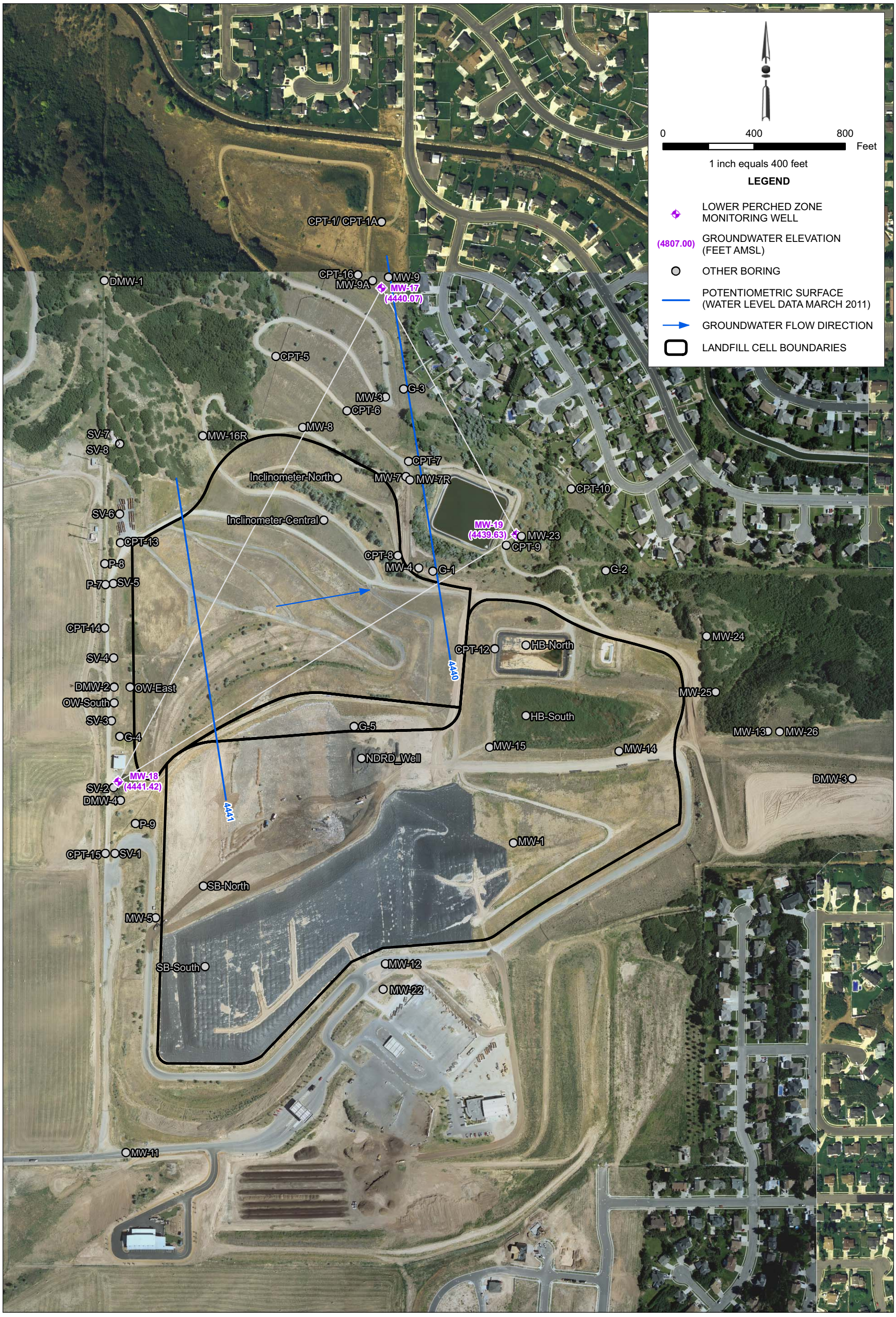

FIGURE 1-9

LOWER PERCHED ZONE POTENTIOMETRIC SURFACE

DAVIS LANDFILL GROUNDWATER MONITORING PLAN

WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT

CH2MHILL

2.0 Groundwater Monitoring Network

The Davis Landfill consists of a lined cell and an unlined cell as discussed in Section 1.0. The groundwater monitoring network for the lined cell includes four monitoring wells; the network for the unlined cell includes eight monitoring wells.

2.1 Lined Landfill Cell

Performance of the lined cell is evaluated by monitoring the Intermediate Perched Zone, which extends upgradient and downgradient of the cell. profile of the lined cell has been projected onto Cross Sections B-B', D-D', and E-E' (Figures 1-3, 1-5, and 1-6) to illustrate the spatial relation between the cell and the Intermediate Perched Zone. Based on the groundwater flow direction in the Intermediate Perched Zone (see Figure 1-8), monitoring wells DMW-4 and MW-22 are upgradient and monitoring wells MW-25 and MW-26 are downgradient of the lined cell. The monitoring well network for the lined cell is summarized in Table 2-1.

2.2 Unlined Landfill Cell

The unlined cell is a canyon-fill that intersects both the Upper and Intermediate Perched Zones (see Figures 1-1 and 1-4). Therefore, those zones are monitored for the unlined cell. Direction of groundwater flow in both zones ranges from east through northeast (see Section 1.2.3).

The Upper Perched Zone is monitored with upgradient monitoring wells DMW-2 and MW-11; and with downgradient monitoring wells MW-4 and MW-16R (see Figure 1-7); and the Intermediate Perched Zone is monitored with upgradient monitoring well DMW-4 and with downgradient monitoring wells MW-7R, MW-8, and MW-23 (see Figure 1-6). The unlined cell monitoring well network is summarized in Table 2-2.

2.3 Well Construction and Completion

Construction details for the compliance monitoring wells are summarized in Table 2-3. Boring logs and monitoring well construction details for the monitoring wells in the current monitoring network are included in Appendix A. Boring logs and construction details for other monitoring wells installed and exploration points performed are included in Appendix B.

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TABLE 2-1
Lined Cell Monitoring Well Network
Groundwater Monitoring Plan for the Davis Landfill

Well Identification	Perched Zone Monitored	Location	Screened Interval (Feet above Mean Sea Level) Top	Bottom
DMW-4	Intermediate	Upgradient	4715.3	4675.3
MW-22	Intermediate	Upgradient	4717.8	4687.8
MW-25	Intermediate	Downgradient	4697.1	4677.1
MW-26	Intermediate	Downgradient	4693.0	4673.0

TABLE 2-2
Unlined Cell Monitoring Well Network
Groundwater Monitoring Plan for the Davis Landfill

Well Identification	Perched Zone Monitored	Location	Screened Interval (Feet above Mean Sea Level) Top	Bottom
DMW-2	Upper	Upgradient	4802.0	4772.0
MW-11	Upper	Upgradient	4827.0	4787.0
MW-4	Upper	Downgradient	4801.0	4786.0
MW-16R	Upper	Downgradient	4814.7	4784.7
DMW-4	Intermediate	Upgradient	4715.3	4675.3
MW-7R	Intermediate	Downgradient	4709.3	4699.3
MW-8	Intermediate	Downgradient	4715.6	4705.6
MW-23	Intermediate	Downgradient	4706.9	4686.9

TABLE 2-3
Monitoring Well Construction Detail Summary
Groundwater Monitoring Plan for the Davis Landfill

		Ground	Borehole		Casing		Screen		Sand Pack		Development		
Well ID	Date Installed	Surface (feet amsl)	Depth (feet bgs)	Diameter (inches)	Type	Diameter (inches)	Slot Size (inches)	Interval (feet bgs)	Type	Interval (feet bgs)	Method	Water Quality Measured?	Pump Intake
DMW-2	10/25/1988	4947.0	390.0	12.0	SCH 40 PVC	4.0	0.020	145–175	#10/20	135–175	N/A	N/A	4784
DMW-4	8/6/1996	4905.3	235.0	9.0	SCH 40 PVC	4.0	0.010	190–230	#16/40	187–236	Bail/Surge	No	4688
MW-4	11/9/1989	4831.0	45.0	12.0	SCH 40 PVC	2.0	0.020	30–45	#10/20	25–45	N/A	N/A	4790
MW-5	9/6/1989	4882.1	85.0	8.0	SCH 40 PVC	4.0	0.020	66–76	#10/20	61–83	N/A	N/A	4810
MW-7R	3/12/2008	4784.3	87.0	10.25	SCH 80 PVC	4.0	0.010	75–85	#20/40	73–87	Bail/Surge/Pump	Yes	4701
MW-8	9/15/1989	4792.3	90.0	10.0	SCH 40 PVC	4.0	0.020	77–87	#10/20	71–90	N/A	N/A	4706
MW-11	8/9/1996	4871.0	95.0	9.0	SCH 40 PVC	2.0	0.010	44–84	#16/40	42–96	Bail/Surge	No	4797
MW-16R	Unknown	4859.7	78.0	8.25	SCH 40 PVC	2.0	0.010	45–75	#16/41	43–78	Bail/Surge	No	4791
MW-22	12/14/2010	4887.8	205.0	8.0	SCH 80 PVC	4.0	0.010	170–200	#20/40	165–200	Bail/Surge/Pump	Yes	4690
MW-23	12/16/2010	4766.9	85.0	8.0	SCH 80 PVC	4.0	0.010	60–80	#20/40	55–80	Bail/Surge/Pump	Yes	4689
MW-25	2/17/2011	4807.1	140.0	8.0	SCH 80 PVC	4.0	0.010	110–130	#20/40	105–130	Bail/Surge/Pump	Yes	4679
MW-26	2/22/2011	4865.0	250.0	8.0	SCH 80 PVC	4.0	0.010	172–192	#20/40	167–192	Bail/Surge/Pump	Yes	4675

NOTES:
amsl = Above Mean Sea Level
bgs = Below Ground Surface
ID= Identification
N/A = Data Not Available
PVC = Polyvinyl Chloride
SCH = Schedule

3.0 Sampling Operations and Procedure

The following subsections detail specific sampling techniques and methodology to be used during all groundwater monitoring to provide consistent quality groundwater data. Groundwater samples are collected semiannually during detection monitoring.

3.1 Groundwater Sampling Procedures

3.1.1 General

Sampling equipment is prepared and calibrated before each sampling event. Observations and measurements obtained in the field are recorded on a Groundwater Monitoring Data Sheet, similar to the one presented in Appendix C1.

Samples are collected using a dedicated bladder pump system and low-flow sampling techniques. Monitoring wells are equipped with dedicated bladder pumps suspended on Teflon-lined tubing for air supply and sample recovery. The pump intakes are positioned at a distance of approximately equal to one-third of the saturated screened length from the bottom of the screen. Monitoring wells are sampled when two criteria are met: (1) drawdown stabilization and (2) stabilization of water quality parameters. The following sections describe this process in detail.

The groundwater monitoring wells at the Davis Landfill are sampled in the order of upgradient wells first, then proceeding to the downgradient wells. Upon arrival at a well, the condition of each of the monitoring wells is observed and noted on the field data sheet (i.e., that the wells are secured with a lock, the apron is intact, and the outer casing is in good repair). Any required repairs are noted on the field sampling sheets.

Groundwater sampling is performed by personnel who are trained in proper sampling techniques and health and safety procedures. This includes training in techniques of well purging, sample collection and preservation, decontamination, and QA/QC. The sampler wears a new pair of latex gloves at each well for handling sampling equipment and containers.

3.1.2 Water Level Measurements

A special cap is installed on the protective casing of each well for installation of the dedicated bladder pump. Water levels are taken through the access hole in the cap and depth to groundwater measured from the top of the cap. The elevations of the caps have been determined by a licensed surveyor and reported to the nearest 0.01 foot. Before purging and sampling, water level readings are obtained using a conductivity-based water level indicator or equivalent instrument capable of obtaining measurements to the nearest 0.01 foot. The probe is decontaminated between use at each well by washing with a non-phosphate detergent and rinsing three times with deionized or distilled water. The probe is then lowered into the well casing until the level indicator alarm sounds or light goes on. The depth to water is read from the top of the cap to the nearest 0.01 foot. This measurement is repeated until two consecutive readings agree to the

nearest 0.01 foot. The depth to groundwater is recorded immediately on the Groundwater Monitoring Data Sheet (Appendix C1) to the nearest 0.01 foot. The water level is also taken during sampling to determine if pumping has created excessive drawdown. This process is detailed in Section 3.1.3.

3.1.3 Well Micropurging

The monitoring wells at the Davis Landfill are sampled using a low-flow sampling technique. During low-flow sampling, groundwater is slowly purged from the monitoring well using a bladder pump in order to collect a groundwater sample from the water-bearing zone adjacent to the pump intake. The pumps are located within the screened section of the wells for this technique.

Before sampling, the wells are purged using a micropurging technique. The minimum purge volume necessary to purge the monitoring well is two times the amount of water in the pump and tubing. Before purging, the pump controller is attached to the pump air supply line. The oil-less compressor is located downwind and away from the well, to minimize potential for sample contamination from exhaust gases. The pump discharge line is then connected to a flow-through water quality sensor (e.g., QED Purge Saver) for continuous monitoring of specific conductance, dissolved oxygen, temperature, and pH. These data are recorded on the field data sheets and data logger at no less than 3-minute intervals. Collection of water quality parameters is detailed in Section 3.1.4.

Purge water is disposed of on the ground surface no closer than 20 feet from any well. If a well produces water with constituents exceeding primary drinking water quality standards (determined from most recent sampling event), the purge water from that well is containerized and disposed of appropriately.

3.1.4 Water Quality Measurements

Monitoring wells are ready for sampling when the required purge volumes (two times the tubing and pump volumes) have been removed and water quality measurements for temperature, pH, specific conductivity, dissolved oxygen, and oxidation-reduction potential meet the following criteria for the last three consecutive readings:

- Specific conductivity ±10 percent
- pH ±0.2 units
- Temperature ±1 degree Celsius
- Dissolved oxygen ±0.2 milligram per liter

If these conditions are not met, purging will continue until a maximum of two additional pump and tubing volumes are removed.

These water quality measurements are measured using a flow-through water quality sensor (e.g., QED Purge Saver). The readings are recorded no less than 3 minutes apart for low-flow sampling and at-time intervals equal to or greater than the required time to purge half of the borehole volume for standard sampling. After the parameters stabilize, the water quality sensor is disconnected and the groundwater sample collected. Groundwater samples are not to be collected after passing through the water quality sensor. Water quality readings, along with date, time, well identification, purge volume,

and pre- and post-sampling water levels, are recorded on the Groundwater Monitoring Data Sheet.

The instruments used to perform field measurements are calibrated in accordance with manufacturers' recommendations at the beginning of each day, at a minimum.

3.1.5 Sample Collection and Preservation

After the field parameters have stabilized, the water quality sensor is disconnected and samples are collected directly from the pump discharge line. The pump discharge rate is adjusted to a flow rate of either 100 milliliters per minute (mL/min) or the same flow rate at which the well was purged, whichever is slower, to minimize the potential for bottle overtopping. At a minimum, monitoring wells are sampled at a flow rate that generates enough volume to fill a 40-milliliter sample vial in a single cycle (approximately 50 mL/min).

The groundwater sampler wears a new pair of disposable gloves to handle sampling equipment and sample containers at each well. Samples are collected in laboratory-supplied bottles. Table 3-1 summarizes the types of containers and associated preservatives that are used for the sample storage and transport. Any required preservatives are added to the containers in advance by the laboratory.

Care is taken to maintain lids on the container until the time to fill the container with the sample. Once filled, the containers are immediately capped to minimize contact with dust and ambient air and to avoid volatilization of the sample. Samples are labeled and immediately stored on ice in a cooler until delivered to the laboratory for analysis under chain of custody.

Trip blank and duplicate samples are prepared as part of the QA/QC plan outlined in Section 5.0.

3.1.6 Decontamination

The water level indicator is decontaminated between wells with a non-phosphate detergent then triple rinsed with distilled (or deionized) water.

3.1.7 Sample Handling

Once collected, each sample is immediately labeled, recorded on the Groundwater Monitoring Data Sheet, and placed in a sample cooler with ice for transport to the laboratory. Samples are hand-delivered to the laboratory within 24 hours of collection. The laboratory is certified by the State of Utah for the analytical methods specified in Section 4.0. The samples are delivered to the laboratory within a sufficient timeframe to ensure that method-specific hold times are not exceeded by the laboratory for the specified analytes. Each sample is accompanied by a chain-of-custody form filled out at the time of sample collection (Appendix C2).

3.1.8 Documentation

An essential part of the sample collection activity is the documentation of the site measurements and ensuring the integrity of the sample from collection to data reporting. The following records and actions are taken:

- **Sample labels.** Samples are labeled with the sample identification, name of the sampler, date and time of collection, and type of preservative (if required). The sample label is filled out completely and attached to each sample bottle or container at the time of collection.
- **Chain of custody.** A chain-of-custody form accompanies the samples from the time of collection to completion of laboratory analysis (Appendix C2). The chain-of-custody record establishes the documentation necessary to trace sample possession from the time of collection through receipt by the analytical laboratory. The original form accompanies the samples to the laboratory, and copies go into the project file. Original forms are returned with the analytical results from the laboratory. If samples must be shipped to a laboratory by overnight air delivery, the air bill will serve as proof of custody by the courier service.
- **Sampling record.** Pertinent field measurements and observations noted during sampling are recorded by the field technician on the Groundwater Monitoring Data Sheet (one for each well) and in their field notes.

3.2 Sample Identification

Each sample is given a unique identification consisting of the monitoring well identification. For example, groundwater sampled from monitoring well MW-3 is labeled "MW-3." The field duplicate sample is labeled "MW-20," and field notes verify from which monitoring well it was obtained.

TABLE 3-1

Required Sample Containers and Preservatives

Groundwater Monitoring Plan for the Davis Landfill

Parameter	Sample Container	Preservative	Holding Time
Volatile organic compounds	Five 40-milliliter glass vials with Teflon-lined lid	HCl, 4°C	14 days
Total organic carbon and ammonia	One 16-ounce HDPE	H_2SO_4, 4°C	28 days
Inorganics	One 1/2-gallon HDPE	4°C	28 days
Metals	One 16-ounce HDPE	HNO_3, 4°C	6 months

NOTES:

°C = Degree Celsius

H_2SO_4 = Sulfuric Acid

HCl = Hydrochloric Acid

HDPE = High-density Polyethylene

HNO_3 = Nitric Acid

4.0 Sample Analysis

4.1 Detection Monitoring Analytes

Groundwater samples are analyzed by a State of Utah-certified laboratory for constituents listed in UAC R315-308-4 using the recommended U.S. Environmental Protection Agency (EPA) method. The laboratory follows the procedures as described and identified and adjusts for potential interferences. Laboratory personnel provide information on the precision and accuracy of the testing and include results of QA/QC laboratory samples. Laboratory detection limits must be below maximum contaminant levels/drinking water quality standards. A list of current (as of September 2011) parameters, EPA methods, required detection limits, and holding times is provided in Table 4-1. The most current constituents listed in UAC R315-308-4 and maximum contaminant levels/drinking water quality standards will be used during each sampling round.

Utah Administrative Code R315-308-2(5)(d) states that analysis will be performed for the required constituents on unfiltered samples. Groundwater samples were collected and analyzed for both total and dissolved metals in 1996 and again 2008. Concentrations of total and dissolved metals were similar, and, therefore, it is not anticipated that the slightly turbid water produced by the monitoring wells at the Davis Landfill will adversely affect the analyzed metals concentrations. Samples for metal analysis are collected without filtering in the field, and the laboratory is instructed to analyze unfiltered samples.

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TABLE 4-1
Groundwater Sampling Parameters
Groundwater Monitoring Plan for the Davis Landfill

Constituent	Method	Detection Limit (mg/L)	Hold Time
Metals (total)			
Antimony	7041	0.005	6 months
Arsenic	7060	0.005	6 months
Barium	6010	0.002	6 months
Beryllium	6010	0.001	6 months
Cadmium	6010	0.004	6 months
Chromium	6010	0.01	6 months
Cobalt	6010	0.01	6 months
Copper	6010	0.004	6 months
Lead	7421	0.005	6 months
Mercury	7470	0.001	28 days
Nickel	6010	0.01	6 months
Selenium	7740	0.005	6 months
Silver	6010	0.01	6 months
Thallium	7841	0.001	6 months
Vanadium	6010	0.005	6 months
Zinc	6010	0.01	6 months
Inorganic Constituents			
Ammonia (as N)	350.1	0.05	28 days
Bicarbonate (as $CaCO_3$)	310.1	10	28 days
Carbonate (as $CaCO_3$)	310.1	10	28 days
Calcium	6010	0.05	6 months
Chloride	300	0.5	28 days
Iron	6010	0.01	6 months
Magnesium	6010	0.05	6 months
Manganese	6010	0.005	6 months
Nitrate (as N)	352.2	0.01	48 hours
pH	150.1	0.1	Immediately
Potassium	6010	0.1	6 months
Sodium	6010	0.1	6 months
Sulfate	375.4	5	28 days
Total dissolved solids	160.1	10	7 days
Total organic carbon	415.1	10	28 days
Organic Constituents			
Acetone	8260	0.01	14 days
Acrylonitrile	8260	0.005	14 days
Benzene	8260	0.002	14 days
Bromochloromethane	8260	0.002	14 days
Bromodichloromethane	8260	0.002	14 days
Bromoform	8260	0.002	14 days
Carbon disulfide	8260	0.002	14 days
Carbon tetrachloride	8260	0.002	14 days
Chlorobenzene	8260	0.002	14 days
Chloroethane	8260	0.005	14 days
Chloroform	8260	0.002	14 days
Dibromochloromethane	8260	0.0002	14 days
1,2-Dibromo-3-chloropropane	504	0.00005	14 days
1,2-Dibromoethane	504	0.00002	14 days
1,2-Dichlorobenzene	8260	0.002	14 days
1,4-Dichlorobenzene	8260	0.002	14 days
trans-1,4-Dichloro-2-butene	8260	0.01	14 days
1,1-Dichloroethane	8260	0.002	14 days
1,2-Dichloroethane	8260	0.002	14 days
1,1-Dichloroethylene	8260	0.002	14 days

TABLE 4-1
Groundwater Sampling Parameters
Groundwater Monitoring Plan for the Davis Landfill

Constituent	Method	Detection Limit (mg/L)	Hold Time
cis-1,2-Dichloroethylene	8260	0.002	14 days
trans-1,2-Dichloroethylene	8260	0.002	14 days
1,2-Dichloropropane	8260	0.002	14 days
cis-1,3-Dichloropropene	8260	0.002	14 days
trans-1,3-Dichloropropene	8260	0.002	14 days
Ethylbenzene	8260	0.002	14 days
2-Hexanone	8260	0.005	14 days
Methyl bromide	8260	0.005	14 days
Methyl chloride	8260	0.002	14 days
Methylene bromide	8260	0.002	14 days
Methylene chloride	8260	0.002	14 days
Methyl ethyl ketone	8260	0.010	14 days
Methyl iodide	8260	0.005	14 days
4-Methyl-2-pentanone	8260	0.005	14 days
Styrene	8260	0.002	14 days
1,1,1,2-Tetrachloroethane	8260	0.002	14 days
1,1,2,2-Tetrachloroethane	8260	0.002	14 days
Tetrachloroethylene	8260	0.002	14 days
Toluene	8260	0.002	14 days
1,1,1-Trichloroethane	8260	0.002	14 days
1,1,2-Trichloroethane	8260	0.002	14 days
Trichloroethylene	8260	0.002	14 days
Trichlorofluoromethane	8260	0.002	14 days
1,2,3-Trichloropropane	8260	0.002	14 days
Vinyl acetate	8260	0.005	14 days
Vinyl chloride	8260	0.002	14 days
Xylenes	8260	0.002	14 days

NOTE:
mg/L = Milligram(s) per Liter
Table prepared in accordance with UAC R315-308-4 as of September 2011. The most curr
constituents listed in UAC R315-308-4 and maximum contaminant levels/drinking water
quality standards will be used during each sampling round.

5.0 Quality Assurance/Quality Control

A detailed QA/QC plan has been developed for sampling and analysis of the groundwater. The objective of the monitoring plan is to obtain high-quality, consistent data that may be used to establish background concentrations and track long-term variations and trends in the groundwater at the site. Specific QA/QC procedures have been developed to accomplish this objective and to identify sampling and laboratory analytical errors that may occur.

5.1 Accuracy

Accuracy is the nearness of the measurement or set of measurements to the true value. It is evaluated by means of a matrix spike sample analysis, where a known quantity of analyte is added to sample matrix. A sample identified as a field blank may not be used for the analysis. Spike recovery is calculated using the following equation.

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

where:

R	=	Spike Recovery
SSR	=	Spike Sample Result
SR	=	Sample Result
SA	=	Spike Added

Target recoveries of 80 to 120 percent are acceptable for most analytes (70 to 130 percent for arsenic, lead, selenium, and thallium). Some organic constituents have acceptable ranges of 60 percent to about 140 percent. If the spike recovery falls outside the specified range, the data will be qualified as "acceptable," "estimated," or "rejected."

5.2 Precision

Precision is an assessment of the agreement between a set of replicate measurements without assumption or knowledge of the true value. Precision is evaluated by means of duplicate sample analysis.

Precision is determined using the following formula:

$$RPD = \frac{(S - D)}{(S - D)/2} \times 100$$

where:

RPD	=	Relative Percent Difference
S	=	Sample Result
D	=	Duplicate Sample Result

Duplicate samples will have a control limit of ±20 percent for the relative percent difference for sample values greater than five times the laboratory detection limit (LDL). If the sample values are less than five times the LDL, a control limit of ± the LDL will be used.

If the field duplicate analysis results for a particular analyte fall outside the control limit of ±20 percent or ±LDL, whichever is appropriate, the results for that analyte in all other samples associated with that laboratory set may be flagged as estimated.

5.3 QA/QC Samples

5.3.1 Field Duplicates

A field duplicate sample is collected and submitted for analysis from one monitoring well during each sampling round to assess data precision. It is labeled in such a way so its identity as a duplicate sample is not known by the analytical laboratory.

5.3.2 Laboratory QA/QC Samples

The laboratory is required to provide results for two types of QA/QC samples: method blanks and matrix spike/matrix spike duplicates. Method blank results are required for each analyte listed in Table 4-1. Matrix spike/matrix spike duplicates are required for each metal and inorganic analyte and for a representative number of organic analytes.

Method blanks provide verification that an analyte has not been introduced into the sample during laboratory handling and analysis. Matrix spike/matrix spike duplicates provide an indication of the laboratory accuracy and precision.

5.3.3 Trip Blanks

A trip blank is prepared and sealed by the analytical laboratory before the sampling event. Trip blanks are intended to be aqueous solutions that are as free of analytes as possible.

The trip blank is transported to the sampling site and back to the laboratory without being opened, accompanying the sample bottles the entire time. It serves as a check on sample contamination originating from sample transport, shipping, and site conditions.

The trip blank will be analyzed, if deemed necessary, to check for contamination originating from a source other than the site groundwater. If, for example, an unexpected contaminant is encountered in a groundwater sample from the site, the trip blank may be analyzed to rule out contamination originating from another source. The blank would be analyzed for the parameters listed in Table 4-1.

5.4 Detection Limits

The laboratory is required to meet the established detection limits given in Table 4-1 for each analyte. The detection limits are designed to be below the drinking water quality criteria. If the laboratory is unable to meet the required limit for an analyte or group of analytes due to characteristics of the sample, the laboratory is required to contact the

Davis Landfill or their sampling representative immediately. If changes in the sampling protocol or established reporting limit are necessary, the Utah Department of Environmental Quality—Division of Solid and Hazardous Waste (DSHW) will be immediately notified.

5.5 Laboratory Internal Quality Control

5.5.1 Calibration Procedures and Frequency

Laboratories subcontracted to perform chemical analyses are certified by the State of Utah for environmental analysis. As such, they follow the calibration procedures according to and at the minimum frequency required by the State.

5.5.2 Internal Quality Control Checks

The laboratory will conduct internal QC checks according to its own QA plan that is a part of State certification requirements. The laboratory will summarize the results of these QC checks and submit them with the analytical results. The QC checks and the laboratory performance and system audits will include the following:

- Method blanks
- Laboratory control samples
- Calibration check samples
- Replicate samples
- Matrix-spiked samples
- "Blind" QC samples
- Control charts
- Surrogate samples
- Zero and span gases
- Reagent QC checks

5.5.3 Preventative Maintenance Procedures and Schedules

Preventative maintenance procedures and schedules are followed according to specifications outlined in the requirements for laboratory certification by the State.

5.5.4 Corrective Action for Laboratory Problems

Corrective action will be initiated if analysis results are not within the precision, accuracy, and completeness specified in the groundwater monitoring plan. Sufficient quantities of samples are retained by the lab so that parameters could be reanalyzed if results are unacceptable and hold times have not been exceeded. In the event that hold times are exceeded, the QA Officer will decide whether re-sampling and re-analysis are required.

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6.0 Data Analysis Plan

6.1 Data Validation

When the laboratory data is received, it is reviewed to assess data validity. The data package is checked to ensure the following:

- Sample identifications match chain of custody and field notes and can be matched to sample location, date, and time.
- Samples were analyzed by requested methods.
- Requested limits of detection were met.
- Samples were analyzed within holding times.
- Analysis reporting limits are acceptable.
- Laboratory method blank requests are included and acceptable.
- Laboratory matrix/matrix spike duplicate results for representative analytes are included and acceptable.
- Field duplicate sample results are included and acceptable.

If potential problems or discrepancies are encountered, the laboratory will be notified and requested to help resolve the question. If the cause of the problem cannot be located, the affected data will be qualified or the affected wells will be re-sampled, depending on the severity of the problem. The person who validates the data will use professional judgment along with the general guidelines established under the EPA Contract Laboratory Program (EPA, 2007) to assign qualifiers to data that do not meet the required data quality objectives. If the data appear usable and can be combined with the historical data with no reservations, then no qualifier will be attached.

If the data appear to accurately represent the presence or absence of an analyte, but the quantification of the analyte is in question, then a "J" will be assigned to the reported concentration to indicate it is an estimated quantity. An example of this might be a case where arsenic is reported in the sample, but arsenic recoveries in the matrix spike/matrix spike duplicate are very low (such as 50 percent). The person validating the data may judge that the reported arsenic value is useful information even if the result is probably too low. In this case, a "J" would appear next to the reported result in subsequent tabulations of the data for that well.

If the data for an analyte appear compromised to the point where the reported result is not useful (such as the appearance of methylene chloride in the method blank and in a sample at similar concentrations), the data will receive an "R" qualifier, indicating it is rejected. The reported result will continue to be shown in subsequent tabulations, but

the "R" qualifier will alert the user not to include the result in statistical compilations, and so forth.

In all cases where data receive qualifiers, an explanation of the validator's judgment will be given in the report of the sampling round where the qualified data are first reported.

6.2 Data Analysis

The data are analyzed by the following:

- Looking for the presence of unnaturally occurring compounds in the sample (such as volatile organic compounds)
- Plotting the concentrations of naturally occurring constituents (metals and minerals) in each well on control charts for that well

If unnaturally occurring compounds are reported by the laboratory, the validity of the results will be assessed by reviewing method blank results, raw laboratory data, the compound's potential status as a common laboratory contaminant, and the reported concentration relative to the method detection limit. If the positive results appear potentially valid, the affected well will be re-sampled to verify the result.

The relative concentrations of naturally occurring constituents will be analyzed to assess whether the water is impacted. Inter-well comparisons of water quality data, between upgradient and downgradient wells, are at times complicated by natural variations within the wells. This may be the situation at the Davis Landfill. Intra-well comparisons may be more useful in determining groundwater quality at the site.

Background water quality are established by reviewing a minimum of eight independent sampling event results from each upgradient well and a minimum of four independent sampling event results from each downgradient well.

Once the background levels are established for the site wells, an appropriate statistical method will be selected to evaluate the sampling data from each succeeding sample event. The statistical method will satisfy the requirements of UAC R315-308-2(8) and will be reviewed and approved by the DSHW before implementation.

6.3 Data Reporting

Following each sampling event, a groundwater monitoring report is prepared, which includes the following information:

- Description of sampling activities
- Discussion of data validity
- Discussion of laboratory QA/QC

- Presentation of water elevation measurements, groundwater flow direction, and hydraulic gradient
- Presentation of field and laboratory data

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7.0 Site Safety

In accordance with UAC R315-308-2(4)(g), the health and safety procedures presented in this section are to be followed to address employee health and safety during well installation and groundwater monitoring at the site.

7.1 Well Installation

The following practices and controls are to be implemented by the party in control of well installation operations:

- Only authorized or licensed personnel, based on State of Utah or other applicable requirements, are permitted to operate drill rigs. Drilling subcontractors will ensure that each drill rig operator is qualified to safely operate the specific equipment through appropriate training and experience.
- Workers should use at least Level D personal protective equipment consisting of the following:
  - Coveralls and long-sleeve shirt
  - Safety boots or shoes
  - Safety glasses or goggles
  - Hard hat
  - Work gloves
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads will not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should be restrained.
- If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have the line de-energized before approaching the equipment.
- Smoking around drilling operations is prohibited.
- A daily safety briefing/meeting should be conducted with all drilling personnel to discuss the work planned for the day and the health and safety requirements to be followed.
- The drill rig and associated equipment will be inspected each day before use to ensure safe operational condition. This inspection should include, at a minimum, the

"kill" switch, cathead, ropes, hoses, pressurized lines, operator controls, and drilling tools.

- The location of underground utilities, installations, and structures will be identified before drilling is permitted. Utility companies and installation owners will be contacted for exact locations of their equipment. When the exact location cannot be determined, detection equipment or other acceptable means of locating the underground installations will be used before drilling.
- Safe clearance distances will be maintained between overhead power lines and any part of the drill rig unless the power lines have been de-energized and grounded or where insulating barriers have been installed to prevent physical contact. To avoid physical contact and potential arcing from the power line to the drill rig, rigs will remain at least 10 feet from overhead power lines for voltage of 50 kilovolts (kV) or less and 10 feet plus ½ inch for every 1 kV over 50 kV in the U.S.
- When it is difficult for the drill rig operator to maintain the safe clearance distance, a person will be designated to observe the clearance and warn the operator.
- Drilling pad preparation is recommended, particularly on steep slopes or areas that are covered with dry, dead grass and weeds. Clean fill or gravel can be brought in to cover areas with surface contamination and to construct a relatively level work surface. Care should be taken in constructing pads if extensive cutting into existing slopes or surfaces is required to level the area. Areas in which extensive fill is required should be avoided. Compaction is recommended if significant amounts of fill are needed.
- The drill rig should be leveled and stabilized with jacks and adequate cribbing before raising the mast and during drilling operations. Cribbing materials should be made from materials that are capable of supporting the weight of the rig. Care should be taken in muddy, soggy soils, or partially frozen areas. In addition to cribbing, guy wires should be used to improve stability if the rig is located on wet, partially frozen ground, in areas with loose, caving soil, or in an area subject to frequent gusty winds.

7.2 Groundwater Monitoring

The following practices and controls are to be implemented by those who perform groundwater monitoring procedures:

- Groundwater sampling will be performed by personnel who have had 40-hour Hazardous Waste Operations and Emergency Response training in accordance with U.S. Occupational Safety and Health Administration requirements set forth in 29 *Code of Federal Regulations* 1910.
- Become familiar with the site and potential hazards before the work is performed by talking with the Davis Landfill manager.

- Wear the appropriate personal protective equipment when sampling, including safety glasses, latex gloves, and steel-toed boots. It is recommended that workers use Level D personal protection consisting of the following:
  - Coveralls and long-sleeve shirt
  - Safety boots or shoes
  - Safety glasses or goggles
  - Latex gloves
- Use caution when opening well lids. Wells may contain venomous spiders and hornet or wasp nests.
- Use the appropriate lifting procedures when unloading equipment and sampling at each well.
- Avoid sharp edges on well casings.
- If dermal contact is made with the groundwater or acid used in sample preservation, wash exposed skin thoroughly with soap and water.
- Avoid eating and drinking onsite and during sampling.
- Use ear plugs during sampling if sampling involves a generator.
- As stated in Section 3.1.3, purge water containing constituents exceeding primary drinking water quality standards will be containerized and transported to the appropriate disposal area.
- Be aware of potential biological hazards including snakes, bees, ticks, other stinging insects, poison ivy, and poison oak.
- Monitor headspace of wells before sampling to minimize any vapor inhalation or flammability/explosion hazards. Be aware of the potential for flammable gasses to be present in the well casing and inside the aboveground or flush-mount protective casing. If such conditions are suspected or have been confirmed through testing with a flame ionization detector, ventilate the well for at least 20 minutes, and keep potential ignition sources a minimum of 50 feet away from the well during sampling. Tools or equipment lowered into the well casing (e.g., a water level meter or direct-reading instrument) or used near the wellhead must be intrinsically safe. Maintain site control to prevent the public or other nearby workers from inadvertently introducing an ignition source (e.g., a lit cigarette).

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8.0 References

Anderson, P.B., D.D. Susong, S.R. Wold, V.M. Heilweil, and R.L. Baskin. 1994. *Hydrogeology of Recharge Areas and Water Quality of the Principal Aquifers along the Wasatch Front and Adjacent Areas, Utah*. U.S. Geological Survey. Water-Resources Investigation Report. pp. 93–4,221.

Bingham Environmental Inc. 1997. *Groundwater Monitoring Plan at Davis County Landfill*. Wasatch Integrated Waste Management District. Davis County, Utah. April.

Feth, J.H., D.A. Barker, L.G. Moore, R.J. Brown, and C.E. Veirs. 1966. *Lake Bonneville: Geology and Hydrology of the Weber Delta District including Ogden, Utah.* U.S. Geological Survey Professional Paper 518.

Lemons, D.R., and M.A. Chan. 1999. "Facies Architecture and Sequence Stratigraphy of Fine-Grained Lacustrine Deltas along the Eastern Margin of Late Pleistocene Lake Bonneville, Northern Utah and Southern Idaho." *AAPG Bulletin*. Vol. 83, No. 4. pp. 635–665.

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APPENDIX A

Current Monitoring Network Well Logs

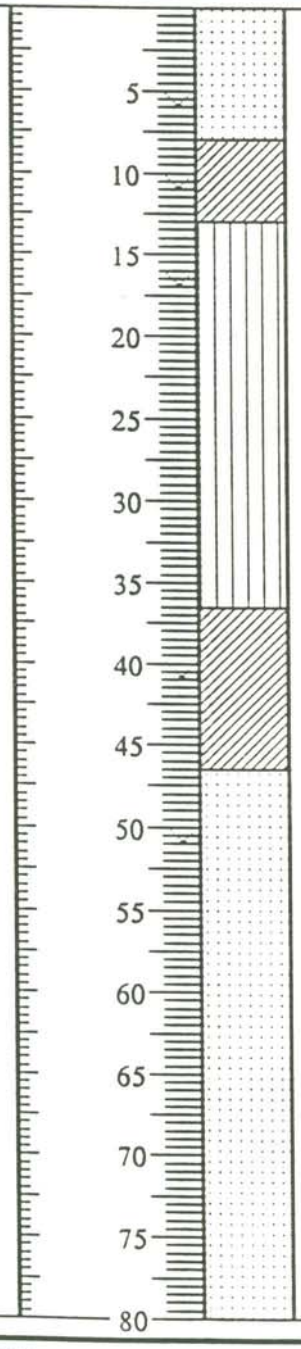
LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-2

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 1 OF 5

BY RCK DATE 10/25/88 SURFACE ELEV. ~ 4947 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAI



SILTY SAND (SP-SM), yellowish brown (10YR, 6/4); moderately silty; fine grained, subangular to subrounded quartz; no cohesion; sparse dark minerals; damp to dry.

SANDY CLAY (CL), yellowish brown (10YR, 6/4); silty; fine sand; moderate cohesion; damp to dry.

CLAYEY SILT (ML), brown (10YR, 5/3); low to moderate plasticity; medium density; dry to damp.

@21-22': sandy

@30': increase in plasticity.

CLAY (CL), olive gray (5Y, 3/2); moderate plasticity; medium density; damp to moist.

SAND (SP), dark brown (10YR, 3/3); minor silt; fine grained, subangular to subrounded quartz; no cohesion; sparse dark minerals; dry to damp.

@55': yellowish brown (10YR, 6/4).

EMCON ASSOCIATES

REMARKS

Boring was drilled using air rotary equipment to 223 feet, then mud rotary equiment to 390 feet. Logged from drill cuttings. Converted to monitoring well. See well detail for construction information.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-2

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 2 OF 5

BY RCK DATE 10/25/88 SURFACE ELEV. 4947 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				85			**SAND** (continued)	
				90				
				95				
				100				
				105				
				110				
				115				
				120				
				125				
				130				
				135			@135': moist.	
			10/25/89 ▽	140			@140: brown (10YR, 5/3); moist to wet.	
				145				
				150				
				155				
				160				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-2

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 3 OF 5

BY RCK DATE 10/25/88 SURFACE ELEV. 4947 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WEL DETA
				165			**SILTY SAND (SM),** dark yellowish brown (10YR, 4/4); slightly cohesive; wet.	
				170				
				175				
				180			@178': begin drilling with water. **CLAY (CH),** dark gray (10YR, 4/1); wet.	
				185				
				190				
				195			**SILTY SAND (SM),** silty; fine grained; dense; well compacted; hard drilling.	
				200				
				205				
				210				
				215				
			▼	220			**CLAY (CH),** dark grayish brown (10YR, 4/2); gravel layers toward bottom of unit; moist to wet.	
			10/25/89					
				225				
				230			**SAND (SP-SM),** silty; fine grained.	
				235				
				240				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-2

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 4 OF 5

BY RCK DATE 10/25/88 SURFACE ELEV. 4947 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAI
				245			SAND (continued) @243': intermittent thin layers of clay and silty clay.	
				250				
				255				
				260				
				265			SILTY CLAY (CH), gray (10YR, 5/1); occasional sand lenses; moderate to high plasicity; moist to wet; very slow drilling.	
				270				
				275				
				280			@278': silt and sand lenses absent.	
				285				
				290			@288': high plasticity; wet.	
				295				
				300				
				305			SAND (SP), fine grained.	
				310				
				315				
				320				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 — BORING NO. DMW-2

PROJECT NAME DAVIS COUNTY LANDFILL — PAGE 5 OF 5

BY RCK — DATE 10/25/88 — SURFACE ELEV. 4947 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAI
				325			CLAY (CH), silty, trace fine sand; moderate to high plasticity.	
				330				
				335				
				340				
				345			SAND (SP), fine to medium grained.	
				350				
				355				
				360				
				365				
				370			SANDY CLAY (CL), silty; maybe interbedded sand, silt, and clay.	
				375				
				380				
				385				
				390			BORING TERMINATED AT 390 FEET.	
				395				
				400				

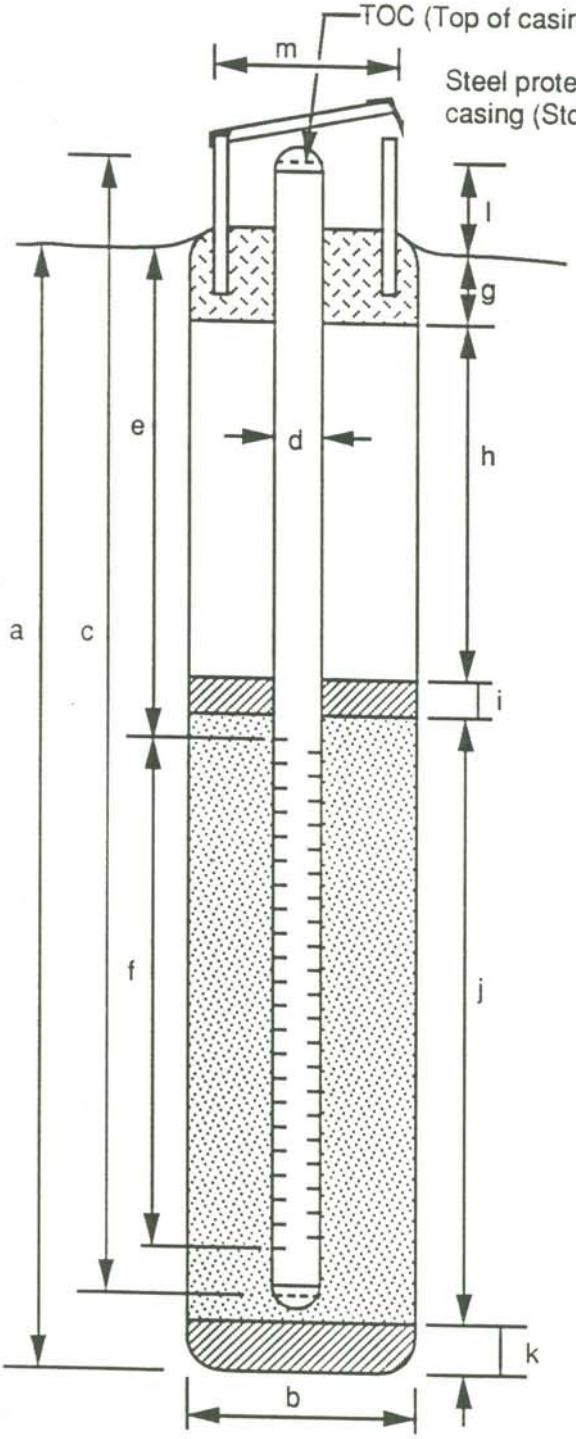
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 558-02.03
PROJECT NAME North Davis Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. _____

BORING / WELL NO. DMW-2
TOP OF CASING ELEV. 4948.99'
GROUND SURFACE ELEV. 4947'
DATUM Davis County Benchmark
INSTALLATION DATE 10/25/88



EXPLORATORY BORING

a. Total depth 390 ft.
b. Diameter 12 in.
Drilling method Mud Rotary

WELL CONSTRUCTION

c. Total casing length 177.5 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 145 ft.
f. Perforated length 30 ft.
Perforated interval from 145 to 175 ft.
Perforation type Machine slotted
Perforation size 0.020 inches
g. Surface seal 1 ft.
Material Concrete
h. Backfill 124 ft.
Material Concrete/Bentonite
i. Seal 10 ft.
Material Bentonite pellets
j. Gravel pack 40 ft.
Gravel pack interval from 135 to 175 ft.
Material #10/20 Sand
k. Bottom seal/fill 215 ft.
Material Bentonite/Concrete/Natural Materials
l. Casing stickup 2.5 ft.
m. Protective casing diameter 8 in.

Form prepared by _____

STRATA DATA INC.

NATURAL GAMMA/ NEUTRON LOG

FILE NO. 5152B

COMPANY: EMCON ASSOCIATES

WELL: DMW-2

FIELD: NORTH DAVIS REFUSE DISPOSAL SITE

COUNTY: DAVIS STATE: UTAH

LOCATION: 202967' N., 104388' E.

SEC: TWP: RGE:

OTHER LOGS: NONE

PERMANENT DATUM: TOP OF CASING

ELEVATION: 4948.99'

LOG MEASURED FROM: TOP OF CASING

RUN NO.	ONE			
DATE:	08/24/89			
DRILLER :				
DEPTH at BIT DIA.				
DEPTH at BIT DIA.				
CASING DPTH/SIZE	4" PVC			
CASING DPTH/SIZE				
LOGGER :				
DEPTH	161.2'			
CASING DEPTH	161.2'			
BOT LOG INTERVAL	161.2'			
TOP LOG INTERVAL	0'			
TYPE FLUID IN HOLE	WATER			
Rm at TEMP	N/A			
SAMPLE SOURCE	N/A			
FLUID LEVEL	N/A			
TIME SINCE CIRC.	N/A			
RECORDED BY:	McDONALD, WEIKUM			
WITNESSED BY:	MR. SCHWYN			

LOGGING DATA

LOG FUNCTION	RUN NO.	EQUIPMENT MODEL	EQUIPMENT PROBE S.N.	EQUIPMENT UPHOLE S.N.	LOGGING DIG INT FEET	LOGGING SPEED FT./MIN	DETECTOR TYPE	SPACING Tx-Rx FEET	SPACING Rx-Rx FEET	SOURCE TYPE	SOURCE SIZE CURIE	LOGGED INTERVAL FROM	LOGGED INTERVAL TO	LOGGED INTERVAL INT. FEET
Gamma	One	9256	27A20	105	0.5	20	Scint.	N/A	N/A	N/A	N/A	161.2	0	161.2
Neutron	One	9250	27U5A35	105	0.5	20	Prop.	12 In.	N/A	AmBe	3.0	161.2	0	161.2

CALIBRATION FACTOR(S): Shop API Calibration.

DIGITAL FILE NAME(S): DMW-2.LOG

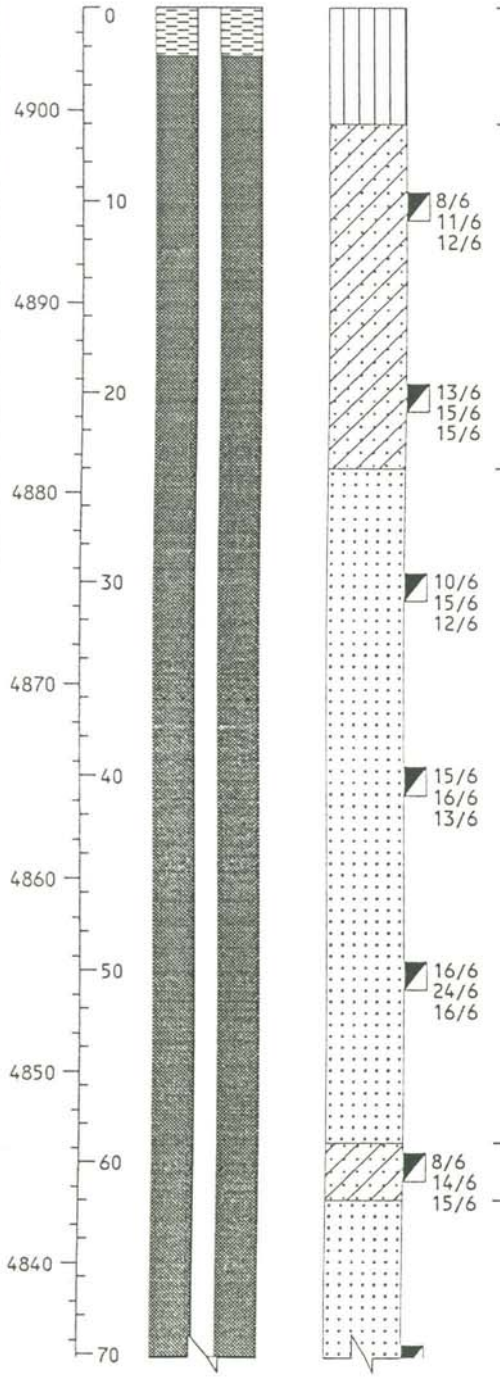
REMARKS:

The Neutron log was recorded on a separate run.

DRILL HOLE LOG
MONITOR WELL NO.: DMW-4

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: West side of site
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 192.67' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-6-96
TOC ELEV.: 4907.55'
GS ELEV.: 4905.3'
LOGGED BY: DCH
WELL NO.: DMW-4



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			ML	SANDY SILT: Brown, fine to medium, moist.			
			CL	SANDY CLAY: Brown, fine, some sand lenses, very stiff, wet.	B-1	9.5-11	18/18
				...grades with occasional wet sand lenses.	B-2	19.5-21	18/18
			SP	SAND: Yellowish brown, fine to medium, dense, moist.	B-3	29.5-31	18/18
					B-4	39.5-41	18/18
					B-5	49.5-51	18/18
			CL	SANDY CLAY: Brown, fine, very stiff, moist.	B-6	59.5-61	18/18
			SP	SAND: Yellowish brown, fine to medium, dense to very dense, moist.			

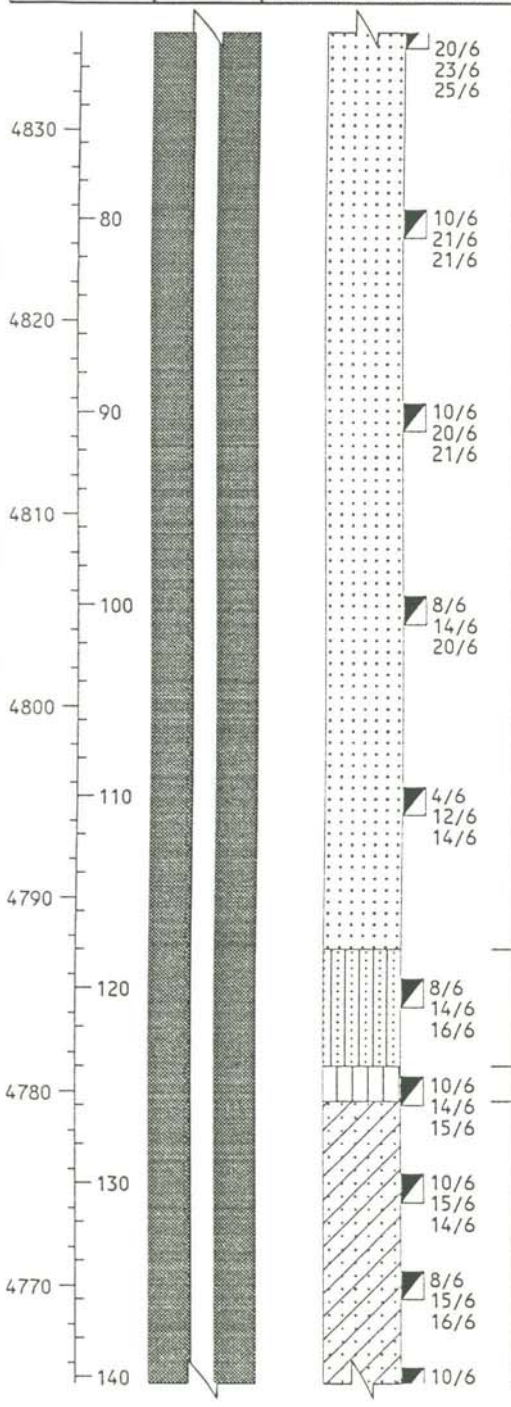
Figure No. 1

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: DMW-4

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: West side of site
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 192.67' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-6-96
TOC ELEV.: 4907.55'
GS ELEV.: 4905.3'
LOGGED BY: DCH
WELL NO.: DMW-4



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
					B-7	69.5-71	18/18
					B-8	79.5-81	18/18
					B-9	89.5-91	18/18
				...grades wet.			
					B-10	99.5-101	18/18
					B-11	109.5-111	18/18
			SM	SILTY SAND: Gray, fine to medium, dense, wet.	B-12	119.5-121	18/18
			ML	SANDY SILT: Gray, fine, stiff, wet.	B-13	124.5-126	18/18
			CL	SANDY CLAY: Gray, fine, interbeded with sandy silt and clay, stiff, moist to very moist.	B-14	129.5-131	18/18
				...grades with occasional reddish brown lenses.	B-15	134.5-136	18/18
					B-16	139.5-	18/18

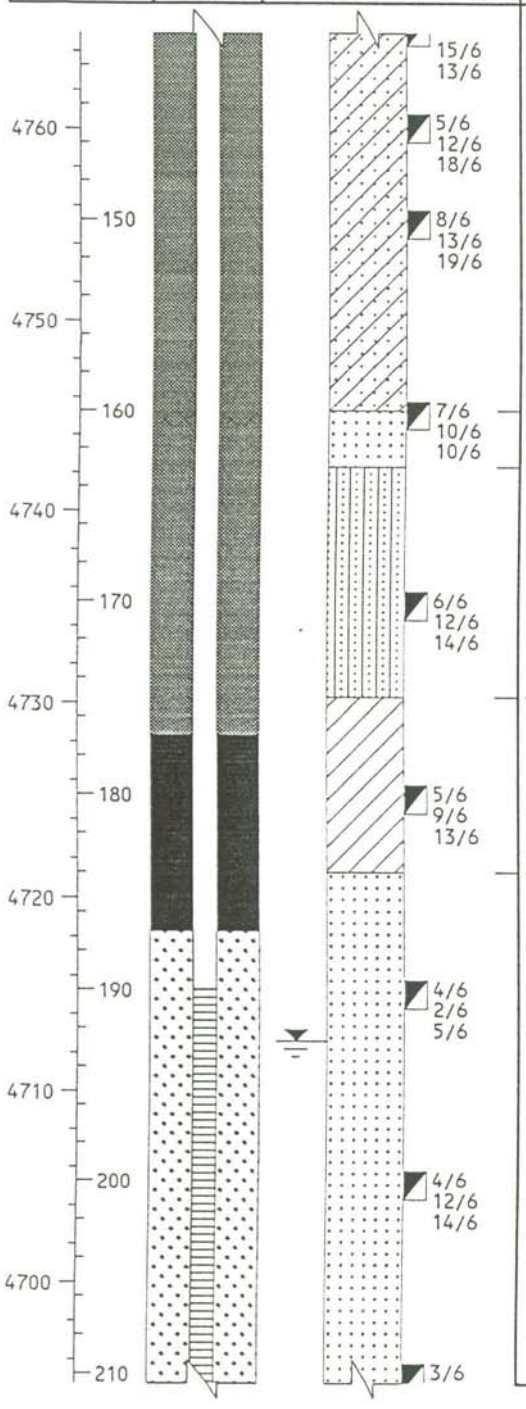
Figure No. 2

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: DMW-4

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: West side of site
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 192.67' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-6-96
TOC ELEV.: 4907.55'
GS ELEV.: 4905.3'
LOGGED BY: DCH
WELL NO.: DMW-4



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
						141	
					B-17	144.5-146	18/18
					B-18	149.5 = 151	18/18
			SP	SAND: Gray, fine to medium, medium dense, moist.	B-19	159.5-161	18/18
			SM	SILTY SAND: Gray, fine, occasional silt and clay lenses, medium dense, moist to wet.			
					B-20	169.5-171	18/18
			CL	SILTY CLAY: Gray, occasional reddish brown lenses, slightly sandy, very stiff, moist.			
					B-21	179.5-181	18/18
			SP	SAND: Gray, fine to medium, loose, moist to wet.			
					B-22	189.5-191	18/18
					B-23	199.5-201	18/18
					B-24	209.5-	18/18

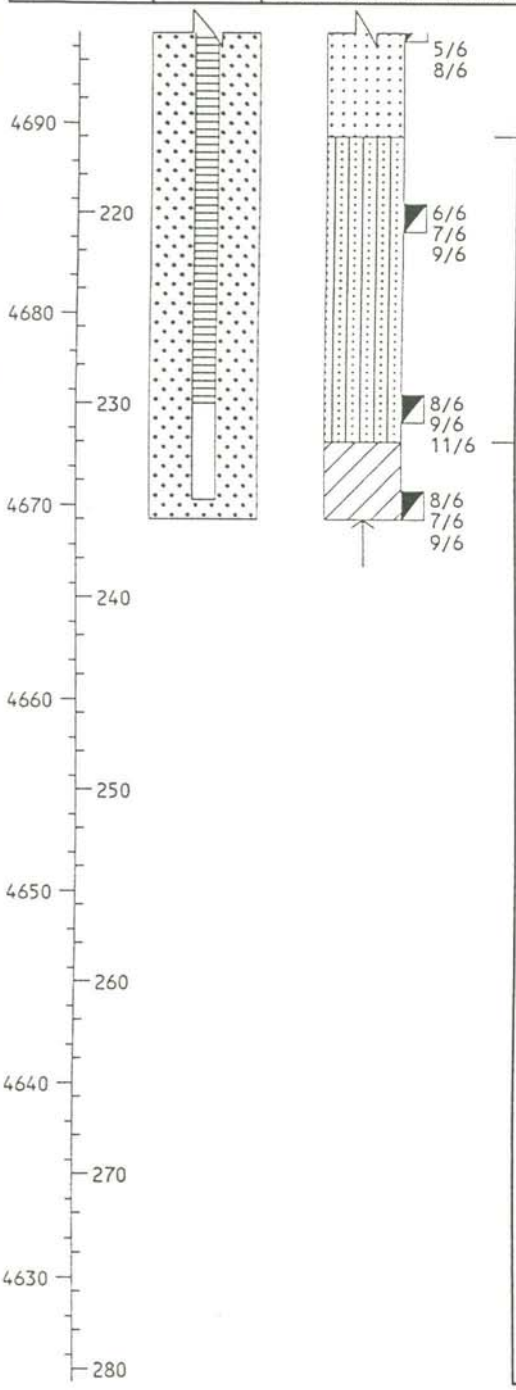
Figure No. 3

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: DMW-4

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: West side of site
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 192.67' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-6-96
TOC ELEV.: 4907.55'
GS ELEV.: 4905.3'
LOGGED BY: DCH
WELL NO.: DMW-4



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
						211	
			SM	SILTY SAND: Gray, fine, medium dense, wet.	B-25	219.5-221	18/18
					B-26	229.5-231	18/18
			CL	SILTY CLAY: Gray, stiff, moist to very moist.	B-27	234.5-236	18/18

Figure No. 4

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-5**

PROJECT NAME **NDRD** PAGE **1 OF 5**

BY **W. A. Lambert** DATE **9/6/89** SURFACE ELEV. **4882.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND	100						**CLAYEY SILT** (ML), dark brown (7.5YR, 4/6) to strong brown (7.5YR, 5/8); 15-20% fines; stiff; dry.	
							SAND (SP), dark brown (7.5YR, 4/6); 5-7% silt; medium dense to dense; damp to moist.	
ND	100	32		5			@5': Clay, dark brown (7.5YR, 4/2); 1/4" to 1/2" thick bed.	
ND	80%	37		10			@ 10-11.5': Sand, as above; no clay beds; dense.	
							@ 12.5': slight moisture increase.	
ND	80%	26		15			@ 15-16.5': moist.	
				20				

REMARKS

Boring was drilled with 8-inch outside diameter (O.D.) holow-stem augers. Samples were collected with a 2-inch inside diameter, 3-inch O.D. California modified split-spoon sampler. ND = Not Detected NR = No Recovery

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-5**

PROJECT NAME **NDRD** PAGE **2 OF 5**

BY **W. A. Lambert** DATE **9/6/89** SURFACE ELEV. **4882.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND	87%	24					**CLAY** (CL), brown (7.5YR, 5/4) to dark brwon (7.5YR, 4/8); red (2.5YR, 4/8) coating partings; closed partings; medium plasticity; very stiff; damp to moist.	
							SAND (SP), as above; medium dense.	
ND	87%	39		25			**CLAY** (CL), as above; moist to wet.	
							SAND AND CLAY (SP/CL) INTERBEDDED , very thinly interbedded; damp to moist; Sand (SP), as above. Clay (CL), as above.	
ND	80%	49		30			**SAND** (SP), as above; 5-7% fines; dense; damp. @ 31': Clay, as above; 1/4"-thick ded.	
ND	87%	39		35			@35': faint thin bedding.	
				40				

REMARKS

Boring was drilled with 8-inch outside diameter (O.D.) holow-stem augers. Samples were collected with a 2-inch inside diameter, 3-inch O.D. California modified split-spoon sampler. ND = Not Detected NR = No Recovery

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/6/89**

BORING NO. **MW-5**

PAGE **3 OF 5**

SURFACE ELEV. **4882.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND	80%	35					@ 40': Silty Clay, 3/4'-thick bed; low to medium plasticity; dense; damp to moist.	
ND	80%	47		45			@45': very dense; damp. @ 45.3': Clay, as above; 1"-thick bed; damp to moist. @ 47': 12-25% fines; moist.	
ND	100%	75		50			@ 50': trace fines; very dense; damp.	
ND	100%	100		55			@ 55': very dense, refusal to sampling.	
				60				

REMARKS

Boring was drilled with 8-inch outside diameter (O.D.) holow-stem augers. Samples were collected with a 2-inch inside diameter, 3-inch O.D. California modified split-spoon sampler. ND = Not Detected NR = No Recovery

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-5**

PROJECT NAME **NDRD** PAGE **4 OF 5**

BY **W. A. Lambert** DATE **9/6/89** SURFACE ELEV. **4882.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND	80%	69					**SAND AND SILTY SAND** (SP/SM), INTERBEDDED, very thinly bedded; very dense; damp to moist: Sand (SP), 7-12% fines; Silty Sand (SM); 20-30% fines.	
			9/6/89	65			**SILTY SAND** (SM-ML), yellowish brown (10YR, 5/4) to dark brown (7.5YR, 4/2); 20-30% fines; 70-80% fine sand; slight to medium plasticity; very loose; wet.	
			9/6/89					
				70				
ND	0.00	37		75				
				80				

REMARKS

Boring was drilled with 8-inch outside diameter (O.D.) holow-stem augers. Samples were collected with a 2-inch inside diameter, 3-inch O.D. California modified split-spoon sampler. ND = Not Detected NR = No Recovery

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/6/89**

BORING NO. **MW-5**

PAGE **5 OF 5**

SURFACE ELEV. **4882.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				85			Silty Sand (SM-ML), as above.	
							BORING TERMINATED AT 85 FEET.	
				90				
				95				
				100				

REMARKS

Boring was drilled with 8-inch outside diameter (O.D.) holow-stem augers. Samples were collected with a 2-inch inside diameter, 3-inch O.D. California modified split-spoon sampler. ND = Not Detected NR = No Recovery

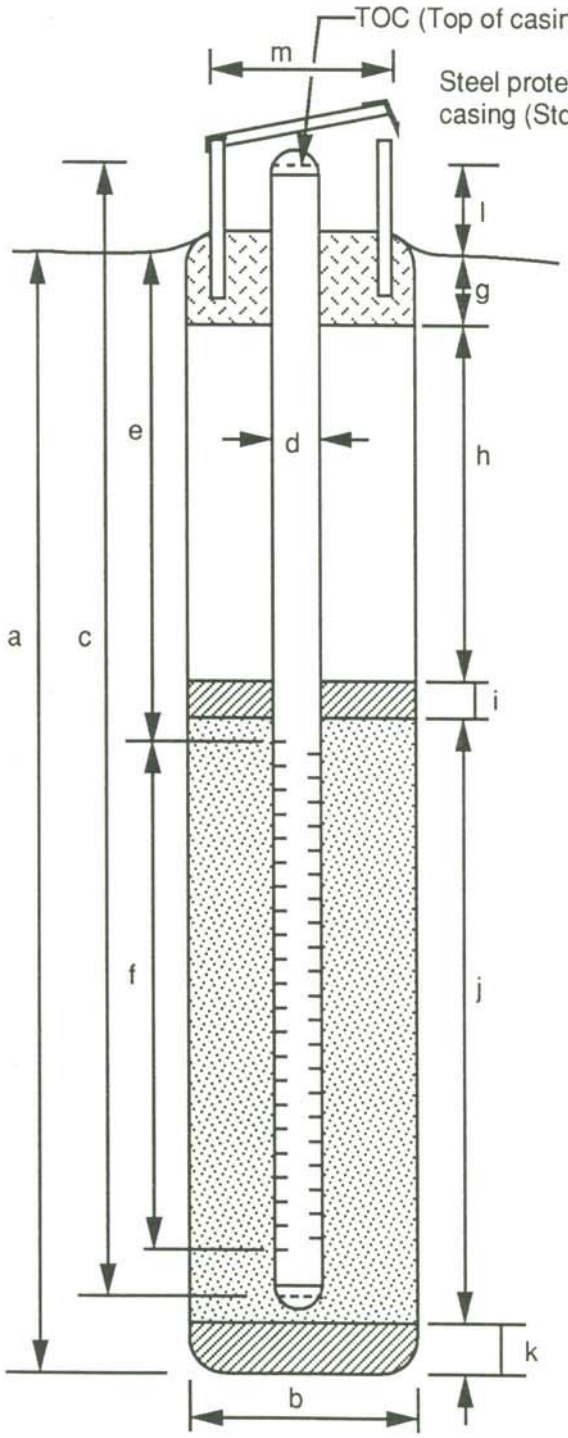
EMCON ASSOCIATES

WELL DETAILS

EMCON Associates

PROJECT NUMBER 558-02.05
PROJECT NAME NDRD Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. NA

BORING / WELL NO. MW-5
TOP OF CASING ELEV. 4884.21
GROUND SURFACE ELEV. 4882.1
DATUM Mean Sea Level
INSTALLATION DATE 9/12/89



EXPLORATORY BORING

a. Total depth 85 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

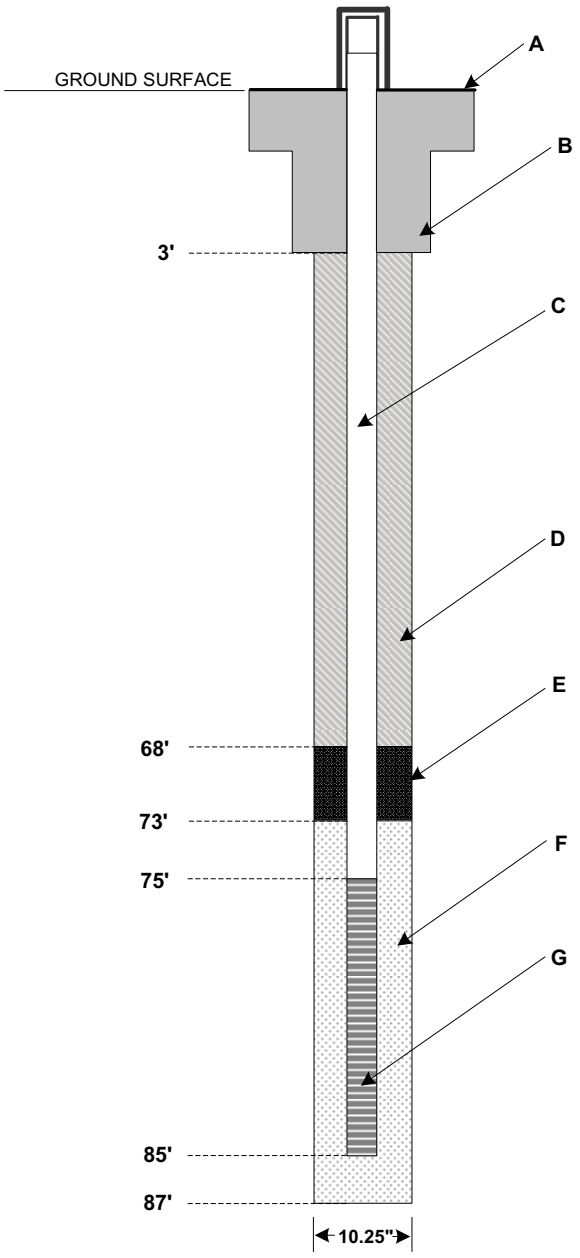
WELL CONSTRUCTION

c. Total casing length 78 ft.
Material Schedule 40, PVC
d. Diameter 2 in.
e. Depth to top perforations 66 ft.
f. Perforated length 10 ft.
Perforated interval from 66 to 76 ft.
Perforation type Factory slot
Perforation size 0.020 in.
g. Surface seal ____ ft.
Material NA
h. Backfill 55 ft.
Material 4% Bentonite/Cement
i. Seal 6 ft.
Material Bentonite
j. Gravel pack 22 ft.
Gravel pack interval from 61 to 83 ft.
Material 10 x 20 Colorado Sand
k. Bottom seal/fill 2 ft.
Material Native
l. Casing stickup 3 ft.
m. Protective casing diameter 6 in.

Form prepared by WAL/HMS

MONITORING WELL / PIEZOMETER CONSTRUCTION LOG

WELL NO: **MW-7R**	PROJECT: **WIWMD MW-7 Replacement**	SITE: **Wasatch Integrated Waste Management District**	
PROJECT NO: **370547.WI.01**	CONSTRUCTED BY: **Boart Longyear**	CITY: **Layton, UT**	
NORTHING: 286554.924	EASTING: 1881766.134	GROUND SURFACE ELEVATION: 4784.32	MEASURING POINT ELEVATION: 4786.71



A. SURFACE COMPLETION

COMPOSITION: **8-inch diameter protector pipe; 2.5-feet stick-up**

SIZE: **4' x 4' concrete pad**

B. SURFACE SEAL

MATERIAL: **Concrete**

INTERVAL: **-1.0' - 3.0'**

C. RISER PIPE

TYPE: **Schedule 80 PVC**

INTERVAL: **-2.5' – 75.0'**

D. GROUT

COMPOSITION: **Bentonite/Cement Grout**

INTERVAL: **3' - 68'**

E. SEAL

TYPE: **Bentonite Chips**

INTERVAL: **68' - 73'**

F. FILTER PACK

TYPE: **#20/40 Silica Sand**

INTERVAL: **73' - 87'**

G. SCREEN

DIAMETER: **4-inch**

TYPE: **Schedule 80 PVC**

SLOT SIZE: **10 slot (.010-inch)**

INTERVAL: **75' - 85'**

TOTAL DEPTH: **87.0'**
(FEET BELOW GROUND SURFACE)

CH2MHILL

PROJECT NUMBER: 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0	0.0-4.0	----	----------	----------	SM - Silty Sand, SM, Grayish Brown 10YR 5/2, med dense, moist, trace clayey sand lenses. (0/70/30)	Logged Cuttings 0'-70'. Split spoon sampling from 70' - 87'. (x/x/x) = %gravel/sand/fines
4	4.0-7.0	----	----------	----------	SC - Clayey sand, SC, very dark gray 10YR 3/1, moist, med dense. (0/60/40)	
7	7.0-10.0	----	----------	----------	CL - Silty sandy clay, CL, Grayish Brown 10YR 5/2, med stiff, moist. (0/20/80)	
10	10.0-16.0	----	----------	----------	CL - Silty sandy clay, CL, Grayish Brown 10YR 5/2, med stiff, moist, trace fine gravel. (0/20/80)	

CH2MHILL

PROJECT NUMBER 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
12.5						
13						
13.5						
14						
14.5						
15						
15.5						
16	16.0-18.0	----	----------	----------	SM - Fine silty sand, SM, yellowish brown 10YR 5/4, med dense, moist to dry. (0/80/20)	
16.5						
17						
17.5						
18	18.0-25.0	----	----------	----------	SM - Fine silty sand, SM, yellowish brown 10YR 5/4m ned dense, moist to dry. (0/90/10)	
18.5						
19						
19.5						
20						
20.5						
21						
21.5						
22						
22.5						
23						
23.5						
24						
24.5						

CH2MHILL

PROJECT NUMBER 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
25	25.0-30.0	----	----------	----------	SM - Fine silty sand, SM, yellowish brown 10YR 5/4, med dense, moist to dry. (0/85/15)	
25.5						
26						
26.5						
27						
27.5						
28						
28.5						
29						
29.5						
30	30.0-35.0	----	----------	----------	SMML - Fine silty sand, SM, Yellowish Brown 10YR 5/4, med dense, moist, with silty sandy clay lenses. (0/75/25)	
30.5						
31						
31.5						
32						
32.5						
33						
33.5						
34						
34.5						
35	35.0-40.0	----	----------	----------	MLSM - Interbedded sandy clayey silt/silty clay and silty sand, MLSM, med dense to dense, moist to dry, brown 10YR 5/3, trace fine gravel. (0/30/70)	
35.5						
36						
36.5						
37						

CH2MHILL

PROJECT NUMBER 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
37.5						
38						
38.5						
39						
39.5						
40	40.0-45.0	----	----------	----------	MLSM - As Above with percent change (0/40/60)	
40.5						
41						
41.5						
42						
42.5						
43						
43.5						
44						
44.5						
45	45.0-50.0	----	----------	----------	MLSM - As above	
45.5						
46						
46.5						
47						
47.5						
48						
48.5						
49						
49.5						

CH2MHILL

PROJECT NUMBER 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
50	50.0-55.0	----	----------	----------	SM - Fine silty sand, SM, Yellowish Brown 10YR 5/6, moist to dry, dense. (0/90/10)	
50.5						
51						
51.5						
52						
52.5						
53						
53.5						
54						
54.5						
55	55.0-60.0	----	----------	----------	SM - As above	
55.5						
56						
56.5						
57						
57.5						
58						
58.5						
59						
59.5						
60	60.0-65.0	----	----------	----------	SM - As above	
60.5						
61						
61.5						
62						

CH2MHILL

PROJECT NUMBER: 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
62.5						
63						
63.5						
64						
64.5						
65	65.0-70.0	----	----------	----------	SM - Fine silty sand, SM, Yellowish Brown 10YR 5/6, dense to very dense, with thin trace clay lenses. (0/80/20)	
65.5						
66						
66.5						
67						
67.5						
68						
68.5						
69						
69.5						
70	70.0-70.5	----	----------	----------	SMCL - Fine silty sand, SM, Yellowish Brown 10YR 5/6, med dense, dry, trace thin reddish brown 5YR 4/4 silty clay lenses (CL). (0/80/20)	Split spoon sample
				12		
70.5	70.5-71.0	----	----------	----------	SM - Fine silty sand, SM, Yellowish Brown 10YR 5/6, med dense, dry, with common oxide staining on bedding planes. (0/85/15)	Split spoon sample
				26		
71	71.0-71.5	----	----------	----------	SW - Fine sand, SW, Yellowish Brown 10YR 5/6, dense, moist to dry, trace mineral staining. (0/98/2)	Split spoon sample
				36		
71.5	71.5-72.0	----	----------	----------	SW - As Above	Split spoon sample
				40		
72						
72.5						
73						
73.5						
74						
74.5						

CH2MHILL

PROJECT NUMBER 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
75	75.0-75.5	----	----------	---------- 10	SW - Fine sand, SW, Yellowish Brown 10YR 5/6, med dense, wet, trace mineral staining. (0/95/5)	Split spoon sample
75.5	75.5-76.0	----	----------	---------- 18	SW - As Above	Split spoon sample
76	76.0-76.5	----	----------	---------- 20	SWML - 76' - 76.3': As above; 76.3'-76.5': Sandy silt, ML, med stiff, common oxide staining, trace clay lenses, moist. (0/35/65)	Split spoon sample
76.5						
77						
77.5						
78						
78.5						
79						
79.5						
80	80.0-80.5	----	----------	---------- 9	SM - Very fine silty sand, SM, Yellowish Brown 10YR 5/6, med dense, wet. (0/75/25)	Split spoon sample
80.5	80.5-81.0	----	----------	---------- 19	SM - As above	Split spoon sample
81	81.0-81.5	----	----------	---------- 20	SM - As above	Split spoon sample
81.5						
82						
82.5						
83						
83.5						
84						
84.5						
85	85.0-85.5	----	----------	---------- 10	SM - Very fine, very silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist, trace clay lenses. (0/70/30)	Split spoon sample
85.5	85.5-86.0	----	----------	---------- 15	SM - As above	Split spoon sample
86	86.0-86.5	----	----------	---------- 15	SMCL - 86'-86.2': As above; 86.2'-86.5': Silty clay, CL, Reddish Gray 5YR 4/2, med stiff, moist	Split spoon sample
86.5						
87	87.0-	----	----------	----------	End of Boring at 87'	

CH2MHILL

PROJECT NUMBER 370547.WI.01

BORING ID: **MW-7R**

SOIL BORING LOG

PROJECT: WIWMD MW-7 Replacement LOCATION:

ELEVATION: 4784.32 NORTHING: 286554.924 EASTING: 1881766.134 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Hollow Stem Auger DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~87.5' START: 3/10/2008 END: 3/12/2008 LOGGER: Corey Schwabenlander

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
87.5						

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/15/89**

BORING NO. **MW-8**

PAGE **1 OF 5**

SURFACE ELEV. **4792.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SILTY SAND (SM), grayish brown (10YR, 5/2) to brown (10YR, 5/3); 25-35% non-plastic fines; common refuse, plastic; loose; damp.	
ND	50%	20		5			**CLAY** (CL), mottled light yellowish brown (5YR, 6/4) to reddish brown (5YR, 4/4), high plasticity.	
							SILT (ML), dark yellowish brown (10YR, 4/4); abundant roots; very stiff; dry. **SILTY CLAY** (CL), brown (10YR, 5/3); medium plasticity; abundant roots; very stiff; dry.	
ND	50%	43		10			**CLAY** (CL), mottled light reddish brown (5YR, 6/4) to reddish brown (5YR, 4/4); high plasticity; hard; damp.	
ND	75%	20		15			**SILTY SAND, SILT, and CLAY** (SM/ML/CL) INTERBEDDED, 2-5" thick beds; abundant rootlets; moist to wet. Silty Sand (SM), reddish brown (5YR, 5/3); medium dense. Silt (ML), reddish brown (5YR, 5/3); non-plastic; very stiff. Clay (CL), mottled brown (10YR, 5/3), with common pinkish gray (5YR, 7/2); high plasticity; very stiff.	
ND	90%	21		20				

REMARKS

Boring drilled with 10-inch outside diameter (O.D.) hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/15/89**

BORING NO. **MW-8**

PAGE **2 OF 5**

SURFACE ELEV. **4792.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							CLAY (CL), reddish brown (5YR, 5/4) with very dark gray (5YR, 3/1) coating bedding plains; high plasticity; abundant rootlets and carbon; very stiff; moist.	
ND	60%	24		25			**SAND, SILT, AND CLAYEY SILT** (SM/ML/ML) INTERBEDDED, damp. Sand (SM), brown (7.5YR, 5/4); medium dense. Silt (ML), brown (7.5YR, 5/4); non- to slight plasticity; stiff. Clayey Silt (ML), reddish brown (5YR, 5/4); slight plasticity; very stiff.	
ND	65%	22		30			@ 29'-30': Clay, as above. **SAND** (SM), dark gray (10YR, 4/1); medium dense; wet.	
ND	75%	44		35			@ 34': Sand (SM), as above; brown (7.5YR, 5/4); dense; damp to moist.	
ND	30%	40		40				

REMARKS

Boring drilled with 10-inch outside diameter (O.D.) hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/15/89**

BORING NO. **MW-8**

PAGE **3 OF 5**

SURFACE ELEV. **4792.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	DEPTH IN FT.	DESCRIPTION
ND		36	45	**SAND AND CLAY** (SM/CL) INTERBEDDED, as above; dense/hard; moist.
ND	60%	40	50	**SAND, SILTY SAND, CLAYEY SILT, SILT, AND CLAY** (SM/ML/ML/ML/CL) INTERBEDDED, as above. dense/hard; damp.
ND	80%	41	55	@ 54': interbedded as above; 45% clay; 30% clayey silt; 25% silt; moderately oxide stained very thin silt beds.
ND	75%	45	60	**SAND** (SM), as above; dense; damp.

GROUND WATER LEVELS | SAMPLES | LITHO-GRAPHIC COLUMN | WELL DETAIL

REMARKS

Boring drilled with 10-inch outside diameter (O.D.) hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/15/89**

BORING NO. **MW-8**

PAGE **4 OF 5**

SURFACE ELEV. **4792.1 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND	80%	40		65				
				70				
ND	75%	45		75			**SAND, SLTY SAND, AND CLAY** (SM/ML/CL), INTERBEDDED, Sand, brown (7.5YR, 5/2) to light brown (7.5YR, 6/4); 2-6" thick beds; dense; wet. Silty Sand, as above; dense; moist. Clay; as above, hard; moist.	
ND	80%	68		80			**SAND** (SM), reddish brown (5YR, 5/3) to (5YR, 5/4); very dense; damp to moist.	

REMARKS

Boring drilled with 10-inch outside diameter (O.D.) hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.05
PROJECT NAME NDRD
BY W. A. Lambert DATE 9/15/89

BORING NO. MW-8
PAGE 5 OF 5
SURFACE ELEV. 4792.1 ft.

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND		68	▽ 9/15/89	85				
ND	85%	68		90			@ 89'; Sand (SM), as above; wet. @ 90': oxide stained throught. @ 90.5': Clay (CL), 1-2" thick bed; hard; moist. BORING TERMINATED AT 90.5 FEET.	
				95				
				100				

REMARKS

Boring drilled with 10-inch outside diameter (O.D.) hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. ND = Not Detected

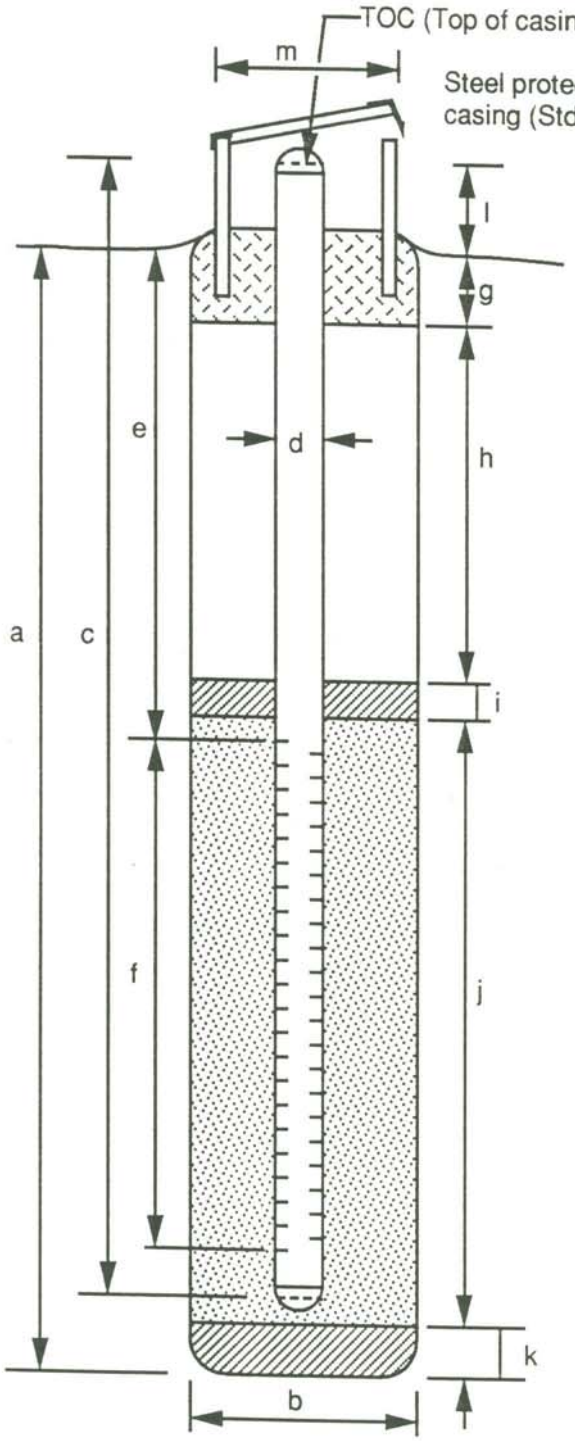
EMCON ASSOCIATES

WELL DETAILS

EMCON Associates

PROJECT NUMBER 558-02.05
PROJECT NAME NDRD Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. NA

BORING / WELL NO. MW-8
TOP OF CASING ELEV. 4794.02
GROUND SURFACE ELEV. 4792.1
DATUM Mean Sea Level
INSTALLATION DATE 9/15/89



EXPLORATORY BORING

a. Total depth 90 ft
b. Diameter 10 in
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

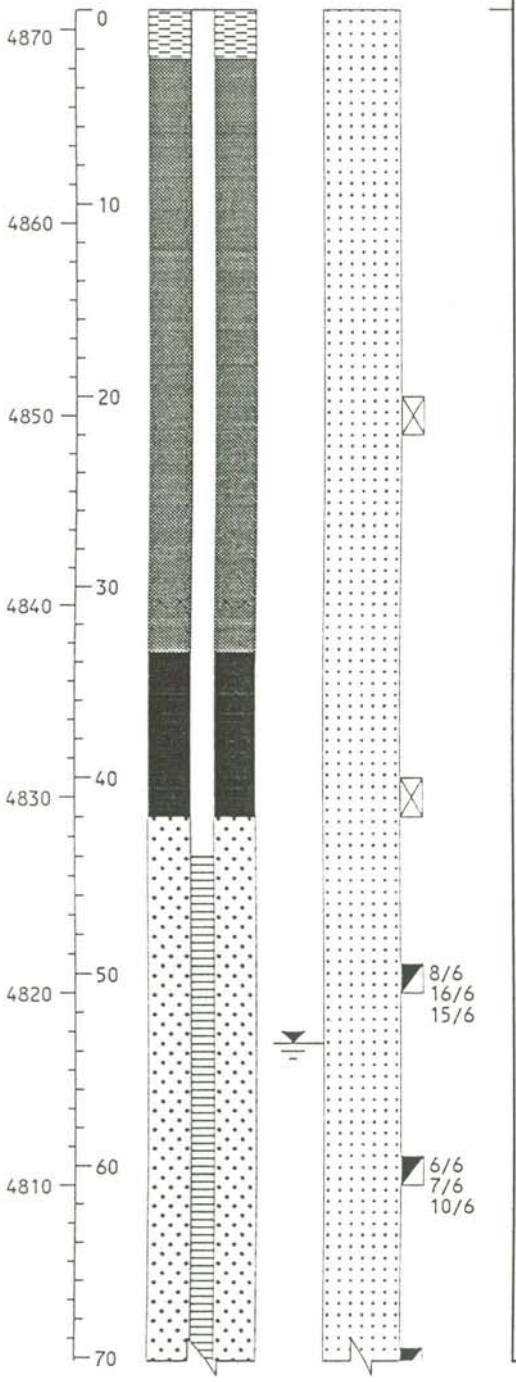
c. Total casing length 87 ft
Material Schedule 40, PVC .
d. Diameter (inside) 4 in
e. Depth to top perforations 76.5 ft
f. Perforated length 10 ft
Perforated interval from 76.5 to 86.5 ft
Perforation type Factory slot
Perforation size 0.020 in.
g. Surface seal 69 ft
Material Cement Grout
h. Backfill ft
Material NA
i. Seal 2 ft
Material Bentonite
j. Gravel pack 19 ft
Gravel pack interval from 71 to 90 ft
Material 10 x 20 Colorado Sand
k. Bottom seal/fill f
Material NA
l. Casing stickup 3 f
m. Protective casing diameter 8 in

Form prepared by WAL/HMS

DRILL HOLE LOG
MONITOR WELL NO.: MW-11

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: South west side of landfill
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 53.57' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-9-96
TOC ELEV.: 4873.10'
GS ELEV.: 4871.0'
LOGGED BY: DCH
WELL NO.: MW-11



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			SP	SAND: Yellowish brown, fine to medium, occasional reddish brown clay lenses, medium dense, moist to wet.			
					B-1	20	
					B-2	40	
					B-3	49.5-51	18/18
					B-4	59.5-61	18/18

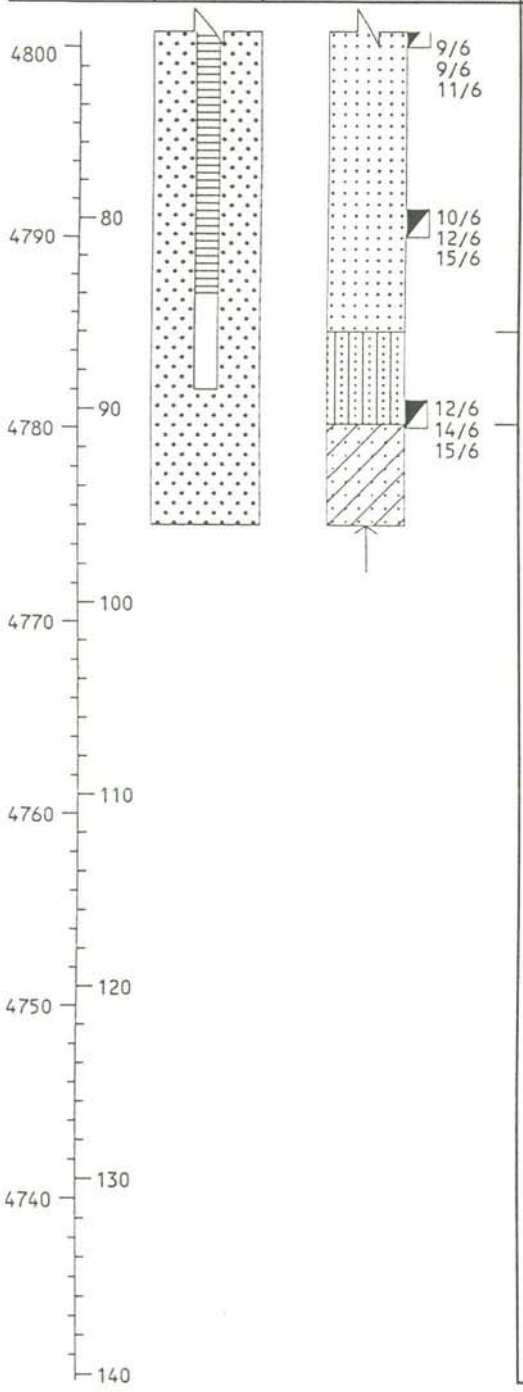
Figure No. 5

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: MW-11

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: South west side of landfill
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 53.57' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-9-96
TOC ELEV.: 4873.10'
GS ELEV.: 4871.0'
LOGGED BY: DCH
WELL NO.: MW-11



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
					B-5	69.5-71	18/18
					B-6	79.5-81	18/18
			SM	SILTY SAND: Gray, fine, medium dense, wet.			
					B-7	89.5-91	18/18
			CL	SANDY CLAY: Gray, fine, very stiff, moist to very moist.			

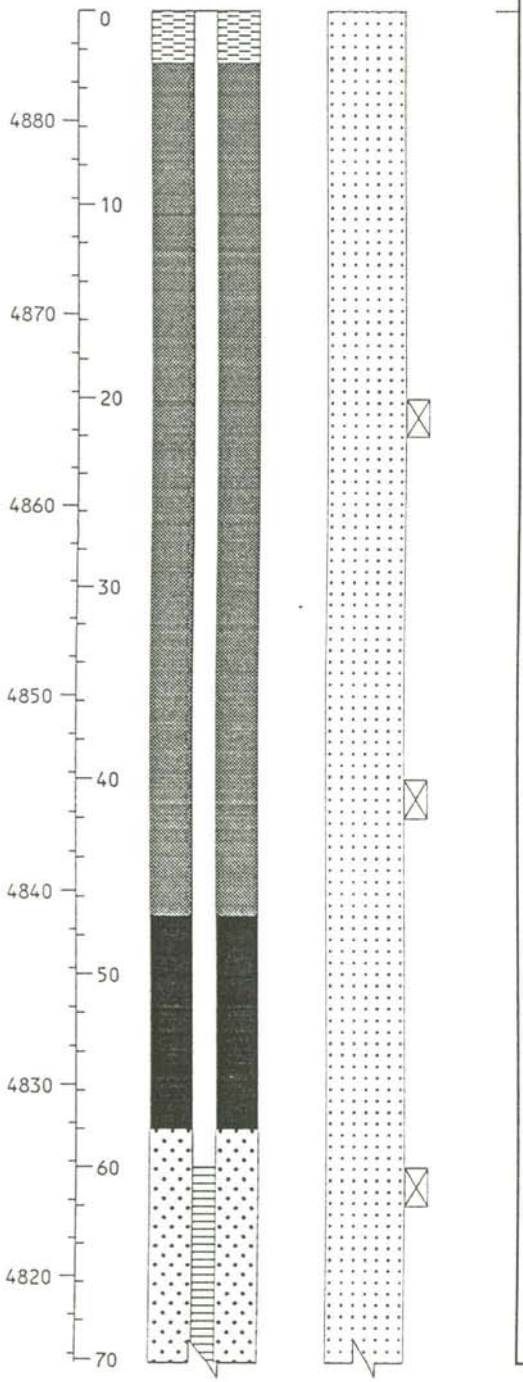
Figure No. 6

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: MW-12

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: South side of landfill
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 72.53' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-8-96
TOC ELEV.: 4887.98'
GS ELEV.: 4885.7'
LOGGED BY: DCH
WELL NO.: MW-12



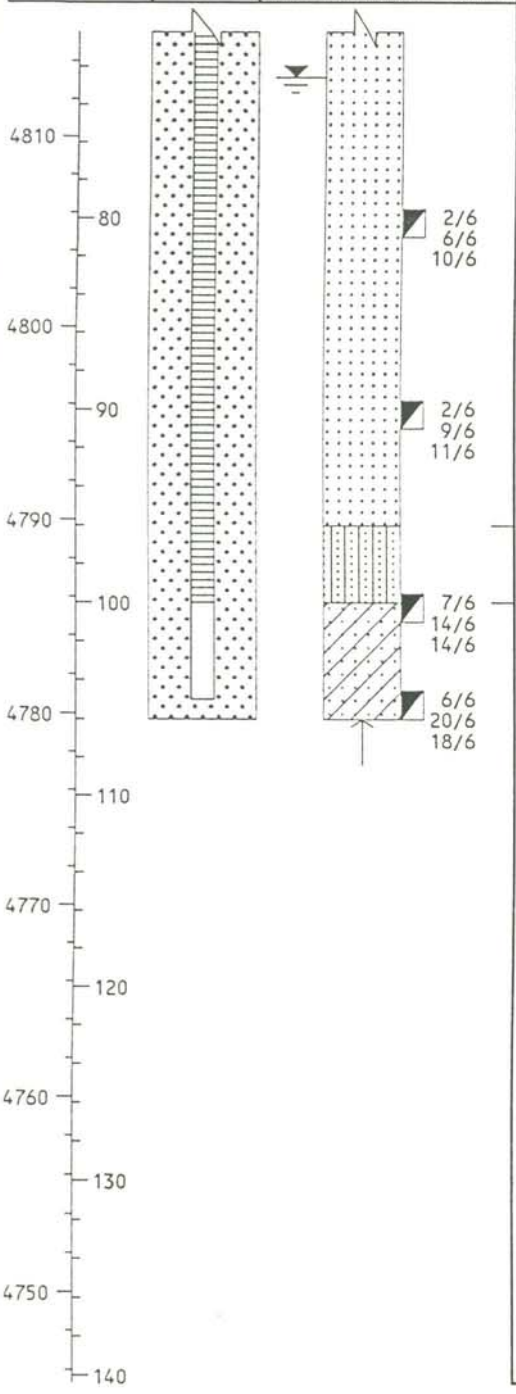
ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			SP	SAND: Brown to yellowsih brown, fine to medium, occasional reddish brown clay lenses, moist to wet.			
					B-1	20	
					B-2	40	
					B-3	60	

Figure No. 7

DRILL HOLE LOG
MONITOR WELL NO.: MW-12

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: South side of landfill
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 72.53' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-8-96
TOC ELEV.: 4887.98'
GS ELEV.: 4885.7'
LOGGED BY: DCH
WELL NO.: MW-12



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
					B-4	79.5-81	18/18
					B-5	89.5-91	18/18
			SM	SILTY SAND: Gray, fine, medium dense, wet.			
			CL	SANDY CLAY: Gray, fine, very stiff, moist to very moist.	B-6	99.5-101	18/18
					B-7	104.5-106	18/18

Figure No. 8

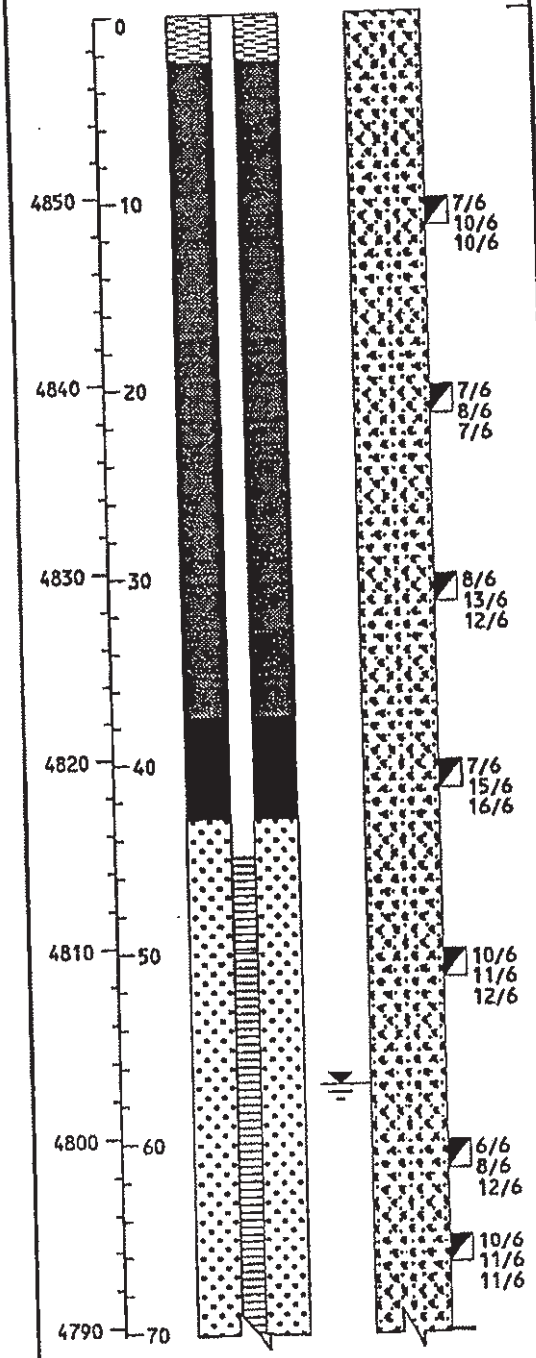
BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: MW-16

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: North side of landfill
DRILLER: Layne Environmental
DRILL RIG: Moble B-61
DEPTH TO WATER: 57'

HOLE DIAMETER: 8.25"

PROJECT NO.: 2697-004
DATE: 4-8-97
TOC ELEV.: 4860.90'
GS ELEV.: 4859.7'
LOGGED BY: DCH
WELL NO.: MW-16



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			SP	SAND: Brown to yellowish brown, fine to medium, occasional reddish brown clay lenses, medium dense, moist to wet.	B-1	10-11.5	14/18
					B-2	20-21.5	14/18
					B-3	30-31.5	13/18
					B-4	40-41.5	10/18
					B-5	50-51.5	12/18
					B-6	60-61.5	10/18
					B-7	65-66.5	16/18

Figure No. 1

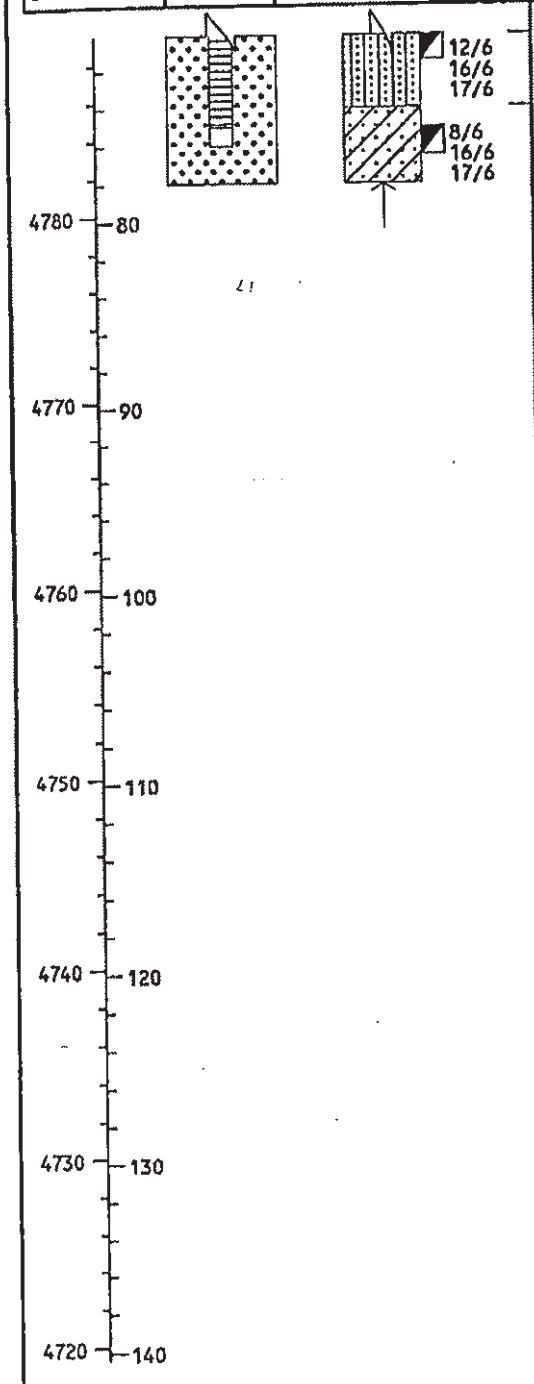
BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: MW-16

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: North side of landfill
DRILLER: Layne Environmental
DRILL RIG: Moble B-61
DEPTH TO WATER: 57'

HOLE DIAMETER: 8.25"

PROJECT NO.: 2697-004
DATE: 4-8-97
TOC ELEV.: 4860.90'
GS ELEV.: 4859.7'
LOGGED BY: DCH
WELL NO.: MW-16



USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
SM	SILTY SAND: Gray, fine, dense, wet.	B-8	70-71.5	18/18
CL	SANDY CLAY: Gray, fine, very stiff, moist to very moist.	B-9	75-76.5	18/18

Figure No. 2

BINGHAM ENVIRONMENTAL

DATE	
STARTED:	12/13/10
COMPLETED:	12/14/10
BACKFILLED:	12/15/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-22**
Sheet 1 of 6

LOCATION
NORTHING 201,424.15 EASTING 102,324.53 ELEVATION 4,887.8 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4885	0				SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with frequent seams of iron staining							
							- @ 2½ feet - with frequent 1 to 2 inch lenses of Sandy Lean CLAY (CL)							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, with occasional lens of Sandy Lean CLAY (CL) throughout, some iron light staining							
4880	5													
	10				SM		- @ 9 feet - 2 inch lens of Sandy Lean CLAY (CL) Silty SAND - medium dense, very moist, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with some light iron staining throughout - @ 11 feet - 3 inch lens of Poorly Graded SAND (SP)							
4875					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, with some light iron staining throughout							
	15													
4870					CL		Sandy Lean CLAY - medium stiff, moist, tan, clay has low plasticity							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained							
	20				SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, with some light iron staining throughout							
4865					SP-SM		Poorly Graded SAND with silt - dense to very dense, slightly moist, light brown, sand is fine- to medium-grained, silt is non-plastic, moderately cemented, thinly laminated							
	25				SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, weakly cemented, with frequent black organics throughout							
4860														
	30				ML		Sandy SILT - stiff, moist, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with some light iron staining throughout, weakly cemented							
4855					SP									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4890.288'

Plate 1a

DATE	
STARTED:	12/13/10
COMPLETED:	12/14/10
BACKFILLED:	12/15/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-22**
Sheet 2 of 6

LOCATION
NORTHING 201,424.15 EASTING 102,324.53 ELEVATION 4,887.8 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
					SP-SM		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, with some light iron staining throughout							
							Poorly Graded SAND with silt - medium dense, wet, brown, sand is fine-grained, with frequent black organics throughout							
4850					SM		Silty SAND - dense, moist, brown, sand is fine-grained, silt is non-plastic, largely isolated to ½- to 1-inch lenses, weakly cemented							
	40													
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained							
4845														
	45				SM		Silty SAND - dense, slightly moist, brown mottled with dark brown, sand is fine-grained, silt is non-plastic, largely isolated in ½- to 1-inch lenses							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained							
4840					CL		Sandy Lean CLAY - stiff, very moist, brown to red-brown, consists of alternating lenses of clay, sand and silt, with thick iron staining throughout							
	50													
					SP-SM		Poorly Graded SAND with silt - medium dense, very moist, light brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
4835					SM		Silty SAND - medium dense, very moist, brown, sand is fine-grained, silt has low to no plasticity, largely isolated to thin seams of Sandy SILT (ML) throughout, with thick iron staining							
	55													
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, with thick iron staining							
4830														
	60				SM		Silty SAND - dense, moist, brown, sand is fine-grained, silt has low to no plasticity, thinly laminated, with some light iron staining throughout							
4825														
	65				SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, with some light iron staining throughout, occasional ½-inch seam of Organic SILT (ML)							
4820														

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4890.288'

Plate 1b

DATE	
STARTED:	12/13/10
COMPLETED:	12/14/10
BACKFILLED:	12/15/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-22**
Sheet 3 of 6

LOCATION
NORTHING 201,424.15 EASTING 102,324.53 ELEVATION 4,887.8 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4815					SC		Clayey SAND - medium dense, very moist, brown to red-brown, sand is fine-grained, clay has low plasticity, with thick iron staining throughout							
	75				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained - @ 76 feet - very moist to wet							
4810					SP		Poorly Graded SAND - medium dense, very moist, brown, sand is fine-grained, with some light iron staining							
	80				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, with freqent ¼- to ½-inch seams of Sandy SILT (ML) throughout, with thick iron staining							
4805					SP		Poorly Graded SAND - medium dense, wet, brown, sand is fine-grained							
	85													
4800														
	90													
4795					SM		Silty SAND - medium dense, wet, brown, sand is fine-grained, silt is non-plastic							
	95				SP-SM		Poorly Graded SAND with silt - medium dense to dense, wet, brown to grey, sand is fine-grained, silt is non-plastic, mild organic odor							
4790														
	100				SM		Silty SAND - dense, wet, grey, sand is fine-grained, silt is non-plastic, mild organic odor							
4785					CL-ML		Sandy Silty CLAY - medium stiff, wet, grey, clay has low plasticity, sand is fine-grained, with occasional lenses of Lean CLAY (CL) throughout, thinly bedded, with some dark organics, moderate organic odor throughout							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4890.288'

Plate 1c

DATE	
STARTED:	12/13/10
COMPLETED:	12/14/10
BACKFILLED:	12/15/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-22
Sheet 4 of 6

LOCATION
NORTHING 201,424.15 EASTING 102,324.53 ELEVATION 4,887.8 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4780														
	110				ML		Sandy SILT - stiff, moist, brown to grey, sand is fine-grained, silt has low to no plasticity, mild organic odor							
					SM		Silty SAND - dense, moist to very moist, brown to grey, sand is fine-grained, silt is non-plastic, thinly laminated, mild organic odor							
4775	115				CL		Sandy Lean CLAY - stiff, moist, brown, sand is fine-grained, clay has low plasticity, contains frequent 1 to 2 inch seams of Clayey SAND (SC) throughout, with some dark organics							
4770					ML		Sandy SILT - stiff, moist, brown, sand is fine-grained, silt has low to no plasticity, with freqent seams of Sandy Lean CLAY (CL) throughout							
	120				CL		Sandy Lean CLAY - stiff, moist, brown to red-brown, sand is fine-grained, clay has low plasticity, frequent 1 to 2 inch seams of Sandy SILT (ML) throughout							
4765					ML		Sandy SILT - stiff, very moist, brown, sand is fine-grained, silt is non-plastic							
					CL		Sandy Lean CLAY - stiff, very moist, brown, sand is fine-grained, clay has low plasticity							
	125				CL-ML		Silty CLAY with sand - stiff to very stiff, moist, brown, clay has low plasticity, sand is fine-grained							
4760					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine- to medium-grained, wiht occasional ½-inch lenses of Sandy SILT (ML) throughout							
	130													
4755														
	135						- @ 136 feet - very moist - @ 137 feet - moist, brown to light grey, with some dark organics throughout							
4750														

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4890.288'

Plate 1d

DATE	
STARTED:	12/13/10
COMPLETED:	12/14/10
BACKFILLED:	12/15/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-22**
Sheet 5 of 6

LOCATION
NORTHING 201,424.15 EASTING 102,324.53 ELEVATION 4,887.8 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4745					SP		Poorly Graded SAND - medium dense, moist, brown to grey-brown, sand is fine-grained, with increasing silt with depth							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist to very moist, brown to grey, sand is fine-grained, silt is non-plastic, with some dark organics throughout							
	145				SM		Silty SAND - medium dense, very moist, brown, sand is fine-grained, silt is non-plastic, with some dark organics throughout							
4740														
	150													
4735					SC-SM		Silty Clayey SAND - medium dense, moist, brown to grey, sand is fine-grained, clay has low to no plasticity							
					SM		Silty SAND - medium dense, moist, brown to grey, sand is fine-grained, silt is non-plastic, with some dark organics throughout							
	155				CL-ML		Sandy Silty CLAY - stiff, moist, brown mottled with red-brown, clay has low plasticity, sand is fine-grained							
4730														
					SC-SM		Silty Clayey SAND - medium dense, moist, brown to grey, sand is fine-grained, clay has low to no plasticity							
	160													
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, largely located in isolated clasts throughout							
4725														
	165				SM		Silty SAND - dense, moist, light brown, sand is fine-grained, silt is non-plastic, silt content increases with depth							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained							
4720														
	170													
					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic							
4715					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, 3 inch lens of Sandy SILT (ML) at 173 feet							
					SP-SM									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4890.288'

Plate 1e

DATE	
STARTED:	12/13/10
COMPLETED:	12/14/10
BACKFILLED:	12/15/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-22**
Sheet 6 of 6

LOCATION
NORTHING 201,424.15 EASTING 102,324.53 ELEVATION 4,887.8 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4710					CL		Poorly Graded SAND with silt - dense, moist, light brown to grey, sand is fine-grained, silt is non-plastic, located in isolated 2 to 3 inch lenses throughout							
					SP		Sandy Lean CLAY - stiff, moist, brown, sand is fine-grained, clay has low plasticity, strong organic odor							
					SP-SC		Poorly Graded SAND - medium dense, moist to very moist, light brown, sand is fine-grained							
	180						Poorly Graded SAND with clay - medium dense, moist to very moist, light brown, sand is fine-grained, clay has low plasticity, largely isolated in 2 inch seams of Sandy Lean CLAY (CL) throughout							
					SP		Poorly Graded SAND - medium dense, very moist to wet, brown, sand is fine-grained							
4705					SP-SM		Poorly Graded SAND with silt - medium dense, very moist, brown, sand is fine-grained, silt is non-plastic, with frequent dark organics throughout							
					SP		Poorly Graded SAND - medium dense, very moist to wet, brown, sand is fine-grained							
	185													
4700					SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown to grey, sand is fine-grained, silt is non-plastic, with some dark organics throughout, mild organic odor							
	190				SM		Silty SAND - medium dense, wet, grey, sand is fine-grained, silt is non-plastic, with frequent dark organics							
					SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown to grey, sand is fine-grained, silt is non-plastic							
4695					SM		Silty SAND - medium dense, wet, brown to grey, sand is fine-grained, silt is non-plastic							
					SP		Poorly Graded SAND - medium dense, wet, brown to grey, sand is fine-grained							
	195				SM		Silty SAND - dense, wet, grey to brown, sand is fine-grained, silt is non-plastic							
4690														
	200				SC-SM		Silty Clayey SAND - dense, very moist, brown to red-brown, sand is fine-grained, clay has low plasticity, mild organic odor							
4685					SM		Silty SAND - dense, very moist, brown, sand is fine-grained, silt is non-plastic, with few dark organics throughout							
	205						Bottom of Boring @ 205 Feet							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4890.288'

Plate 1f

DATE
STARTED: 12/16/10
COMPLETED: 12/16/10
BACKFILLED: 12/17/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-23
Sheet 1 of 3

LOCATION
NORTHING 203,416.42 EASTING 102,933.40 ELEVATION 4,766.9 (feet)

ELEVATION	FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4765	0				SM		Silty SAND - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, with thin roots in upper 6 inches							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic							
	5				SM		Silty SAND - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic							
4760					ML		Sandy SILT - stiff, moist, light brown, sand is fine-grained, silt is non-plastic, thinly bedded							
	10						- @ 12 feet - dark brown to black, with thick roots and other organics, moderate organic odor							
4755					CL-ML		Silty CLAY with sand - stiff, moist, brown mottled with black organics, sand is fine-grained, clay has low to no plasticity, moderate organic odor							
	15				SC-SM		Silty Clayey SAND - dense, moist, light brown, sand is fine-grained, silt has low to no plasticity, with some thin roots throughout							
4750														
	20						- @ 20 feet - shells observed in soil							
4745							- @ 22 feet - 6 inch seam of Clayey SAND (SC)							
							- @ 23 feet - increasing sand, very moist							
	25				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown to light brown, sand is fine-grained, silt is non-plastic, occasional 1 to 2 inch lenses of Clayey SAND (SC) throughout, 4 inch diameter cobble observed at 27 feet							
4740					CL		Sandy Lean CLAY - stiff, moist, red-brown, sand is fine-grained, clay has low plasticity							
	30				SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic							
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained							
4735					SP-SM									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4769.360'

Plate 2a

DATE	
STARTED:	12/16/10
COMPLETED:	12/16/10
BACKFILLED:	12/17/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-23**
Sheet 2 of 3

LOCATION
NORTHING 203,416.42 EASTING 102,933.40 ELEVATION 4,766.9 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4730							Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt has low to no plasticity, largely isolated to 1 to 2 inch lenses of Sandy SILT (ML), with some light iron staining							
	40				SP		Poorly Graded SAND - medium dense, moist, light brown to brown, sand is fine- to medium-grained, with some light iron staining							
4725					ML		Sandy SILT - stiff, moist, brown, sand is fine-grained, silt is non-plastic							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic - @ 45 feet - very moist to wet							
	45													
4720					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, with some light iron staining throughout							
	50													
4715														
	55				SP-SM		Poorly Graded SAND with silt - medium dense to dense, moist, brown, sand is fine-grained, silt is non-plastic, largely isolated to 1 inch lenses							
4710					SM		Silty SAND - dense, moist, brown, sand is fine-grained, silt is non-plastic, silt largely isolated to frequent ½-inch lenses throughout, with some dark organics, weakly cemented - @ 61 feet - very moist to wet, silt has low to no plasticity							
	60													
4705					SC-SM		Silty Clayey SAND - dense, very moist to wet, brown, sand is fine-grained, clay has low to no plasticity, with thick iron staining throughout, thinly laminated							
	65													
4700					SM		Silty SAND - dense, wet, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout, occasional 1 to 2 inch lenses of Sandy Lean CLAY (CL) throughout							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4769.360'

Plate 2b

DATE
STARTED: 12/16/10
COMPLETED: 12/16/10
BACKFILLED: 12/17/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO:
MW-23
Sheet 3 of 3

LOCATION
NORTHING 203,416.42 EASTING 102,933.40 ELEVATION 4,766.9 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4695					CL		Sandy Lean CLAY - stiff, moist, red-brown, sand is fine-grained, clay has low plasticity, with thick iron staining throughout							
					SM		Silty SAND - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
	75				ML		Sandy SILT - stiff, moist, brown, with thick iron staining throughout							
4690					SM		Silty SAND - medium dense, very moist to wet, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
	80				CL		Sandy Lean CLAY - stiff, moist, red-brown, sand is fine-grained, clay has low plasticity							
4685					SM		Silty SAND - dense, very moist to wet, grey, sand is fine-grained, silt is non-plastic, with frequent 2 inch Sandy Lean CLAY (CL) lenses							
	85						Bottom of Boring @ 85 Feet							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4769.360'

Plate 2c

DATE	
STARTED:	2/16/11
COMPLETED:	2/17/11
BACKFILLED:	2/17/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-25**
Sheet 1 of 5

LOCATION
NORTHING 202,730.95 EASTING 103,787.94 ELEVATION 4,807.1 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4805							FILL - Silty SAND - medium dense, moist, light brown, with frequent organics throughout, likely a mixture of disturbed topsoil							
					SP		Poorly Graded SAND - medium dense, moist, red-brown, sand is medium-grained, massively bedded, uniform							
	5						- @ 5 feet - sand grades to fine-grained							
4800					ML		Sandy SILT - stiff, moist, brown to light brown, sand is fine-grained, silt is low to non-plastic, with roots, thick iron staining throughout, frequent ¼-inch seams of lightly cemented Silty SAND (SM) throughout							
					SM		Silty SAND - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, with some light iron staining throughout							
	10				CL-ML		Silty CLAY with sand - stiff, moist, brown to orange-brown, clay has low plasticity, sand is fine-grained, with frequent carbonate stingers, some iron staining throughout, occasional ¼-inch seams of Silty SAND (SM)							
4795														
					SM		Silty SAND - medium dense, very moist, light brown to grey, sand is fine-grained, silt is non-plastic, with occasional laminations of iron staining throughout, with minor clay content from 15 to 16 feet							
	15													
4790							- @ 18½ feet - grey, with no iron staining							
					CL-ML		Silty CLAY with sand - medium stiff, very moist, grey, clay has low plasticity, sand is fine-grained							
	20													
					SC-SM		Silty Clayey SAND - medium stiff, very moist, grey, clay has low to no plasticity, sand is fine-grained, occasional thin laminations throughout, some ¼-inch thick seams of Sandy SILT (ML)							
4785							- @ 24 feet - very moist to wet							
	25													
					CL		Lean CLAY with sand - stiff, moist, brown with red-brown mottling, clay has low plasticity, sand is fine-grained, thinly laminated, homogenous							
4780														
	30						- @ 30 feet - 6-inch seam of Silty Clayey SAND (SC-SM)							
							- @ 32½ feet - frequent seams of Poorly Graded SAND with clay (SP-SC), thick iron staining							
4775					SP									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4809.450'

Plate 4a

DATE
STARTED: 2/16/11
COMPLETED: 2/17/11
BACKFILLED: 2/17/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-25
Sheet 2 of 5

LOCATION
NORTHING 202,730.95 EASTING 103,787.94 ELEVATION 4,807.1 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4770					SM		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, thick iron staining throughout, with freuqent ½- to 1-inch seams of Silty CLAY (CL-ML) throughout							
					SP-SM		Silty SAND - medium dense, moist, red-brown, sand is fine-grained, silt is non-plastic							
							Poorly Graded SAND with silt - medium dense, moist, tan, sand is fine-grained, silt is non-plastic, with some light iron staining, uniform							
	40				SM		Silty SAND - very dense, slightly moist, light brown, sand is fine-grained, silt is non-plastic, moderately cemented, 1- to 2-inch seams of non-cemented Poorly Graded SAND with silt (SP-SM) throughout							
4765					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-gained, silt is non-plastic, uniform							
	45				SP		Poorly Graded SAND - dense, moist, light brown, sand is fine- to medium-grained, with some light iron staining throughout - @ 46 feet - occasional moderately cemented clasts of Silty SAND (SM) throughout - @ 49 feet - sand grades to fine-grained							
4760	50				SM		Silty SAND - dense, moist, brown, sand is fine-grained, silt is non-plastic, light cemented							
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, with some light iron staining throughout - @ 52½ feet - very moist							
4755					SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with thick iron staining, some black organics throughout							
	55						- @ 57 feet - increasing fines, possibly grading to a Silty SAND (SM) - @ 58 feet - frequent ¼-inch Sandy Lean CLAY (CL) seams throughout, increasing fequency with depth							
4750	60				SC-SM		Silty Clayey SAND - medium dense, wet, brown, sand is fine-grained, clay has low plasticity, thinly laminated, occasional seams of iron staining, ¼-inch seams of Sandy Lean CLAY (CL) througout							
					SM		Silty SAND - medium dense, very moist, tan mottled with grey, sand is fine-grained, silt is non-plastic, wiht thick iron staining throughout, thinly laminated							
4745	65				SP-SM		Poorly Graded SAND with silt - medium dense, ery moist, brown to red-brown, sand is fine-grained, silt is non-plastic, with occasional ½-inch seams of Sandy Lean CLAY (CL) throughout							
					SP		Poorly Graded SAND - medium dense, very moist, brown, sand is fine-grained, with thick iron staining, frequent ½-inch seams of Sandy Lean CLAY (CL) throughout							
4740														

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4809.450'

Plate 4b

DATE	
STARTED:	2/16/11
COMPLETED:	2/17/11
BACKFILLED:	2/17/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-25**
Sheet 3 of 5

LOCATION
NORTHING 202,730.95 EASTING 103,787.94 ELEVATION 4,807.1 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4735					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, with some light iron staining, uniform							
	75				SM		Silty SAND - dense, very moist, brown, sand is fine-grained, silt is non-plastic, with thick seams of iron staining throughout							
4730					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, with minor iron staining throughout							
	80						- @ 82 feet - 6-inch seam of moderately cemented Silty SAND (SM)							
4725					SM		Silty SAND - medium dense, very moist, brown, sand is fine-grained, silt is non-plastic, with some iron staining throughout, thinly laminated, decreasing silt with depth							
	85				SP-SM		Poorly Graded SAND with silt - medium dense, moist, tan, sand is fine-grained, silt is non-plastic, massively bedded, occasional clasts of moderately cemented Silty SAND (SM)							
4720							- @ 90 feet - lightly cemented 6-inch seam of Silty SAND (SM)							
	90				SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform							
4715					SM		Silty SAND - dense, moist, brown, sand is fine-grained, silt is non-plastic, frequent seams of moderately cemented organic silt-rich material throughout							
	95						- @ 96 feet - 6-inch seam of alternating sand-silt material							
4710							- @ 98 feet - very moist, with thick iron staining							
							- @ 99 feet - wet, frequent laminations							
	100													
4705							- @ 103 feet - 6-inch seam of Sandy Lean CLAY (CL)							
							- @ 103½ feet - moist							
					ML									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4809.450'

Plate 4c

DATE
STARTED: 2/16/11
COMPLETED: 2/17/11
BACKFILLED: 2/17/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-25
Sheet 4 of 5

LOCATION
NORTHING 202,730.95 EASTING 103,787.94 ELEVATION 4,807.1 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4700							Sandy SILT - medium stiff, moist, brown, sand is fine-grained, silt is non-plastic, with some iron staining, frequent Silty SAND (SM) seams throughout - @ 106 feet - wet, mottled with iron staining, some lighty cemented Sandy Lean CLAY (CL) seams throughout							
	110				SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, mottled with iron staining							
4695					SM		Silty SAND - dense, wet, brown, sand is fine-gained, silt is non-plastic, thinly laminated, with thick iron staining, some dark organics throughout							
	115				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, mottled with thick iron staining, uniform							
4690														
	120				SM		Silty SAND - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
4685					SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout - @ 127 feet - increasing fines, possibly grades into Silty SAND (SM)							
	125													
4680														
	130				SM		Silty SAND - medium dense, wet, brown mottled with grey, sand is fine-grained, silt is non-plastic							
4675					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, uniform							
	135				SM		Silty SAND - dense, very moist to wet, brown, sand is fine-grained, silt is non-plastic, uniform							
4670					CL		Lean CLAY - stiff, moist, brown to red-brown, clay has low to high plasticity, occasional ¼-inch seams of Poorly Graded SAND (SP) throughout							
					SM		Silty SAND - medium dense, moist to very moist, brown, sand is fine-grained, silt is non-plastic, occasional ¼-inch seams of Sandy Lean CLAY (CL) throughout, with thick iron staining							
					ML									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4809.450'

Plate 4d

DATE	
STARTED:	2/16/11
COMPLETED:	2/17/11
BACKFILLED:	2/17/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-25
Sheet 5 of 5

LOCATION
NORTHING 202,730.95 EASTING 103,787.94 ELEVATION 4,807.1 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
							Sandy SILT - medium stiff to stiff, moist to very moist, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with some iron staining							
							Bottom of Boring @ 140 Feet							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4809.450'

Plate 4e

DATE
STARTED: 2/22/11
COMPLETED: 2/24/11
BACKFILLED: 2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO:
MW-26
Sheet 1 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4860	5				SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform - @ 5 feet - with some light iron staining							
4855	10				SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is low to non-plastic, with some thin carbonate stringers							
					SC		Clayey SAND - medium dense, moist, brown, sand is fine-grained, clay has low plasticity, top six inches of sample consist of Sandy Lean CLAY (CL) with frequent carbonate stringers							
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform							
4850	15				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, occasional clasts of Silty SAND (SM) throughout, lightly cemented							
					SM		Silty SAND - medium dense, moist to very moist, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with frequent seams of iron staining throughout							
4845	20				SP		Poorly Graded SAND - medium dense, moist, brown to light brown, sand is fine-grained, uniform, with some light iron staining							
4840	25				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, wiht occasional seams of moderately cemented Silty SAND (SM) throughout							
4835	30						- 29½ feet - occasional 1 to 2 inch seams of Sandy SILT (ML), with some light iron staining throughout							
					SP		Poorly Graded SAND - medium dense, moist, brown mottled with iron staining, sand is fine-grained, uniform							
					SC-SM		Silty Clayey SAND - dense, very moist, brown, sand is fine-grained, clay has low plasticity, with occasional seams of iron staining							
					SP									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5a

DATE	
STARTED:	2/22/11
COMPLETED:	2/24/11
BACKFILLED:	2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-26**
Sheet 2 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
							Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform, with thick iron staining throughout							
					SM		Silty SAND - very dense, slightly moist, brown to grey, sand is fine-grained, silt is non-plastic, silt conatins frequent black organic material, moderately cemented							
4825	40						- @ 40 feet - alternating moderately cemented to non-cemented seams							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, uniform, with some light iron staining							
4820	45						- @ 44 feet - 3 inch seam of moderately cemented material							
							- Sandy Lean CLAY - stiff, moist, red-brown, clay has low to high plasticity							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown to light brown, sand is fine-grained, silt is non-plastic, with thick iron staining, occasional ½-inch seams of Silty SAND (SM) throughout							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, uniform, with some light iron staining							
4815	50													
					SM		Silty SAND - dense, slightly moist, brown, sand is fine-grained, silt is non-plastic							
					SP		Poorly Graded SAND - medium dense, miost, light brown							
					SM		Silty SAND - medium dense, moist, brown, silt has low plasticity							
4810	55													
					SP		Poorly Graded SAND - medium dense, moist, brown, with some light iron staining, uniform							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, uniform							
4805	60													
					SM		Silty SAND - dense, slightly moist, light brown, moderately cemented							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist to very moist, light brown, wiht some light iron staining							
4800	65													
					SM		Silty SAND - medium dense, very moist to wet, brown, sand is fine-grained, silt is non-plastic, thinly laminated, with thick iron staining							
					SC-SM		Silty Clayey SAND - medium dense, very moist to wet, brown, sand is fine-grained, silt has low to no plasticity, thinly laminated							
					SM									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5b

DATE	
STARTED:	2/22/11
COMPLETED:	2/24/11
BACKFILLED:	2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-26**

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
							Silty SAND - dense, moist, brown, sand is fine-grained, silt has low plasticity, thinly laminated, with some dark organics throughout							
					ML		Sandy SILT - stiff, moist to very moist, brown to grey, silt is non-plastic, sand is fine-grained, occasional ½-inch seams of Sandy Lean CLAY (CL) throughout							
4790	75				SM		Silty SAND - medium dense, very moist, brown, sand is fine-grained, silt is non-plastic							
					SP-SM		Poorly Graded SAND with silt - very moist to wet, medium dense, brown, sand is fine-grained, silt is non-plastic, increasing silt with depth, with some dark organics throughout - @ 79 feet - 2 inch seam of Sandy Lean CLAY (CL), low to high plasticity							
4785	80				CL-ML		Sandy Silty CLAY - stiff, very moist, brown to red-brown, sand is fine-grained, clay has low plasticity, with occasional ½ inch seams of Silty SAND (SM) throughout							
4780	85						- @ 87½ feet - medium stiff to soft, mottled brown to red-brown - @ 88 feet - stiff, moist							
4775	90						- @ 90 feet - decreasing sand							
							- @ 92 feet - occasional 1 inch seams of Poorly Graded SAND (SP), with thick iron staining							
4770	95				SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
					SP		Poorly Graded SAND - medium dense, moist, brown to tan, sand is fine-grained							
4765	100				SM		Silty SAND - medium dense, slightly moist, tan, with thick iron staining throughout							
					SP-SM		Poorly Graded SAND with silt - medium dense, slightly moist, tan, sand is fine-grained							
					SP		Poorly Graded SAND - medium dense, moist, tan, sand is fine-grained, uniform							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5c

DATE
STARTED: 2/22/11
COMPLETED: 2/24/11
BACKFILLED: 2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-26
Sheet 4 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

ELEVATION	FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
					SP-SM		- @ 105 feet - occasional ½-inch seams of Sandy SILT (ML) Poorly Graded SAND with silt - medium dense, moist, tan, sand is fine-grained, silt is non-plastic							
					SP		Poorly Graded SAND - medium dense, moist, tan, sand is fine-grained, uniform, with some light iron staining throughout							
4755	110				SM		Silty SAND - dense, slightly moist, light brown, sand is fine-grained, silt is non-plastic, occasional seams of lightly cemented material throughout							
					CL		Sandy Lean CLAY - stiff to very stiff, moist, brown to red brown, clay has low plasticity, sand is fine-grained, frequent ¼-inch seams of Poorly Graded SAND (SP), with thick iron staining							
					SP-SM		Poorly Graded SAND with silt - medium dense, slightly moist, liht brown							
4750	115				SM		Silty SAND - medium dense, moist, brown							
					CL-ML		Sandy Silty CLAY - medium stiff, moist, brown, clay has low plasticity, sand is fine-grained, with some light iron staining							
					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic							
4745	120				ML		Sandy SILT - medium stiff, moist, brown, sand is fine-grained, silt is non-plastic, frequent ½-inch seams of Poorly Graded SAND (SP), thick iron staining, sand increases with depth							
							- @ 123 feet - 6 inch seam of Poorly Graded SAND (SP-SM) with silt							
4740	125						- @ 126 feet - 3 inch seam of Sandy Lean CLAY (CL)							
					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with frequent ½- to 1- inch seams of Sandy SILT (ML) throughout, with some iron staining							
4735	130				SP-SM		Poorly Graded SAND with silt - medium dense to dense, slighly moist, brown, sand is fine-grained, silt is non-plastic, occasional 2 to 3 inch seams of lightly to moderately cemented material, with some light iron staining							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, uniform - @ 133 feet - 6 inch seams of Silty SAND (SM) moderately cemented, slightly moist, light grey - @ 134 feet - occasional 1 inch seams of Sandy SILT (ML), with some light iron staining							
4730	135				SM		Silty SAND - dense, slightly moist, light grey, sand is fine-grained, silt is non-plastic							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, occasional moderately cemented clasts of Silty SAND (SM) throughout							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5d

DATE
STARTED: 2/22/11
COMPLETED: 2/24/11
BACKFILLED: 2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-26
Sheet 5 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

ELEVATION	FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4720	145				SM		Silty SAND - dense, slightly moist, light grey, sand is fine-grained, silt is non-plastic, lightly cemented							
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform - @ 142 feet - 3 inch seam of Sandy SILT (ML), light grey, moderately cemented - @ 144 feet - 3 inch seam of Silty SAND (SM), light grey, moderately cemented							
					SM		Silty SAND - dense, slightly moist, light brown to grey, sand is fine-grained, silt is non-plastic, with some organics							
4715	150				SP		Poorly Graded SAND - medium dense to dense, moist, brown, sand is fine-grained, uniform, occasional lightly cemented clasts of Silty SAND (SM) throughout, grades to medium- to fine-grained with depth - @ 149 feet - sand is fine-grained							
					ML		Sandy SILT - medium stiff, moist to very moist, brown mottled with ligh brown to red-brown, silt has low to no plasticity, sand is fine-grained, thinly laminated, frequent seams of iron staining, occasional ½-inch seams of Sandy Lean CLAY (CL)							
					SM		Silty SAND - dense, moist, brown, sand is fine-grained, silt is non-plastic, occasional 1 inch seams of organic Sandy SILT (ML)							
4710	155				SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, uniform							
					SM		Silty SAND - medium dense to dense, moist, light brown mottled with brown, sand is fine-grained, silt is non-plastic, with frequent ½-inch seams of Sandy SILT (ML), lightly cemented							
4705	160				SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic							
					SM		Silty SAND - medium dense, slightly moist, light brown mottled with brown, sand is fine-grained, silt is non-plastic - @ 162½ feet - 3 inch seam of Sandy Lean CLAY (CL)							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, occasional clasts of lightly cemented material throughout							
4700	165				SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with some dark organics throughout, decreasing silt with depth							
					SP-SM		Poorly graded SAND with silt - medium dense, moist, brown, sand is fine-gained, silt is non-plastic - @ 169 feet - 3 inch seam of Sandy Lean CLAY (CL), red-brown							
4695	170						- @ 172½ feet - moist to very moist - @ 173 feet - frequent 1 inch seams of organic Sandy SILT (ML)							
					SP									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5e

DATE
STARTED: 2/22/11
COMPLETED: 2/24/11
BACKFILLED: 2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-26
Sheet 6 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4685	180				SM		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform, with some light iron staining throughout Silty SAND - medium dense, moist to very moist, brown, sand is fine-grained, silt is non-plastic, silt contains frequent dark organics, thinly laminated - @ 181 feet - wet - @ 183 feet - occasional 1 to 2 inch seams of Sandy Lean CLAY (CL), red-brown							
4680	185				SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, uniform, with some light iron staining							
4675	190				SM		Silty SAND - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, with occasional dark organics, frequent heavy iron staining - @ 192 feet - dense							
4670	195				SP		Poorly Graded SAND - medium dense, moist to very moist, brown, sand is fine-grained, uniform							
					SM		Silty SAND - medium dense, very moist to wet, brown, sand is fine-grained, silt is non-plastic							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist to very moist, light brown, sand is fine-grained, silt is non-plastic - @ 199 feet - thick iron staining throughout, 3 inch seam of Sandy SILT (ML)							
4665	200				ML		Sandy SILT - medium stiff, moist, grey to brown, silt is non-plastic, sand is fine-grained, with frequent dark organics throughout, bottom 4 inches is composed of Sandy Lean CLAY (CL)							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, with thick iron staining - @ 203 feet - 6 inch seam of Sandy Lean CLAY (CL) - @ 204 - increasing silt with depth							
4660	205						- @ 205 feet - 3 inch seam of moderately cemented Sandy SILT (ML)							
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform, with some light iron staining							
					SM									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5f

DATE	
STARTED:	2/22/11
COMPLETED:	2/24/11
BACKFILLED:	2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-26**
Sheet 7 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

ELEVATION	FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
							Silty SAND - dense, moist, light brown, sand is fine-grained, silt is non-plastic, frequent ½- to 1 inch seams of moderately cementation, thinkly laminated, with some dark organics throughout - @ 211 feet - brown, medium dense, with thick iron staining							
					SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform, with occasional ¼- to ½-inch seams of Sandy Silty CLAY (CL-ML)							
4650	215				SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with occasional clasts of lightly cemented Silty SAND (SM) throughout							
					SM		Silty SAND - medium dense, very moist to wet, brown, sand is fine-grained, silt is non-plastic, with some light iron staining throughout							
4645	220				SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, uniform, with some light iron staining							
					SM		Silty SAND - dense, slighty moist, brown to light brown, sand is fine-grained, silt is non-plastic, occasional seams of moderately cemented material throughout, occasional ¼-inch seams of Sandy SILT (ML) throughout, thick iron staining in silty seams							
4640	225				SP		Poorly Graded SAND - medium dense, moist, brown, sand is fine-grained, uniform, with some light iron staining throughout							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with occasional ¼-inch seams of organic Sandy SILT (ML) throughout							
4635	230				ML		Sandy SILT - medium stiff, moist, brown, sand is fine-grained, silt is non-plastic							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, fine-grained, non-plastic, occasional ½-inch seams of Sandy SILT (ML)							
4630	235				SM		Silty SAND - medium dense, moist, brown mottled with dark brown, sand is fine-grained, silt is non-plastic, with occasional seams of iron staining, increasing silt with depth, occasional 1 to 2 inch seams of Silty Clayey SAND (SC-SM) throughout - @ 236 feet - moist to very moist							
							Poorly Graded SAND - medium dense, moist, brown, sand is fine-gained, uniform, with some light iron staining - @ 238 feet - alternating 6 inch seams of Poorly Graded SAND (SP) and Silty SAND (SM), with thick iron staining							
4625	240				SC-SM		Silty Clayey SAND - medium dense, moist, brown, sand is fine-grained, clay has low plasticity, with some light iron staining, thinly laminated							
					CL-ML		Silty CLAY - stiff, moist, brown, sand is fine-grained, clay has low plasticity, with thick iron staining, occasional ¼-inch seams of Poorly Graded SAND (SP-SM) with silt							
					SM									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5g

DATE
STARTED: 2/22/11
COMPLETED: 2/24/11
BACKFILLED: 2/25/11

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO:
MW-26
Sheet 8 of 8

LOCATION
NORTHING 202,558.10 EASTING 104,069.76 ELEVATION 4,865.0 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
					CL-ML		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with thick iron staining							
					SM		Silty CLAY - stiff, moist, brown, clay has low plasticity, with thick iron staining throughout							
							Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained							
	250						Bottom of Boring @ 250 Feet							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: 4867.661'

Plate 5h

APPENDIX B

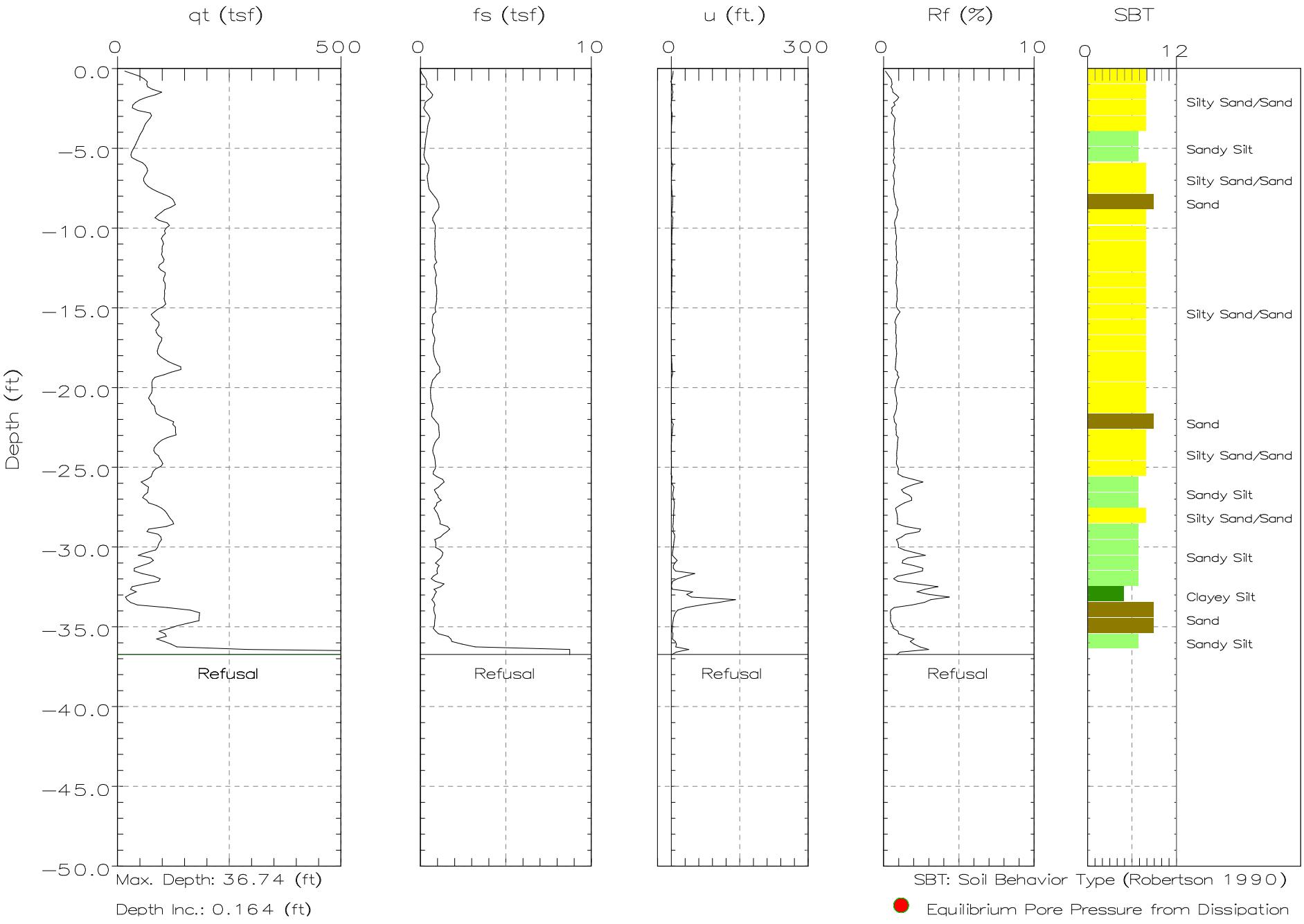
Other Well and Exploration Point Logs

CONETEC

CH2M Hill

Hole No.:CPT-01
Location:WIWM

Cone:20 TON 122
Date:04:18:07 14:06



Max. Depth: 36.74 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

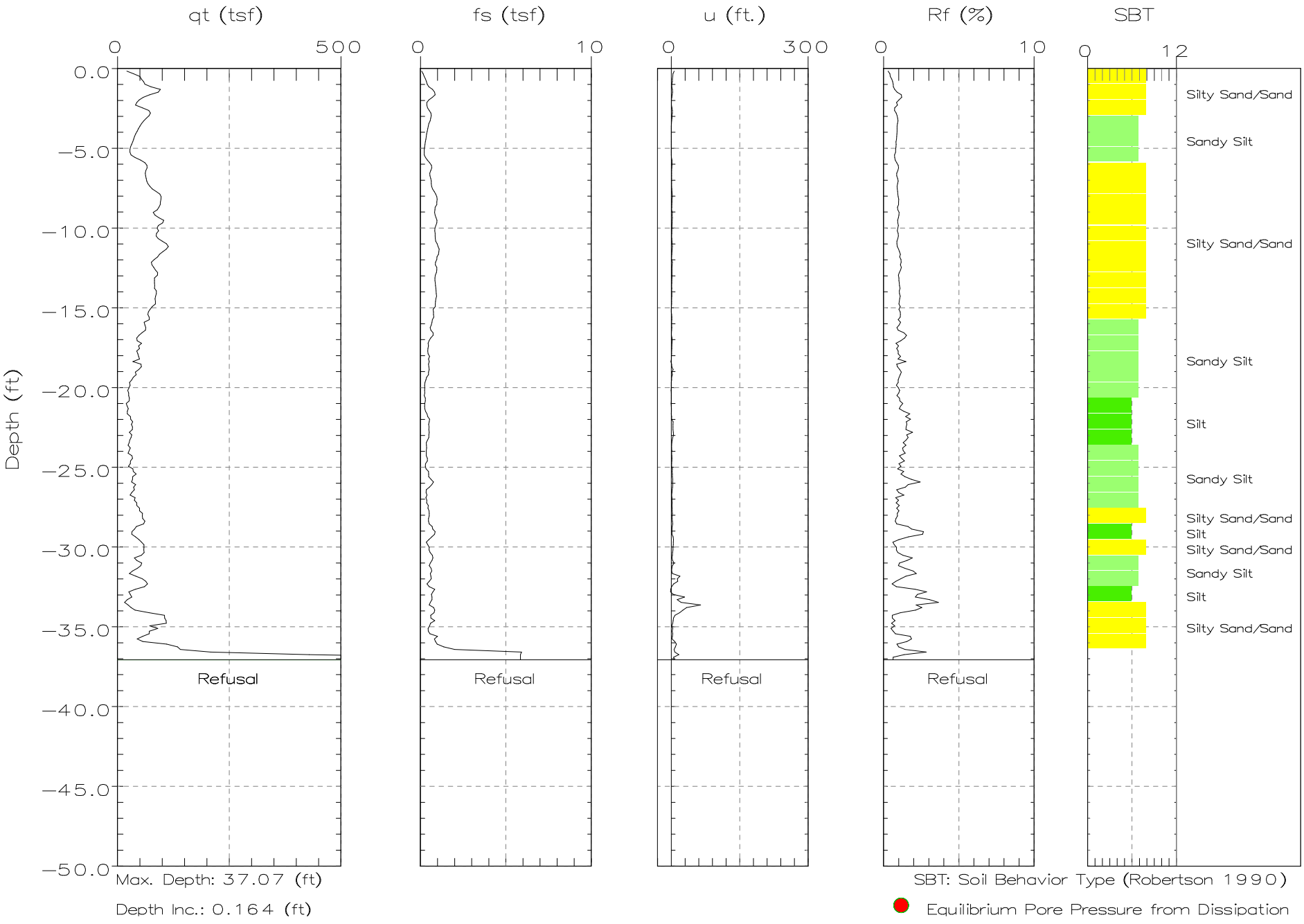
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-01A
Location:WIWM

Cone:20 TON 122
Date:04:18:07 14:39



Max. Depth: 37.07 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

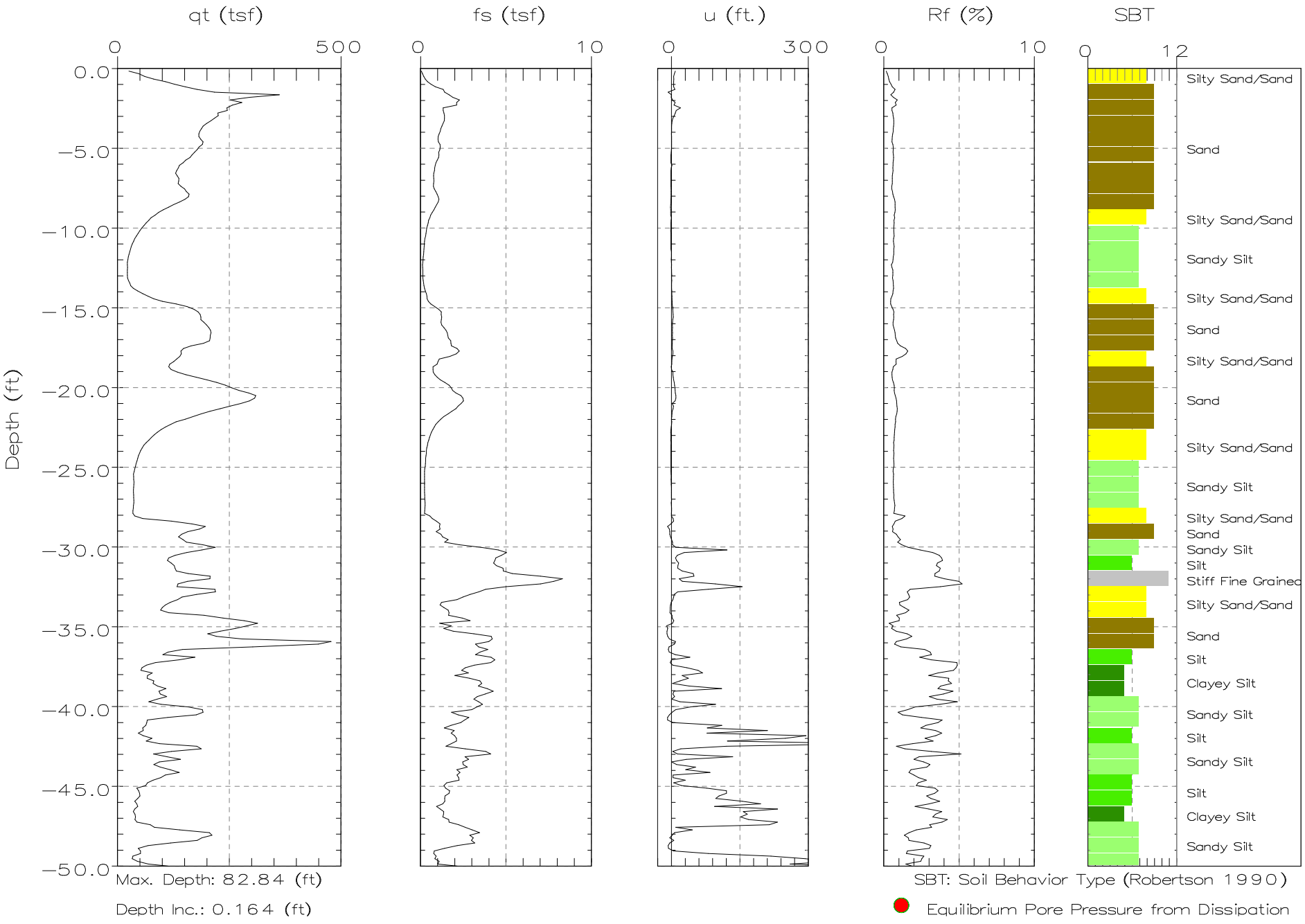
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-05
Location:WIWM

Cone:20 TON 122
Date:04:18:07 12:26



Max. Depth: 82.84 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

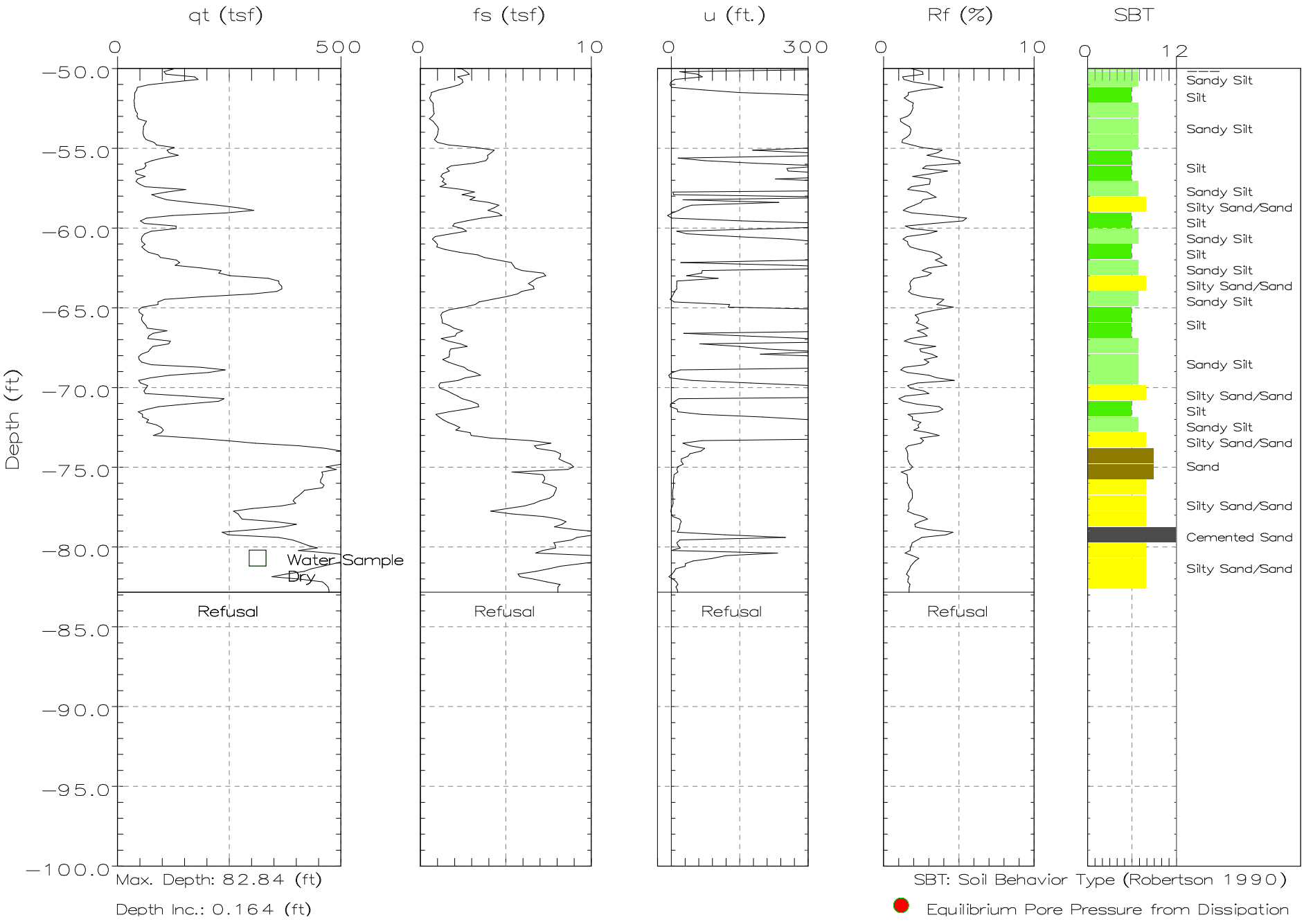
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-05
Location:WIWM

Cone:20 TON 122
Date:04:18:07 12:26



Max. Depth: 82.84 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

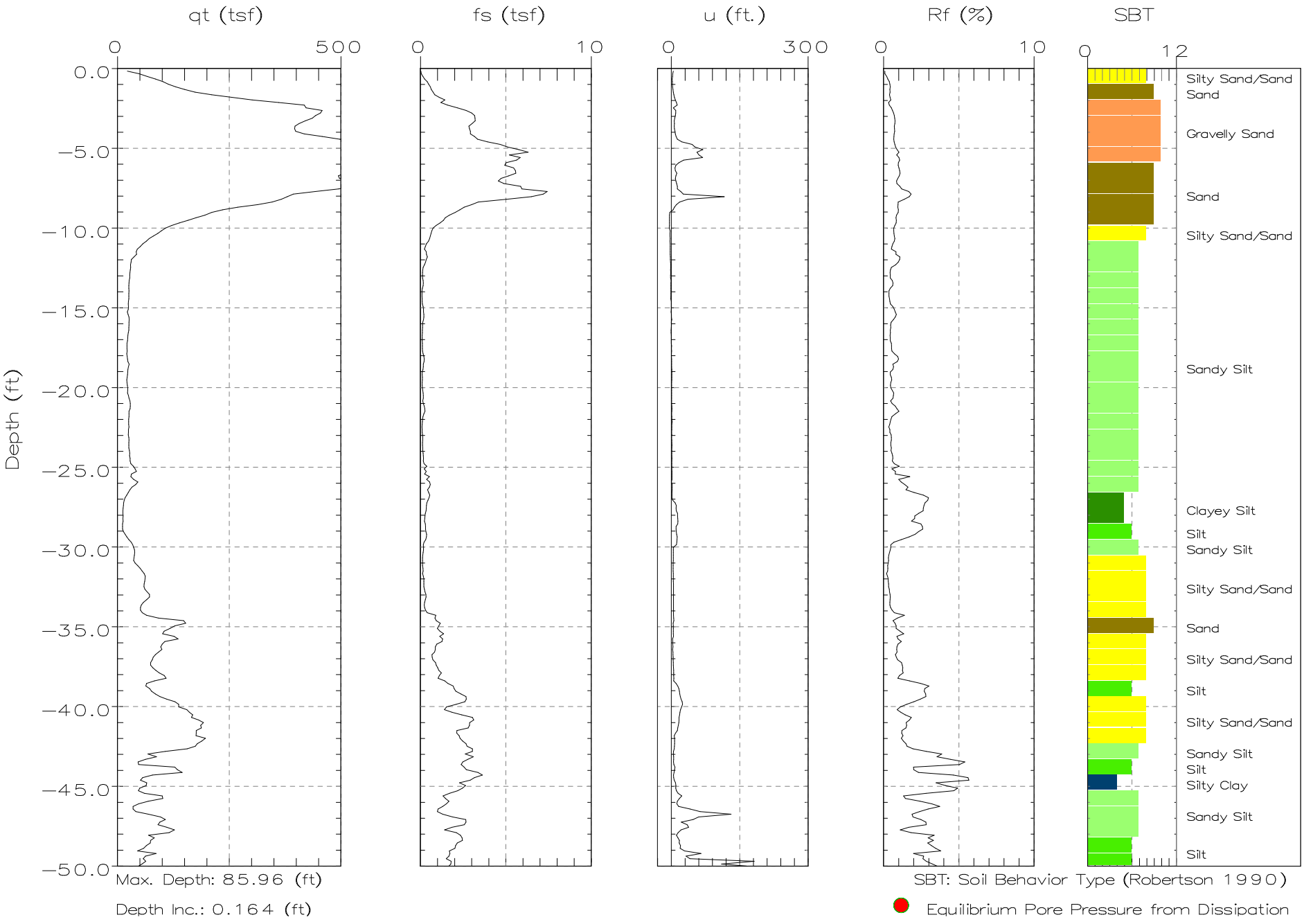
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-06
Location:WIWM

Cone:20 TON 122
Date:04:18:07 11:04



Max. Depth: 85.96 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

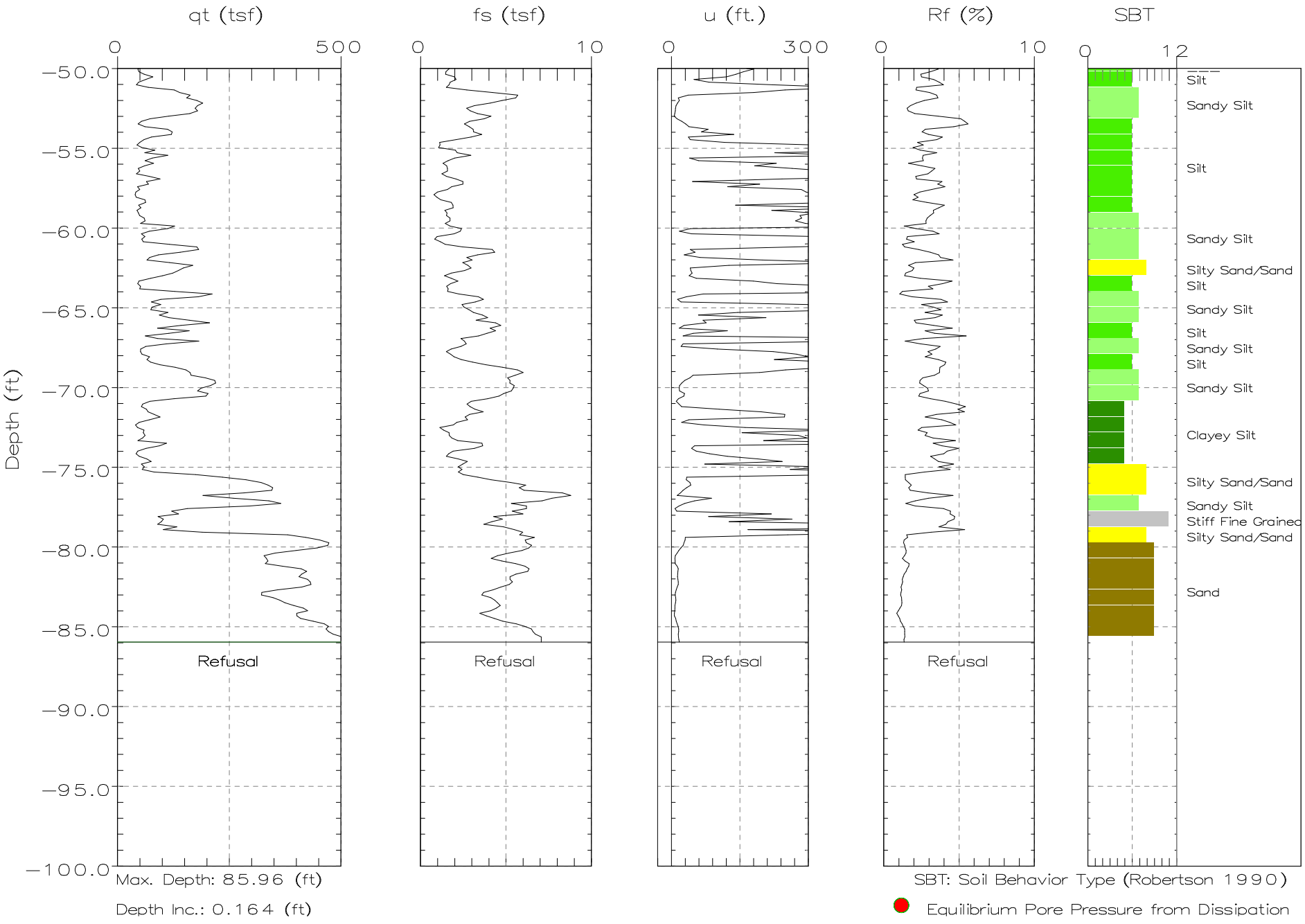
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-06
Location:WIWM

Cone:20 TON 122
Date:04:18:07 11:04



Max. Depth: 85.96 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

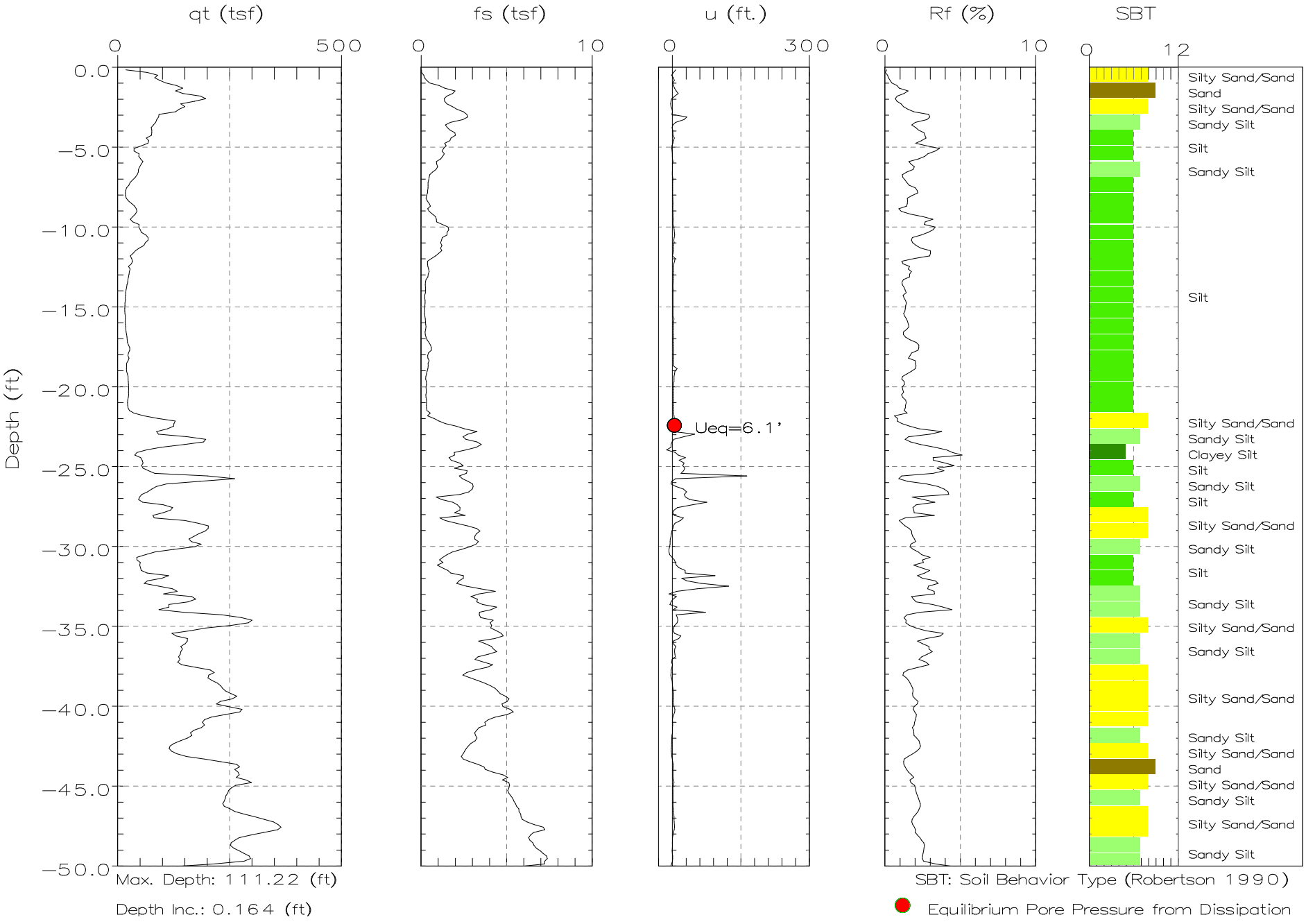
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-07
Location:WIWM

Cone:20 TON 122
Date:04:18:07 09:36



Max. Depth: 111.22 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

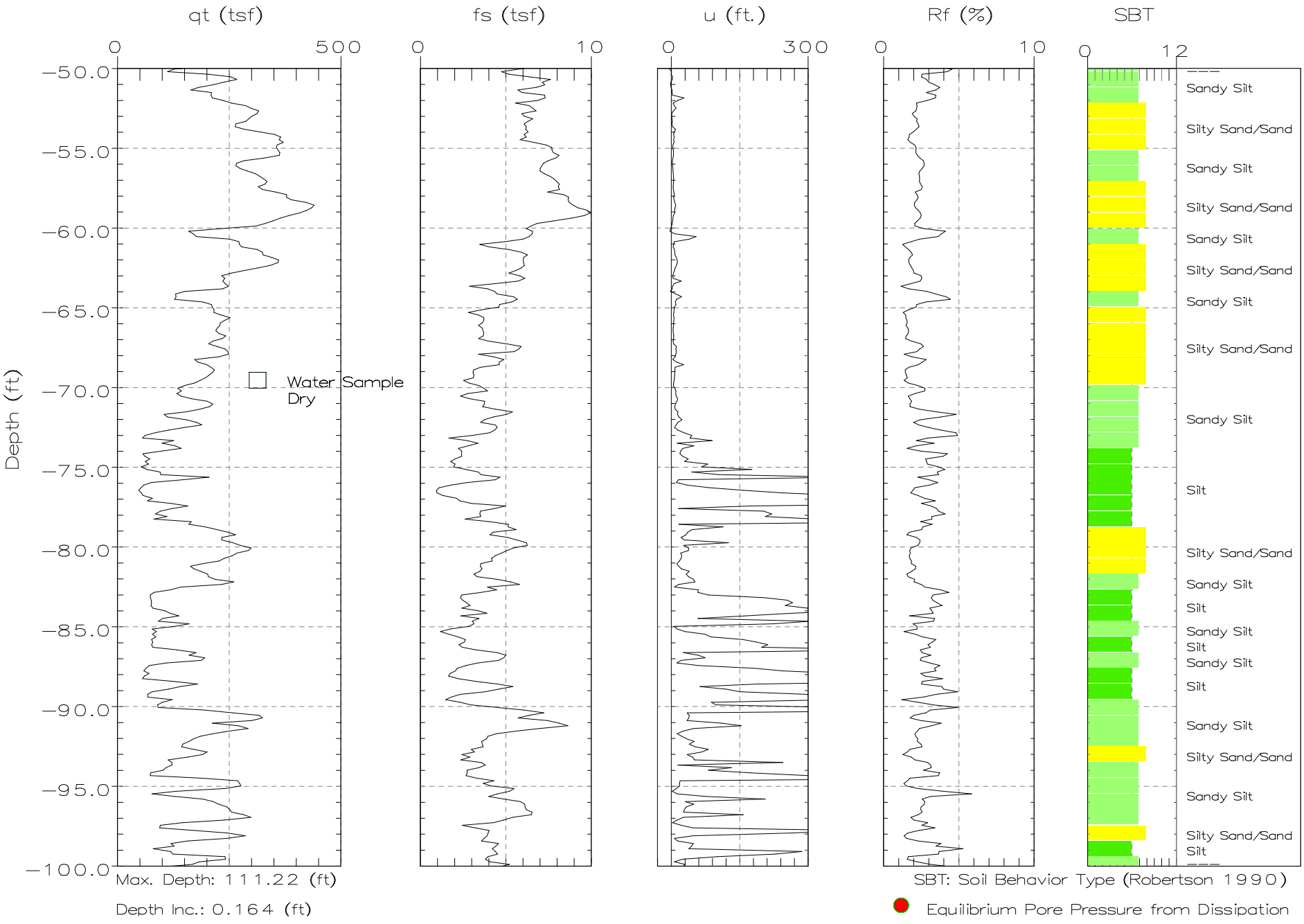
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-07
Location:WIWM

Cone:20 TON 122
Date:04:18:07 09:36



Max. Depth: 111.22 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

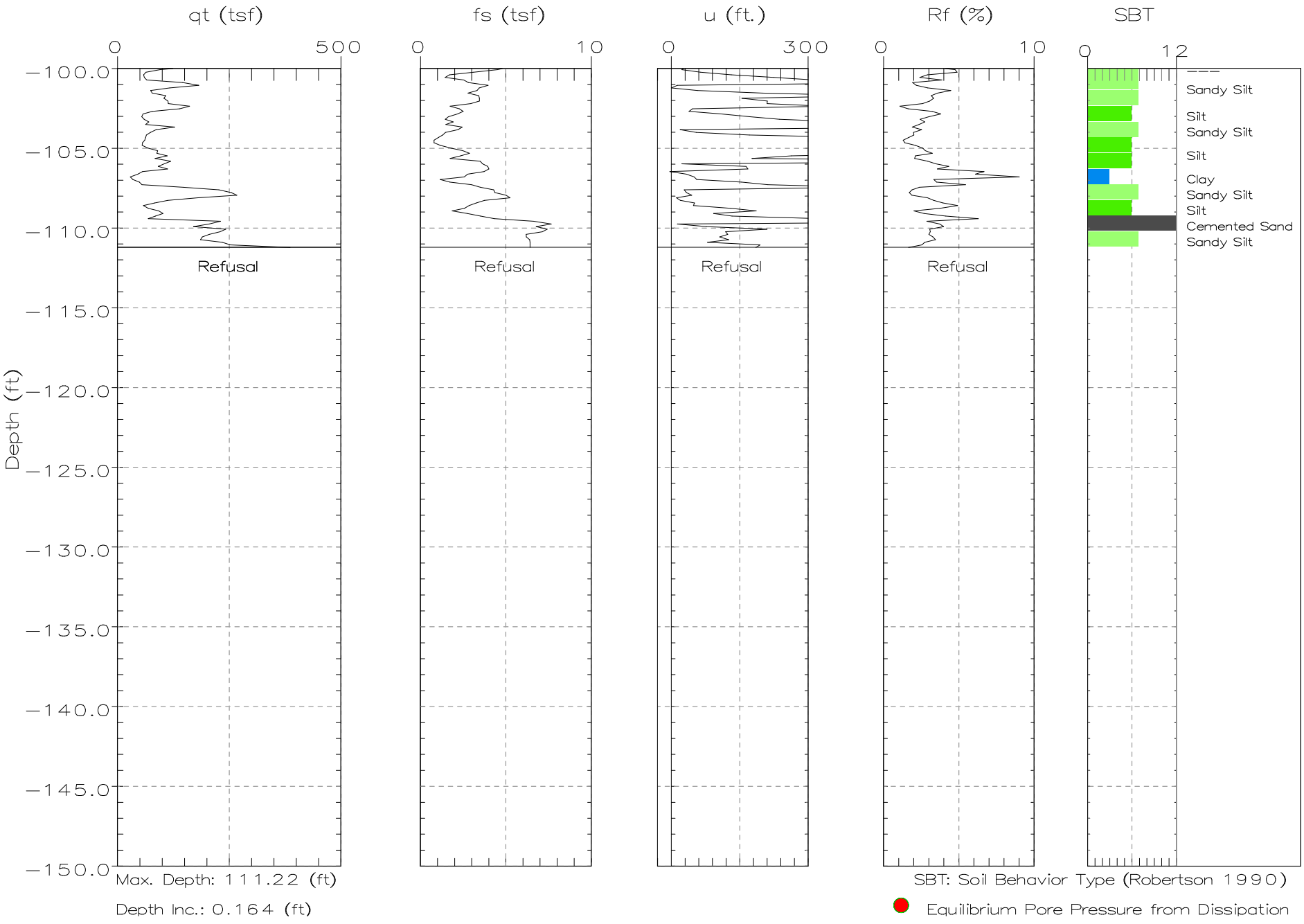
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-07
Location:WIWM

Cone:20 TON 122
Date:04:18:07 09:36

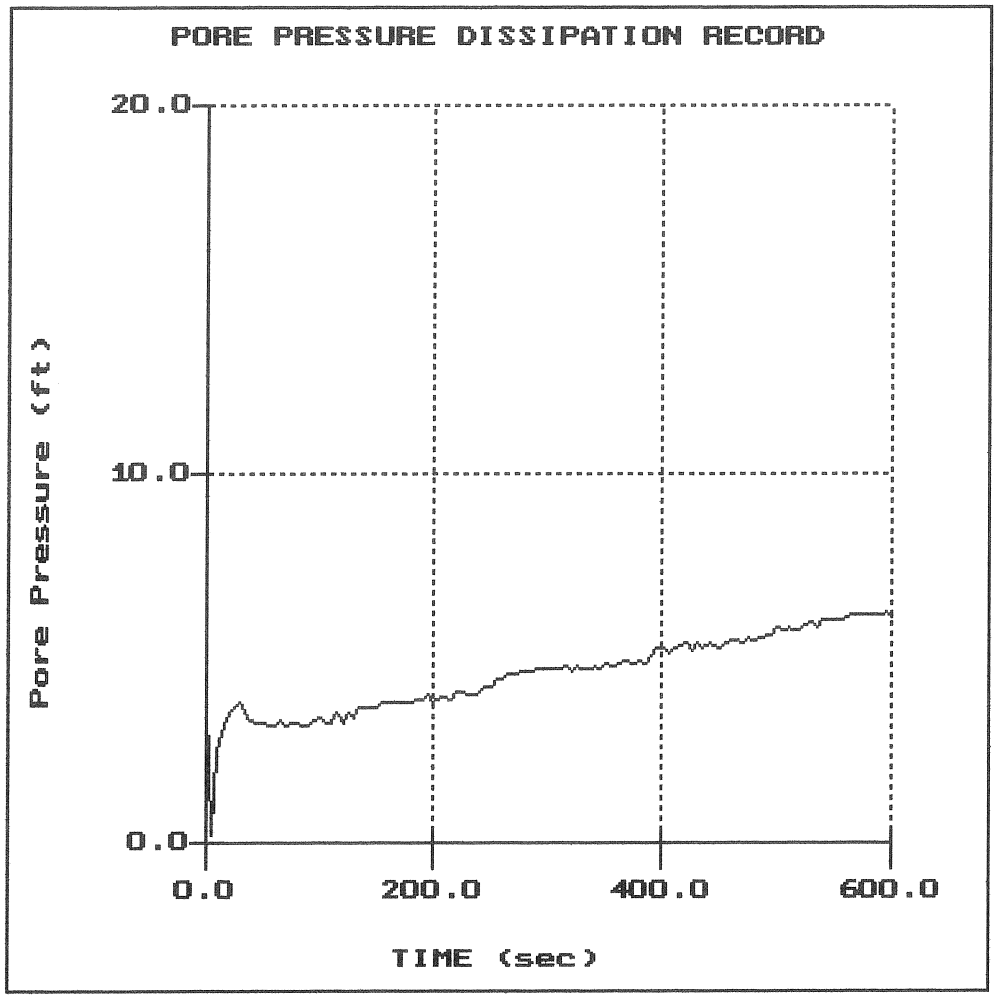


CH2M Hill

Hole:CPT-07
Location:WIWM

Cone:20 TON 122
Date:04:18:07 09:36

File: 352CP07.PPD
Depth (m): 6.85
(ft): 22.47
Duration : 600.0s
U-min: 0.19 5.0s
U-max: 6.24 595.0s

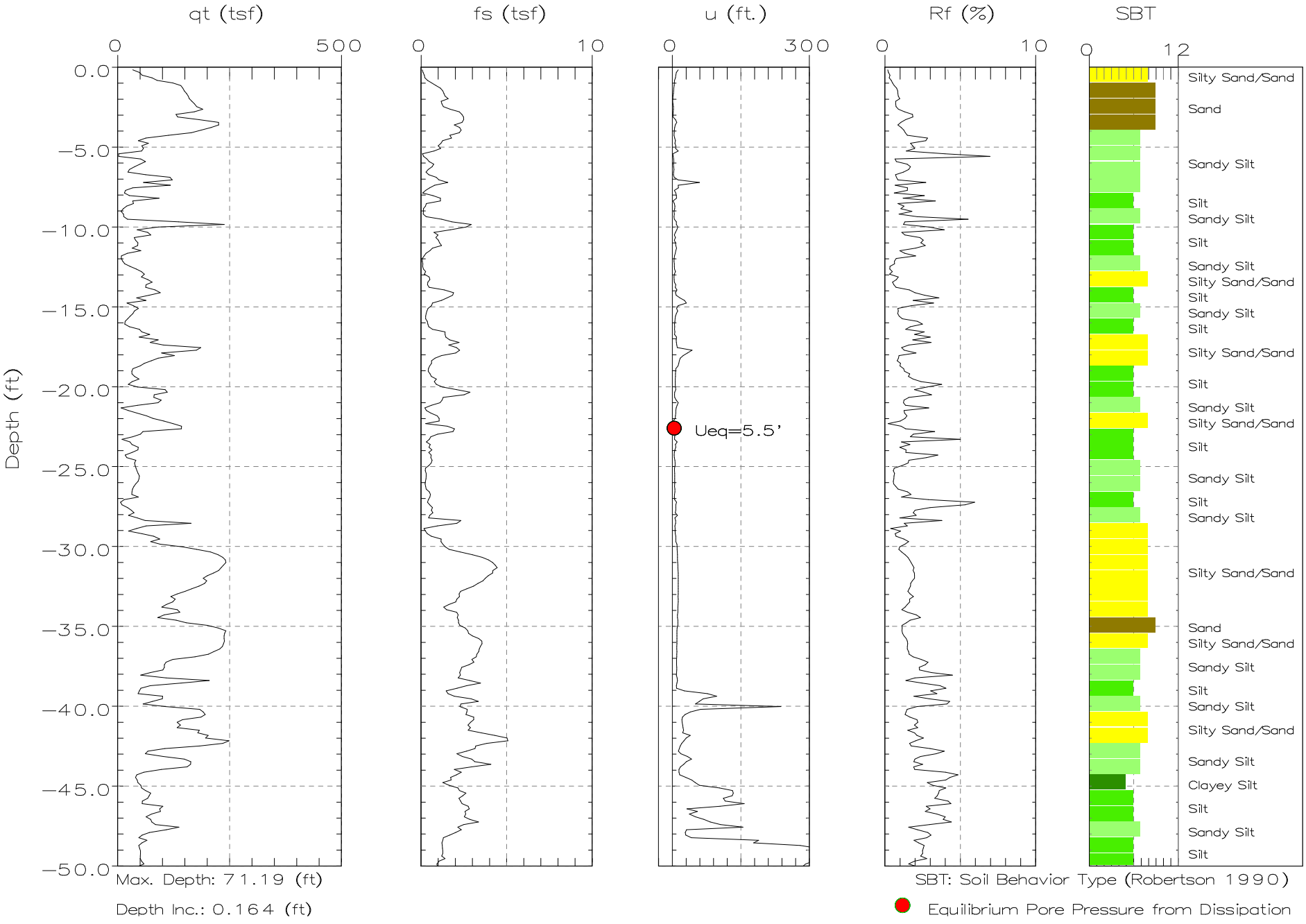


CONETEC

CH2M Hill

Hole No.:CPT-08
Location:WIWM

Cone:20 TON 122
Date:04:18:07 07:58



Max. Depth: 71.19 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

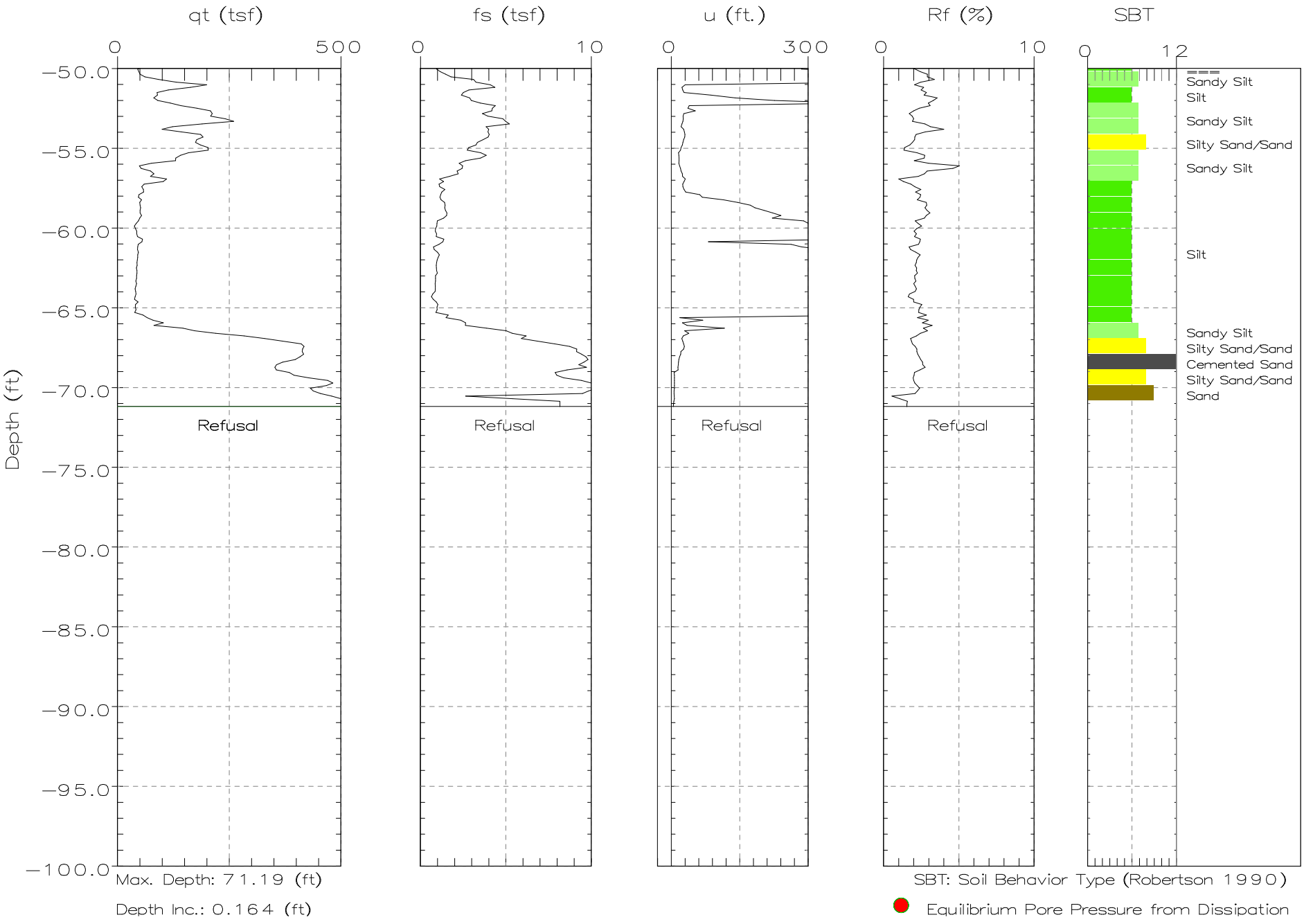
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-08
Location:WIWM

Cone:20 TON 122
Date:04:18:07 07:58



Max. Depth: 71.19 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

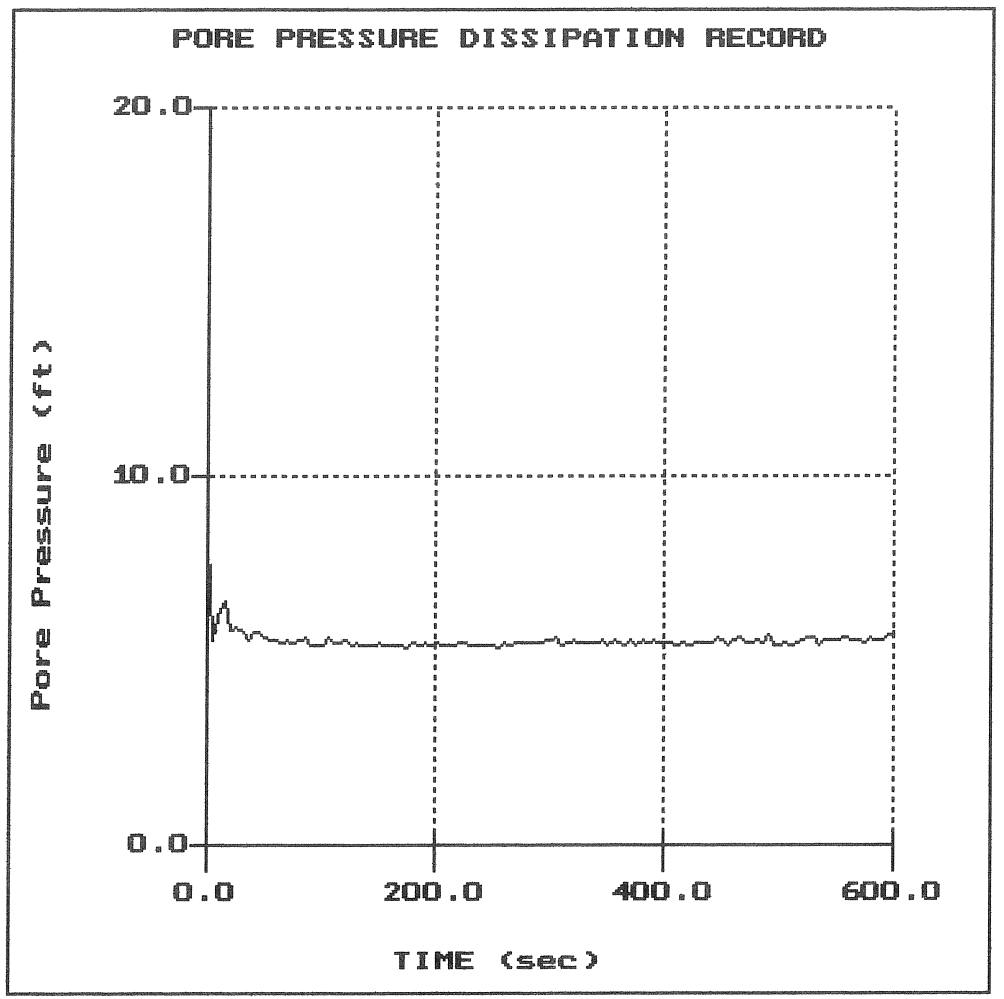
Equilibrium Pore Pressure from Dissipation

CH2M Hill

Hole:CPT-08
Location:WIWM

Cone:20 TON 122
Date:04:18:07 07:58

File: 352CP08.PPD
Depth (m): 6.90
(ft): 22.64
Duration : 600.0s
U-min: 5.35 255.0s
U-max: 8.26 0.0s

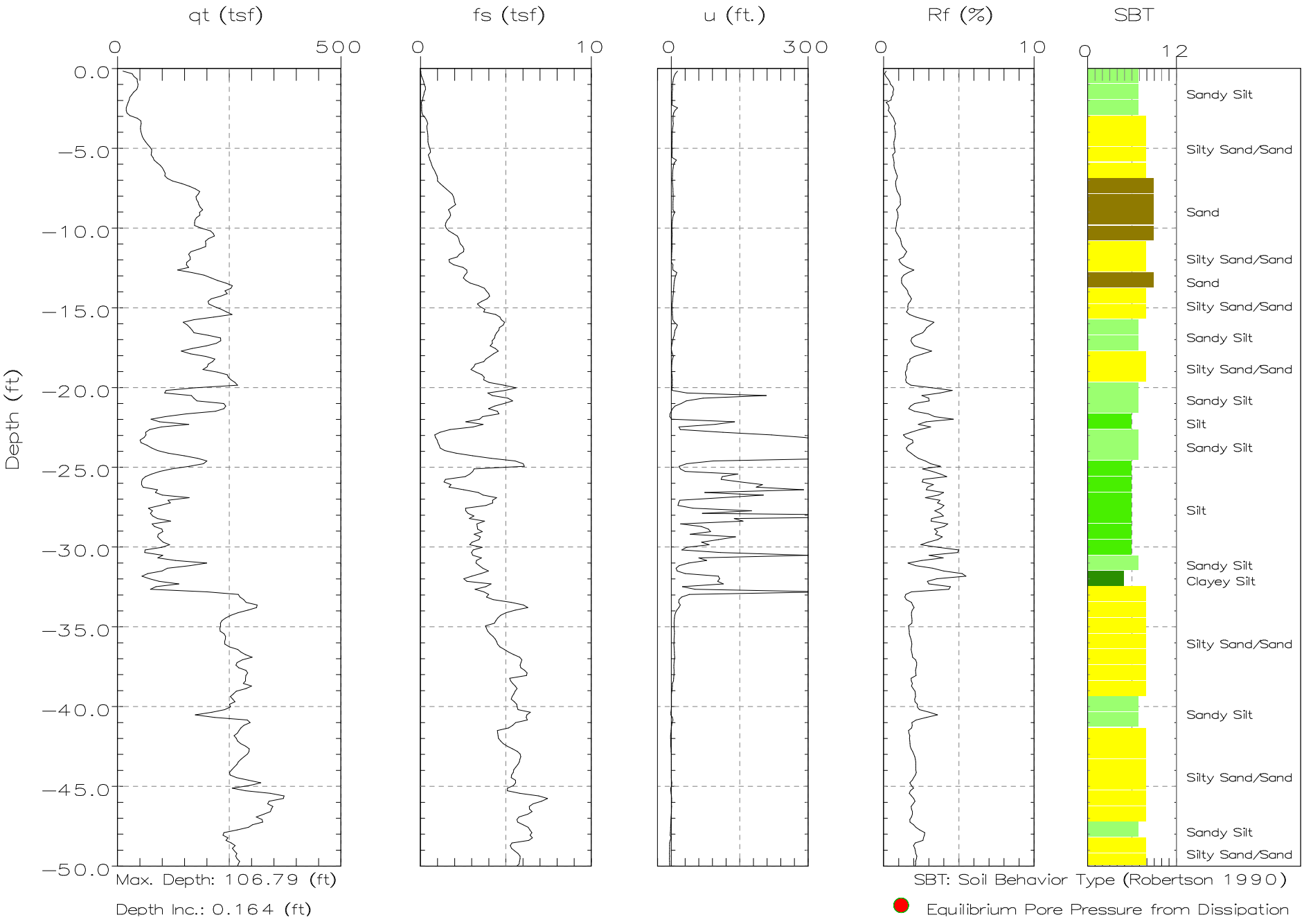


CONETEC

CH2M Hill

Hole No.:CPT-09
Location:WIWM

Cone:20 TON 122
Date:04:17:07 14:12



Max. Depth: 106.79 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

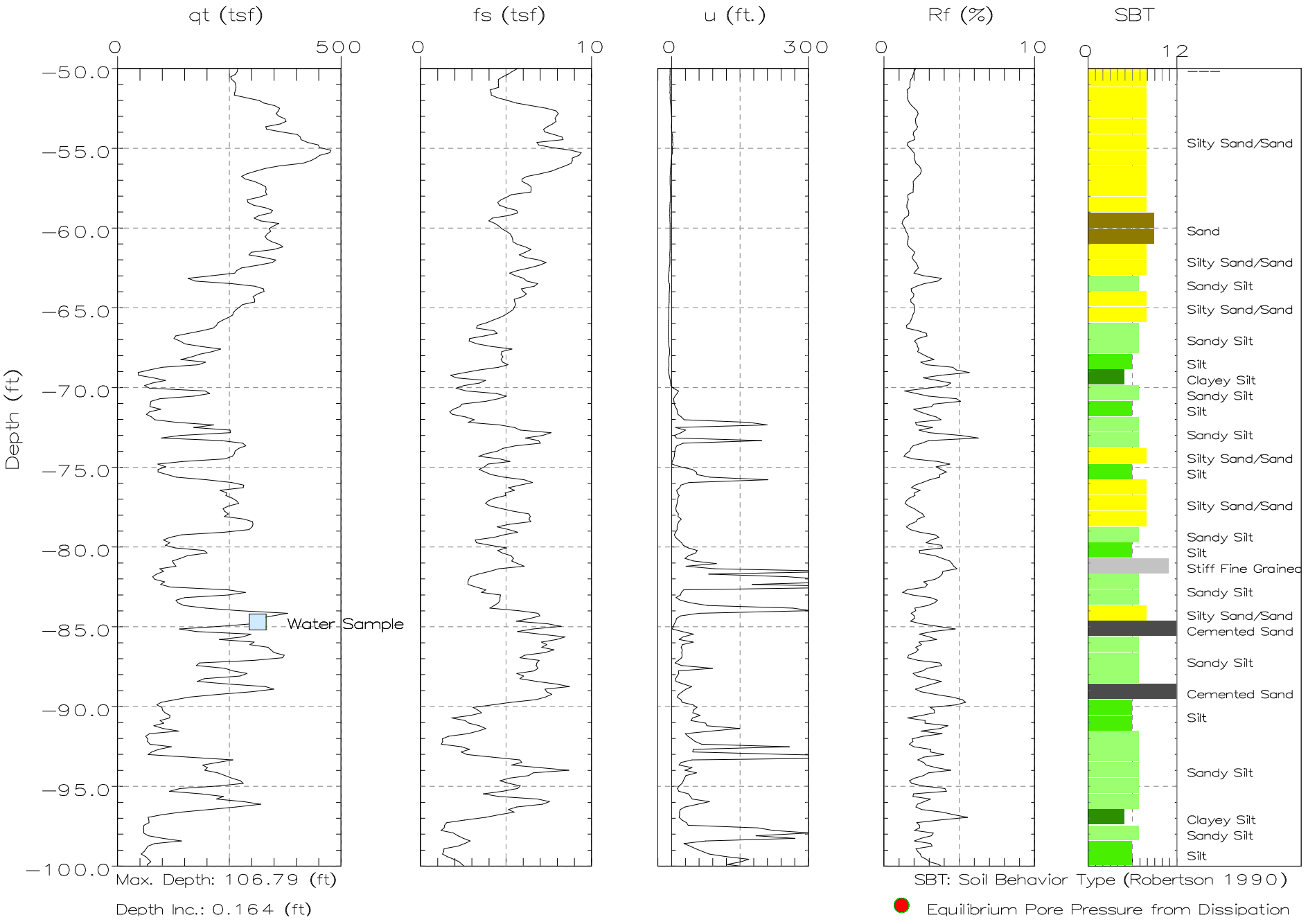
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-09
Location:WIWM

Cone:20 TON 122
Date:04:17:07 14:12



Max. Depth: 106.79 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

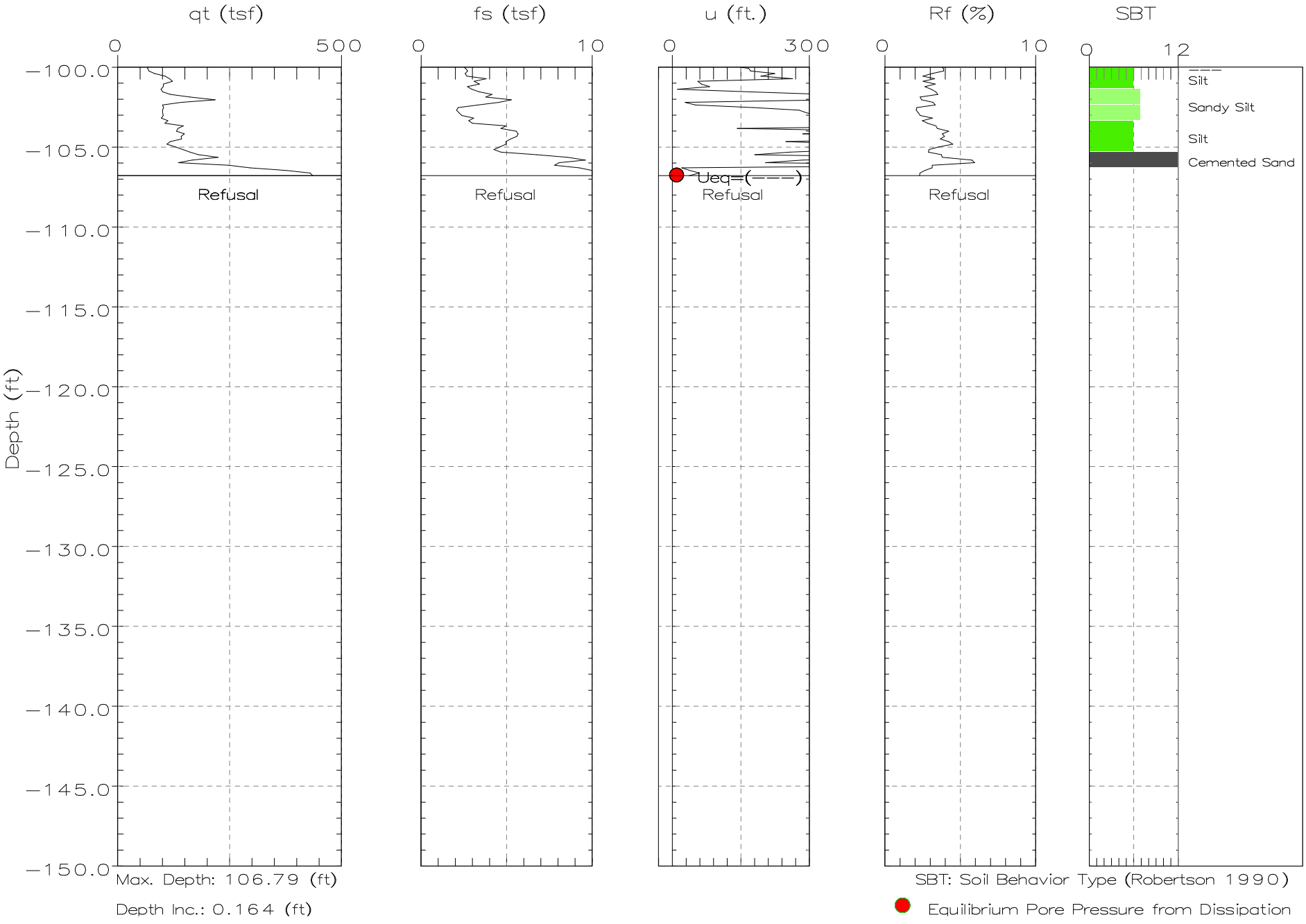
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-09
Location:WIWM

Cone:20 TON 122
Date:04:17:07 14:12



Max. Depth: 106.79 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

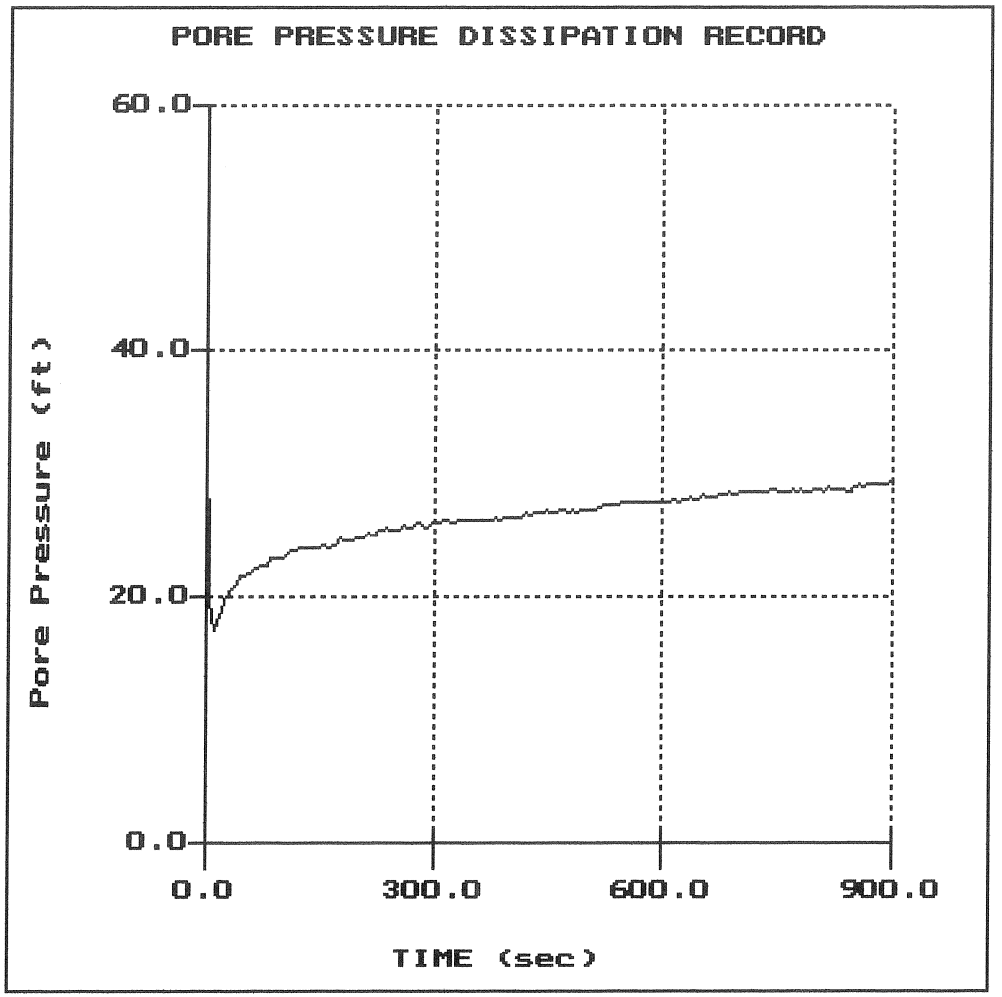
Equilibrium Pore Pressure from Dissipation

CH2M Hill

Hole:CPT-09
Location:WIWM

Cone:20 TON 122
Date:04:17:07 14:12

File: 352CP09.PPD
Depth (m): 32.55
(ft): 106.79
Duration : 900.0s
U-min: 17.27 10.0s
U-max: 36.51 0.0s

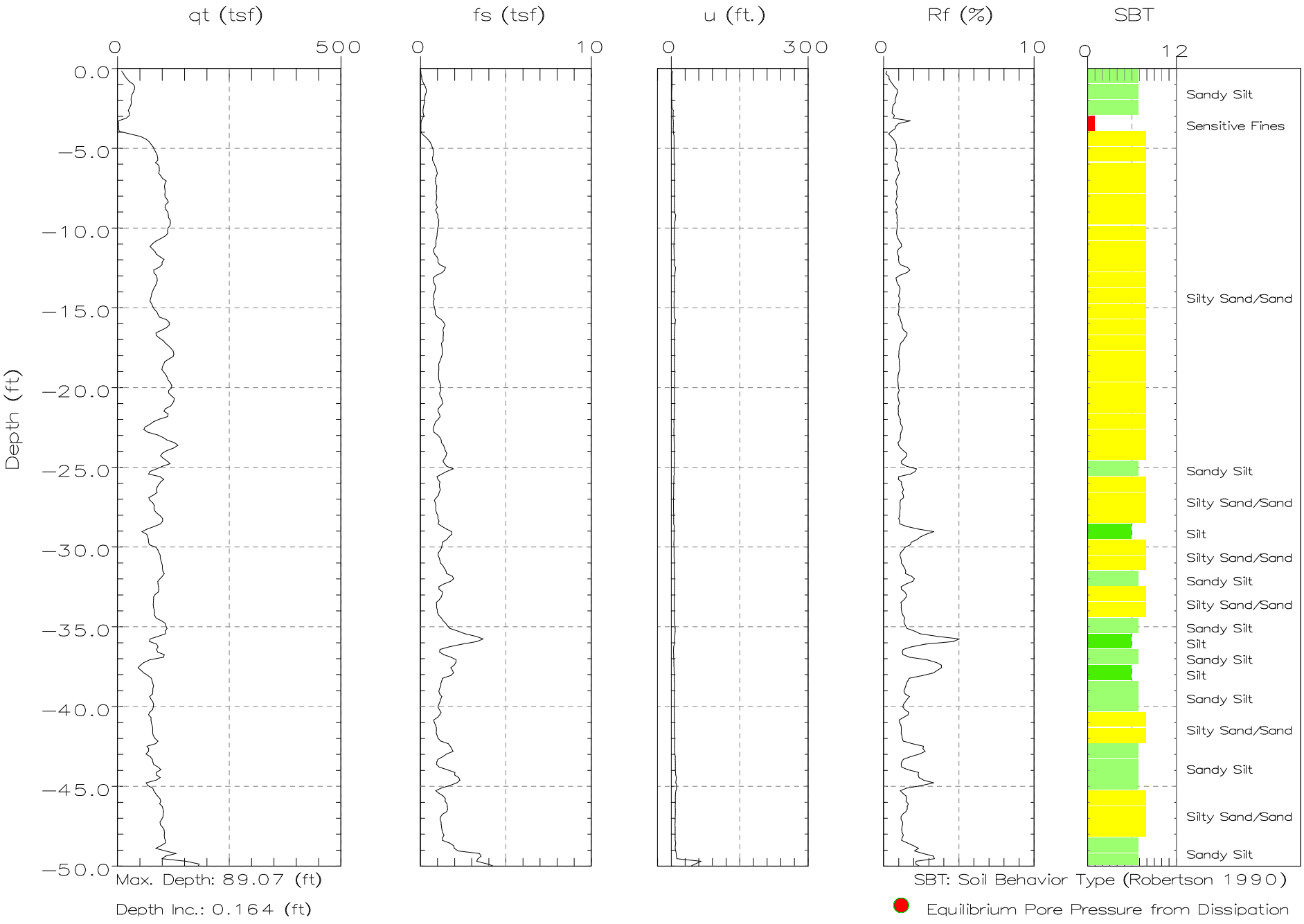


CONETEC

CH2M Hill

Hole No.:CPT-10
Location:WIWM

Cone:20 TON 122
Date:04:20:07 09:02



Max. Depth: 89.07 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

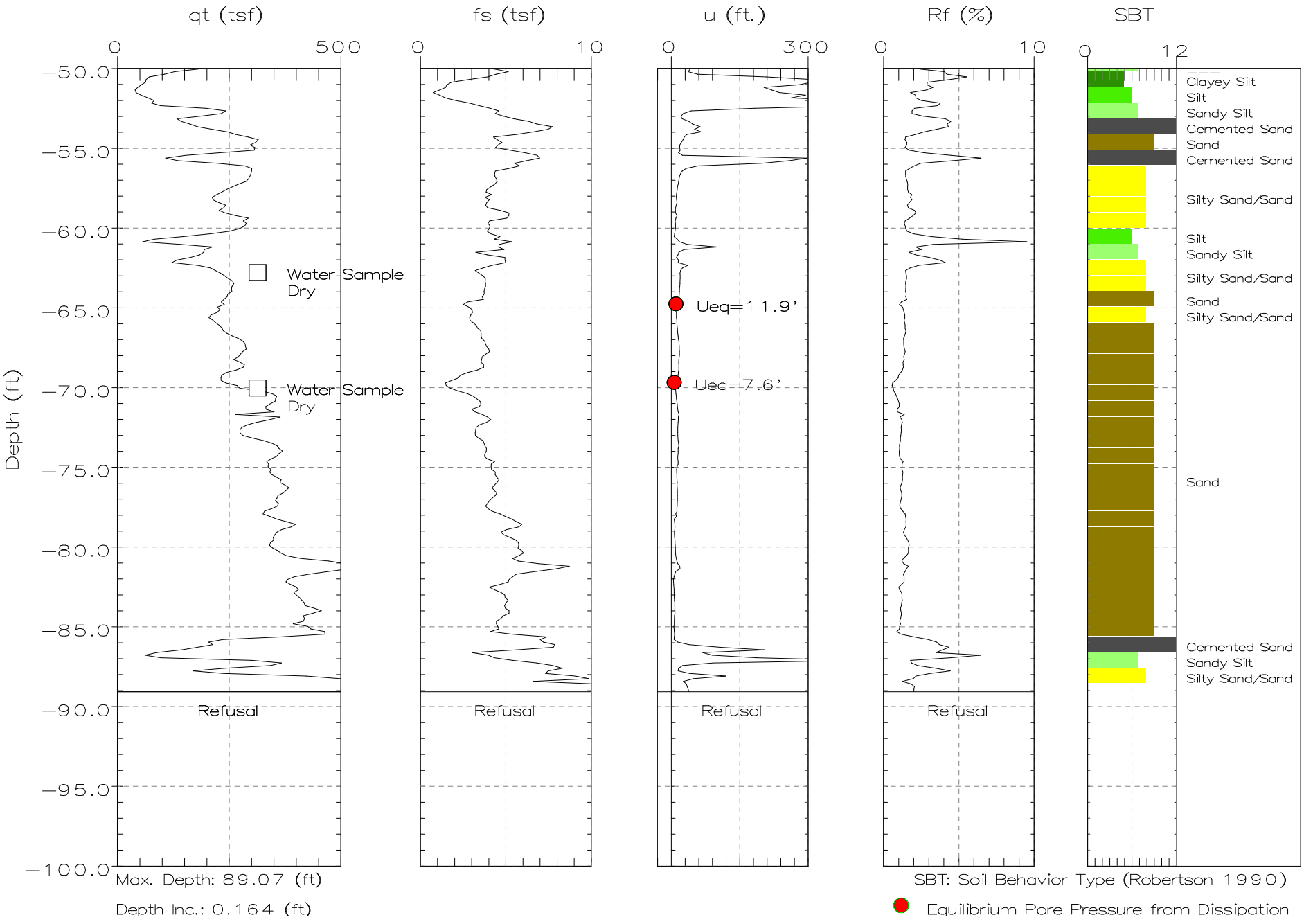
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-10
Location:WIWM

Cone:20 TON 122
Date:04:20:07 09:02



Max. Depth: 89.07 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

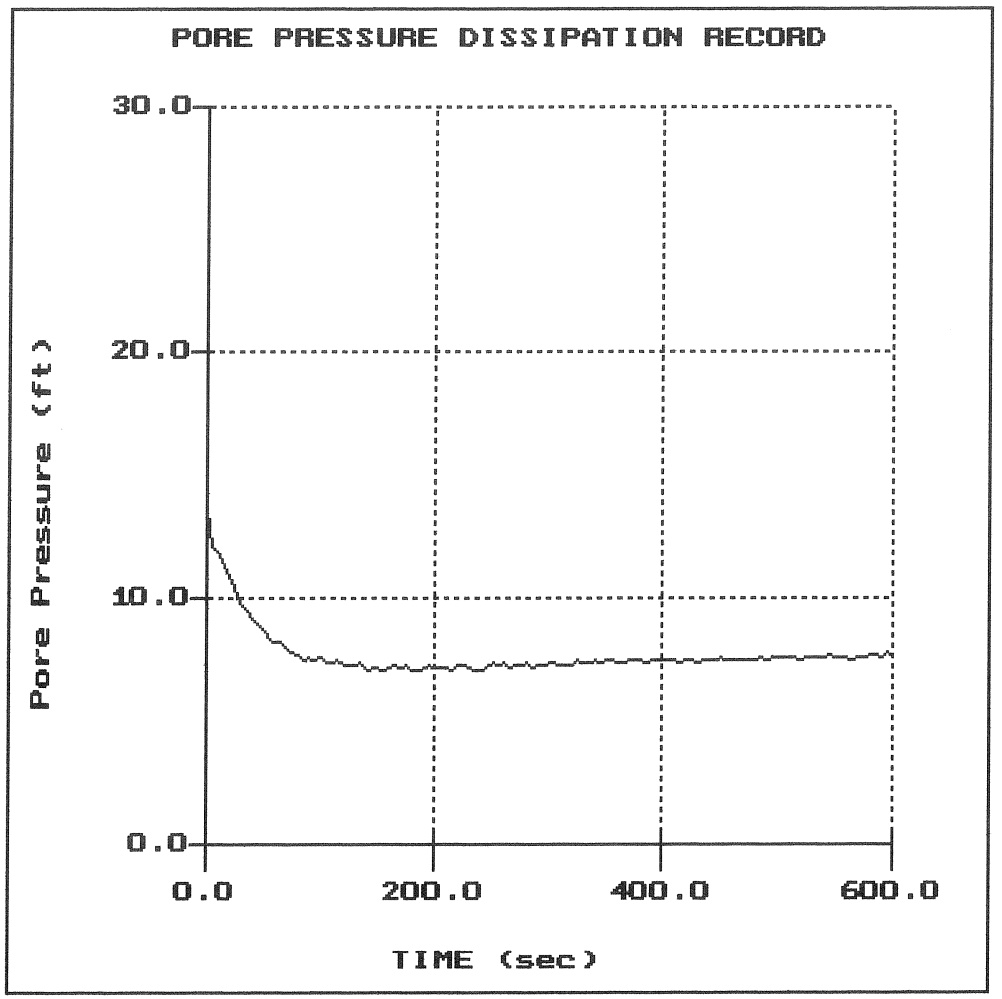
Equilibrium Pore Pressure from Dissipation

CH2M Hill

Hole:CPT-10
Location:WIWM

Cone:20 TON 122
Date:04:20:07 09:02

File: 352CP10.PPD
Depth (m): 21.25
(ft): 69.72
Duration : 600.0s
U-min: 7.09 235.0s
U-max: 13.66 0.0s

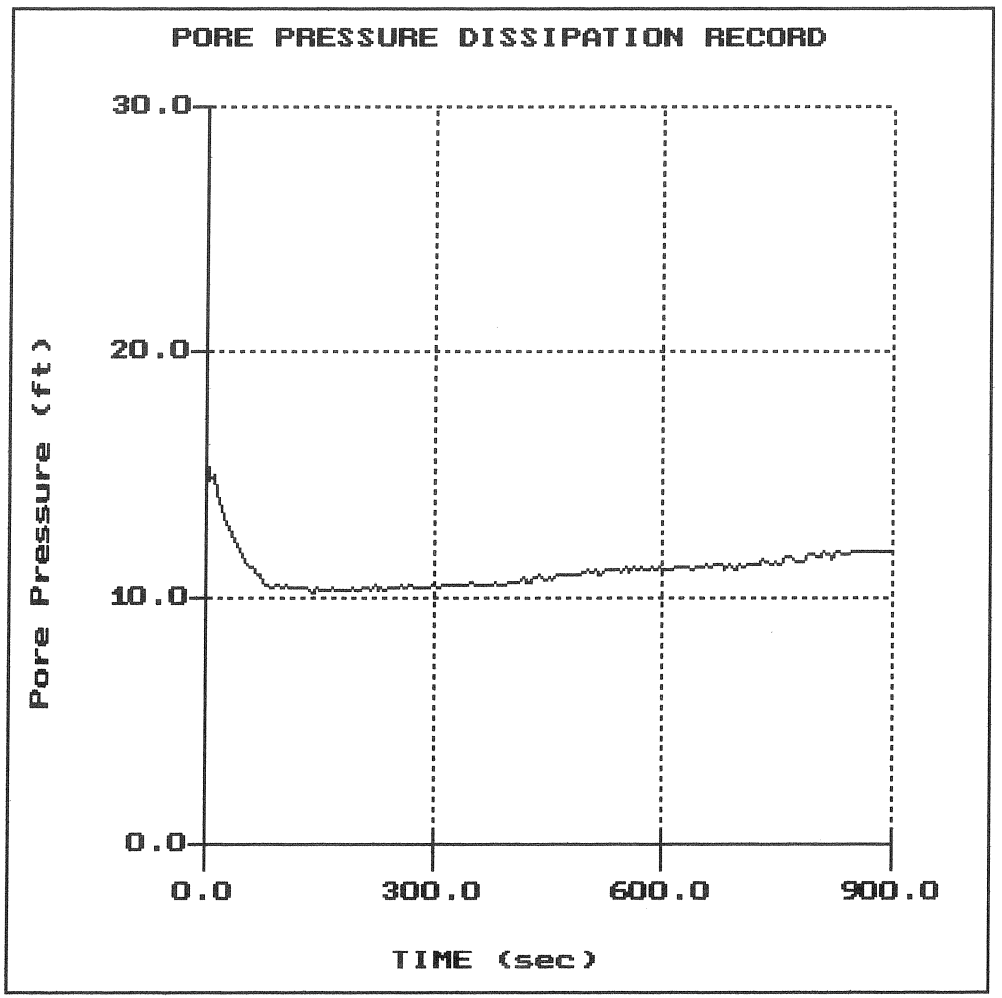


CH2M Hill

Hole:CPT-10
Location:WIWM

Cone:20 TON 122
Date:04:20:07 09:02

File: 352CP10.PPD
Depth (m): 19.75
(ft): 64.80
Duration : 900.0s
U-min: 10.18 140.0s
U-max: 15.81 0.0s

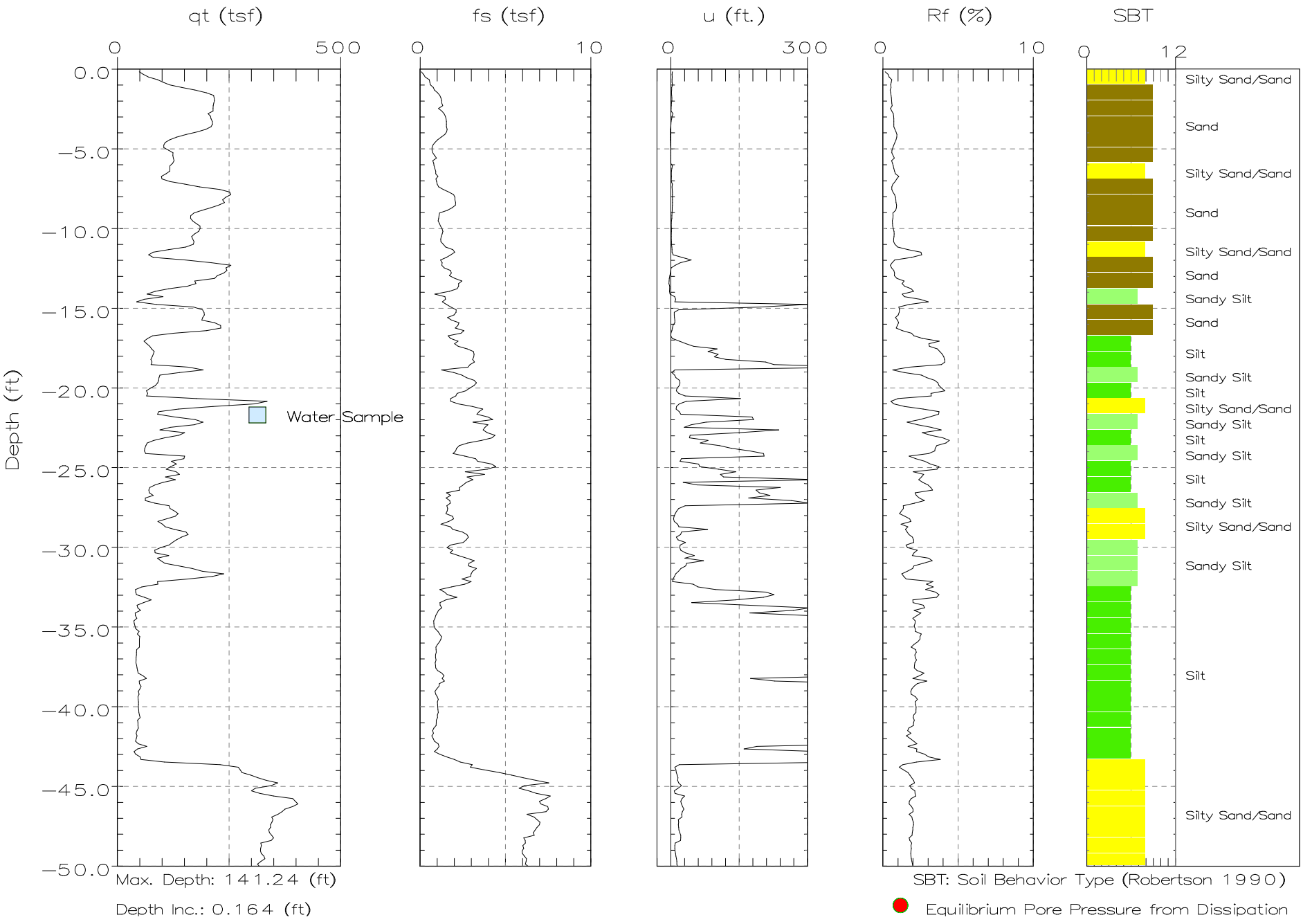


CONETEC

CH2M Hill

Hole No.:CPT-12
Location:WIWM

Cone:20 TON 122
Date:04:16:07 09:32



Max. Depth: 141.24 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

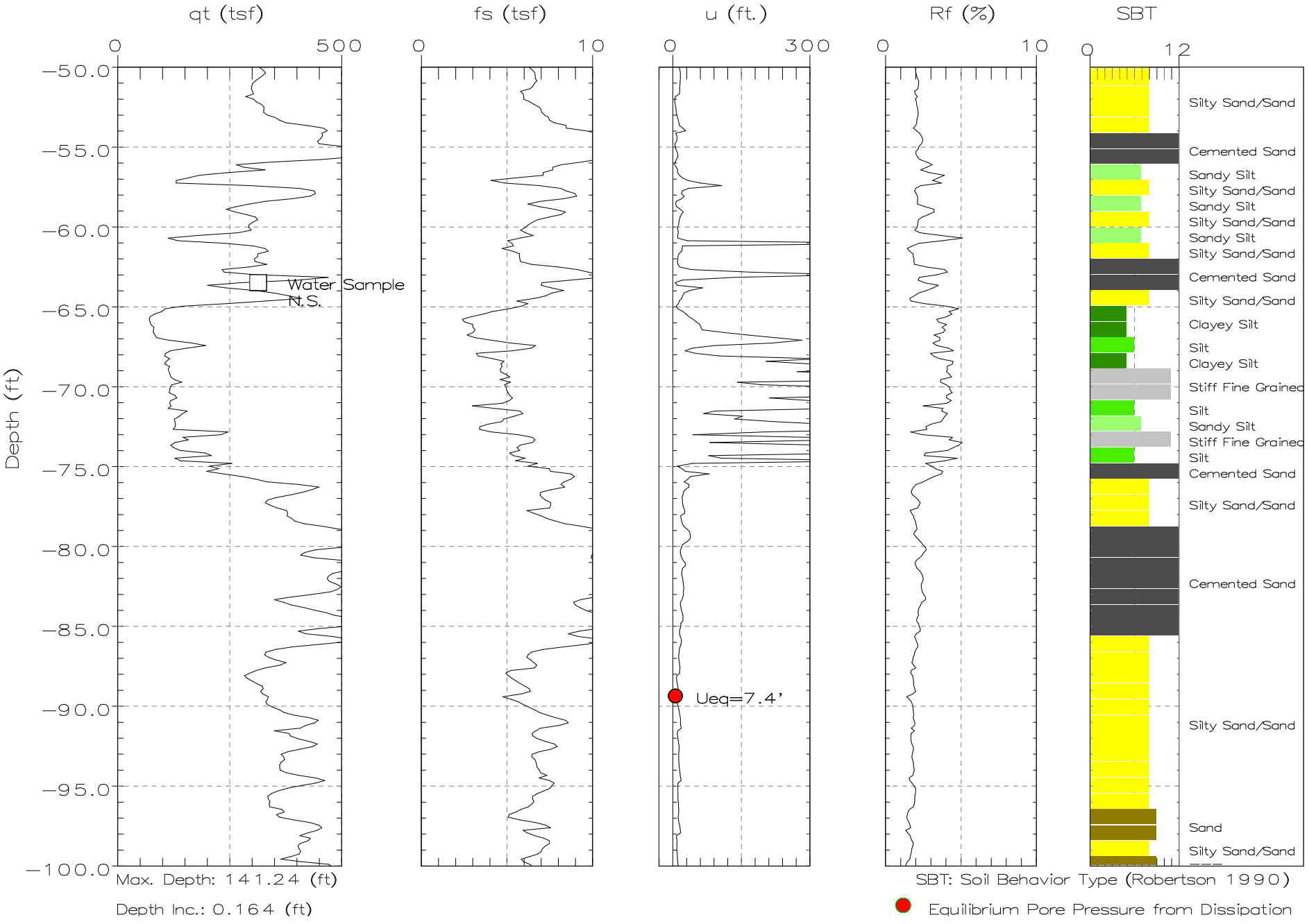
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-12
Location:WIWM

Cone:20 TON 122
Date:04:16:07 09:32



Max. Depth: 141.24 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

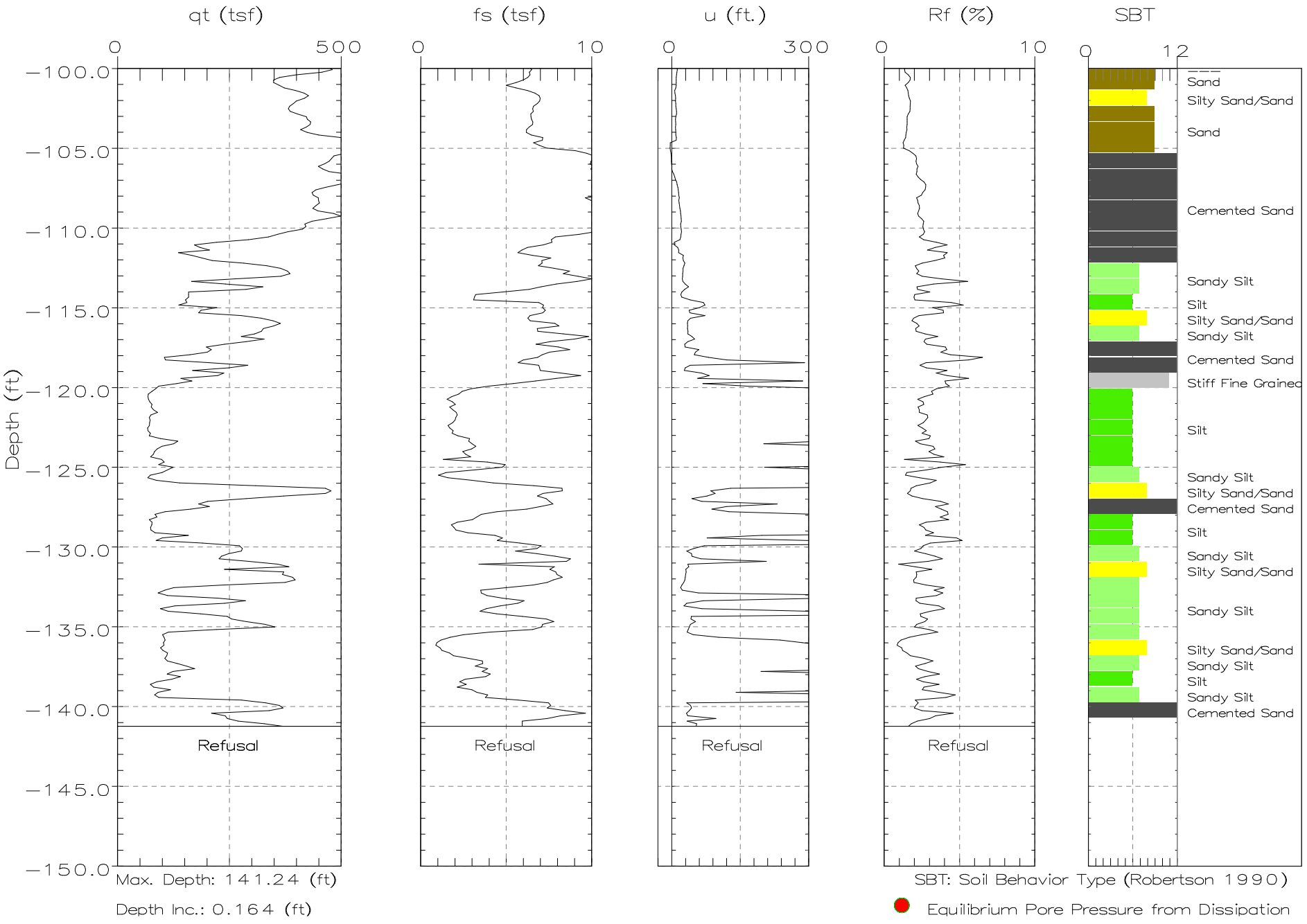
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-12
Location:WIWM

Cone:20 TON 122
Date:04:16:07 09:32



Max. Depth: 141.24 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

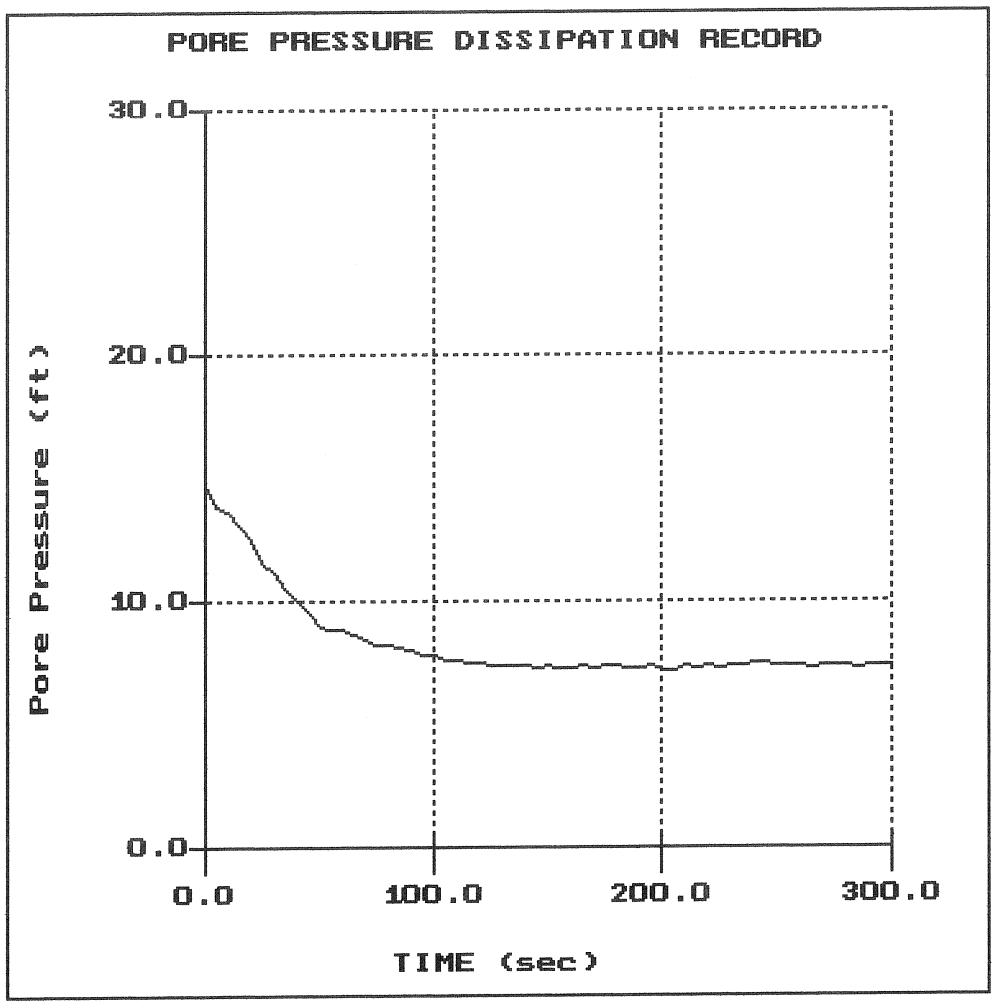
Equilibrium Pore Pressure from Dissipation

CH2M Hill

Hole:CPT-12
Location:WIWM

Cone:20 TON 122
Date:04:16:07 09:32

File: 352CP12.PPD
Depth (m): 27.25
(ft): 89.40
Duration : 300.0s
U-min: 7.23 205.0s
U-max: 14.78 0.0s

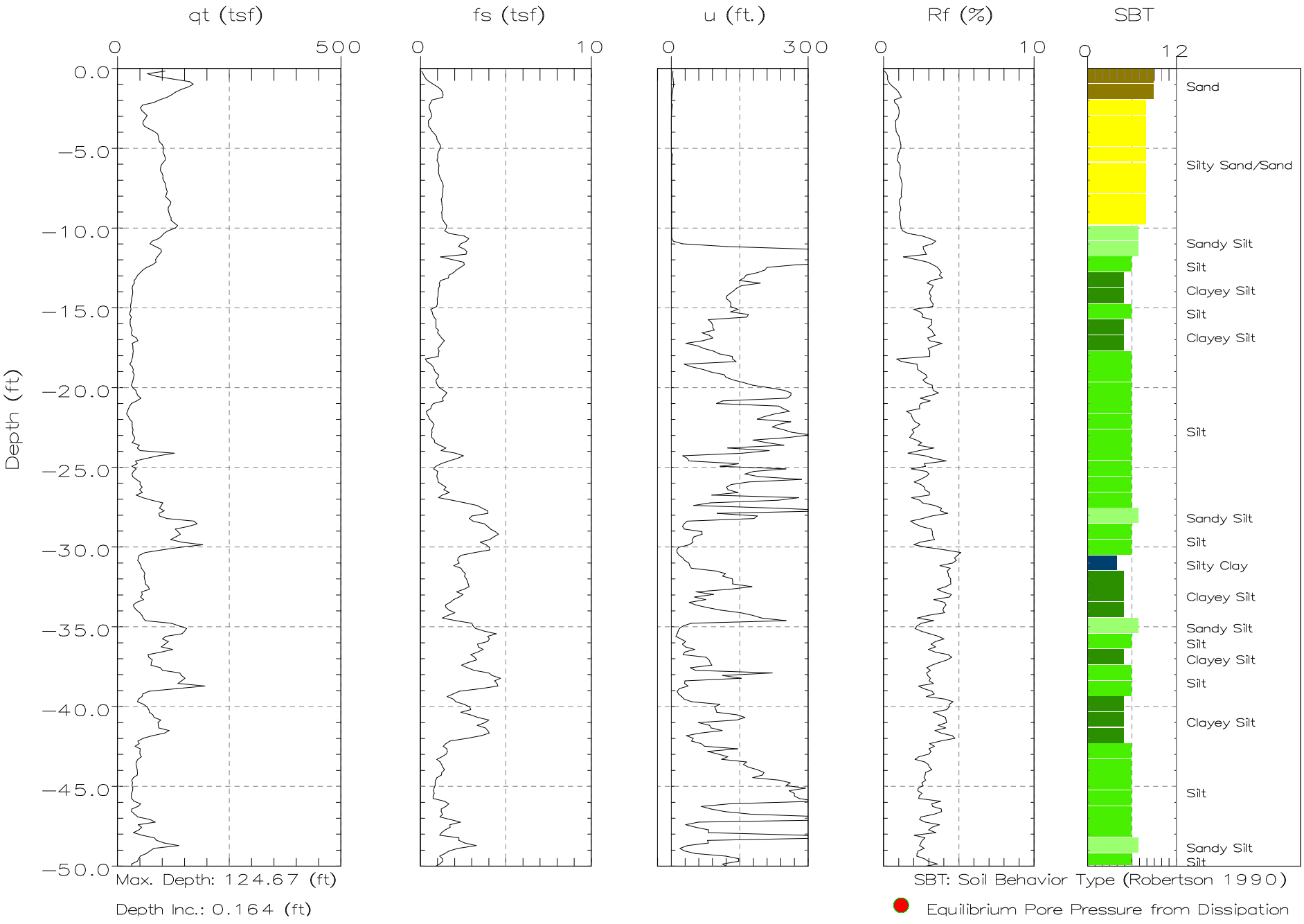


CONETEC

CH2M Hill

Hole No.:CPT-13
Location:WIWM

Cone:20 TON 122
Date:04:16:07 15:34



Max. Depth: 124.67 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

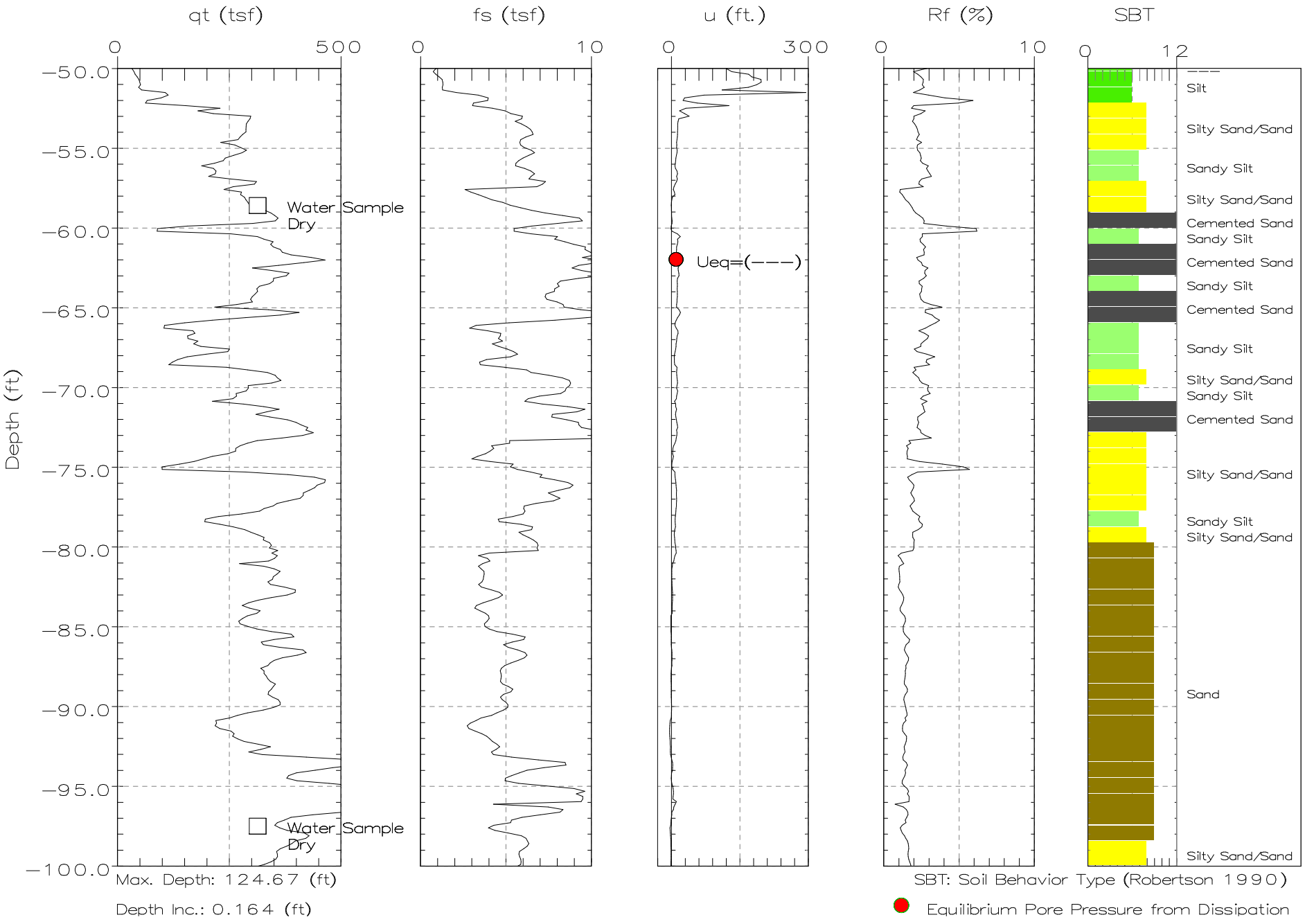
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-13
Location:WIWM

Cone:20 TON 122
Date:04:16:07 15:34



Max. Depth: 124.67 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

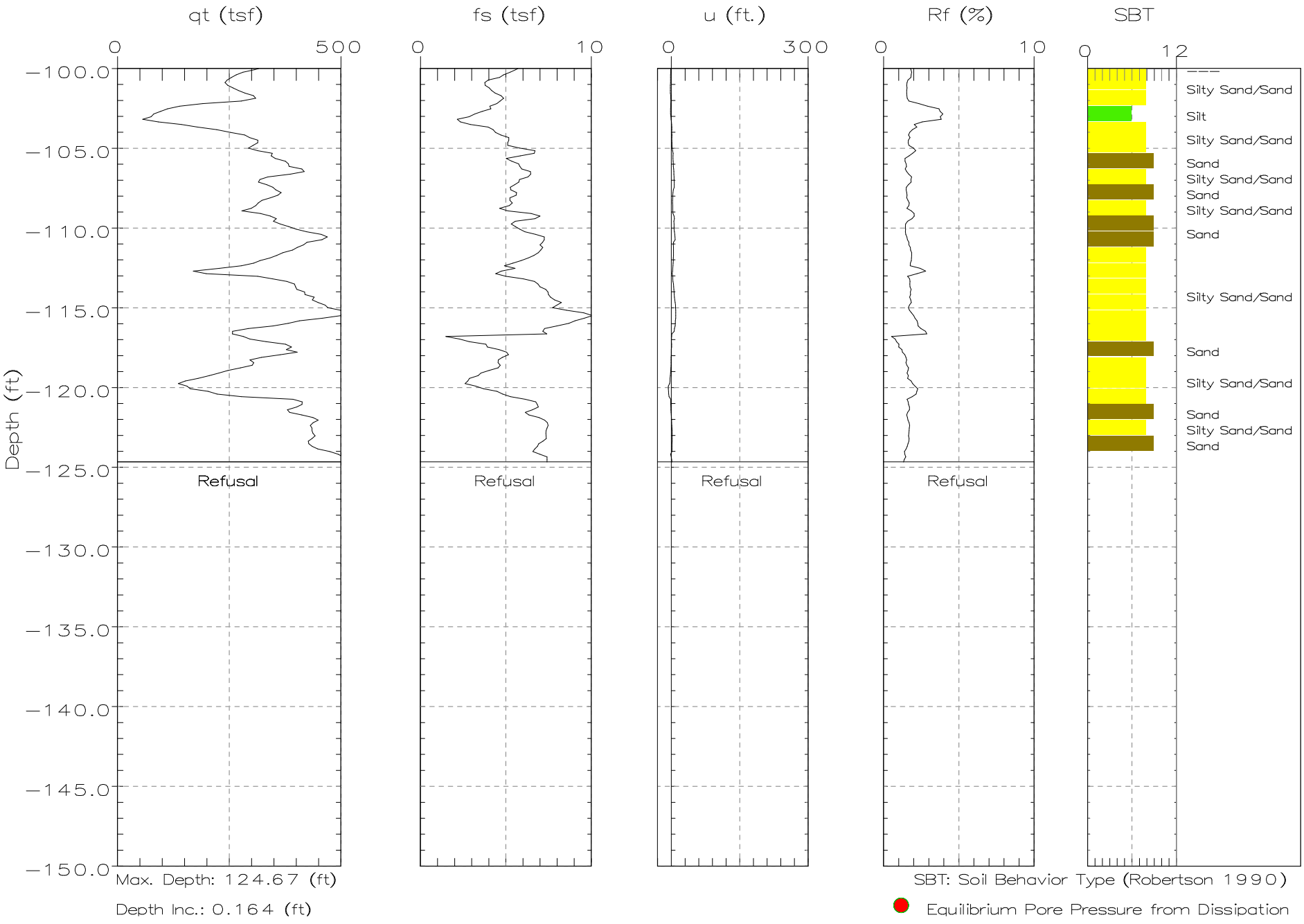
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-13
Location:WIWM

Cone:20 TON 122
Date:04:16:07 15:34



Max. Depth: 124.67 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

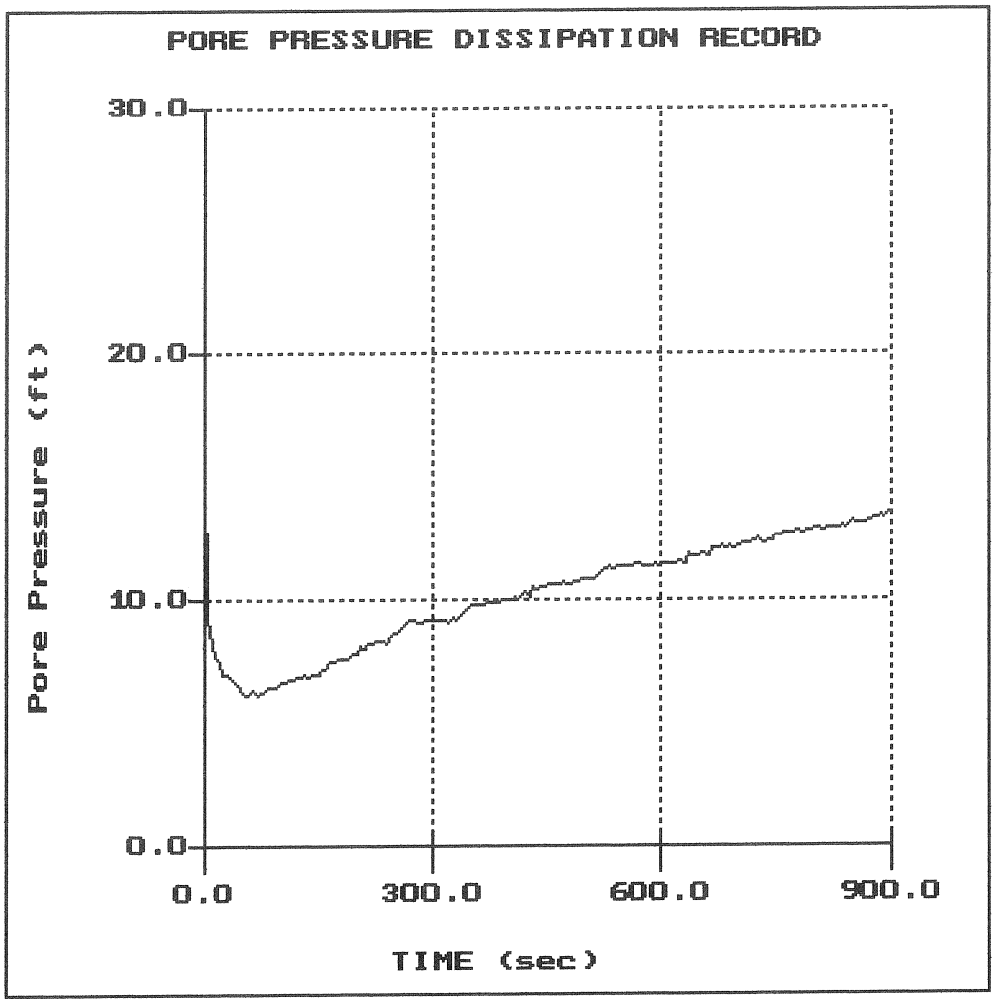
Equilibrium Pore Pressure from Dissipation

CH2M Hill

Hole:CPT-13
Location:WIWM

Cone:20 TON 122
Date:04:16:07 15:34

File: 352CP13.PPD
Depth (m): 18.90
(ft): 62.01
Duration : 900.0s
U-min: 6.15 55.0s
U-max: 16.14 0.0s

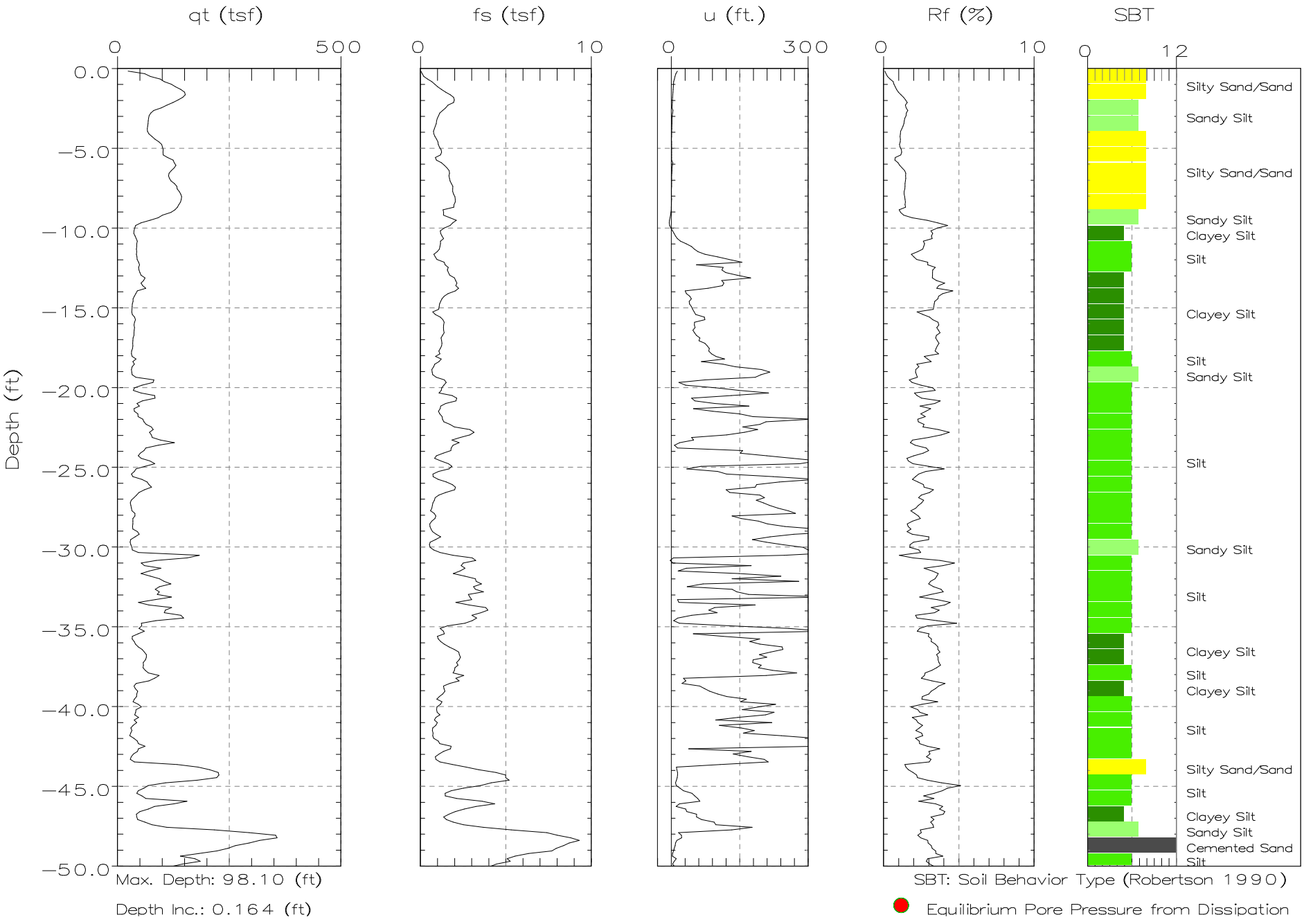


CONETEC

CH2M Hill

Hole No.:CPT-14
Location:WIWM

Cone:20 TON 122
Date:04:17:07 08:21



Max. Depth: 98.10 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

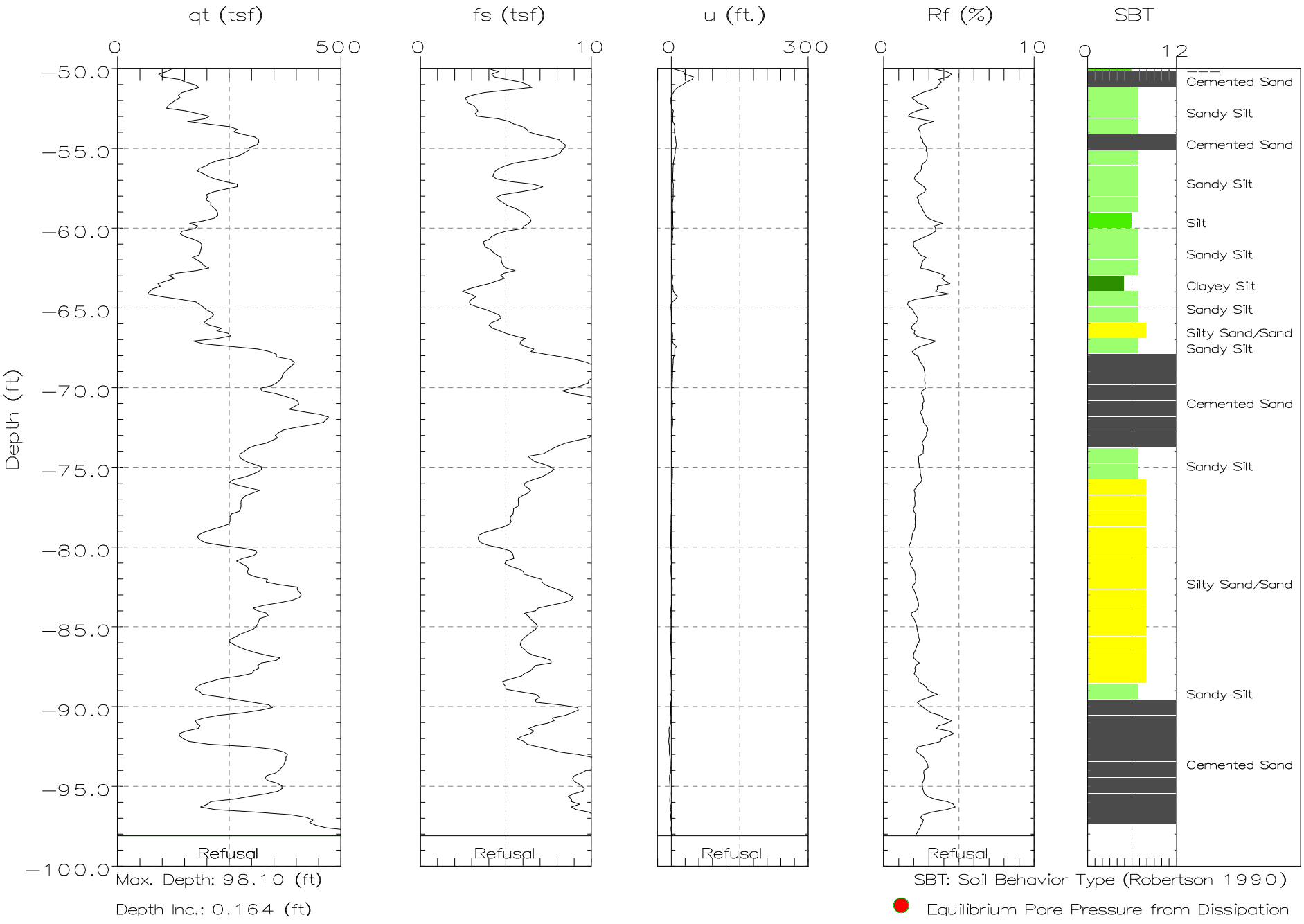
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-14
Location:WIWM

Cone:20 TON 122
Date:04:17:07 08:21



Max. Depth: 98.10 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

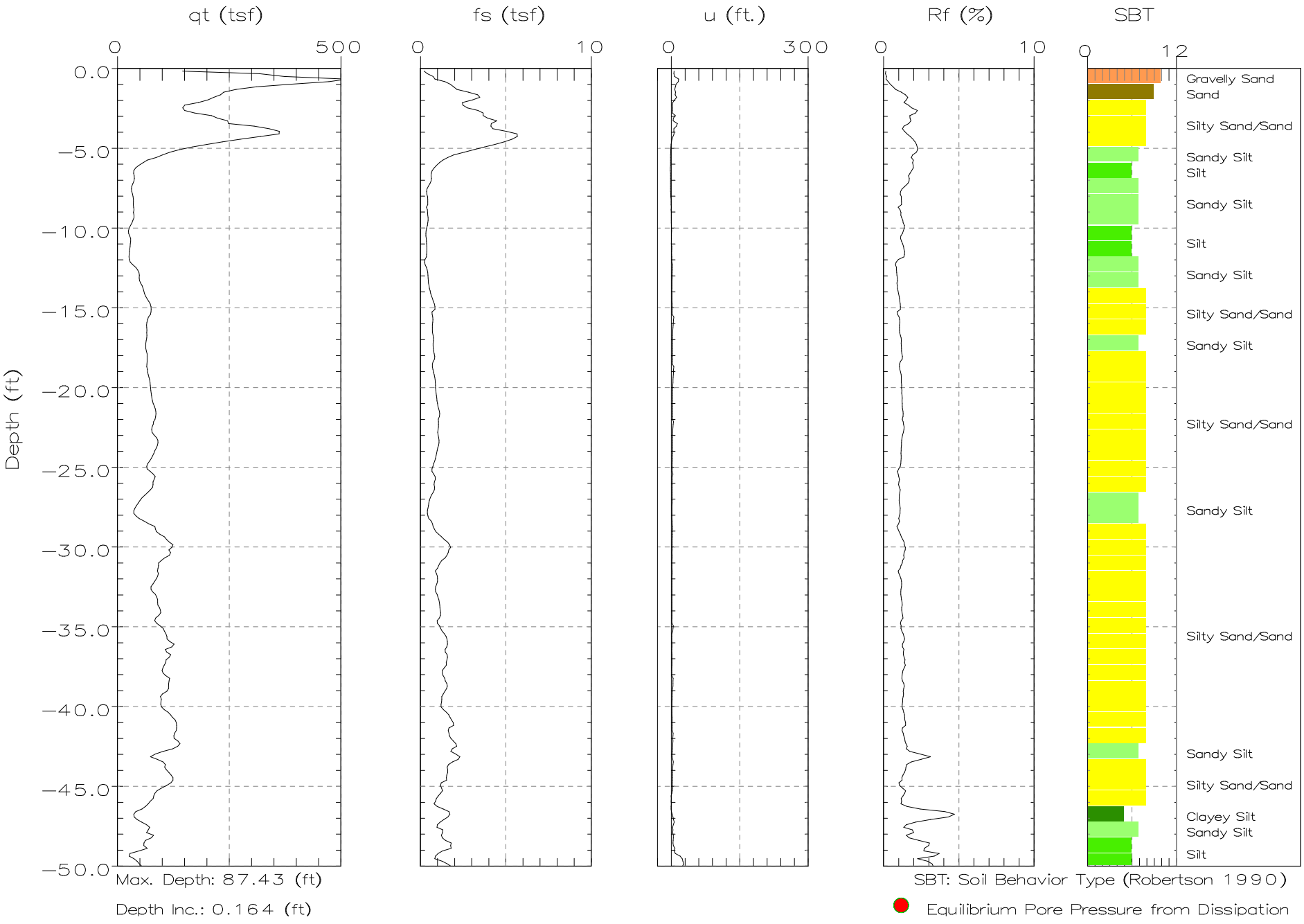
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-15
Location:WIWM

Cone:20 TON 122
Date:04:16:07 13:43



Max. Depth: 87.43 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

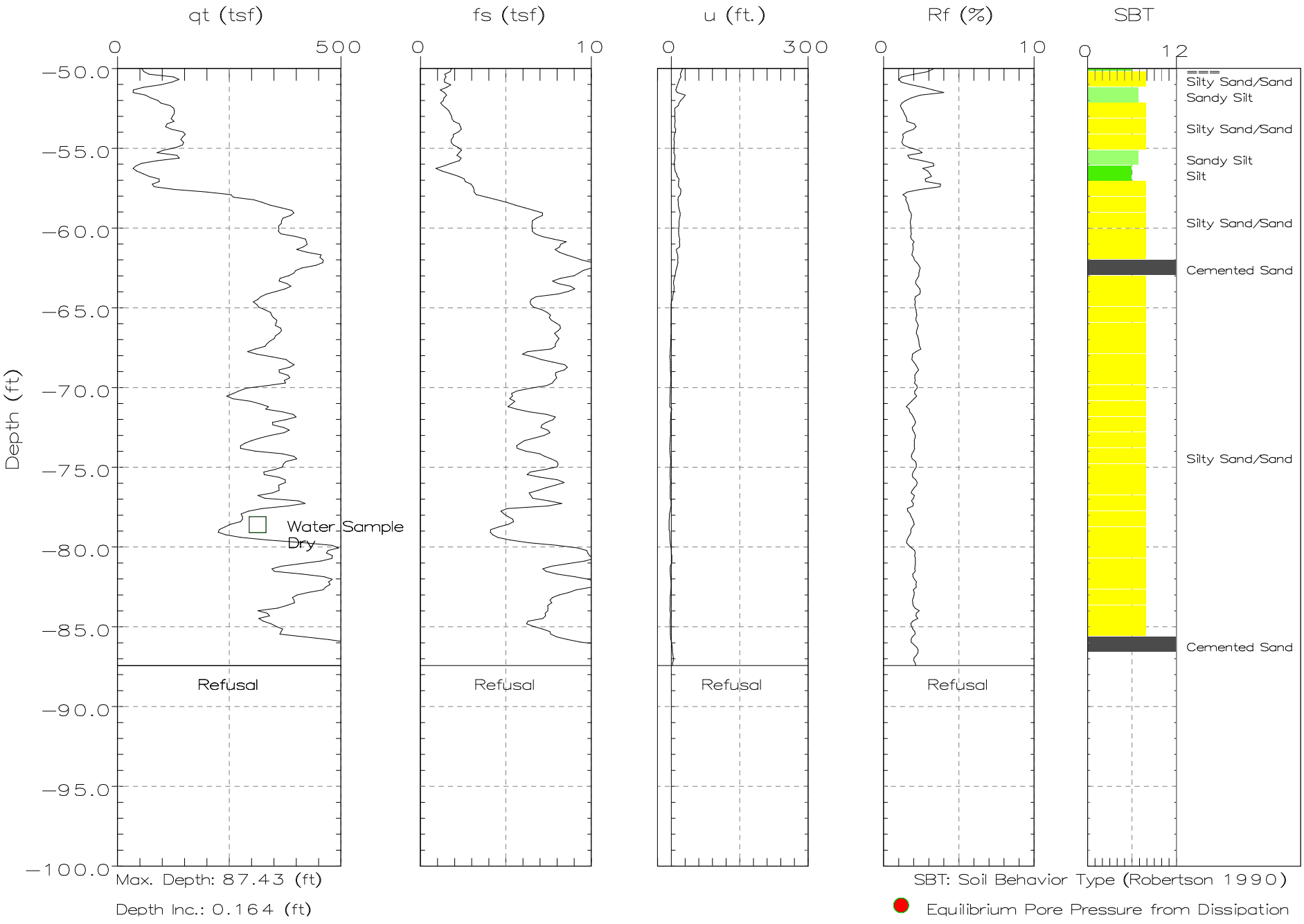
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-15
Location:WIWM

Cone:20 TON 122
Date:04:16:07 13:43



Max. Depth: 87.43 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

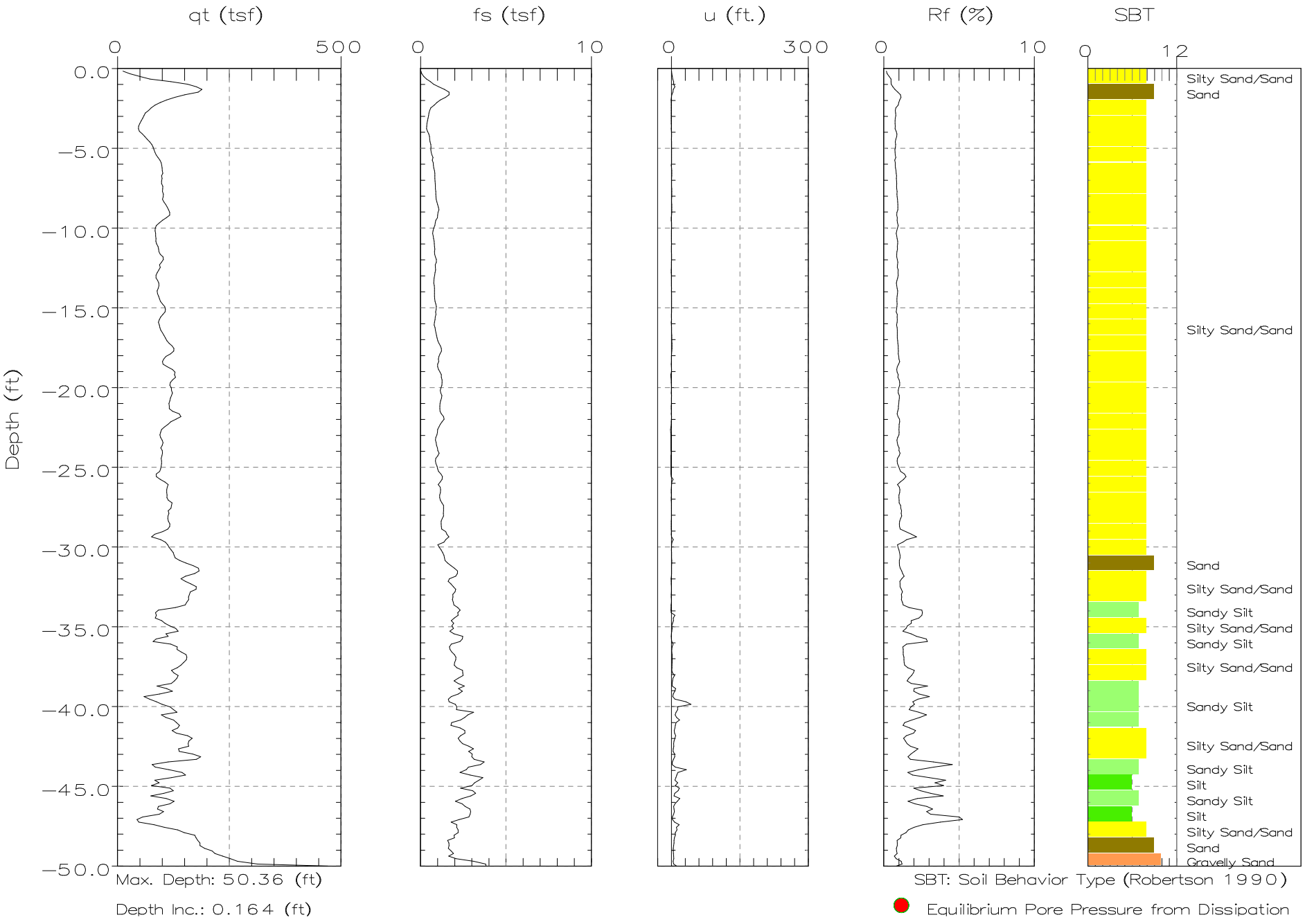
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT–16
Location:WIWM

Cone:20 TON 122
Date:04:20:07 13:20



Max. Depth: 50.36 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

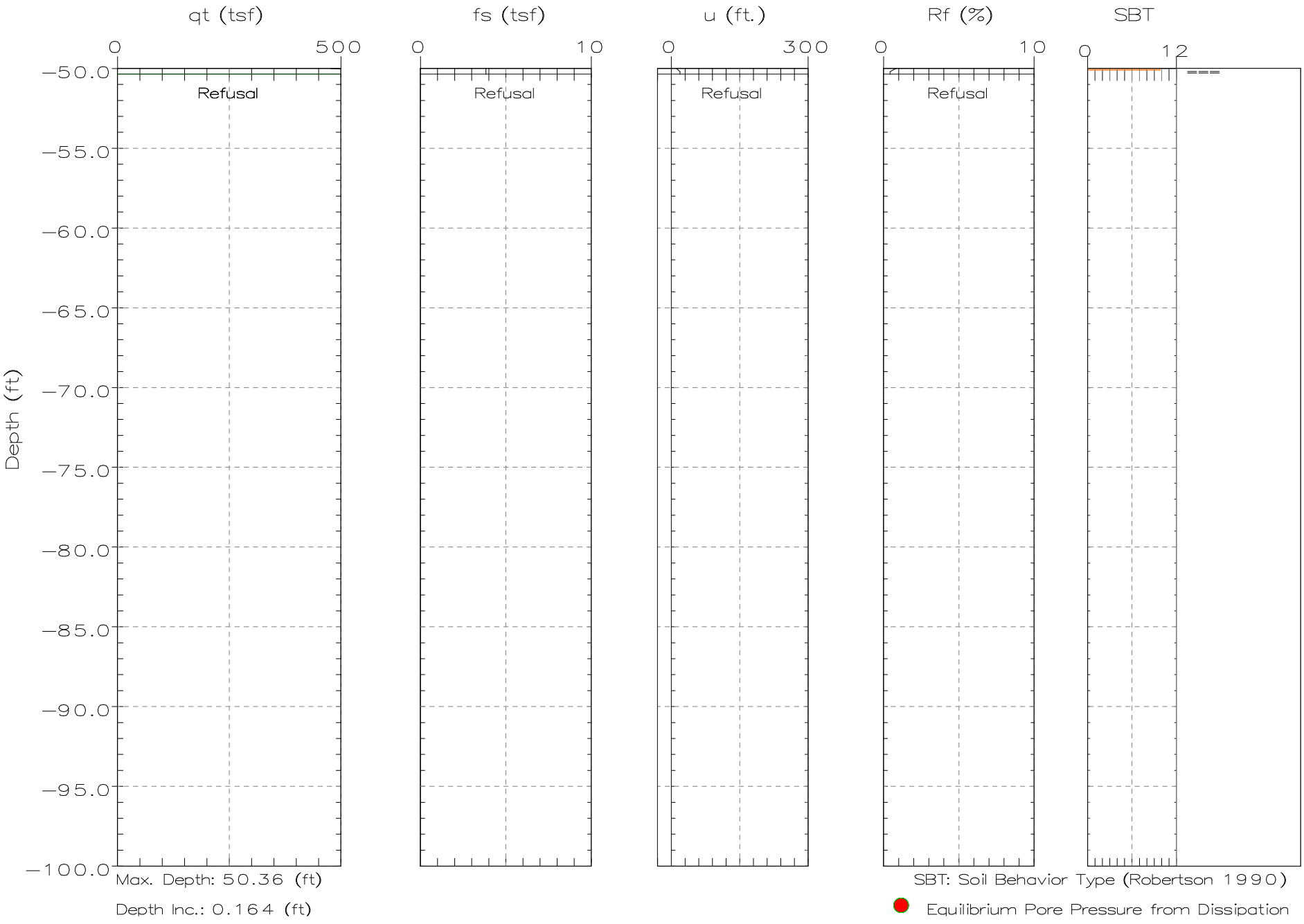
Equilibrium Pore Pressure from Dissipation

CONETEC

CH2M Hill

Hole No.:CPT-16
Location:WIWM

Cone:20 TON 122
Date:04:20:07 13:20



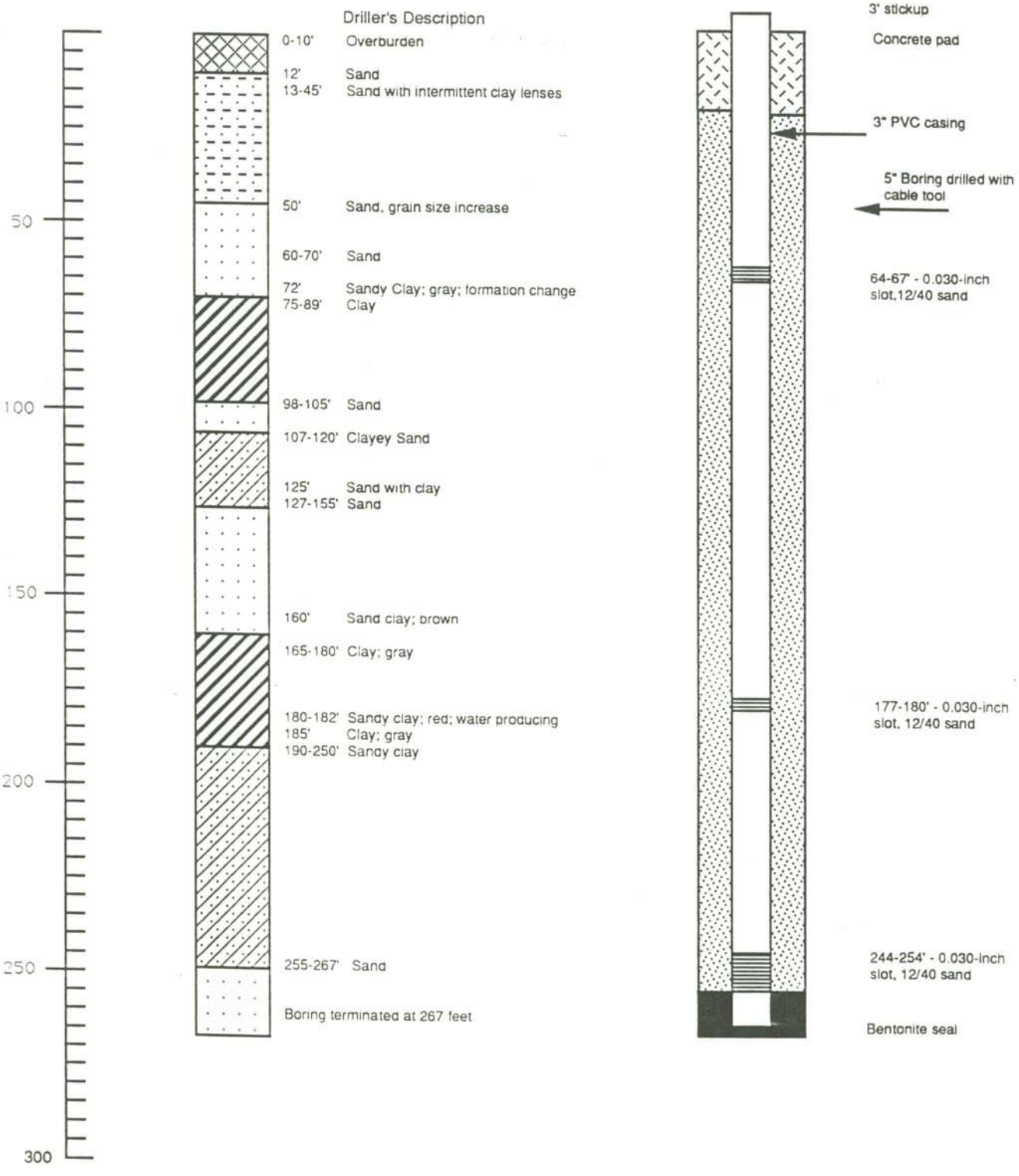
Max. Depth: 50.36 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Equilibrium Pore Pressure from Dissipation

Well #2 (DMW-1)
North Davis Refuse District
Graphic Log and Well Construction
(Based on data provided by Davis County Health Department)



(based on data provided by Davis County Heath Dept.)

SOIL LOG FOR WELL #2

(DMW-1)

0-10'	overburden from site prep
12'	sand color change
13-45'	sand (with intermittent clay lenses too thin to detect with drilling method)
50'	Sand slightly larger grain size. The hole seemed to be taking in water.
60-70'	sand
72'	sandy clay, grey (formation change)
75'	clay
85-98'	clay (water accumulation in hole after sitting overnight)
98-105'	sand, change from clay
107-120'	claying sand
125'	sand with small bits of clay
127-155'	sand
160'	sandy clay, brown
165-180'	clay, grey
180-182'	sandy clay, red, water producing
185'	clay, grey
190-250'	sandy clay
255-267'	sand

(based on data provided by Davis County Health Dept.)

WELL #2 CONSTRUCTION - Southwest corner of property (DMW-1)

	Slot Size	Gravel Pack
3' Surface		
20' Solid PVC		
20' Solid PVC		
20' Solid PVC		
1' Solid PVC		
3' Screen	.030	12/40 Silica Sand
9' Solid PVC		
20' Solid PVC		
20' Solid PVC		
20' Solid PVC		
20' Solid PVC		
20' Solid PVC		
1' Solid PVC		
3' Screen	.030	12/40 Silica Sand
1' Solid PVC		
20' Solid PVC		
20' Solid PVC		
20' Solid PVC		
10' Screen	.030	12/40 Silica Sand

13' Blank to bottom with Bentonite seal to protect lower aquifers and prevent water loss.

STRATA DATA INC.

NATURAL GAMMA/ NEUTRON LOG

FILE NO. 5152A

COMPANY: EMCON ASSOCIATES

WELL: DMW-1

FIELD: NORTH DAVIS REFUSE DISPOSAL SITE

COUNTY: DAVIS STATE: UTAH

LOCATION:

SEC: TWP: RGE:

OTHER LOGS:

NONE

PERMANENT DATUM: TOP OF CASING

ELEVATION: N/A

LOG MEASURED FROM: TOP OF CASING

RUN NO.	ONE			
DATE:	08/24/89			
DRILLER :				
DEPTH at BIT DIA.				
DEPTH at BIT DIA.				
CASING DPTH/SIZE	5" PVC			
CASING DPTH/SIZE				
LOGGER :				
DEPTH	267'			
CASING DEPTH	267'			
BOT LOG INTERVAL	267'			
TOP LOG INTERVAL	0'			
TYPE FLUID IN HOLE	WATER			
Rm at TEMP	N/A			
SAMPLE SOURCE	N/A			
FLUID LEVEL	N/A			
TIME SINCE CIRC.	N/A			
RECORDED BY:	McDONALD, WEIKUM			

LOGGING DATA

LOG FUNCTION	RUN NO.	EQUIPMENT MODEL	EQUIPMENT PROBE S.N.	EQUIPMENT UPHOLE S.N.	LOGGING DIG INT FEET	LOGGING SPEED FT./MIN	DETECTOR TYPE	SPACING Tx-Rx FEET	SPACING Rx-Rx FEET	SOURCE TYPE	SOURCE SIZE CURIE	LOGGED INTERVAL FROM	LOGGED INTERVAL TO	LOGGED INTERVAL INT. FEET
Gamma	One	9256	27A20	105	0.5	20	Scint.	N/A	N/A	N/A	N/A	267	0	267
Neutron	One	9250	27U5A35	105	0.5	20	Prop.	12 In.	N/A	AmBe	3.0	267	0	267

CALIBRATION FACTOR(S): Shop API Calibration

DIGITAL FILE NAME(S): DWM-1.LOG

REMARKS:

The Neutron log was recorded on a separate run.

NATURAL GAMMA/ NEUTRON LOG

STRATA DATA INC.

FILE NO. 5152A

COMPANY: EMCON ASSOCIATES

WELL: DMW-1

FIELD: NORTH DAVIS REFUSE DISPOSAL SITE

COUNTY: DAVIS STATE: UTAH

LOCATION:

SEC: TWP: RGE:

OTHER LOGS:

NONE

PERMANENT DATUM: TOP OF CASING
ELEVATION: N/A
LOG MEASURED FROM: TOP OF CASING

RUN NO.	ONE			
DATE:	08/24/89			
DRILLER :				
DEPTH at BIT DIA.				
DEPTH at BIT DIA.				
CASING DPTH/SIZE	5" PVC			
CASING DPTH/SIZE				
LOGGER :				
DEPTH	267'			
CASING DEPTH	267'			
BOT LOG INTERVAL	267'			
TOP LOG INTERVAL	0'			
TYPE FLUID IN HOLE	WATER			
Rm at TEMP	N/A			
SAMPLE SOURCE	N/A			
FLUID LEVEL	N/A			
TIME SINCE CIRC.	N/A			
RECORDED BY:	McDONALD, WEIKUM			

LOGGING DATA

LOG FUNCTION	RUN NO.	EQUIPMENT MODEL	EQUIPMENT PROBE S.N.	EQUIPMENT UPHOLE S.N.	LOGGING DIG INT FEET	LOGGING SPEED FT./MIN	DETECTOR TYPE	SPACING Tx-Rx FEET	SPACING Rx-Rx FEET	SOURCE TYPE	SOURCE SIZE CURIE	LOGGED INTERVAL FROM	LOGGED INTERVAL TO	LOGGED INTERVAL INT. FEET
Gamma	One	9256	27A20	105	0.5	20	Scint.	N/A	N/A	N/A	N/A	267	0	267
Neutron	One	9250	27U5A35	105	0.5	20	Prop.	12 In.	N/A	AmBe	3.0	267	0	267

CALIBRATION FACTOR(S): Shop API Calibration.

DIGITAL FILE NAME(S): DWM-1.LOG

REMARKS:

The Neutron log was recorded on a separate run.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-3

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 1 OF 5

BY RCK DATE 10/29/88 SURFACE ELEV. 4872 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80			**SAND (SP),** reddish brown (5YR, 4/3); fine grained; quartzose; sparse dark minerals; little to no cohesion; dry to damp.	
			▽ 11/16/88				@66': increase in moisture content.	
							@72': dark grayish brown (10YR, 3/2); slightly cohesive.	
							CLAYEY SAND (SC), dark grayish brown (10YR, 4/2); fine grained; moderate cohesion; moderate plasticity.	

REMARKS

Boring drilled to 141 feet with air rotary, then mud rotary to 400 feet. Logged from drill cuttings. Converted to monitoring well. See well detail for construction information.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 — BORING NO. DMW-3

PROJECT NAME DAVIS COUNTY LANDFILL — PAGE 2 OF 5

BY RCK — DATE 10/29/88 — SURFACE ELEV. 4872 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAI
				85			CLAYEY SAND (continued)	
				90			@86': begin adding water to air circulation.	
				95			CLAY (CH), dark gray (10YR, 4/1); high plasticity; damp to moist.	
				100				
				105			SAND (SP), dark yellowish brown (10YR, 4/4); silty; fine grained.	
				110				
				115			@115': medium grained.	
			▼ 120					
			11/16/89					
				125				
				130			CLAY (CH), dark gray (10YR, 4/1).	
				135				
				140			SILTY SAND (SP-SM), fine grained; no cohesion; moderate amount of dark mineral grains.	
				145			@141': begin drilling with bentonite mud.	
				150				
				155				
				160				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY RCK DATE 10/29/88

BORING NO. DMW-3
PAGE 3 OF 5
SURFACE ELEV. 4872 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				165			**SILTY SAND** (continued)	
				170				
				175				
				180				
				185				
				190				
				195				
				200				
				205				
				210				
				215				
				220			@220'-235': thin layers of brownish clay.	
				225				
				230				
				235				
				240				

REMARKS

EMCON ASSOCIATES

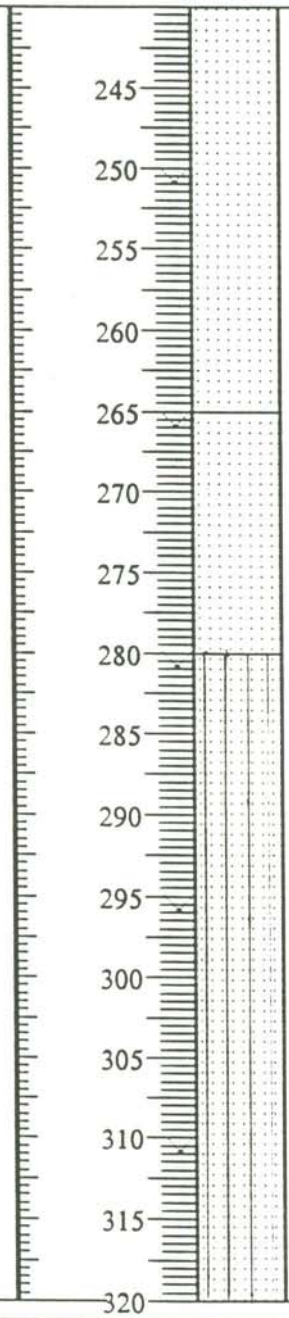
LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-3

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 4 OF 5

BY RCK DATE 10/29/88 SURFACE ELEV. 4872 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL



SAND (SP), very few fines; medium to coarse grained; dominantly quartzose with feldspar, abundant dark minerals, and sparse muscovite chips.

SILTY SAND (SP-SM), fine grained; no cohesion; abundant dark mineral grains.

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. DMW-3

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 5 OF 5

BY RCK DATE 10/29/88 SURFACE ELEV. 4872 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				325			SILTY SAND (continued)	
				330				
				335				
				340				
				345				
				350				
				355				
				360				
				365				
				370				
				375				
				380				
				385				
				390				
				395				
				400			BORING TERMINATED AT 400 FEET.	

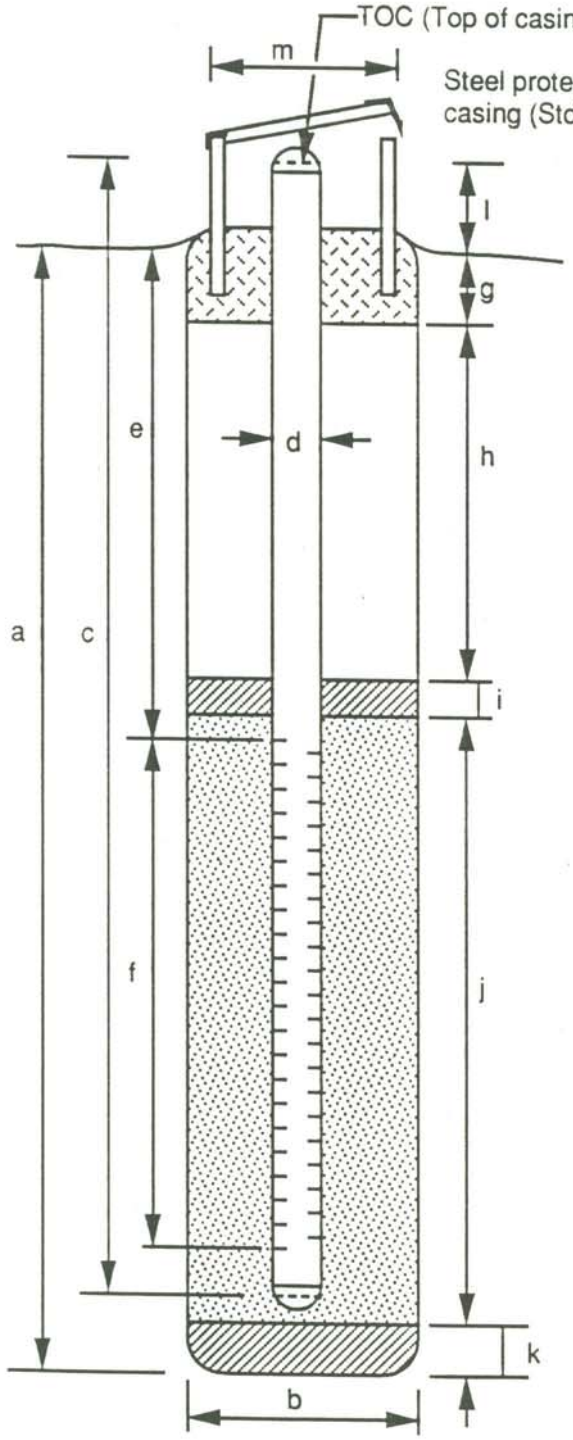
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 558-02.03
PROJECT NAME North Davis Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. _____

BORING / WELL NO. DMW-3
TOP OF CASING ELEV. 4874.03'
GROUND SURFACE ELEV. 4872'
DATUM Davis County Benchmark
INSTALLATION DATE 10/29/88



EXPLORATORY BORING

a. Total depth 400 ft.
b. Diameter 12 in.
Drilling method Mud Rotary

WELL CONSTRUCTION

c. Total casing length 392.5 ft.
Material Schedule 40 PVC
d. Diameter 5 in.
e. Depth to top perforations 370 ft.
f. Perforated length 20 ft.
Perforated interval from 370 to 390 ft.
Perforation type Machine slotted
Perforation size 0.020 inches
g. Surface seal 1 ft.
Material Concrete
h. Backfill 319 ft.
Material Concrete/Bentonite
i. Seal 10 ft.
Material Bentonite pellets
j. Gravel pack 60 ft.
Gravel pack interval from 330 to 390 ft.
Material #10/20 Sand
k. Bottom seal/fill 10 ft.
Material Natural materials
l. Casing stickup 2.5 ft.
m. Protective casing diameter 8 in.

Form prepared by _____

STRATA DATA INC.

NATURAL GAMMA/ NEUTRON LOG

FILE NO. 5152C

COMPANY: EMCON ASSOCIATES

WELL: DMW-3

FIELD: NORTH DAVIS REFUSE DISPOSAL SITE

COUNTY: DAVIS STATE: UTAH

LOCATION: 202352' N., 104388' E.

SEC: TWP: RGE:

OTHER LOGS: NONE

PERMANENT DATUM: TOP OF CASING

ELEVATION: 4874.03'

LOG MEASURED FROM: TOP OF CASING

RUN NO.	ONE			
DATE:	08/24/89			
DRILLER :				
DEPTH at BIT DIA.				
DEPTH at BIT DIA.				
CASING DPTH/SIZE	5" PVC			
CASING DPTH/SIZE				
LOGGER :				
DEPTH	388'			
CASING DEPTH	388'			
BOT LOG INTERVAL	388'			
TOP LOG INTERVAL	0'			
TYPE FLUID IN HOLE	WATER			
Rm at TEMP	N/A			
SAMPLE SOURCE	N/A			
FLUID LEVEL	N/A			
TIME SINCE CIRC.	N/A			
RECORDED BY:	McDONALD, WEIKUM			
WITNESSED BY:	MR. SCHWYN			

LOGGING DATA

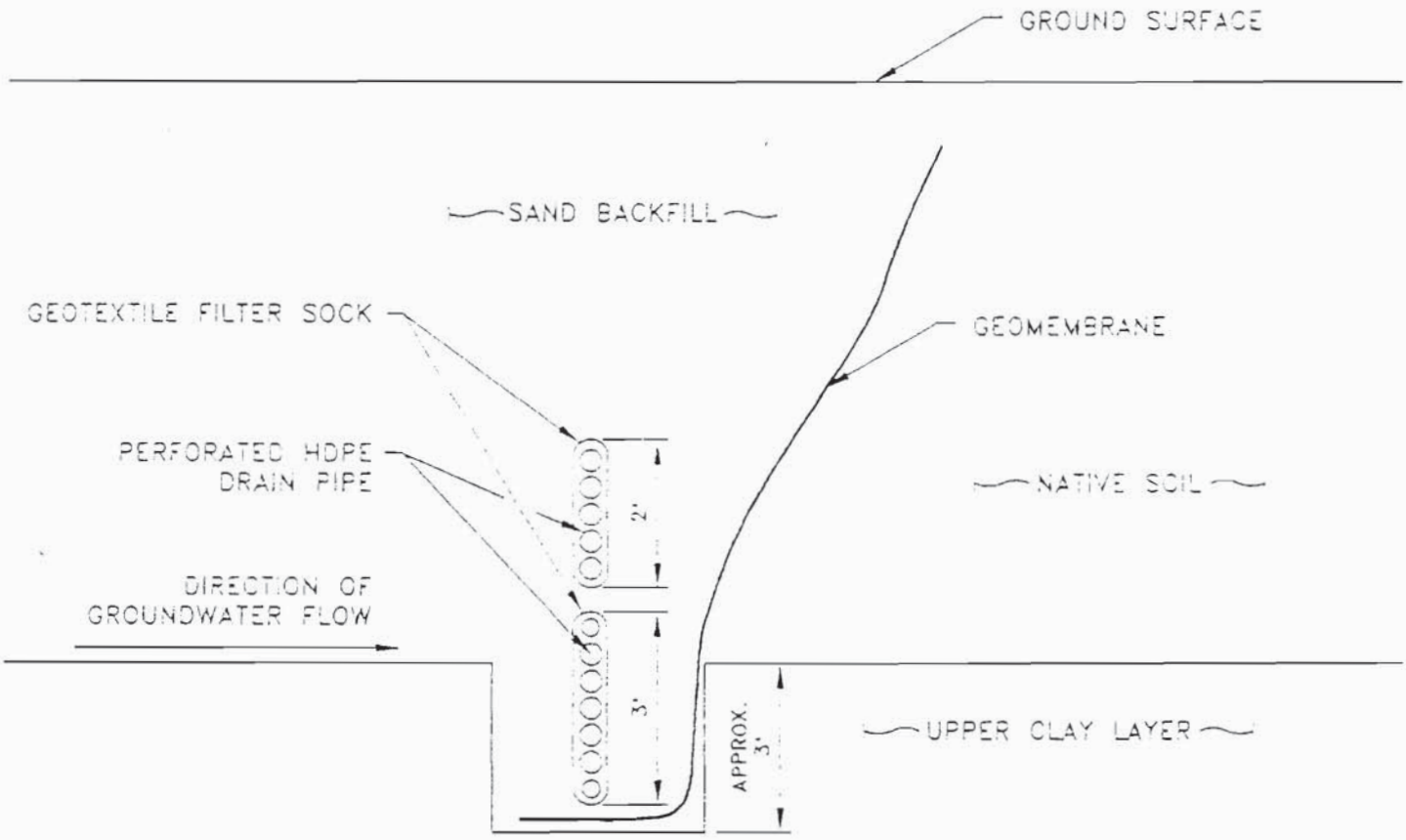
LOG FUNCTION	RUN NO.	EQUIPMENT MODEL	EQUIPMENT PROBE S.N.	EQUIPMENT UPHOLE S.N.	LOGGING DIG INT FEET	LOGGING SPEED FT./MIN	DETECTOR TYPE	SPACING Tx-Rx FEET	SPACING Rx-Rx FEET	SOURCE TYPE	SOURCE SIZE CURIE	LOGGED INTERVAL FROM	LOGGED INTERVAL TO	LOGGED INTERVAL INT. FEET
Gamma	One	9256	27A20	105	0.5	20	Scint.	N/A	N/A	N/A	N/A	388	0	388
Neutron	One	9250	27U5A35	105	0.5	20	Prop.	12 In.	N/A	AmBe	3.0	388	0	388

CALIBRATION FACTOR(S): Shop API Calibration.

DIGITAL FILE NAME(S): DMW-3.LOG

REMARKS:

The Neutron log was recorded on a separate run.



NOT TO SCALE

DAVIS COUNTY LANDFILL

FRENCH DRAIN CONSTRUCTION DETAIL

BINGHAM ENVIRONMENTAL
SALT LAKE CITY - (801) 532-2230

FIGURE 1

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. G-1

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 1 OF 3

BY DRF DATE 11/8/88 SURFACE ELEV. ~4826.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		21		5			**SAND (SP),** light reddish brown (5YR, 6/3); <10% fines; fine grained, subangular to subrounded quartz; 1-2 mm-thick laminations; iron oxide staining; medium dense; damp.	
		20		10			**SILTY SAND (SM),** light reddish brown (5YR, 6/3); 30-35% non-plastic fines; fine grained quartz; iron oxide stained; moist.	
		31		15			**SAND (SP),** light reddish brown (5YR, 6/3); <10% fines; fine to medium grained, subangular to subrounded quartz; 1-2 mm-thick laminations; dense; damp.	
		30		20				

REMARKS

Boring drilled with 6-inch-diameter hollow stem-augers. Converted to gas probe. See probe detail for construction information.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 — BORING NO. G-1

PROJECT NAME DAVIS COUNTY LANDFILL — PAGE 2 OF 3

BY DRF — DATE 11/8/88 — SURFACE ELEV. ~4826.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	DEPTH IN FT.	DESCRIPTION
				SAND (continued) @20': fine grained. @20.5': brownish yellow (10YR, 6/8).
		36	25	@25': light yellowish brown (10YR, 6/4).
		33	30	**SILTY SAND (SM),** yellowish brown (10YR, 5/8); 15 to 20% non-plastic fines; fine grained; moist. **SAND (SP),** yellowish brown (10YR, 5/8); <10% fines; fine grained; dense; moist.
2.5	1.8	37	35	**CLAY (CL),** yellowish brown (10YR, 5/8); <10% sand; moderate plasticity; stiff; moist to wet. **SAND (SP),** yellowish brown (10yr, 5/8); <10% fines; fine grained; wet.
1.5	4.5	24	40	**SANDY CLAY (CL),** light brownish gray (10YR, 6/2); 20-25% fine sand; moderate plasticity; very stiff; moist.

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF DATE 11/8/88

BORING NO. G-1
PAGE 3 OF 3
SURFACE ELEV. ~4826.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				45			SANDY CLAY (continued) BORING TERMINATED AT 40.5 FEET.	
				50				
				55				
				60				

REMARKS

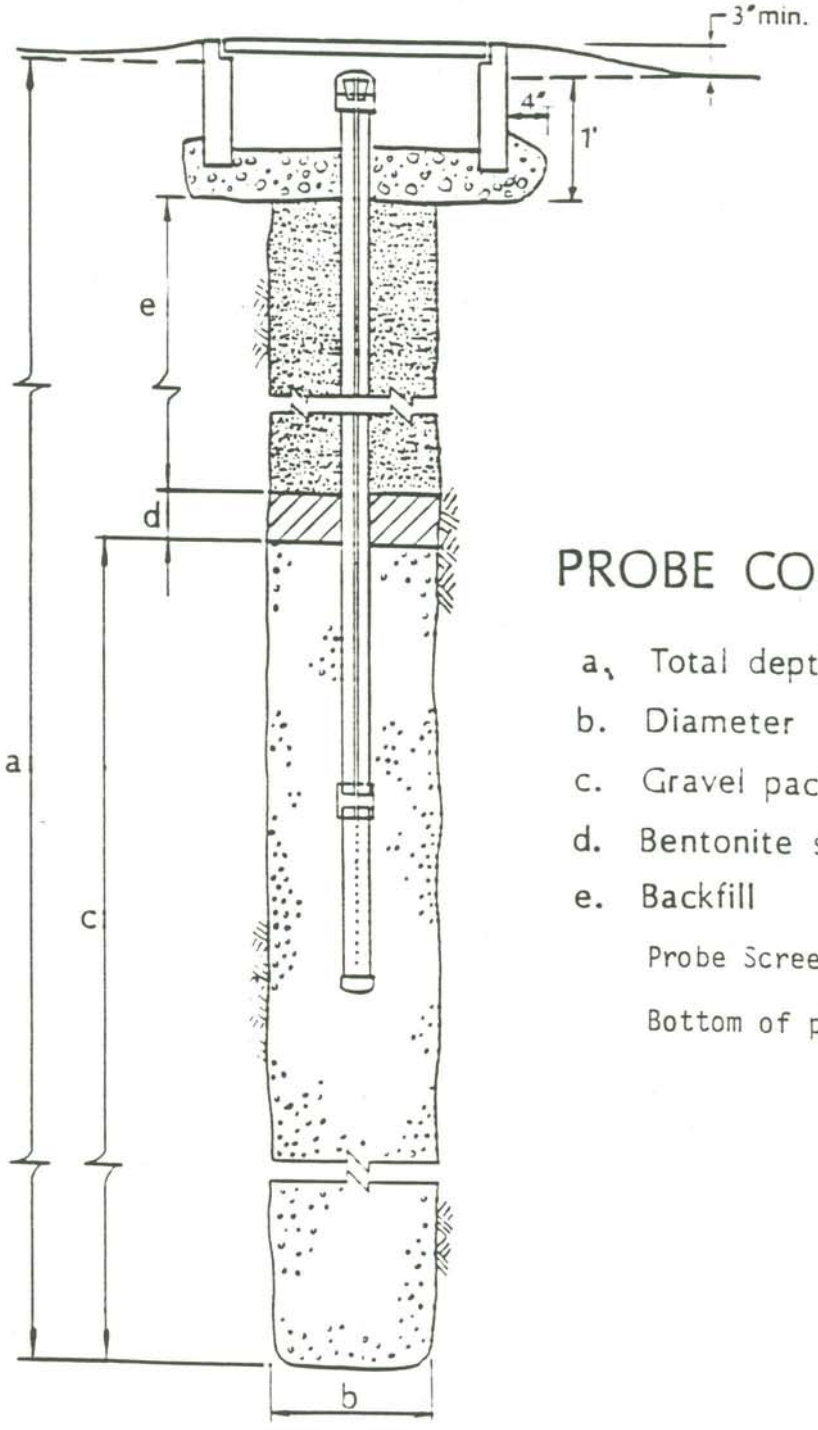
EMCON ASSOCIATES

PROBE DETAIL SHEET

EMCON ASSOCIATES

PROJECT NUMBER 558-02.03
LOCATION Davis County Landfill
DATE 11/09/88

PROBE NUMBER G-1
INSTALLER DRF
SUPERVISOR SIGNATURE



PROBE CONSTRUCTION

a.	Total depth	40.5	ft.
b.	Diameter	6	in.
c.	Gravel pack	24.5	ft.
d.	Bentonite seal	12	in.
e.	Backfill	15	ft.
	Probe Screen Length	16	in.
	Bottom of probe at	25	ft.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. G-2

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 1 OF 1

BY DRF DATE 11/12/88 SURFACE ELEV. ~4665 ft.

POCKET TORR VANE (tfs)	POCKET PENETRO-METER (tsf)	PENETRA-TION (bls/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**SILTY SAND (SM),** yellowish brown (10YR, 5/8); 25-30% non-plastic fines; fine grained; medium dense; dry.	
				10			@11': dark yellowish brown (10YR, 3/6).	
							CLAYEY SAND (SC), yellowish brown (10YR, 5/8); 30-35% plastic fines; fine grained; damp.	
				15			@19': 10-15% plastic fines; medium dense.	
				20			**BORING TERMINATED AT 20 FEET.**	

REMARKS

Boring drilled with 6-inch-diameter hollow-steam augers. Converted to gas probe. See probe detail for constuction information.

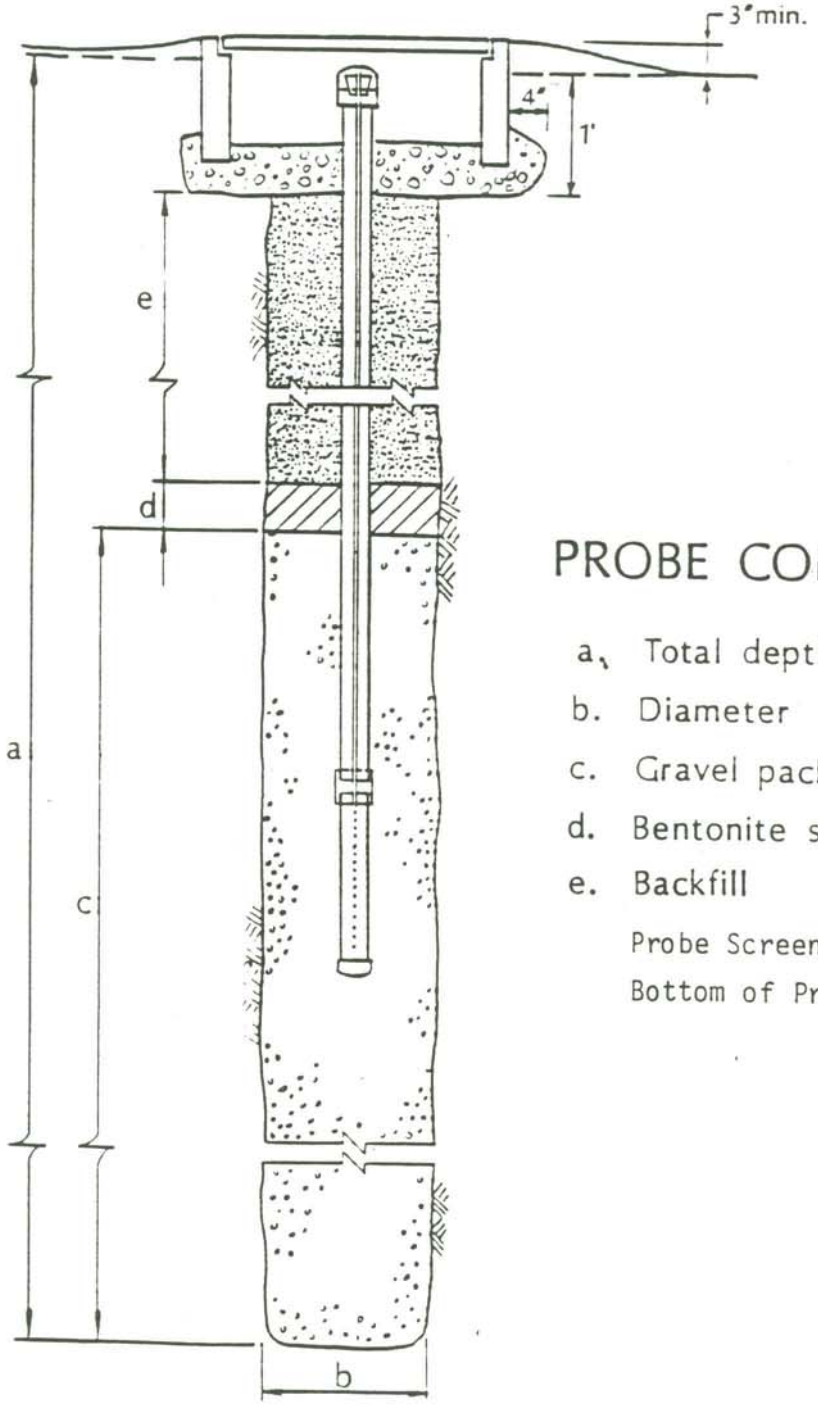
EMCON ASSOCIATES

PROBE DETAIL SHEET

EMCON ASSOCIATES

PROJECT NUMBER 558-02.03
LOCATION Davis County Landfill
DATE 11/12/88

PROBE NUMBER G-2
INSTALLER DRF
SUPERVISOR SIGNATURE _____



PROBE CONSTRUCTION

a.	Total depth	20	ft.
b.	Diameter	6	in.
c.	Gravel pack	4	ft.
d.	Bentonite seal	12	in.
e.	Backfill	14	ft.
	Probe Screen Length	16	in.
	Bottom of Probe at	18	ft.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF DATE 11/12/88

BORING NO. G-3
PAGE 1 OF 1
SURFACE ELEV. ~4662.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**ORGANIC SANDY SILT (OL),** dark brown (7.5 YR, 3/2); 15-20% fine sand; non-plastic; damp.	
				10			**SAND (SP),** yellowish brown (10YR, 5/8); <10% fines; fine grained quartz; trace gravel; damp.	
				15			**ORGANIC SANDY SILT (OL),** dark brown (7.5YR, 3/2); 15-20% fine sand; non-plastic; damp. **SAND (SP),** yellowish brown (10YR, 5/8); <10% fines; fine grained subangular to subrounded quartz; medium dense; damp.	
				20			**BORING TERMINATED AT 20 FEET**	

REMARKS

Boring drilled with 12-inch-diameter hollow-stem sugers. Converted to gas probe. See probe detail for construction information.

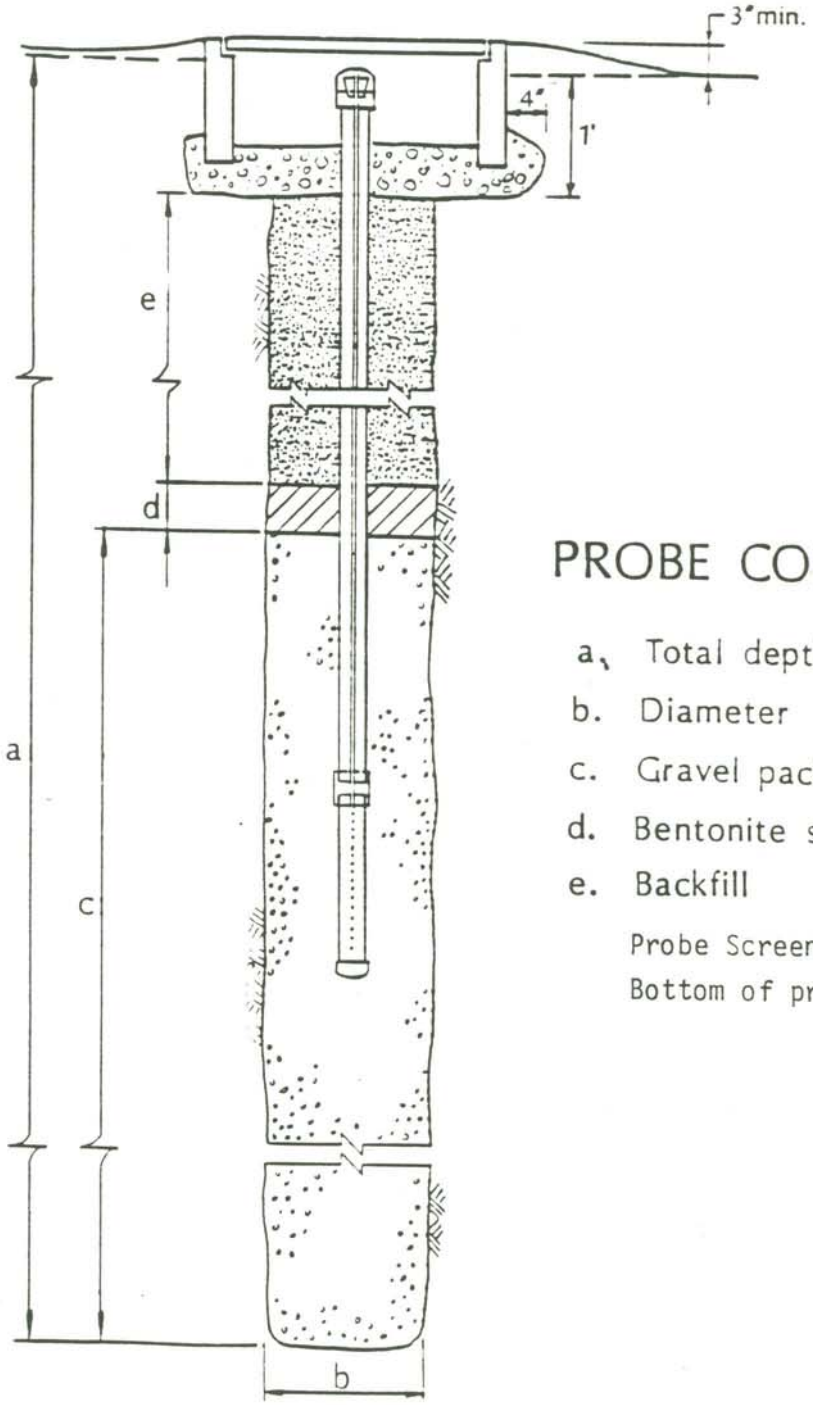
EMCON ASSOCIATES

PROBE DETAIL SHEET

EMCON ASSOCIATES

PROJECT NUMBER 558-02.03
LOCATION Davis County Landfill
DATE 11/12/88

PROBE NUMBER G-3
INSTALLER DRF
SUPERVISOR SIGNATURE _____



PROBE CONSTRUCTION

a.	Total depth	20	ft.
b.	Diameter	6	in.
c.	Gravel pack	4	ft.
d.	Bentonite seal	12	in.
e.	Backfill	14	ft.
	Probe Screen Length	16	in.
	Bottom of probe at	18	ft.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF DATE 10/31/88

BORING NO. G-4
PAGE 1 OF 5
SURFACE ELEV. ~4930.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**SILTY SAND (SM),** reddish brown (5YR, 4/3); 15-20% non-plastic fine; fine grained, subangular to subrounded quartz; iron oxide stained; damp.	
0.1	2.75	14		10			**SANDY CLAY (CL),** reddish brown (5YR, 4/3); 15% fine sand; medium plasticity; damp. **SILTY SAND (SM),** reddish brown (5YR, 4/3); 15-20% non-plastic fines; fine grained subangular to subrounded quartz; iron oxide stained; damp.	
				15			**SANDY CLAY (CL),** reddish brown (5YR, 4/3); 10-15% fine sand; medium plasticity; firm; damp.	
0.1	1.0	13		20			@19': silty.	

REMARKS

Boring drilled with 6-inch-diameter hollow-stem augers. Converted to gas probe. See probe detail for construction information.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. G-4

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 2 OF 5

BY DRF DATE 10/31/88 SURFACE ELEV. ~4930.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				25			**SANDY CLAY** (continued) @23': dark reddish brown (5YR, 3/4).	
		26		30			**SAND (SP),** reddish yellow (7.5YR, 7/6); <10% fines; fine grained, subangular to subrounded quartz; 1-2 mm-thick laminations; iron oxide stained laminations.	
		44		35				
				40				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF DATE 10/31/88

BORING NO. G-4
PAGE 3 OF 5
SURFACE ELEV. ~4930.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				45			**SAND** (continued)	
		43		50			@ 50': yellowish brown (10YR, 5/6); moist.	
		43		55				
				60				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF DATE 10/31/88

BORING NO. G-4

SURFACE ELEV. ~4930.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65			**CLAY (CL),** dark yellowish brown (10YR, 4/6); 10-15% fine sand; interbedded with sand; medium plasticity; damp. **SAND (SP),** yellowish brown (10YR, 5/6); less than 10% fines; fine grained; subangular to angular quartz; well sorted; moist.	
		75		70			**SILTY SAND (SM),** strong brown (7.5YR, 4/6); 10-15% fines; fine grained, subangular to subrounded quartz; moderately sorted; moist.	
				75			**SAND (SP),** light reddish brown (5YR, 6/4); less than 10% fines; fine grained; subangular to subrounded quartz; moderately to well sorted; damp.	
		69		80				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF DATE 10/31/88

BORING NO. G-4
PAGE 5 OF 5
SURFACE ELEV. ~4930.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				85			SAND (continued)	
				90				
				95				
				100			BOTTOM OF BORING AT 100 FEET.	

REMARKS

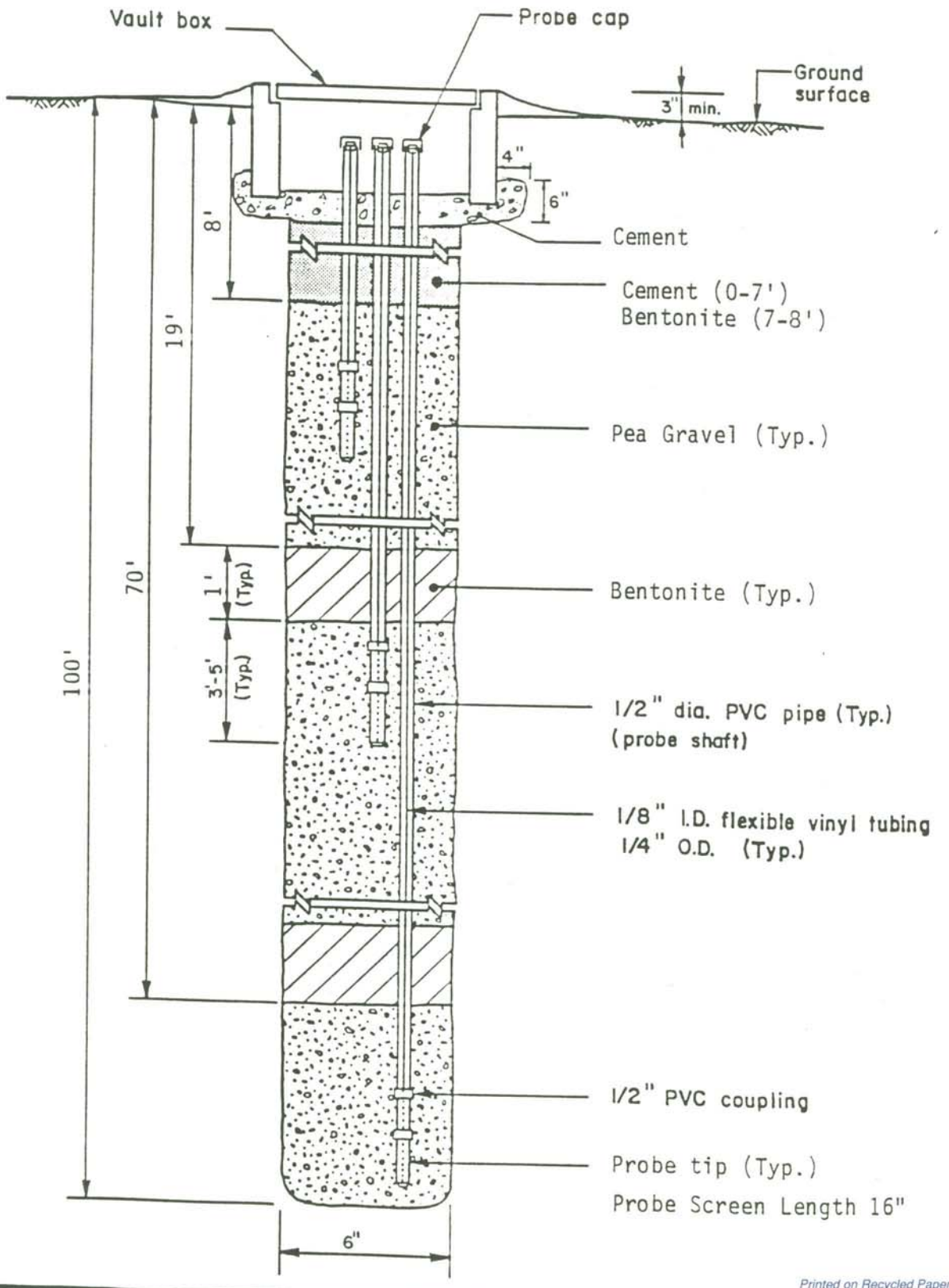
EMCON ASSOCIATES

PROBE DETAIL SHEET

EMCON ASSOCIATES

PROJECT NUMBER 558-02.03
LOCATION Davis County Landfill
DATE 10/31/88

PROBE NUMBER G-4
INSTALLER DRF
SUPERVISOR SIGNATURE



LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03
PROJECT NAME DAVIS COUNTY LANDFILL
BY DRF
DATE 10/31/88

BORING NO. G-5
PAGE 1 OF 1
SURFACE ELEV. ~4930.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**SILTY SAND (SM),** brown (7.5YR, 4/4); 15-20% non plastic fines; fine grained, subangular to subrounded quartz; damp.	
				10			@ 10': light brown (7.5YR, 6/4).	
				15				
				20			TOTAL DEPTH AT 20 FEET	

REMARKS

Boring drilled with 6-inch-diameter hollow-stem augers. Converted to gas probe. See probe detail for construction information.

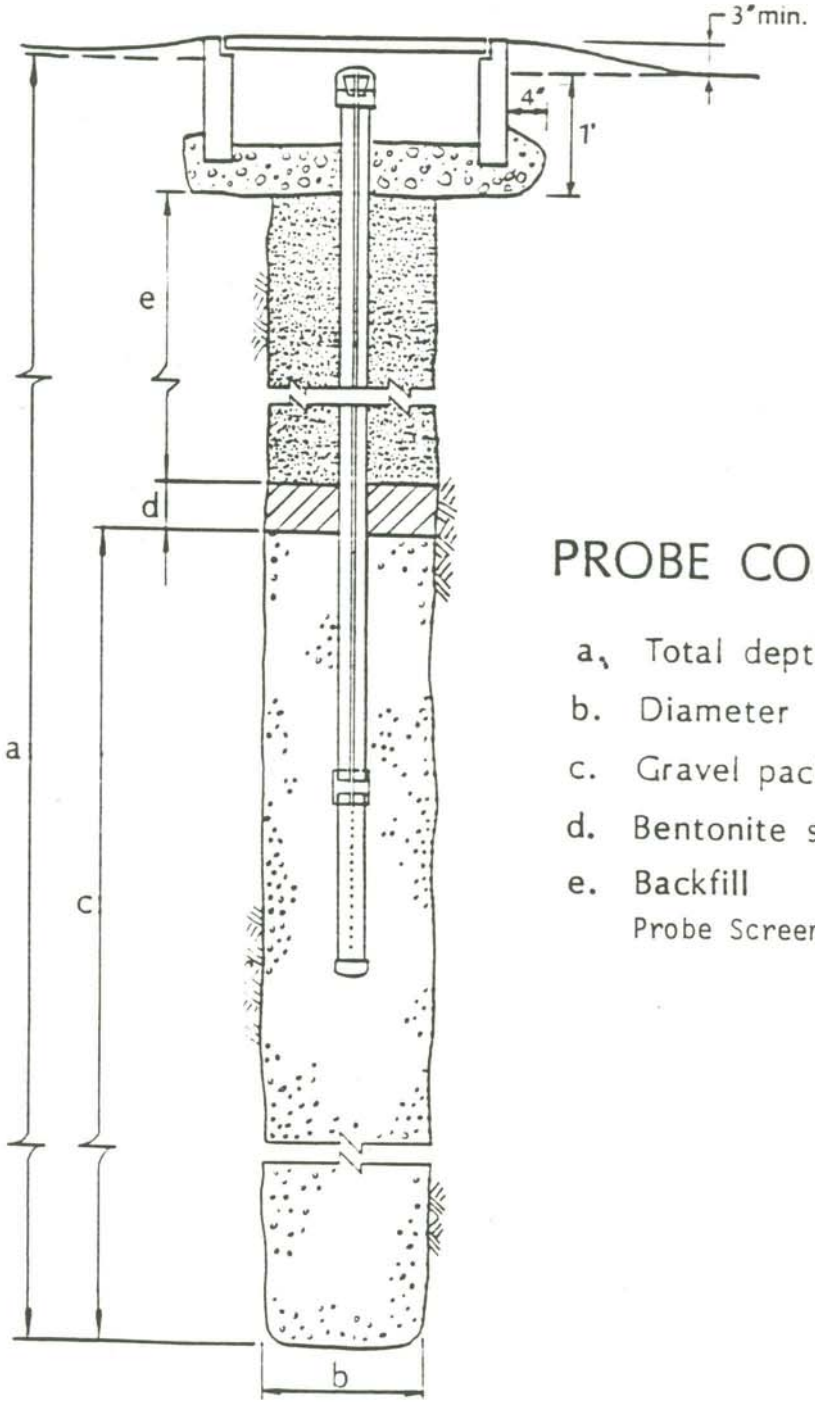
EMCON ASSOCIATES

PROBE DETAIL SHEET

EMCON ASSOCIATES

PROJECT NUMBER 558-02.03
LOCATION Davis County Landfill
DATE 10/31/88

PROBE NUMBER G-5
INSTALLER DRF
SUPERVISOR SIGNATURE _____



PROBE CONSTRUCTION

a.	Total depth	20	ft.
b.	Diameter	6	in.
c.	Gravel pack	5	ft.
d.	Bentonite seal	24	in.
e.	Backfill	10	ft.
	Probe Screen Length	16	in.

DATE DRILLED	5/18/94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	Hand Auger
BORING DIAMETER	3 inches
DEPTH TO GROUNDWATER	Not Determined

1150-4HBN

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Poorly graded SAND, little Silt, moist (wet @ 1.5 feet) (flowing sand @ 4 feet)	brown	loose	SP	1 2 3 4					BENTONITE 16/40 COLORADO SILICA SAND 2-in PVC 0.02" SLOTTED SCREEN
BOTTOM OF WELL @ 4 FEET									

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 MONITOR WELL: HB-NORTH

DATE DRILLED	5/18/94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	Hand auger
BORING DIAMETER	3 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE
Poorly graded SAND, little Silt, moist	brown	loose	SP
(wet @ 1.5 feet)	orange staining		
(flowing Sand @ 4 feet)			
BOTTOM OF WELL @ 4 FEET			

DEPTH (FEET): 1, 2, 3, 4

SAMPLER | BLOWS/FOOT | OVM (ppm) | WATER CONTENT

1160AHBS

WELL CONSTRUCTION

BENTONITE

16/40 COLORADO SILICA SAND

2-in PVC 0.02" SLOTTED SCREEN

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES, THE TRANSITION MAY BE GRADUAL

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1160-4 MONITOR WELL: HB SOUTH

WASATCH ENVIRONMENTAL, INC.

DATE DRILLED	[illegible]
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	USOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	BORING WELL CONSTRUCTION
Garbage, damp	gray, black	-----	--	0					CEMENT
(easy drilling, very little cuttings)				4					
				8					
(drilling more difficult @ 11 feet)				12					8/12 COLORADO SILICA SAND
				16					1.5 INCH SCHEDULE 40 PVC
				20					
				24					
				28					
				30					
				32					
				34					
				36					
(continued)				38					
				40					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: INCLINOMETER-CENTRAL 1 of 5

DATE DRILLED	5/10/94-5/20/94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	COMPLIANCE: WELL CONSTRUCTION
Garbage - minimal cuttings - dry	gray	------	--	40					
				44					
				46					
				48					
				50					8/12 COLORADO SILICA SAND
(very difficult drilling @ 54 feet)				54					
				56					3 3/4-INCH ABS INCLINOMETER
				58					
(a little easier drilling @ 60-70 feet)				60					
				64					
				66					
				68					
				70					
(very difficult drilling @ 75-76 feet)				74					
				76					
(continued)				78					
				80					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: INCLINOMETER - CENTRAL 6 of 6

DATE DRILLED	8/10 94 - 8 20 94
LOGGED BY	TC
REFERENCE ELEVATION	Not Determined
DRILL RIG	LP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	USCS SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	1150A1CC WELL CONSTRUCTION
Garbage, dry (difficult drilling)	gray	----	--	82 84 86 88 90 92 94 96 98					8/12 COLORADO SILICA SAND; 3 3/4-INCH ABS INCLINOMETER
(a little less difficult drilling from 100-110 feet)				100 102 104 106 108 110 112 114 116 118 120					
(continued)									

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: INCLINOMETER-CENTRAL 3 of 5

DATE DRILLED	8-12-94 & 20-94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AD 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	1160-4104 WELL CONSTRUCTION
Garbage, dry (difficult drilling)	gray	-----	--	100					
(glass, rail road ties, very difficult drilling @ 120-130 feet)				104					
				108					
				130					8/12 COLORADO SILICA SAND
				132					
				134					
Silty fine SAND, damp	brown	dense	SM	136					2 1/4-INCH ABS INCLINOMETER
				138					
				140		32			
(little garbage in cuttings, may be residual)				144					
				146					
				148					
				150					
(wet @ 151 feet, flowing sands)		medium dense		152		16			
				154					
				156					
(continued)				158					
				160					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: INCLINOMETER-CENTRAL 4 of 5

DATE DRILLED	5/10/94-5/20/94
LOGGED BY	TC
REFERENCE ELEVATION	Not Determined
DRILL RIG	CME 750
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	1150ACS WELL CONSTRUCTION
Silty fine SAND, wet (trace Clay @ 161 feet interlayered with Clayey Silt @ 165 feet) (7 feet of slough flowed into drill rod @ 170 feet)	brown gray	medium dense	SM	162 164 166 168 170 172 174		21			2 1/4-INCH ABS INCLINOMETER 8/12 COLORADO SILICA SAND
BOTTOM OF INCLINOMETER @ 170 FEET BOTTOM OF BORING @ 175 FEET — - Indicates Standard Penetration — Drive Sampler				175					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: INCLINOMETER-CENTRAL 5 of 5

DATE DRILLED	5-17-91
LOGGED BY	TC
REFERENCE ELEVATION	Not Determined
DRILL RIG	[illegible]
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE
Poorly graded SAND, little Silt, damp	brown	medium dense	SP
Silty fine SAND, little Clay, damp (no Clay @ 15 feet)	brown	medium dense	SM
Poorly graded SAND, little Silt, damp	brown/ gray	medium dense	SP
Garbage, damp (wet @ 28.5 feet) (continued)	gray	------	--

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES; THE TRANSITION MAY BE GRADUAL

DEPTH (FEET): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

SAMPLER

BLOWS/FOOT: 20

OVM (ppm)

WATER CONTENT

1150-INN

WELL CONSTRUCTION

CEMENT

8/12 COLORADO SILICA SAND

2 1/4-INCH ABS INCLINOMETER

BENTONITE HOLEPLUG

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: INCLINOMETER-NORTH [illegible] of 3

WASATCH ENVIRONMENTAL, INC.

DATE DRILLED	8/17/94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

1150-4.N2

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Garbage - mostly wood, some plastic, moist, odor	brown	-----	--	42	X	100+	0		BENTONITE HOLEPLUG
				44					
				46					
				48					
				50					8/12 COLORADO SILICA SAND
				52					
				54					2 3/4-INCH ABS INCLINOMETER
				56					
				58					
(newspaper)				60					
				62					
				64					
(tires @ 65-70 feet)				66					
				68					
				70					
				72					
				74					
Poorly graded SAND, little Silt, damp, dry	brown	dense	SP	76					
				78					
(continued)				80					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: INCLINOMETER-NORTH (2 of 3)

DATE DRILLED	8/17/94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	BACKING / WELL CONSTRUCTION
Poorly graded SAND, damp interlayered Clayey Silt (varved, roots)	brown	medium dense	SP & ML	82	☒	47			8/12 COLORADO SILICA SAND
(very moist/wet @ 90 feet)				84, 86, 88, 90, 92, 94					2 1/4-INCH ABS INCLINOMETER
Silty CLAY, little Sand, moist	brown	stiff	CL	96, 98, 100	×				
Sandy SILT/Silty Sand, wet (flowing sands)	brown	medium dense	ML/ SM	102, 104, 106					

BOTTOM OF BORING @ 105 FEET

BOTTOM OF INCLINOMETER @ 100 FEET

☒ - Indicates California Drive Sampler (2 1/2-Inch I.D.)

× - Indicates Grab Samples

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES: THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: INCLINOMETER-NORTH (3 of 3)

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. MW-1

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 1 OF 4

BY DRF DATE 10/28/88 SURFACE ELEV. 4867 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		11		5			**SAND (SP),** strong brown (7.5YR, 5/8); <10% non-plastic fines; fine to very fine, rounded quartz grains; iron oxide staining; medium dense; damp.	
		16		10				
		11		15				
		17		20				

REMARKS

Boring was drilled with 12-inch-diameter hollow-stem augers. Converted to monitoring well. See well detail for construction information.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. MW-1

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 2 OF 4

BY DRF DATE 10/28/88 SURFACE ELEV. 4867 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SAND (continued)	
		25		25			**SILTY SAND (SM),** strong brown (7.5YR, 5/8); 15-20% non-plastic fines; fine grained; damp. **SAND (SP),** strong brown (7.5YR, 5/8); <10% non-plastic fines; fine grained; 5mm-thick laminations; medium dense; damp. @25.5': pinkish gray (7.5YR, 7/2); laminations absent.	
		33		30			@30': 5 mm-thick laminations present.	
		32		35				
		43		40			**SANDY SILT (ML),** pink (7.5YR, 7/4); 20-25% fine sand; non-plastic; very stiff; damp.	

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. MW-1

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 3 OF 4

BY DRF DATE 10/28/88 SURFACE ELEV. 4867 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		57		45			**SAND (SP),** reddish yellow (7.5YR, 6/6); <10% non-plasic fines; fine grained, quartz; iron oxide stained; 1-2 mm-thick laminations; very dense; moist.	
		50		50				
		43	10/30/88 ▽	55			@55': dense; wet.	
			10/31/88 ▼					
		36		60				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. MW-1

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 4 OF 4

BY DRF DATE 10/28/88 SURFACE ELEV. 4867 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65			**SAND** (continued) @64': flowing sands. BOTTOM OF BORING AT 65.5 FEET.	
				70				
				75				
				80				

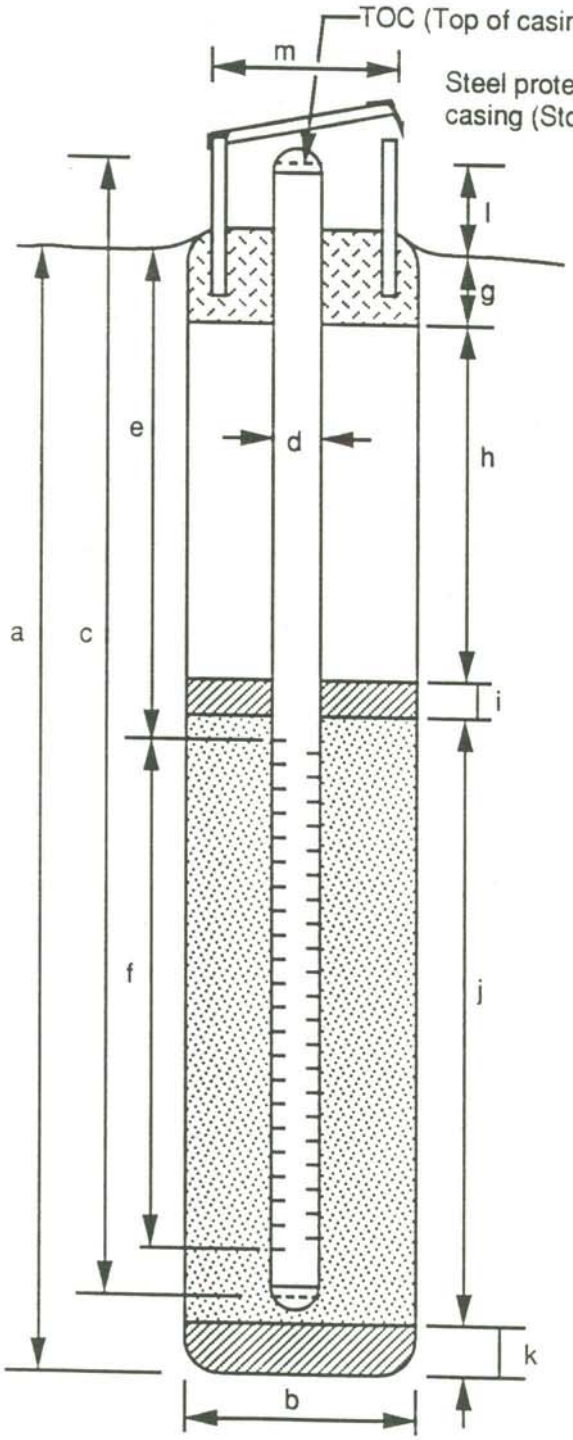
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 558-02.03
PROJECT NAME North Davis Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. _____

BORING / WELL NO. MW-1
TOP OF CASING ELEV. 4869.44'
GROUND SURFACE ELEV. 4867"
DATUM Davis County Benchmark
INSTALLATION DATE 10/28/88



EXPLORATORY BORING

a. Total depth 65.5 ft.
b. Diameter 12 in.
Drilling method Hollow-stem auger

WELL CONSTRUCTION

c. Total casing length 67.5 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 50 ft.
f. Perforated length 15 ft.
Perforated interval from 50 to 65 ft.
Perforation type Machine slotted
Perforation size 0.020 inches
g. Surface seal 1 ft.
Material Concrete
h. Backfill 40 ft.
Material Concrete/Bentonite
i. Seal 4 ft.
Material Bentonite pellets
j. Gravel pack 20 ft.
Gravel pack interval from 45 to 65 ft.
Material #10/20 Sand
k. Bottom seal/fill 0.5 ft.
Material Natural materials
l. Casing stickup 2.5 ft.
m. Protective casing diameter 8 in.

Form prepared by _____

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 — BORING NO. MW-2

PROJECT NAME DAVIS COUNTY LANDFILL — PAGE 1 OF 2

BY DRF — DATE 11/13/88 — SURFACE ELEV. 4665.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**SILTY SAND (SM),** yellowish brown (10YR, 5/8); 25-30% non-plastic fines; fine grained; medium dense; dry.	
		10		10			@11': dark yellowish brown (10YR, 3/6). **CLAYEY SAND (SC),** yellowish brown (10YR, 5/8); 30-35% plastic fines; fine grained; damp.	
		13		15			@19': 10-15% plastic fines; medium dense.	
		22		20			**SAND (SP),** yellowish brown (10YR, 5/8); <10% fines; fine grained, subrounded quartz; thin laminations; medium dense; moist.	
		39		25			**CLAYEY SAND (SC),** yellowish brown (10YR, 5/8); 25-30% fines; fine grained; moist. **SAND (SP),** yellowish brown (10YR, 5/8); <10% fines; fine grained, subrounded quartz; 1 to 2 mm-thick laminations; dense; moist.	
		25		30			**SANDY SILT (ML),** pinkish gray (7.5YR, 7/2); 15-20% fine sand; dry to damp. **SAND (SP),** yellowish brown (10YR, 5/6); <10% fines; fine to medium grained, subrounded quartz; thin laminations; very dense; moist.	
		60		35				
		40		40				
		78		45				
		82		50				
		72		55				
				60				
				65				
				70				
				75			@75': 10-15% non-plastic fines; 1/2"-thick layers of medium plasticity clay.	
				80				

EMCON ASSOCIATES

REMARKS

Boring drilled with 12-inch-diameter hollow-stem augers 0-65 feet and 10-inch-diameter augers 65-105.5 feet. Ground water not encountered. Boring backfilled with soil cuttings and capped with surface grout plug.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 — BORING NO. MW-2

PROJECT NAME DAVIS COUNTY LANDFILL — PAGE 2 OF 2

BY DRF — DATE 11/13/88 — SURFACE ELEV. 4665.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		77		85			**SAND** (continued)	
				90				
		72		95				
				100				
		76		105				
							BORING TERMINATED AT 105.5 FEET.	
				110				
				115				
				120				
				125				
				130				
				135				
				140				
				145				
				150				
				155				
				160				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. MW-3

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 1 OF 3

BY DRF DATE 11/11/88 SURFACE ELEV. 4662.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**ORGANIC SANDY SILT (OL),** dark brown (7.5 YR, 3/2); 15-20% fine sand; non-plastic; damp.	
							SAND (SP), yellowish brown (10YR, 5/8); <10% fines; fine grained quartz; trace gravel; damp.	
		19		10			**ORGANIC SANDY SILT (OL),** dark brown (7.5YR, 3/2); 15-20% fine sand; non-plastic; damp. **SAND (SP),** yellowish brown (10YR, 5/8); <10% fines; fine grained subangular to subrounded quartz; medium dense; damp.	
				15				
		21		20				

REMARKS

Boring drilled with 12-inch-diameter hollow-stem augers. Converted to monitoring well. See well detail for construction information.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 BORING NO. MW-3

PROJECT NAME DAVIS COUNTY LANDFILL PAGE 2 OF 3

BY DRF DATE 11/11/88 SURFACE ELEV. 4662.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SAND (continued) @20': moist.	
			11/11/88 ▽	25				
		17		30			**CLAYEY SAND (SC),** yellowish brown (10YR, 5/8); 30-35% medium plasticity fines; fine grained; medium dense; wet.	
				35			**SAND (SP),** olive brown (2.5Y, 4/4); <10% fines; fine grained, subrounded quartz; loose; wet.	
		8		40				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 558-02.03 — BORING NO. MW-3

PROJECT NAME DAVIS COUNTY LANDFILL — PAGE 3 OF 3

BY DRF — DATE 11/11/88 — SURFACE ELEV. 4662.00 ft

POCKET TORR VANE (tsf)	POCKET PENETRO-METER (tsf)	PENETRA-TION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SAND (continued)	
							@42': dark grayish brown (10YR, 4/2); fine to medium grained.	
0.6		18		45			**SANDY CLAY (CL),** light yellowish brown (10YR, 6/4); 15-20% fine sand; low to moderate plasticity; very stiff; moist to wet.	
							BORING TERMINATED AT 45.5 FEET.	
				50				
				55				
				60				

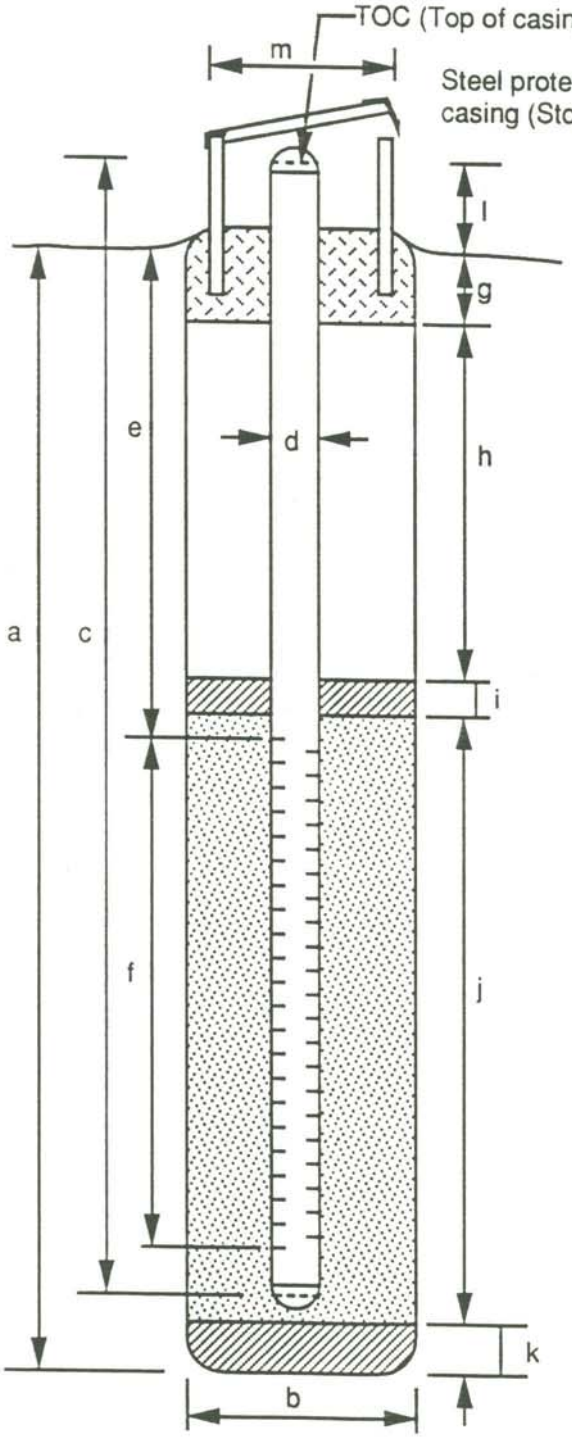
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 558-02.03
PROJECT NAME North Davis Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. _____

BORING / WELL NO. MW-3
TOP OF CASING ELEV. 4664.18'
GROUND SURFACE ELEV. 4662'
DATUM Davis County Benchmark
INSTALLATION DATE 11/11/88



EXPLORATORY BORING

a. Total depth 45.5 ft.
b. Diameter 12 in.
Drilling method Hollow-stem auger

WELL CONSTRUCTION

c. Total casing length 47.5 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 30 ft.
f. Perforated length 15 ft.
Perforated interval from 30 to 45 ft.
Perforation type Machine slotted
Perforation size 0.020 inches
g. Surface seal 1 ft.
Material Concrete
h. Backfill 21 ft.
Material Concrete/Bentonite
i. Seal 3 ft.
Material Bentonite pellets
j. Gravel pack 20 ft.
Gravel pack interval from 25 to 45 ft.
Material #10/20 Sand
k. Bottom seal/fill 0.5 ft.
Material Natural materials
l. Casing stickup 2.5 ft.
m. Protective casing diameter 8 in.

Form prepared by _____

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-6**

PROJECT NAME **NDRD** PAGE **1 OF 5**

BY **W. A. Lambert** DATE **9/13/89** SURFACE ELEV. **4796. ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SAND (SP), light brown (7.5YR, 6/4); loose; dry.	
							CLAYEY SILT (ML-SM), brown (7.5YR, 5/2); non- to slighlty plastic; dry to damp.	
ND	90%	20		10			**CLAYEY SILT** (ML), brown (7.5YR, 5/2) to dark brown (7.5YR, 4/2); 5-7% fine sand; slight to medium plasticity; hard; damp. @ 10': abundant roots and rootlets to 1-2" thick.	
ND	30%	19		15			**SILT** (ML), brown (7.5YR, 5/2); non-plastic; very stiff; wet.	
ND	85%	37		20			@ 19': yellowish brown (10YR, 5/4).	

REMARKS

Boring drilled with 8-inch outside diameter (O.D.) hollow-stem augers. Soil samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. Boring was grouted to the surface with neat cement
ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-6**

PROJECT NAME **NDRD** PAGE **2 OF 5**

BY **W. A. Lambert** DATE **9/13/89** SURFACE ELEV. **4796. ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							CLAY (CL), grayish brown (10YR, 5/2); fair bedding; hard; moist. **SILT** (ML), as above.	
ND	75%	24		25			@ 24': dark yellowish brown (10YR, 4/6); very stiff; wet. **CLAY** (CL), yellowish brown (10YR, 5/2); common oxide staining in zones; .	
ND	65%	26		30			**CLAYEY SILT TO SILTY CLAY** (CL-ML), grayish brown (10YR, 5/2) to dark gray (10YR, 4/1); medium to high plasticity; very stiff; wet.	
ND	90%	30		35			**CLAY** (CL), brown (10YR, 5/3) to dark brown (10YR, 4/3); very stiff; wet. **CLAYEY SILT** (ML), light brown (7.5YR, 4/6); moderate plasticity; very stiff; wet.	
ND	95%	36		40				

REMARKS

Boring drilled with 8-inch outside diameter (O.D.) hollow-stem augers. Soil samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. Boring was grouted to the surface with neat cement
ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-6**

PROJECT NAME **NDRD** PAGE **3 OF 5**

BY **W. A. Lambert** DATE **9/13/89** SURFACE ELEV. **4796. ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SILT AND CLAY (ML/CL) INTERBEDDED, brown (7.5YR, 5/4) to strong brown (7.5YR, 5/8); thin beds to 1" thick; medium to high plasticity; oxide stained throughout silty beds; very stiff to hard; damp to moist.	
ND	70%	76		45			**SILTY SAND**, (SM), reddish brown (5YR, 5/4); 30-40% fines; 60-70% fine sand; non-plastic; very dense; damp.	
ND	70%	68		55			**SILTY SAND, SILT, AND CLAYEY SILT** (SM/ML/ML), INTERBEDDED, thinly bedded; moist to wet. Silty Sand (SM), yellowish brown (10YR, 4/4); 4" thick bed; 30-40% fines; very dense; wet. Silt (ML), reddish brown (5YR, 4/4); 30-40% fines; hard; moist. Clayey Silt (ML), reddish brown (5YR, 4/4); slight plasticity; hard; moist.	
ND	80%	68		60			@ 59': wet.	

REMARKS

Boring drilled with 8-inch outside diameter (O.D.) hollow-stem augers. Soil samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. Boring was grouted to the surface with neat cement
ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/13/89**

BORING NO. **MW-6**

PAGE **4 OF 5**

SURFACE ELEV. **4796. ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65			Silty Sand and Clayey Silt (SM/ML) Interbedded, as above.	
ND	70%	41		70			@ 69': strong oxide staining.	
ND	65%	56		75			@ 74': as above; prodominantly Silty Sand (SM).	
				80				

REMARKS

Boring drilled with 8-inch outside diameter (O.D.) hollow-stem augers. Soil samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. Boring was grouted to the surface with neat cement
ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**
PROJECT NAME **NDRD**
BY **W. A. Lambert** DATE **9/13/89**

BORING NO. **MW-6**
PAGE **5 OF 5**
SURFACE ELEV. **4796. ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SIlty Sand and Clayey Silt (SM/ML) Interbedded, as above.	
ND		93		85			**SILTY SAND** (SM), reddish brown (5YR, 5/4); 30-40% fines; 60-70% fine sand; very dense; moist.	
ND		100		90			**SILTY SAND, and SILT** (SM/ML) INTERBEDDED, as at 54'; no clayey silt.	
ND	70%	100		95				
				100			**BORING TERMINATED AT 99 FEET.**	

REMARKS

Boring drilled with 8-inch outside diameter (O.D.) hollow-stem augers. Soil samples were collected with 2-inch inside diameter, 3-inch (O.D.) California modified split-spoon sampler. Boring was grouted to the surface with neat cement
ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-7**

PROJECT NAME **NDRD** PAGE **1 OF 5**

BY **W. A. Lambert** DATE **9/14/89** SURFACE ELEV. **4782.6 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			**SILTY SAND** (SM), grayish brown (10YR, 5/2) to brown (10YR, 5/3); 25-35% non- plastic fines; abundant rootlets and roots; loose; damp.	
ND	50%	9		10			@ 9.5' TO 10.5': very dark gray (10YR, 3/1).	
ND	75%	11		15			**CLAY** (CL), mottled light gray (10YR, 7/2) to grayish brown (10YR, 5/2); high plasticity; abundant rootlets and roots; stiff; damp.	
ND	75%	19		20				

REMARKS

Boring was drilled with 10-inch outside (O.D.) diameter hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.), California modified split-spoon samper. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-7**

PROJECT NAME **NDRD** PAGE **2 OF 5**

BY **W. A. Lambert** DATE **9/14/89** SURFACE ELEV. **4782.6 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SILTY SAND (SM), brown (7.5YR, 5/2); 10-15% non-plastic fines; minor roots; medium dense; damp.	
ND	75%	29		25			@ 24'-24.5': 5-7% fines.	
ND	55%	26		30			**CLAYEY SILTS AND SILTS** (ML), INTERBEDDED, mottled yellowish brown (10YR, 5/4) to (10YR, 5/6); non- to slighlty plastic fines; 10-20% fine sand; thinly bedded; very stiff; damp.	
ND	75%	36		35			**SILTY SAND** (SM), mottled yellowish brown (10YR, 5/4); with minor grayish brown (10YR, 5/2); 15-25% non- to slighlty plastic fines; 75-85% fine sand; thinly bedded; common oxide staining on bedding planes; dense; moist to wet.	
				40				

REMARKS

Boring was drilled with 10-inch outside (O.D.) diameter hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.), California modified split-spoon samper. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05** BORING NO. **MW-7**

PROJECT NAME **NDRD** PAGE **3 OF 5**

BY **W. A. Lambert** DATE **9/14/89** SURFACE ELEV. **4782.6 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							Silty Sand (SM), as above	
ND		52		45			**CLAY AND SILTY SAND** (CL,SM), very dense to hard; moist to wet. Silty Sand: brownish yellow (10YR, 6/8); common oxide staining. Clay: reddish brown (5YR, 4/4) to brown (10YR, 5/3), with minor black (7.5YR, N2/0).	
ND	70%	76		50			**SAND to SILTY SAND** (ML-SM), yellowish brown (10YR, 5/6); trace black (micaceous or ferric) very thin beds; thinly bedded; 5-10% non-plastic fines; 90-95% fine sand; very dense; common oxide staining on bedding plains;	
				55				
ND	70%	62		60				

REMARKS

Boring was drilled with 10-inch outside (O.D.) diameter hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.), California modified split-spoon samper. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**
PROJECT NAME **NDRD**
BY **W. A. Lambert** DATE **9/14/89**

BORING NO. **MW-7**
PAGE **4 OF 5**
SURFACE ELEV. **4782.6 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65			Sand and Silty Sand (SM-ML), as above.	
ND	70%	91		70			@ 69': Clayey Silt (ML), reddish brown (5YR, 5/4); 3" thick bed; non- to slightly plastic; moist. **SAND TO SILTY SAND** (SM-ML), as above.	
			9/14/89				@ 72.8': wet.	
ND	90%	42		75				
ND	90%	52		80				

REMARKS

Boring was drilled with 10-inch outside (O.D.) diameter hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.), California modified split-spoon samper. ND = Not Detected

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER **558-02.05**

PROJECT NAME **NDRD**

BY **W. A. Lambert** DATE **9/14/89**

BORING NO. **MW-7**

PAGE **5 OF 5**

SURFACE ELEV. **4782.6 ft.**

PID (ppm)	RECOVERY (% 1.5')	PENETRATION (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
ND	60%	40		85			**CLAY** (CL), yellowish brown (10YR, 5/6) to (10YR, 5/8); medium plastic; common oxide staining in thin bedding plains.	
							SAND to Silty Sand (SM-ML), as above; pinkish gray (5YR, 5/6) to gray (5YR, 5/8);	
							CLAYEY SILT (ML), reddish gray (5YR, 5/2) to dark reddish gray (5YR, 4/2); medium to highly plastic; hard; wet.	
							BORING TERMINATED AT 85.5 FEET.	
				90				
				95				
				100				

REMARKS

Boring was drilled with 10-inch outside (O.D.) diameter hollow-stem augers. Samples were collected with 2-inch inside diameter, 3-inch (O.D.), California modified split-spoon samper. ND = Not Detected

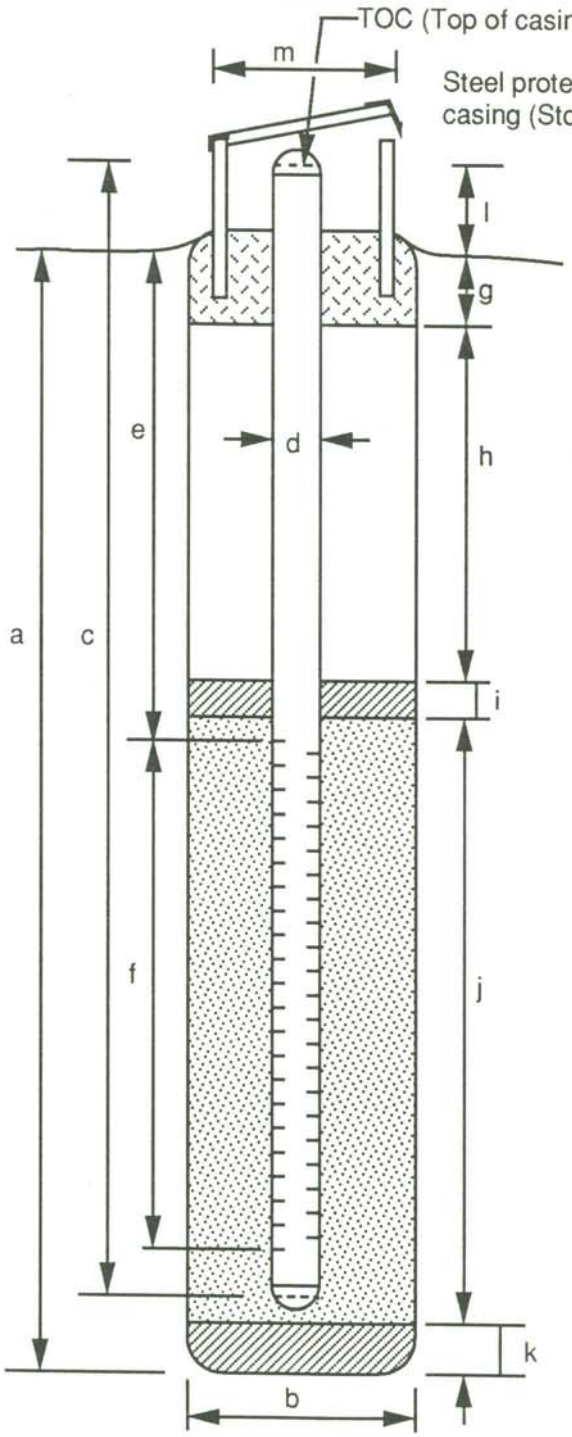
EMCON ASSOCIATES

WELL DETAILS

EMCON Associates

PROJECT NUMBER 558-02.05
PROJECT NAME NDRD Landfill
LOCATION Davis County, Utah
WELL PERMIT NO. NA

BORING / WELL NO. MW-7
TOP OF CASING ELEV. 4784.55
GROUND SURFACE ELEV. 4782.6
DATUM Mean Sea Level
INSTALLATION DATE 9/15/89



EXPLORATORY BORING

a. Total depth 84 ft.
b. Diameter 10 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 84 ft.
Material Schedule 40, PVC
d. Diameter (inside) 4 in.
e. Depth to top perforations 73.5 ft.
f. Perforated length 10 ft.
Perforated interval from 73.5 to 83.5 ft.
Perforation type Factory slot
Perforation size 0.020 in.
g. Surface seal 60 ft.
Material Cement Grout
h. Backfill ft.
Material NA
i. Seal 5 ft.
Material Bentonite
j. Gravel pack 18 ft.
Gravel pack interval from 66 to 84 ft.
Material 10 x 20 Colorado Sand
k. Bottom seal/fill ft.
Material NA
l. Casing stickup 3 ft.
m. Protective casing diameter 8 in.

(65' - 66': Native material, caved)

Form prepared by WAL/HMS

DATE DRILLED	5-20-94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	CP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE
Poorly graded SAND, little Silt, damp	brown	medium dense	SP
(continued)			

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES: THE TRANSITION MAY BE GRADUAL

DEPTH (FEET): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

SAMPLER

BLOWS/FOOT: 16

OVM (ppm)

WATER CONTENT

1150-MW9

WELL CONSTRUCTION

CEMENT

BENTONITE

2-in SCHEDULE 40 PVC BLANK

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: MW9 (1 of 2)

WASATCH ENVIRONMENTAL, INC.

DATE DRILLED	4/23/94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE
Poorly graded SAND, fine, damp (thin (1/8-inch) lenses of Clayey Silt observed in drive sample @ 40-41.5 feet)	brown	medium dense	SP
(little Clay/Silt, damp/moist)			
(moist @ 55 feet)			
(Clayey Silt in tip of sample, very moist/wet)			
Sandy GRAVEL, moist grades to coarse Gravel, little Sand	brown	dense	GP

DEPTH (FEET): 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70

SAMPLER

BLOWS/FOOT: 22, 10

OVM (ppm)

WATER CONTENT

11604MW2

WELL CONSTRUCTION

BENTONITE

2-in SCHEDULE 40 PVC BLANK

16/40 COLORADO SILICA SAND

2-in SCHEDULE 40 PVC 0.01" SLOTTED SCREEN

BENTONITE

2-in SCHEDULE 40 PVC BLANK

BOTTOM OF WELL @ 70 FEET

____ - Indicates Standard Penetration Drive Sampler

* - Indicates Grab Sample

X - Indicates California Sampler

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES, THE TRANSITION MAY BE GRADUAL

WELL LOG

WASATCH ENVIRONMENTAL, INC.

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: MW-2 of 2

DATE DRILLED	6-3-94 & 10-3-94
LOGGED BY	TC
SURFACE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	PID (ppm)	1150-4WG- WATER CONTENT (%)	DRY DENSITY (pcf)	SHEAR STRENGTH (tsf)
Poorly graded SAND, fine grained, little Silt, damp	brown	medium dense	SP	0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40	X X X X	11 16 11				
(continued)										

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: MW9A 1 of 2

DATE DRILLED	5-6-94-5-10-94
LOGGED BY	TC
SURFACE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
Poorly graded SAND, fine grained, little Silt, damp Clayey Silt lenses	brown	medium dense	SP	42		22				
				44						
				46	X					
				48						
				50						
(moist @ 51 feet)				52	X	11				
				54						
				56						
				58						
				60						
(moist/very moist @ 61 feet)				62		13				
				64	X					
				66						
Sandy Gravel grades to coarse GRAVEL, little Sand, moist	brown	dense	GP	68						
				70	X					
Poorly graded SAND, little Silt, damp	brown	medium dense	SM	72						
				74						
				76	X					
(continued)				78						
				80	X					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: MW9A Page 2 of 3

DATE DRILLED	5-9-94 - 5-10-94
LOGGED BY	TG
SURFACE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL SYMB.
Poorly graded SAND, fine grained, little Silt, damp	brown	medium dense	SP
Silty fine SAND, moist (continued)	brown	medium dense	SM

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES, THE TRANSITION MAY BE GRADUAL

DEPTH (FEET) | SAMPLER | BLOWS/FOOT | OVM (ppm) | 1150-4GAC: WATER CONTENT (%) | DRY DENSITY (PCF) | SHEAR STRENGTH (KSF)

82 84 86 88 90 92 94 96 98 100 102 104 106 108 110 112 114 116 118 120

BLOWS/FOOT: 11

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: MWGA-10 of 5

DATE DRILLED	5-3-94 - 5-10-94
LOGGED BY	TC
SURFACE ELEVATION	Not Determined
DRILL RIG	CME 750
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	1150-4-WA1 WATER CONTENT (%)	1150-4-WA1 DRY DENSITY (PCF)	1150-4-WA1 SHEAR STRENGTH (KSF)
Silty fine SAND, moist	brown	medium dense	SM	120	X					
Poorly graded SAND, fine grained, little Silt, damp	brown	medium dense	SP	124	X					
				126						
				128						
				130						
				132						
				134						
				136	X					
				138						
				140						
				142						
				144						
				146	X					
				148						
				150						
				152						
				154						
				156	X					
Silty fine SAND, moist (continued)	brown	medium dense	SM	158						
				160	X					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: MW9A 4 OF 5

DATE DRILLED	4-6-94 & 10-94
LOGGED BY	TG
SURFACE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Encountered

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	1150434 WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
Silty fine SAND, damp	brown	medium dense	SM	160	X					
Poorly graded SAND, fine grained, damp	brown	medium dense	SP	164	X					
				166						
				168						
SILT and fine SAND, little Clay, moist	brown	medium dense	ML/SM	172						
				174	X					
Poorly graded SAND, fine grained, damp	brown	medium dense	SP	178						
				180	X					
				182						
				184						
				186	X					
				188						
Silty CLAY, moist	brown	stiff	CL		X					
				190						

BOTTOM OF BORING @ 190 FEET

x - Indicates Grab Sample

[ ] - Indicates Standard Penetration Drive Sampler

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

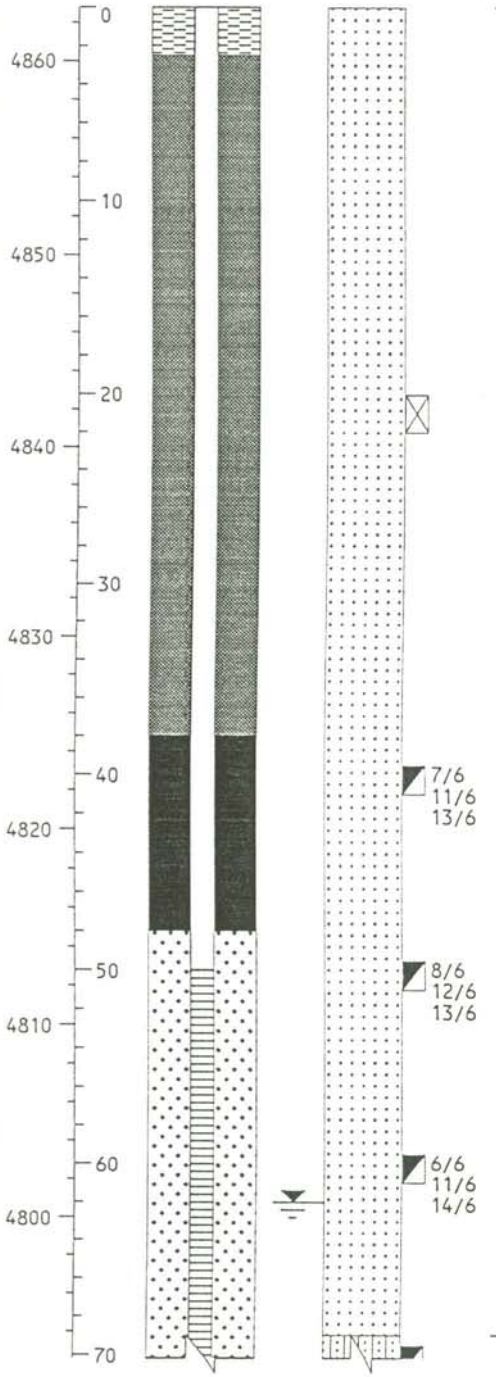
DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: MW9A 5 of 5

DRILL HOLE LOG
MONITOR WELL NO.: MW-13

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: East side of landfill
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 62' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-12-96
TOC ELEV.: 4865.12'
GS ELEV.: 4862.8'
LOGGED BY: DCH
WELL NO.: MW-13



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			SP	SAND: Yellowish brown, fine to medium, occasional reddish brown clay lenses, medium dense, moist to wet.			
					B-1	20	
					B-2	39.5-41	4/18
					B-3	49.5-51	8/18
					B-4	59.5-61	7/18

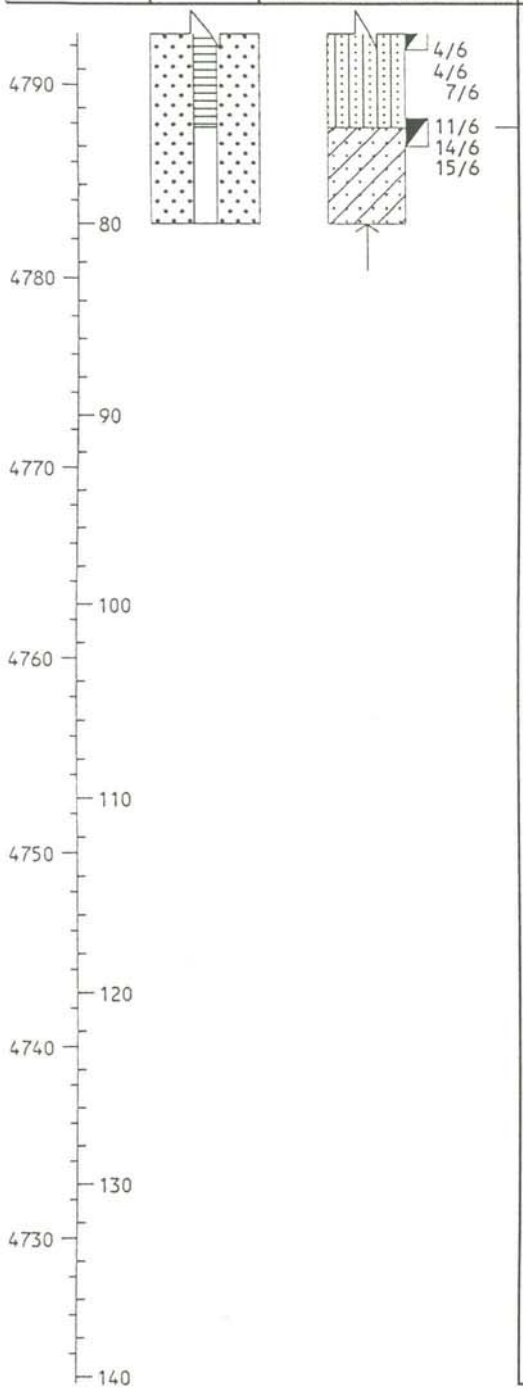
Figure No. 9

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: MW-13

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: East side of landfill
DRILLER: Layne Environmental
DRILL RIG: AP-1000
DEPTH TO WATER: 62' HOLE DIAMETER: 9"

PROJECT NO.: 2697-004
DATE: 8-12-96
TOC ELEV.: 4865.12'
GS ELEV.: 4862.8'
LOGGED BY: DCH
WELL NO.: MW-13



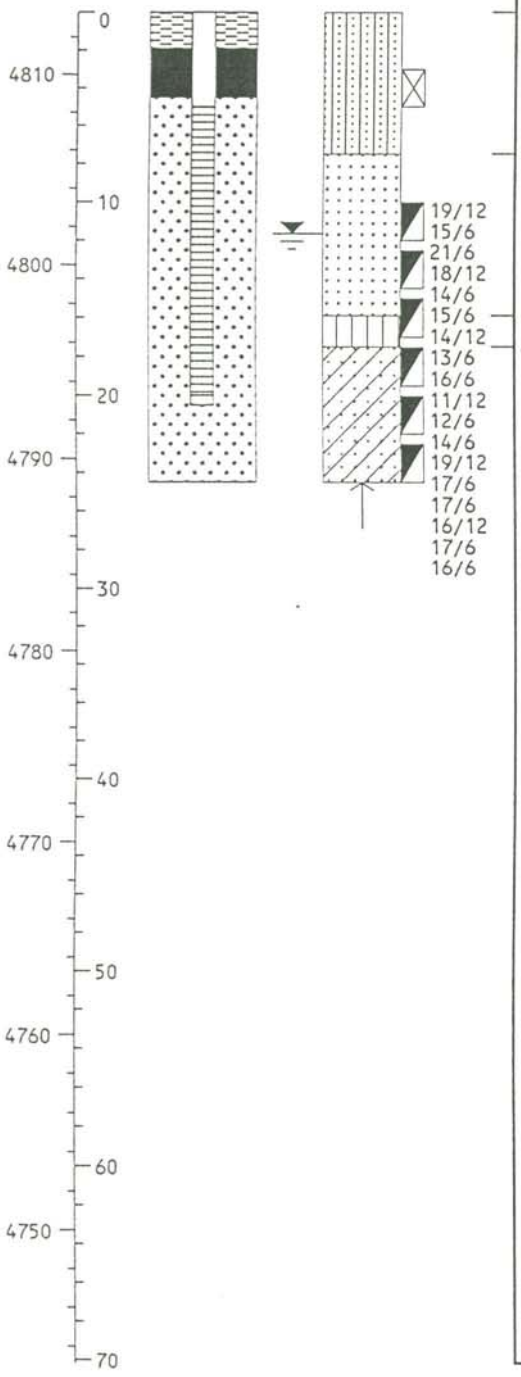
ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
		4/6 4/6 7/6	SM	SILTY SAND: Gray, fine, medium dense, wet.	B-5	69.5-71	8/18
		11/6 14/6 15/6	CL	SANDY CLAY: Gray, fine, very stiff, moist to very moist.	B-6	79.5-81	10/18

Figure No. 10

DRILL HOLE LOG
MONITOR WELL NO.: MW-14

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: East side of stormwater detention pond
DRILLER: Layne Environmental
DRILL RIG: B-57
DEPTH TO WATER: 11.65' HOLE DIAMETER: 8.25"

PROJECT NO.: 2697-004
DATE: 7-31-96
TOC ELEV.: 4815.44'
GS ELEV.: 4813.3'
LOGGED BY: DCH
WELL NO.: MW-14



USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
SM	SILTY SAND: Brown, fine to medium, moist (reworked soil).	B-1	3-5	24/23
SP	SAND: Yellowish brown, fine to medium dense, moist to wet.	B-2	10-12	24/24
		B-3	12.5-14.5	24/24
		B-4	15-17	24/24
ML	SANDY SILT: Gray, fine, very stiff, very moist.	B-5	17.5-19.5	19/24
CL	SANDY CLAY: Gray brown, fine, very stiff, moist.	B-6	20-22	20/24
		B-7	22.5-24.5	24/24

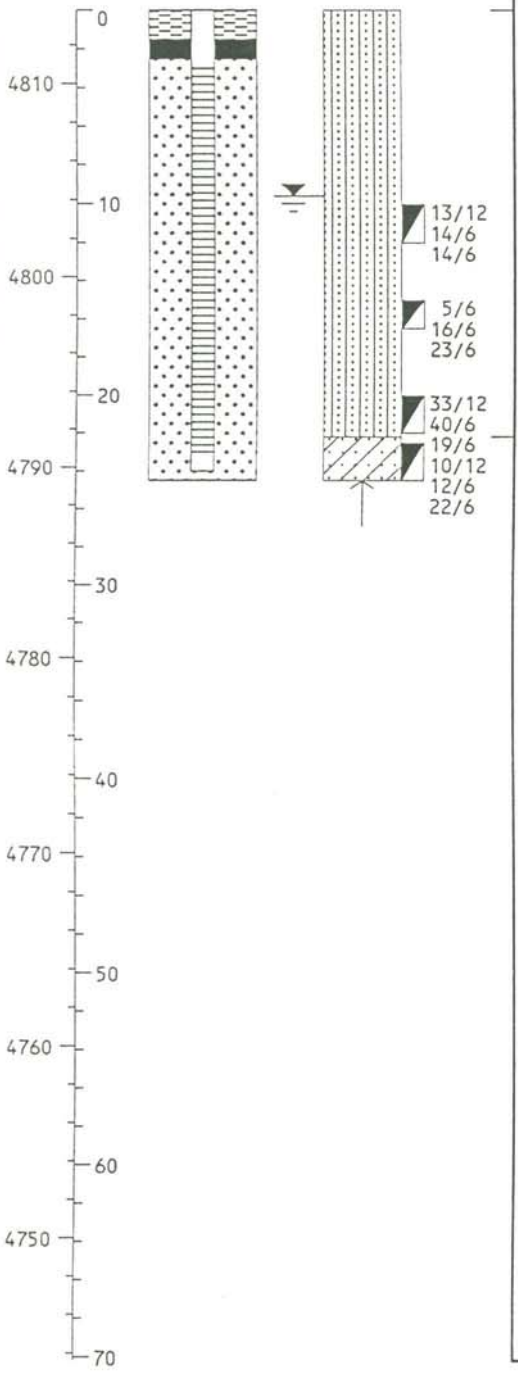
MW-14 was drilled and installed five feet to the east of this drill hole log.

Figure No. 11

DRILL HOLE LOG
MONITOR WELL NO.: MW-15

PROJECT: Davis County Landfill
CLIENT/OWNER: Davis County SWM & ERSSD
HOLE LOCATION: West side of stormwater detention pond
DRILLER: Layne Environmental
DRILL RIG: B-57
DEPTH TO WATER: 9.57' HOLE DIAMETER: 8.25"

PROJECT NO.: 2697-004
DATE: 8-1-96
TOC ELEV.: 4816.27
GS ELEV.: 4813.8
LOGGED BY: DCH
WELL NO.: MW-15



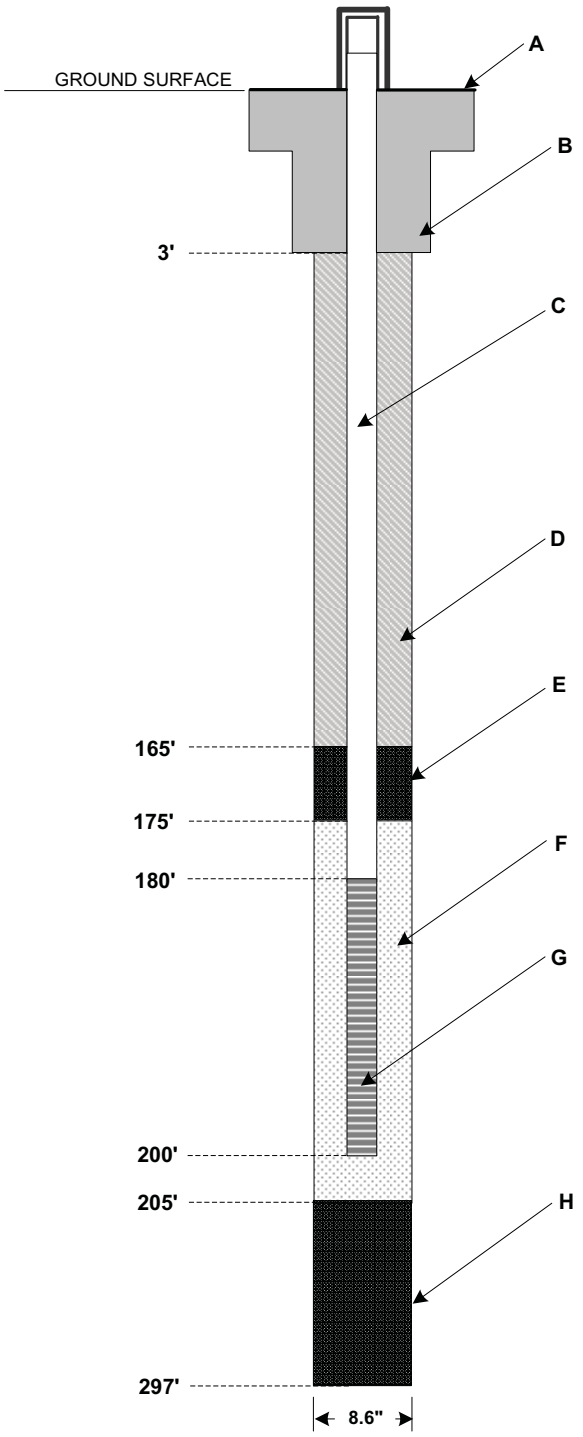
ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			SM	SILTY SAND: Brown, fine to medium, medium dense to dence, moist to wet (reworked soil).			
					B-1	10-12	5/24
					B-2	15-16.5	18/18
				...grades with occasional large gravel and pieces of clay.	B-3	20-22	24/24
			CL	SANDY CLAY: Gray, fine, silty, very stiff, moist.	B-4	22.5-24.5	20/24

Figure No. 12

BINGHAM ENVIRONMENTAL

MONITORING WELL / PIEZOMETER CONSTRUCTION LOG

WELL NO: **MW-17**	PROJECT: **WIWMD Deep Well Installation**	SITE: **Wasatch Integrated Waste Management District**
PROJECT NO: **370585.DW.02**	CONSTRUCTED BY: **Boart Longyear**	CITY: **Layton, UT**
NORTHING: 287398.738 EASTING: 1881646.181	GROUND SURFACE ELEVATION: 4623.73	MEASURING POINT ELEVATION: 4625.70



TOTAL DEPTH: **297.0'**
(FEET BELOW GROUND SURFACE)

A. SURFACE COMPLETION

COMPOSITION: **8-inch diameter protector pipe; 2.5-feet stick-up**
SIZE: **4' x 4' concrete pad**

B. SURFACE SEAL

MATERIAL: **Concrete**
INTERVAL: **-1.0' - 3.0'**

C. RISER PIPE

TYPE: **Schedule 80 PVC**
INTERVAL: **-2.0' – 180.0'**

D. GROUT

COMPOSITION: **Bentonite/Cement Grout**
INTERVAL: **3' - 165'**

E. SEAL

TYPE: **Bentonite Chips**
INTERVAL: **165' - 175'**

F. FILTER PACK

TYPE: **#20/40 Silica Sand**
INTERVAL: **175' - 205'**

G. SCREEN

DIAMETER: **4-inch**
TYPE: **Schedule 80 PVC**
SLOT SIZE: **10 slot (.010-inch)**
INTERVAL: **180' - 200'**

H. BACKFILL

TYPE: **Bentonite Chips**
INTERVAL: **205' - 297'**

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0	0.0-7.0	----	----------	----------	SM - Fine grain silty sand, SM, Reddish Brown 5YR 4/4, dry, loose, trace of organic silt. (0/70/30)	(x/x/x) = % gravel/sand/fines
7	7.0-17.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, dry/moist, loose, with trace sandy silt lenses. (0/80/20)	
17	17.0-27.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, dry/moist, loose, with trace sandy silt lenses. (0/80/20)	

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
25						
26						
27	27.0-41.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, dry/moist, loose. (0/80/20)	
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41	41.0-49.0	----	----------	----------	SMCL - Interbedded sequence of: (1) Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist/wet, loose; and (2) Silty Clay, CL, Dark Yellowish Brown 10YR 4/6, moist/very moist, med stiff. (0/65/35)	Bedded in ~6" alternating lenses with trace orange (Fe) staining.
42						
43						
44						
45						
46						
47						
48						
49	49.0-52.0	----	----------	----------	SM - Interbedded sequence of: (1) Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, wet, med dense; and (2)	

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
50					Silty Clay, CL, Dark Yellowish Brown 10YR 4/6, moist, med stiff. (0/65/35)	
51						
52	52.0-54.0	----	----------	----------	SM - Fine grain silty sand with fine to coarse gravel, SM, Dark Yellowish Brown 10YR 4/6, moist, loose. (5/80/15)	Trace orange (Fe) staining and black organic stains
53						
54	54.0-55.0	----	----------	----------	SW - Fine grain sand, SW, Dark Yellowish Brown 10YR 4/6, moist, loose. (0/90/10)	
55	55.0-56.0	----	----------	----------	SM - Fine grain silty sand, Dark Yellowish Brown 10YR 4/6, wet, trace clay lenses. (0/80/20)	
56	56.0-61.0	----	----------	----------	SM - Fine grain silty sand with little fine to coarse gravel, SM, Dark Yellowish Brown 10YR 4/6. (5/80/15)	Orange (Fe) staining. Some gravel stuck together with clay like a conglomerate.
57						
58						
59						
60						
61	61.0-77.0	----	----------	----------	SM - Fien grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, with trace ~2" clay lenses. (0/85/15)	
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						
73						
74						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
75						
76						
77	77.0-87.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose. (0/80/20)	Organic odor. Trace fine gravel at 87'
78						
79						
80						
81						
82						
83						
84						
85						
86						
87	87.0-97.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace organic silt. (0/80/20)	Trace fine gravel to 88'. Trace orange (Fe) staining.
88						
89						
90						
91						
92						
93						
94						
95						
96						
97	97.0-107.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose. (0/80/20)	
98						
99						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
100						
101						
102						
103						
104						
105						
106						
107	107.0-111.	----	----------	----------	SM - Fine grain silty sand, SM, Yellowish Brown 10YR 5/6, moist, loose. (0/80/20)	
108						
109						
110						
111	111.0-117.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose. (0/80/20)	
112						
113						
114						
115						
116						
117	117.0-131.	----	----------	----------	SM - Fine grain silty sand, SM, Yellowish Brown 10YR 5/6, moist, loose. (0/80/20)	
118						
119						
120						
121						
122						
123						
124						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
125						
126						
127						
128						
129						
130						
131	131.0-133.	----	----------	----------	ML - Sandy Silt, ML, Dark Yellowish Brown 10YR 4/6, med dense, moist. (0/45/55)	Trace orange (Fe) staining
132						
133	133.0-134.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose. (0/80/20)	
134	134.0-136.	----	----------	----------	SMML - Silty Sand/Sandy Silt, SM/ML, Dark Yellowish Brown 10YR 4/6, med dense, moist. (0/55/45)	
135						
136	136.0-138.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose. (0/80/20)	
137						
138						
139	139.0-140.	----	----------	----------	ML - Sandy Silt, ML, Dark Yellowish Brown 10YR 4/6, med dense, moist. (0/45/55)	
140	140.0-143.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose. (0/80/20)	
141						
142						
143	143.0-146.	----	----------	----------	ML - Sandy Silt, ML, Brown 7.5YR 5/3, med dense, moist. (0/45/55)	Orange (Fe) staining.
144						
145						
146	146.0-155.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose, with trace thin silt lenses. (0/80/20)	Orange (Fe) staining
147						
148						
149						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
150						
151						
152						
153						
154						
155	155.0-156.	----	----------	----------	ML - Sandy Silt, ML, Brown 7.5YR 5/4, med dense, moist. (0/45/55)	
156	156.0-168.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose to med dense, with trace orange (Fe) and black (Mn?) staining. (0/80/20)	
157						
158						
159						
160						
161						
162						
163						
164						
165						
166						
167						
168	168.0-171.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Yellowish Brown 10YR 4/4, moist, med dense/stiff, with laminated orange/black staining. (0/35/65)	
169						
170						
171	171.0-172.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose, with trace orange (Fe) staining. (0/80/20)	
172	172.0-175.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Yellowish Brown 10YR 4/4, med dense, moist/wet, with trace thin sand lenses, and with laminated orange/black staining. (0/45/55)	
173						
174						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
175	175.0-177.	----	----------	----------	GM - Fine to coarse gravelly silty sand, Dark Yellowish Brown 10YR 4/4, moist, loose. (30/60/10)	
176						
177	177.0-179.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Yellowish Brown 10YR 4/4, med dense, moist.(0/45/55)	
178						
179	179.0-185.	----	----------	----------	GM - Silty sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, loose, moist. (30/60/10)	
180						
181						
182						
183						
184						
185	185.0-194.	----	----------	----------	GM - Silty sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, loose, wet, trace cobbles. (55/35/10)	
186						
187						
188						
189						
190						
191						
192						
193						
194	194.0-195.	----	----------	----------	SW - Fine to medium grain sand, SW, Dark Yellowish Brown 10YR 4/4, wet, loose	
195	195.0-208.	----	----------	----------	GM - Sandy fine to coarse gravel with cobbles, GM, Dark Yellowish Brown 10YR 4/6, wet, loose	
196						
197						
198						
199						

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PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
200						
201						
202						
203						
204						
205						
206						
207						
208	208.0-217.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose to med dense, with trace plant detritus and layers of laminated organics. (0/70/30)	Organic odor
209						
210						
211						
212						
213						
214						
215						
216						
217	217.0-223.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose to med dense, with trace thin (1/2") clay lenses, trace plant detritus, and laminated organic banding. (0/70/30)	
218						
219						
220						
221						
222						
223	223.0-225.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist to wet, loose. (0/70/30)	
224						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
225	225.0-227.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, moist, stiff. (0/30/70)	
226						
227	227.0-230.	----	----------	----------	SM - Medium grain silty sand, SM, Very Dark Gray 10YR 3/1, moist, loose. (0/80/20)	
228						
229						
230	230.0-237.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist to wet, loose to med dense. (0/80/20)	
231						
232						
233						
234						
235						
236						
237	237.0-243.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist to wet, trace black organic silt, and trace clay lenses. (0/80/20)	
238						
239						
240						
241						
242						
243	243.0-245.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose (0/80/20)	
244						
245	245.0-251.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist to wet, med dense, trace black organic silt (0/80/20)	
246						
247						
248						
249						

CH2MHILL

PROJECT NUMBER 370585.DW.02 | BORING ID: MW-17 |

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
250						
251	251.0-255.	----	----------	----------	CL - Sandy Silty Clay, CL, Dark Grayish Brown 10YR 4/2, moist, stiff, trace organic silt laminations (0/25/75)	
252						
253						
254						
255	255.0-257.	----	----------	----------	ML - Sandy clayey silt, ML, Dark Grayish Brown 10YR 4/2, med dense, moist, trace organic silt, and trace thin clay lenses. (0/40/60)	Organic odor
256						
257	257.0-260.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, med dense, trace organic silt. (0/80/20)	
258						
259						
260	260.0-261.	----	----------	----------	CL - Sandy Silty Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff to stiff, moist. (0/20/80)	
261	261.0-264.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose (0/80/20)	
262						
263						
264	264.0-273.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose, trace organic silt, and trace thin clay lenses. (0/80/20)	
265						
266						
267						
268						
269						
270						
271						
272						
273	273.0-275.	----	----------	----------	CL - Silty Sandy Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff to stiff, moist. (0/20/80)	
274						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-17**

SOIL BORING LOG

PROJECT: WIWMD Deep Monitoring Well Installation LOCATION:

ELEVATION: 4623.73 NORTHING: 287398.738 EASTING: 1881646.181 COORDINATE SYSTEM: NAD27 State Plane

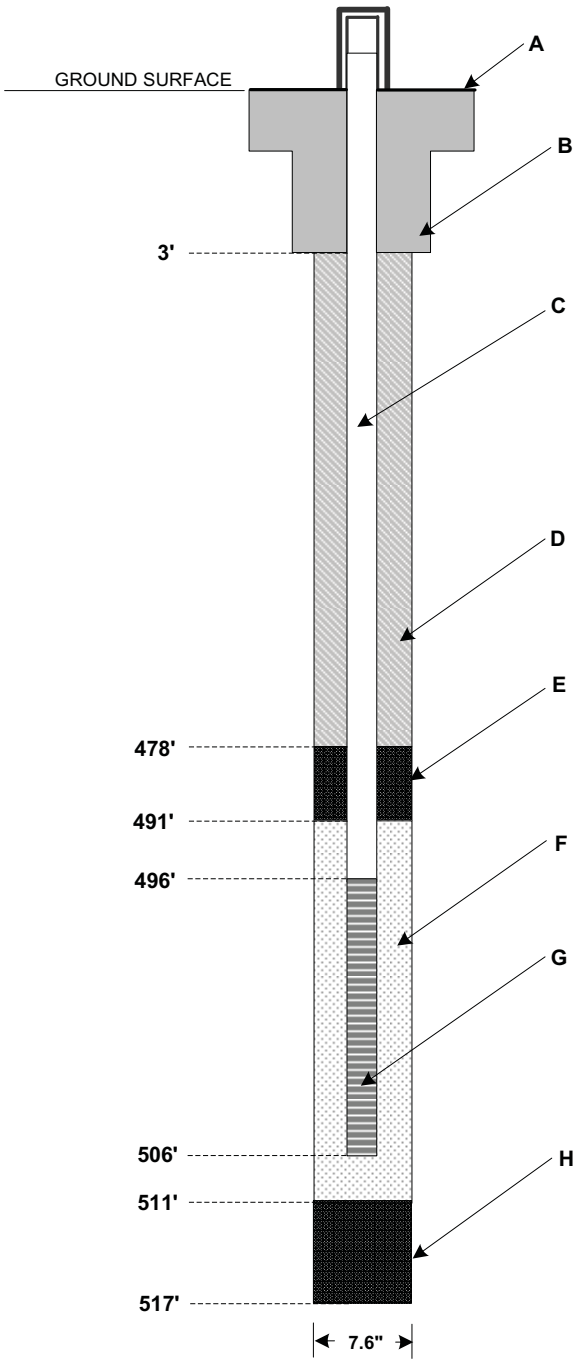
DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~185' START: 3/4/2008 END: 3/11/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
275	275.0-276.	----	----------	----------	SM - Fine to medium Silty Sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose. (0/80/20)	
276	276.0-277.	----	----------	----------	CL - Silty Sandy Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff to stiff, moist, trace organic silt laminations. (0/20/80)	
277	277.0-278.	----	----------	----------	SM - Fine Silty Sand, SM, Dark Grayish Brown 10YR 4/2, moist to wet, med dense. (0/80/20)	
278	278.0-279.	----	----------	----------	CL - Silty Sandy Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff, moist. (0/35/65)	
279	279.0-287.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist/wet, loose/med dense, trace organic silt, trace clay	Organic odor
280					lenses. (0/80/20)	
281						
282						
283						
284						
285						
286						
287	287.0-297.	----	----------	----------	CL - Silty Sandy Clay, CL, Dark Grayish Brown 10YR 4/2, moist, med stiff to stiff, few organic silt laminations, trace	Organic odor
288					thin sand lenses. (0/15/85)	
289						
290						
291						
292						
293						
294						
295						
296						
297	297.0-	----	----------	----------	End of Boring @ 297' bgs	
298						

MONITORING WELL / PIEZOMETER CONSTRUCTION LOG

WELL NO: **MW-18**	PROJECT: **WIWMD Deep Well Installation**	SITE: **Wasatch Integrated Waste Management District**
PROJECT NO: **370585.DW.02**	CONSTRUCTED BY: **Boart Longyear**	CITY: **Layton, UT**
NORTHING: 285233.953 EASTING: 1880473.687	GROUND SURFACE ELEVATION: 4914.63	MEASURING POINT ELEVATION: 4917.75



A. SURFACE COMPLETION

COMPOSITION: **8-inch diameter protector pipe; 2.5-feet stick-up**

SIZE: **4' x 4' concrete pad**

B. SURFACE SEAL

MATERIAL: **Concrete**

INTERVAL: **-1.0' - 3.0'**

C. RISER PIPE

TYPE: **Schedule 80 PVC**

INTERVAL: **-3.0' – 180.0'**

D. GROUT

COMPOSITION: **Bentonite/Cement Grout**

INTERVAL: **3' - 478'**

E. SEAL

TYPE: **Bentonite Chips**

INTERVAL: **478' - 491'**

F. FILTER PACK

TYPE: **#20/40 Silica Sand**

INTERVAL: **491' - 511'**

G. SCREEN

DIAMETER: **4-inch**

TYPE: **Schedule 80 PVC**

SLOT SIZE: **10 slot (.010-inch)**

INTERVAL: **496' - 506'**

H. BACKFILL

TYPE: **Bentonite Chips**

INTERVAL: **511' - 517'**

TOTAL DEPTH: **517.0'**
(FEET BELOW GROUND SURFACE)

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0	0.0-1.5	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose. (0/80/20)	(x/x/x) = %gravel/sand/fines
1						
	1.5-7.0	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Yellowish Brown 10YR 4/4,
2					moist, med dense, with trace organics. (0/35/65)	
3						
4						
5						
6						
7	7.0-13.0	----	----------	----------	ML - Fine grain sandy silt, ML, Dark Yellowish Brown 10YR 4/6,
8					soft/loose, trace thin clay lenses and trace organic matter. (0/45/55)	
9						
10						
11						
12						
13	13.0-23.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6,
14					dry, loose, with trace silt/clay lenses. (0/80/20)	
15						
16						
17						
18						
19						
20						
21						
22						
23	23.0-28.0	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Yellowish Brown 10YR 4/4,
24					moist, med dense. (0/40/60)	

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
25						
26						
27						
28	28.0-37.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4,loose to med dense, moist, with trace thin silt/clay lenses (0/80/20)	
29						
30						
31						
32						
33						
34						
35						
36						
37	37.0-43.0	----	----------	----------	SM - Fine grain sand, SM, Dark Yellowish Brown 10YR 4/2, moist to dry, loose, with trace 1/2" clay lenses. (0/80/20)	
38						
39						
40						
41						
42						
43	43.0-60.0	----	----------	----------	SW - Fine grain sand, SW, Dark Yellowish Brown 10YR 4/4, moist, loose, with trace thin clay lenses (0/90/10)	
44						
45						
46						
47						
48						
49						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60	60.0-61.0	----	----------	----------	SM - Fine to medium grain silty sand, SM, 10YR 4/3, moist, loost. (0/80/20)	
61	61.0-64.0	----	----------	----------	ML - Sandy Clayey Silty, ML, Dark Yellowish Brown 10YR 4/4, med stiff, moist, trace clay lenses. (0/35/65)	
62						
63						
64	64.0-67.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, loose, moist, trace thin clay lenses. (0/80/20)	
65						
66						
67	67.0-69.0	----	----------	----------	CL - Sandy Silty Clay, CL, Dark Yellowish Brown 10YR 4/6, med stiff, trace organic silt. (0/20/80)	
68						
69	69.0-77.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, loose, moist. (0/80/20)	
70						
71						
72						
73						
74						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

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75						
76						
77	77.0-87.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, loose, moist, with trace thin clay lenses and trace orange (Fe) staining on clay lenses. (0/80/20)	
78						
79						
80						
81						
82						
83						
84						
85						
86						
87	87.0-98.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, with trace thin silt lenses. (0/80/20)	
88						
89						
90						
91						
92						
93						
94						
95						
96						
97						
98	98.0-100.0	----	----------	----------	CLML - Silty Clay/Clayey Silt, CL/ML, Dark Yellowish Brown 10YR 4/4, moist, med stiff to stiff. (0/15/85)	
99						

CH2MHILL

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SOIL BORING LOG

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100	100.0-101.	----	----------	----------	SM - Fine grain silty sand, SM,Dark Yellowish Brown 10YR 4/4-4/6, moist, loose. (0/90/10)	
101						
	101.5-103.	----	----------	----------	CLSM - Interbedded sequence of: (1) Silty Clay, CL, Dark Yellowish	
102					Brown 10YR 4/4, moist, med stiff; and (2) Silty Sand, SM,	
					10YR 4/4, moist, med dense. (0/25/75)	
103	103.0-112.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4,	Perched Water Table at ~105
					wet, med dense, trace thin clay lenses. (0/80/20)	
104						
105						
106						
107						
108						
109						
110						
111						
112	112.0-122.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR	
					4/2-4/6, med dense, wet, trace thin clay lenses and trace	
113					orange (Fe) staining. (0/80/20)	
114						
115						
116						
117						
118						
119						
120						
121						
122	122.0-127.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Yellowish Brown 10YR 4/4,	
					med dense, wet. (0/80/20)	
123						
124						

CH2MHILL

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SOIL BORING LOG

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125						
126						
127	127.0-131.	----	----------	----------	SM - Fine Grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med dense, wet, trace black organic silt. (0/80/20)	Organic odor
128						
129						
130						
131						
132	131.5-133.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff, moist. (0/15/85)	
133	133.0-138.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, dense, wet, trace black organic silt. (0/75/25)	Organic odor
134						
135						
136						
137						
138	138.0-141.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, stiff, moist, thin ribbons of blue to pink colored sediment, trace black organic silt. (0/5/95)	
139						
140						
141	141.0-143.	----	----------	----------	ML - Very fine grain sandy silt, ML, Dark Grayish Brown 10YR 4/2, trace organic silt. (0/25/75)	
142						
143	143.0-153.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff, moist, trace organic silt, trace ribbons of blue and pink seds. (0/5/95)	
144						
145						
146						
147						
148						
149						

CH2MHILL

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150						
151						
152						
153	153.0-155.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Grayish Brown 10YR 4/2, med dense, moist. (0/30/70)	
154						
155						
156	155.5-161.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, moist, med stiff, lean, thin laminations of Dark Reddish Brown 5YR 4/2 clay, trace organic silt. (0/95/5)	Organic odor
157						
158						
159						
160						
161	161.0-167.	----	----------	----------	SW - Fine grain Sand, SW, well graded, clean, Dark Grayish Brown 10YR 4/2, wet, loose, trace organic silt	Perched water table at ~161'
162						
163						
164						
165						
166						
167	167.0-176.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense to loose, wet to very wet, trace organic silt	Very wet
168						
169						
170						
171						
172						
173						
174						

CH2MHILL

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175						
176	176.0-178.	----	----------	----------	CLSM - Interbedded: (1) Silty Sandy Clay, CL, Dark Grayish Brown 10YR 4/2, moist, stiff; and (2) Fine grain Silty Sand, SM, 10YR 4/2, wet, loose. (0/25/75)	
177						
178	178.0-181.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, med dense, trace organic silt and trace thin clay lenses. (0/70/30)	
179						
180						
181	181.0-191.	----	----------	----------	CLML - Silty Sandy Clay/Clayey Sandy Silt, CL/ML, Dark Grayish Brown 10YR 4/2, moist, med stiff. (0/30/70)	
182						
183						
184						
185						
186						
187						
188						
189						
190						
191	191.0-195.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, moise, loose, trace thin clay lenses. (0/75/25)	Organic odor
192						
193						
194						
195	195.0-217.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose, trace organic silt, trace thin clay lenses. (0/80/20)	Strong organic odor
196						
197						
198						
199						

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200						
201						
202						
203						
204						
205						
206						
207						
208						
209						
210						
211						
212						
213						
214						
215						
216						
217	217.0-225.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med dense, loose, trace organic silt. (0/75/25)	Strong organic odor
218						
219						
220						
221						
222						
223						
224						

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225	225.0-237.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose to med dense, trace organic silt. (0/70/30)	Organic odor
226						
227						
228						
229						
230						
231						
232						
233						
234						
235						
236						
237	237.0-247.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense to loose, wet	Perched water level @ ~237
238						
239						
240						
241						
242						
243						
244						
245						
246						
247	247.0-257.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, moist, stiff, trace silt lenses, trace laminations of 5YR 4/2 clay. (0/10/90)	
248						
249						

CH2MHILL

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250						
251						
252						
253						
254						
255						
256						
257	257.0-267.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, moist, stiff, trace sand lenses, trace black organic silt (0/5/95)	
258						
259						
260						
261						
262						
263						
264						
265						
266						
267	267.0-271.	----	----------	----------	CL - Silty Clay, CL, Dark Brown 7.5YR 3/3, moist, stiff, trace silt lenses and trace organic silt. (0/5/95)	
268						
269						
270						
271	271.0-277.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Grayish Brown 10YR 4/2, med dense, wet, trace clay lenses. (0/40/60)	
272						
273						
274						

CH2MHILL

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275						
276						
277	277.0-281.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff, moist, trace organic silt. (0/10/90)	
278						
279						
280						
281	281.0-289.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Grayish Brown 10YR 4/2, moist, med dense, trace organic silt. (0/40/60)	
282						
283						
284						
285						
286						
287						
288						
289	289.0-303.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, stiff, moist, trace thin sandy silt lenses, trace plant detritus/organic silt. (0/10/90)	
290						
291						
292						
293						
294						
295						
296						
297						
298						
299						

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300						
301						
302						
303	303.0-313.	----	----------	----------	ML - Sandy Clayey Silt, ML, Dark Grayish Brown 10YR 4/2, med dense, moist, with trace clay lenses. (0/25/75)	No sample 307-313
304						
305						
306						
307						
308						
309						
310						
311						
312						
313	313.0-315.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, moist, loose to med dense. (0/70/30)	
314						
315	315.0-317.	----	----------	----------	CLML - Silty Clay/Clayey Silt, CL/ML, Dark Grayish Brown 10YR 4/2, med stiff, moist. (0/25/75)	
316						
317	317.0-322.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist to wet. (0/50/50)	Strong "smokey" odor. Begin drilling with water at 317'
318						
319						
320						
321						
322	322.0-330.	----	----------	----------	No Sample. Likely an SM.	
323						
324						

CH2MHILL

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325						
326						
327						
328						
329						
330	330.0-339.	----	----------	----------	SM - Fine grain to very fine grain Silty Clayey Sand, SM, Dark Grayish Brown 10YR 4/2, moist to wet, med dense. (0/75/25)	
331						
332						
333						
334						
335						
336						
337						
338						
339	339.0-347.	----	----------	----------	ML - Sandy Clayey Silt, ML sightly plastic, Dark Grayish Brown 10YR 4/2, med dense to dense, trace thin sand lenses, trace organic silt. (0/40/60)	
340						
341						
342						
343						
344						
345						
346						
347	347.0-367.	----	----------	----------	No Sample	
348						
349						

CH2MHILL

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350						
351						
352						
353						
354						
355						
356						
357						
358						
359						
360						
361						
362						
363						
364						
365						
366						
367		----	----------	----------	SM - Fine to medium grain very silty sand, SM, Dark Grayish Brown 10YR 4/2, moist, dense, trace organic silt. (0/55/45)	
368						
369	369.0-371.	----	----------	----------	ML - Very fine silt with very low plasticity, ML, Dark Grayish Brown 10YR 4/2, very dry, dense? (0/5/95)	Hard drilling indicates that this layer is very dense
370						
371	371.0-372.	----	----------	----------	SM - Fine grain very silty sand, SM, 10YR 4/2, moist, dense, trace organic silt. (0/50/50)	
372	372.0-375.	----	----------	----------	No sample	
373						
374						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
375	375.0-376.	----	----------	----------	CL - Silty Sandy Clay, CL, Dark Grayish Brown 10YR 4/2, moist, med stiff. (0/20/80)	
376	376.0-377.	----	----------	----------	ML - Very fine silt with very low plasticity, ML, Dark Grayish Brown 10YR 4/2, very dry, dense? (0/10/90)	
377	377.0-378.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist, trace thin clay lenses. (0/70/30)	
378	378.0-384.	----	----------	----------	No sample	
379						
380						
381						
382						
383						
384	384.0-388.	----	----------	----------	SM - Fine grain Silty Sand, SM, Very Dark Gray to Dark Grayish Brown 10YR 3/1-4/2, med dense, moist, trace of organic	"Smokey" odor
385					silt, trace of the dry ML seen above. (0/60/40)	
386						
387						
388	388.0-390.	----	----------	----------	No Sample	
389						
390	390.0-392.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist, trace plant detritus. (0/75/25)	
391						
392	392.0-394.	----	----------	----------	No Sample	
393						
394	394.0-396.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med dense. (0/60/40)	
395						
396	396.0-397.	----	----------	----------	ML - Fine silt, ML, 10YR 4/2, very dry, dense?	
397						
	397.5-399.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med	
398					dense. (0/60/40)	
399	399.0-405.	----	----------	----------	No Sample	

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
400						
401						
402						
403						
404						
405	405.0-409.	----	----------	----------	SM - Fine grain Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med dense. (0/70/30)	No Sample from 407-408.5
406						
407						
408						
409	409.0-411.	----	----------	----------	SM - Fine grain silty clayey sand, SM, very dark gray 10YR 3/1, moist, med dense to dense	"smokey" odor
410						
411	411.0-422.	----	----------	----------	No Sample	
412						
413						
414						
415						
416						
417						
418						
419						
420						
421						
422	422.0-426.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist, trace thin clay lenses, trace plant detritus (organics), trace organic silt. (0/65/35)	
423						
424						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
425						
426	426.0-437.	----	----------	----------	No Sample	
427						
428						
429						
430						
431						
432						
433						
434						
435						
436						
437	437.0-447.	----	----------	----------	SM - Very fine to fine Silty Sand, SM, Dark Grayish Brown 10YR 4/2, med dense, moist, trace thin clay lenses, trace medium sand, trace cemented sand and silt. (0/70/30)	
438						
439						
440						
441						
442						
443						
444						
445						
446						
447	447.0-453.	----	----------	----------	No sample	
448						
449						

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
450						
451						
452						
453	453.0-456.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, med dense to loose, trace thin clay lenses. (0/80/20)	
454						
455						
456						
	456.5-458.	----	----------	----------	ML - Very fine sandy silt, ML, 10YR 4/4, 10YR 4/4 to 10YR 8/1,	
457					dry, sandier than previous silt layers. (0/20/80)	
458	458.0-460.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4,	
459					med dense to loose, trace organics and organic silt, trace fine gravel, trace cemented lenses. (0/80/20)	
460	460.0-462.	----	----------	----------	ML - Sandy Clayey Silt, ML , Very Dark Grayish Brown 10YR 3/2,	
461					moist, dense, trace organics and organic silt, trace cemented sandy silt	
462	462.0-464.	----	----------	----------	No Sample	
463						
464	464.0-469.	----	----------	----------	SMML - Semi-Interbedded sequence of: (1) Fine grain silty sand,	
465					SM, Dark Yellowish Brown 10YR 4/4, moist, loose; and (2) Sandy clayey silt, ML, very Dark Gray 10YR 3/2, moist, med	
466					dense , trace organic silt. (0/60/40)	
467						
468						
469	469.0-470.	----	----------	----------	No sample	
470	470.0-472.	----	----------	----------	ML - Sandy clayey silt, ML, Dark Grayish Brown 10YR 4/2, med	
471					dense, dry/moist, trace very dark gray lenses, trace cemented silt. (0/50/50)	
472	472.0-476.	----	----------	----------	No Sample	
473						
474						

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PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
475						
476	476.0-477.	----	----------	----------	SW - Fine to medium sand, SW, 10YR 4/4 dark yellowish brown, moist/wet, loose, organic odor. (0/90/10)	
477	477.0-480.	----	----------	----------	MLSM - Interbedded layer of silt sand and clay, ML/SM/CL, Very Dark Gray 10YR 3/1, med stiff/dense, moist to wet. (0/30/70)	
478						
479						
480	480.0-486.	----	----------	----------	No Sample	
481						
482						
483						
484						
485						
486	486.0-490.	----	----------	----------	SMML - Interbedded sequence of: (1) Fine to medium grain silty sand, SM, 10YR 4/2, med dense, moist/wet; and (2) Sandy clayey Silt, ML, Dark Yellowish/Grayish Brown 10YR 4/2-4/4, med dense, moist, trace organic silt. (0/70/30)	
487						
488						
489						
490	490.0-496.	----	----------	----------	No Sample	
491						
492						
493						
494						
495						
496	496.0-505.	----	----------	----------	GM - Poorly graded sandy silty gravel, GM, fine sand to small cobbles, Dark Grayish Brown 10YR 4/2, wet, loose. (60/30/10)	Water level at 496'. No Sample from 498'-501'
497						
498						
499						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-18**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4914.63 NORTHING: 285233.953 EASTING: 1880473.687 COORDINATE SYSTEM: NAD27 State Plane

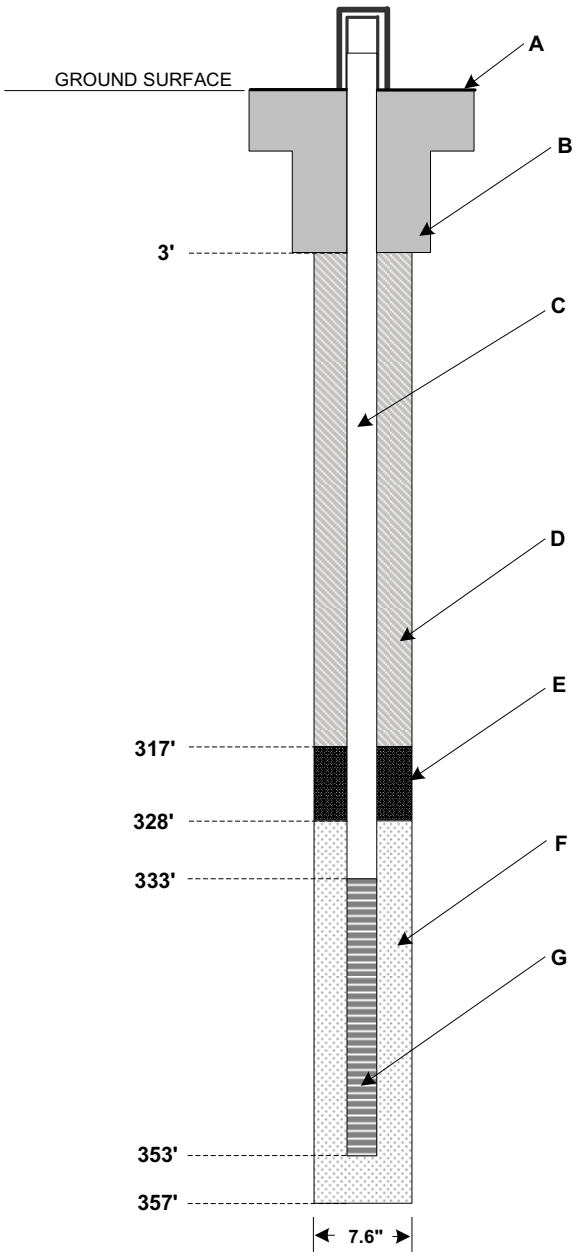
DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~473' START: 3/13/2008 END: 4/2/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
500						
501						
502						
503						
504						
505	505.0-506.	----	----------	----------	SW - Fine to medium grain sand, SW, Dark Grayish Brown 10YR 4/2, wet, loose. (0/90/10)	
506	506.0-507.	----	----------	----------	CL - Silty Clay, CL, Dark Grayish Brown 10YR 4/2, med stiff, moist. (0/5/95)	
507	507.0-517.	----	----------	----------	No sample	
508						
509						
510						
511						
512						
513						
514						
515						
516						
517	517.0-517.	----	----------	----------	End of Boring @ 517'	
518						

MONITORING WELL / PIEZOMETER CONSTRUCTION LOG

WELL NO: **MW-19**	PROJECT: **WIWMD Deep Well Installation**	SITE: **Wasatch Integrated Waste Management District**
PROJECT NO: **370585.DW.02**	CONSTRUCTED BY: **Boart Longyear**	CITY: **Layton, UT**
NORTHING: 286310.920 EASTING: 1882232.660	GROUND SURFACE ELEVATION: 4768.40	MEASURING POINT ELEVATION: 4770.88



TOTAL DEPTH: **357.0'**
(FEET BELOW GROUND SURFACE)

A. SURFACE COMPLETION

COMPOSITION: **8-inch diameter protector pipe; 2.5-feet stick-up**
SIZE: **4' x 4' concrete pad**

B. SURFACE SEAL

MATERIAL: **Concrete**
INTERVAL: **-1.0' - 3.0'**

C. RISER PIPE

TYPE: **Schedule 80 PVC**
INTERVAL: **-2.5' – 180.0'**

D. GROUT

COMPOSITION: **Bentonite/Cement Grout**
INTERVAL: **3' - 317'**

E. SEAL

TYPE: **Bentonite Chips**
INTERVAL: **317' - 328'**

F. FILTER PACK

TYPE: **#20/40 Silica Sand**
INTERVAL: **328' - 357'**

G. SCREEN

DIAMETER: **4-inch**
TYPE: **Schedule 80 PVC**
SLOT SIZE: **10 slot (.010-inch)**
INTERVAL: **333' - 353'**

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PROJECT NUMBER	BORING ID:	
370585.DW.02	**MW-19**	Sheet 1 of 15

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0	0.0-5.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace plant detritus/roots. (0/70/30)	(x/x/x) = %gravel/sand/fines
5	5.0-7.0	----	----------	----------	ML - Sandy Silt, ML, Dark Brown to Dark Yellowish Brown 10YR 4/2-4/6, moist, med dense, some organics detritus/wood/roots. (0/50/50)	
7	7.0-10.0	----	----------	----------	ML - Sandy Clayey Silt, ML, Brown 7.5YR 4/4, moist, med dense, some organics (detritus, roots, intact shell). (0/40/60)	
10	10.0-14.0	----	----------	----------	ML - Sandy Clayey Silt, ML, Yellowish Brown 10YR 5/8, moist, med dense, some organic detritus/roots/pine needles. (0/40/60)	
14	14.0-16.5	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace silty clay lenses, trace organic detritus. (0/70/30)	
16.5	16.5-24.0	----	----------	----------	SMCL - Interbedded layers of: (1) Silty sand, SM, Dark Yellowish 10YR 4/6, moist, med dense; and (2) Silty sandy clay, CL, Brown 7.5YR 4/4, moist, med stiff, trace organics. (0/50/50)	Wet at ~ 23'
24	24.0-28.5	----	----------	----------	SM - Fine silty sand, SM, Dark Yellowish Brown 10YR 4/6, wet, dense. (0/70/30)	

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
25						
26						
27						
28						
	28.5-30.5	----	----------	----------	SMCL - Interbedded sequence of: (1) Fine silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist/wet, dense; and (2) Silty Clay, CL, Brown 7.5YR 4/4. moist, stiff, trace orange staining. (0/65/35)	
29						
30						
	30.5-37.0	----	----------	----------	SM - Very fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist/dry, loose, trace cemented lenses. (0/80/20)	
31						
32						
33						
34						
35						
36						
37	37.0-45.0	----	----------	----------	SM - Fine to medium grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, with trace thin gray, dry, silt lenses. (0/75/25)	
38						
39						
40						
41						
42						
43						
44						
45	45.0-59.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, loose to med dense, moist, trace thin silt/clay lenses, trace cemented sand lenses. (0/75/25)	
46						
47						
48						
49						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
50						
51						
52						
53						
54						
55						
56						
57						
58						
59	59.0-77.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown, wet, med dense, trace orange (Fe) staining, trace rganic silt, some thin clay lenses. (0/70/30)	Wet at 59'
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						
73						
74						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
75						
76						
77	77.0-79.0	----	----------	----------	CLSM - Interbedded sequence of: (1) Silty Clay, CL, Brown 7.5YR 4/3, moist, stiff; and (2) Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, med dense, wet. (0/35/65)	
78						
79	79.0-88.5	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, wet, trace thin clay lenses, trace organic silt. (0/70/30)	
80						
81						
82						
83						
84						
85						
86						
87						
88						
89	88.5-92.0	----	----------	----------	CL - Silty Clay, CL, Brown 7.5YR 4/3 and Dark Grayish Brown 10YR 4/2, med stiff to stiff, moist. (0/10/90)	
90						
91						
92	92.0-94.0	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, wet, trace thin clay lenses, trace organic silt. (0/60/40)	
93						
94		----	----------	----------	CL - Silty Clay, CL, Brown 7.5YR 4/3 and Dark Grayish Brown 10YR 4/2, med stiff to stiff, moist. (0/10/90)	
95						
96	95.5-97.5	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, wet, trace thin clay lenses, trace organic silt. (0/65/35)	
97						
98	97.5-105.5	----	----------	----------	SM - Fine grain silty clayey sand, SM, Brown 7.5YR 5/4, med dense, wet, trace orange staining, trace thin clay lenses. (0/65/35)	
99						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
100						
101						
102						
103						
104						
105						
	105.5-111.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6,	
106					moist, loose. (0/85/15)	
107						
108						
109						
110						
111	111.0-112.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Brown 7.5YR 5/4, med	
					dense, moist, trace orange staining, trace organic silt. (0/65/35)	
112	112.0-116.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace orange staining. (0/85/15)	
113						
114						
115						
116	116.0-119.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Brown 7.5YR 5/4, med	
					dense, moist to wet, trace thin clay lenses. (0/65/35)	
117						
118						
119	119.0-121.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6,	
					moist, loose. (0/85/15)	
120						
121	121.0-125.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Brown 7.5YR 5/4, med	
					dense, moist to wet, some iron-like platelettes (~1/16"	
122					thick). (0/65/35)	
123						
124						

CH2MHILL

PROJECT NUMBER 370585.DW.02 | BORING ID: MW-19 | Sheet 6 of 15

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
125	125.0-131.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Yellowish Brown 10YR 5/4, med dense, moist to wet, trace thin clay lenses. (0/70/30)	
131	131.0-135.	----	----------	----------	CL - Silty Sandy Clay, CL, Yellowish Brown 10YR 5/4, moist, med stiff, trace organic silt, trace orange staining. (0/85/15)	
135	135.0-141.	----	----------	----------	SM - Fine grain silty clayey sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace thin clay lenses	
141	141.0-143.	----	----------	----------	ML - Very fine sandy clayey silt, ML, Dark Yellowish Brown 10YR 4/4, dry, loose, with a large organic silt lense. (0/25/75)	"smokey" smell
143	143.0-151.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, wet, med dense, trace medium sand, trace cemented silt lenses, trace organic silt, trace orange staining. (0/80/20)	

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
150						
151	151.0-156.	----	----------	----------	ML - Sandy clayey silt, Reddish Brown 5YR 5/4, moist, med dense, thin clay laminations, trace orange staining, trace iron-like platelettes. (0/25/75)	
152						
153						
154						
155						
156	156.0-165.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace cemented lenses, trace orange staining, trace organic silt, trace thin lenses of sandy clayey silt. (0/75/25)	
157						
158						
159						
160						
161						
162						
163						
164						
165	165.0-177.	----	----------	----------	SM - Fine to medium grain silty sand, SM, Dark Yellowish Brown 10YR 4/4, moist, loose, trace coarse sand to fine gravel, trace thin silt/clay lenses. (0/85/15)	
166						
167						
168						
169						
170						
171						
172						
173						
174						

CH2MHILL

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
175						
176						
177	177.0-193.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4-4/6, trace cemented sand lenses, trace thin silt/clay lenses. (0/75/25)	
178						
179						
180						
181						
182						
183						
184						
185						
186						
187						
188						
189						
190						
191						
192						
193	193.0-204.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, loose, moist, with some sandy clayey silt lenses, trace cemented sand lenses. (0/70/30)	
194						
195						
196						
197						
198						
199						

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
200						
201						
202						
203						
204						
	204.5-213.	----	----------	----------	SM - Fine to medium sand, SM, Dark Yellowish Brown 10YR 4/6-4/4,	
205					moist, loose, trace coarse sand to fine gravel, trace	
206					organic silt. (0/85/15)	
207						
208						
209						
210						
211						
212						
213	213.0-227.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR	Cemented lenses are oxidized (orange in color)
214					4/4-4/6, moist, loose, trace thin silt/clay lenses, trace	
215					cemented sand lenses. (0/70/30)	
216						
217						
218						
219						
220						
221						
222						
223						
224						

CH2MHILL

PROJECT NUMBER 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
225						
226						
227	227.0-238.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace coarse sand/fine gravel, trace thin silt lenses, trace clay ooids from 237-238. (0/75/25)	
228						
229						
230						
231						
232						
233						
234						
235						
236						
237						
238						
239	238.5-241.	----	----------	----------	ML - Very fine grain sandy clayey silt, ML, Dark Grayish Brown 10YR 4/2, dry, very dense, trace cemented silt lenses. (0/30/70)	
240						
241	241.0-242.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose. (0/75/25)	
242	242.0-244.	----	----------	----------	ML - Very fine grain sandy clayey silt, ML, Dark Grayish Brown 10YR 4/2, dry, very dense, trace cemented silt lenses. (0/30/70)	
243						
244	244.0-247.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace cemented sand and silt lenses. (0/70/30)	
245						
246						
247	247.0-257.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, with trace silt, ML, (10YR 4/2) lenses. (0/70/30)	
248						
249						

CH2MHILL

PROJECT NUMBER 370585.DW.02 | BORING ID: **MW-19** | Sheet 11 of 15

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
250						
251						
252						
253						
254						
255						
256						
257	257.0-271.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/4-4/6, moist to dry, loose, trace cemented sand/silt lenses, trace thin silt/clay lenses, trace orange (Fe) staining. (0/65/35)	
258						
259						
260						
261						
262						
263						
264						
265						
266						
267						
268						
269						
270						
271	271.0-274.	----	----------	----------	ML - Sandy clayey silt, ML, Dark Grayish Brown 10YR 4/2, dry/moist, loose, with trace thin cemented sand lenses. (0/50/50)	
272						
273						
274	274.0-279.	----	----------	----------	SM - Very fine grain sand, SM, Dark Yellowish Brown 10YR 4/6,	

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
275					moist, loose, trace orange staining, trace thin clay lenses, trace cemented lenses. (0/75/25)	
276						
277						
278						
279	279.0-285.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace cemented sand lenses with laminated orange staining, trace thin silt lenses. (0/65/35)	
280						
281						
282						
283						
284						
285						
286	285.5-291.	----	----------	----------	SM - Very fine sand, SM, Dark Yellowish Brown 10YR 4/6, moist, loose, trace thin clay/silt lenses, trace thin cemented lenses. (0/70/30)	
287						
288						
289						
290						
291	291.0-305.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6, med dense, moist to wet, trace organic silt, trace thin cemented lenses. (0/75/25)	Beginning to become wet at 294'
292						
293						
294						
295						
296						
297						
298						
299						

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
300						
301						
302						
303						
304						
305	305.0-318.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, wet, trace to heavy orange and black (oxidized) staining, trace thin clay lenses, trace plant detritus/organic silt. (0/65/35)	Wet (Water Table) at 308.5'; becoming less wet (moist) at 316'
306						
307						
308						
309						
310						
311						
312						
313						
314						
315						
316						
317						
318						
	318.5-322.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Yellowish Brown 10YR 4/6-4/4, loose to med dense, moist, trace organic silt lenses, trace thin clay lenses. (0/75/25)	Wet again at ~322'
319						
320						
321						
322						
	322.5-327.	----	----------	----------	GM - Sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, moist to dry, loose, with some small cobbles. (35/45/20)	Moist from 322.5-324. Dry to 327.
323						
324						

CH2MHILL

PROJECT NUMBER 370585.DW.02 | BORING ID: **MW-19** | Sheet 14 of 15

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
325						
326						
327	327.0-335.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense, wet, trace thin clay lenses. (0/75/25)	Wet at 327'
328						
329						
330						
331						
332						
333						
334						
335	335.0-342.	----	----------	----------	GM - Sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, wet, loose, trace small cobbles. (50/35/15)	
336						
337						
338						
339						
340						
341						
342						
343	342.5-344.	----	----------	----------	GM - Sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, wet, loose, trace small cobbles. (20/60/20)	
344						
345	344.5-347.	----	----------	----------	GM - Sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, wet, loose, trace small cobbles. (50/40/10)	
346						
347	347.0-350.	----	----------	----------	GM - Silty fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, wet, loose, trace small cobbles, no sand. (90/0/10)	
348						
349						

CH2MHILL

PROJECT NUMBER: 370585.DW.02

BORING ID: **MW-19**

SOIL BORING LOG

PROJECT: WIWMD Deep Well Installation LOCATION:

ELEVATION: 4768.40 NORTHING: 286310.920 EASTING: 1882232.660 COORDINATE SYSTEM: NAD27 State Plane

DRILLING METHOD/EQUIPMENT USED: Rotosonic DRILLING CONTRACTOR: BOART LONGYEAR CO., PEORIA, AZ

DEPTH TO WATER: ~329 START: 4/9/2008 END: 4/14/2008 LOGGER: Aaron Cantrell

DEPTH BGS (ft)	INTERVAL (ft)	RECOVERY	TYPE-# (SS=Split Spoon ST=ShelbyTube)	STANDARD PENETRATION TEST RESULTS 6-6-6 (in) (N)	CORE DESCRIPTION: SOIL NAME (USCS GROUP SYMBOL), COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
350	350.0-353.	----	----------	----------	GM - Sandy fine to coarse gravel, GM, Dark Yellowish Brown 10YR 4/4, wet, loose, trace small cobbles. (60/30/10)	
351						
352						
353	353.0-357.	----	----------	----------	SM - Fine grain silty sand, SM, Dark Grayish Brown 10YR 4/2, med dense/loose, wet, trace clay lenses. (0/70/30)	
354						
355						
356						
357	357.0-	----	----------	----------	End of boring @ 357'	
358						

DATE	
STARTED:	12/18/10
COMPLETED:	12/18/10
BACKFILLED:	12/19/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: **MW-24**
Sheet 1 of 4

LOCATION
NORTHING 202,990.35 EASTING 103,754.36 ELEVATION 4,806.7 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4805	0				SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with thin roots in the upper 6 inches							
					ML		Sandy SILT - stiff, slightly moist, light brown, sand is fine-grained, silt is non-plastic, with some light iron staining throughout, occasional 1 inch lenses of Poorly Graded SAND (SP)							
4800	5						- @ 7 feet - 6 inch seam of moderately cemented material							
							- @ 9 feet - 3 inch seam of moderately cemented material							
	10				SP-SM		Poorly Graded SAND with silt - loose, slightly moist, light brown, sand is fine-grained, silt is non-plastic, with some light iron staining							
4795					ML		Sandy SILT - medium stiff, slightly moist, light brown, sand is fine-grained, silt is non-plastic, with occasional 1 to 2 inch lenses of moderately cemented material throughout, some light iron staining							
	15													
4790					CL-ML		Silty CLAY with sand - very stiff, slightly moist, light brown, sand is fine-grained, clay has low plasticity, moderately cemented, thinly laminated							
	20				SM		Silty SAND - medium dense, slightly moist, light brown, sand is fine-grained, silt is non-plastic, with occasional 1 to 2 inch lenses of Silty CLAY (CL-ML) throughout							
4785					CL-ML		Silty CLAY with sand - stiff, moist, brown to light brown, sand is fine-grained, clay has low plasticity, with frequent 1 to 2 inch lenses of brown Lean CLAY (CL), some organics throughout, weakly cemented							
	25						- @ 27 feet - very moist, decreasing sand, thinly laminated							
4780														
	30													
4775							- @ 34 feet - increasing sand, located in ½-inch seams throughout							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: '

Plate 3a

DATE	
STARTED:	12/18/10
COMPLETED:	12/18/10
BACKFILLED:	12/19/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep: JSS
Drilling Co.: Boart Longyear
Drill Rig: Sonic PC 300
Boring Type/Dia.: Sonic Borehole/8in.
Hammer Type: N/A

BORING NO: MW-24
Sheet 2 of 4

LOCATION
NORTHING 202,990.35 EASTING 103,754.36 ELEVATION 4,806.7 (feet)

DEPTH ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4770														
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic, with some light iron staining							
	40													
4765					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic							
					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with occasional 2 inch lenses of SILT (ML) throughout, some light iron staining							
	45													
4760					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with occasional ½- to 1-inch lenses of SILT (ML) throughout							
					SP		Poorly Graded SAND - medium dense, moist, light brown, sand is fine-grained, with some light iron staining							
	50													
4755					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic occasional ½- to 1-inches lenses of SILT (ML), with some light iron staining							
					SC-SM		Silty Clayey SAND - medium dense, moist, brown, sand is fine-grained, clay has low plasticity							
	55				CL		Sandy Lean CLAY - medium stiff, moist, brown to red-brown, sand is fine-grained, clay has low plasticity, with frequent ½-inch seams of Poorly Graded SAND (SP) throughout							
4750					SC-SM		Silty Clayey SAND - medium dense, moist, brown, sand is fine-grained, clay has low to no plasticity, with some iron staining throughout, occasional 1 to 2 inch seams of SILT (ML) throughout, some dark organics, thinly laminated							
	60						- @ 62 feet - 6 inch seam of Sandy Lean CLAY (CL)							
4745					SM		Silty SAND - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with frequent ½- to 1-inch lenses of SILT (ML) throughout, thick iron staining							
	65													
4740					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic							
					SM									

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: '

Plate 3b

DATE	
STARTED:	12/18/10
COMPLETED:	12/18/10
BACKFILLED:	12/19/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-24**

LOCATION
NORTHING 202,990.35 EASTING 103,754.36 ELEVATION 4,806.7 (feet)

ELEVATION	DEPTH FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4735					SP-SM		Silty SAND - medium dense, miost, brown, sand is fine-grained, silt is non-plastic							
							Poorly Graded SAND with silt - medium dense, moist, light brown, sand is fine-grained, silt is non-plastic							
	75				ML		Sandy SILT - medium stiff, moist, brown, sand is fine-grained, silt is non-plastic, contains frequent 1 inch lenses of Poorly Graded SAND (SP), with thick iron staining, thinly laminated							
4730					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with some light iron staining, occasional 1 to 2 inch lenses of SILT (ML) throughout							
	80				ML		Sandy SILT - medium stiff, moist, brown, sand is fine-grained, silt is non-plastic, with some iron staining, thinly laminated							
4725					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with some light iron staining							
	85						- @ 87 feet - occasional ½-inch seams of Silty SAND (SM) throughout							
4720							- @ 88 feet - very moist							
					SM		Silty SAND - medium dense, wet, brown, sand is fine-grained, silt is non-plastic							
	90				SP		Poorly Graded SAND - medium dense, wet, brown, sand is fine-grained, with some iron staining							
4715					SP-SM		Poorly Graded SAND with silt - medium dense, moist, brown, sand is fine-grained, silt is non-plastic, with thick iron staining throughout							
	95						- @ 97½ feet - with frequent 1 inch lenses of Silty CLAY (CL-ML)							
4710														
	100				SM		Silty SAND - medium dense, very moist to wet, brown, sand is fine-grained, silt is non-plastic							
4705														

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL ▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: '

Plate 3c

DATE	
STARTED:	12/18/10
COMPLETED:	12/18/10
BACKFILLED:	12/19/10

Geotechnical Investigation
Wasatch Intigrated
Highway 193
Layton Utah
IGES Project Number: 00169-065

IGES Rep:	JSS
Drilling Co.:	Boart Longyear
Drill Rig:	Sonic PC 300
Boring Type/Dia.:	Sonic Borehole/8in.
Hammer Type:	N/A

BORING NO: **MW-24**
Sheet 4 of 4

LOCATION
NORTHING 202,990.35 EASTING 103,754.36 ELEVATION 4,806.7 (feet)

ELEVATION	FEET	SAMPLES	RECOVERY (in.)	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	WELL LOG AND WATER LEVEL	MATERIAL DESCRIPTION	N	(N1)60	Percent minus 200	Dry Density(pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index
4700					SP		Poorly Graded SAND - medium dense, very moist to wet, brown, sand is fine-grained							
					SP-SM		Poorly Graded SAND with silt - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, with some iron staining throughout, thinly laminated							
	110						- @ 110 feet - brown to grey, with some dark organics throughout							
4695					SC-SM		Silty Clayey SAND - medium dense, wet, brown, sand is fine-grained, clay has low to no plasticity, thinly laminated							
					SP-SM		Poorly Graded SAND with silt - medium dense, moist to very moist, brown, sand is fine-grained, with frequent 1 inch lenses of SILT (ML) throughout							
	115						- @ 116 feet - 3 inch lens of SILT (ML)							
4690					SM		Silty SAND - medium dense, wet, brown, sand is fine-grained, silt is non-plastic, thinly laminated							
					SC-SM		Silty Clayey SAND - medium dense, moist, brown, sand is fine-grained, clay has low to no plasticity, thinly laminated, with some light iron staining							
	120						Bottom of Boring @ 120 Feet							

N - OBSERVED BLOW COUNT PER 6-INCHES

BORING LOG

IGES

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- Modified California Sampler
- Sample from Auger Cuttings

Top Pipe Cap | Cuttings (around pipe) | Bentonite (below pipe) | Grout | Bentonite | 10-20 Silica Sand | 10 Slot Screen | Bottom Pipe Cap

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Notes: Top of Casing: '

Plate 3d

Form 113—5M—11-60

Examined 12-22-65 V.F.O.
Recorded: B. 12-22-65 V.F.O. T. B. V.F.O.
Inspection Sheet 12-22-65 B.M.
Copies 12-22-65 V.F.O.

31-2987

REPORT OF WELL DRILLER

STATE OF UTAH

Application No. 37897
Claim No.
Coordinate No. (B-4-1)3-32d

GENERAL STATEMENT: Report of well driller is hereby made and filed with the State Engineer, in accordance with the laws of Utah. (This report shall be filed with the State Engineer within 30 days after the completion or abandonment of the well. Failure to file such reports constitutes a misdemeanor.)

(1) WELL OWNER:

Name [illegible]
Address [illegible]

(2) LOCATION OF WELL:

County Box Elder Ground Water Basin (leave blank)

North 840 feet East 150 feet from [illegible] Corner
South West

of Section 3, T. 4 N, R. 1 W, SLBM (strike out words not needed)

(3) NATURE OF WORK (check):

New Well ☒ Replacement Well ☐ Deepening ☐ Repair ☐ Abandon ☐

If abandonment, describe material and procedure:

(4) NATURE OF USE (check):

Domestic ☐ Industrial ☐ Municipal ☐ Stockwater ☐
Irrigation ☐ Mining ☐ Other ☐ Test Well ☐

(5) TYPE OF CONSTRUCTION (check):

Rotary ☒ Dug ☐ Jetted ☐
Cable ☐ Driven ☐ Bored ☐

(6) CASING SCHEDULE: Threaded ☐ Welded ☒

" Diam. from feet to feet Gage
" Diam. from feet to feet Gage
" Diam. from feet to feet Gage

New ☒ Reject ☐ Used ☐

(7) PERFORATIONS: Perforated? Yes ☒ No ☐

Type of perforator used
Size of perforations inches by inches
5 perforations from 526 feet to 544 feet
perforations from feet to feet
perforations from feet to feet
perforations from feet to feet
perforations from feet to feet

(8) SCREENS: Well screen installed? Yes ☐ No ☒

Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to
Diam. Slot size Set from ft. to

(9) CONSTRUCTION:

Was well gravel packed? Yes ☐ No ☒ Size of gravel:
Gravel placed from feet to feet
Was a surface seal provided? Yes ☐ No ☒
To what depth? feet
Material used in seal:
Did any strata contain unusable water? Yes ☐ No ☒
Type of water: Depth of strata
Method of sealing strata off:

Was surface casing used? Yes ☐ No ☒
Was it cemented in place? Yes ☐ No ☒

(10) WATER LEVELS:

Static level 418 feet below land surface Date Dec. 6-65
Artesian pressure feet above land surface Date

LOG RECEIVED: 12-22-65 V.F.O.

(11) FLOWING WELL:

Controlled by (check) Valve ☐
Cap ☐ Plug ☐ No Control ☐
Does well leak around casing? Yes ☐ No ☐

(12) WELL TESTS:

Drawdown is the distance in feet the water level is lowered below static level.

Was a pump test made? Yes ☐ No ☐ If so, by whom?
Yield: gal./min. with feet drawdown after hours
Bailer test 40 gal./min. with 135 feet drawdown after hours
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? No ☒ Yes ☐

(13) WELL LOG:

Diameter of well 6 inches
Depth drilled 544 feet. Depth of completed well 544 feet.

NOTE: Place an "X" in the space or combination of spaces needed to designate the material or combination of materials encountered in each depth interval. Under REMARKS make any desirable notes as to occurrence of water and the color, size, nature, etc., of material encountered in each depth interval. Use additional sheet if needed.

Depth From	Depth To	Clay	Silt	Sand	Gravel	Cobbles	Boulders	Hardpan	Conglomerate	Bedrock	Other	REMARKS
0	15			X								fine
15	[illegible]	X										
[illegible]	[illegible]			X								fine
[illegible]	45	X										
[illegible]	[illegible]			X								
[illegible]	92	X										
92	[illegible]			X								fine
[illegible]	120	X										
[illegible]	[illegible]							X				
[illegible]	[illegible]			X								
[illegible]	[illegible]	X						X				
[illegible]	[illegible]							X				
[illegible]	[illegible]			X & Stone								
[illegible]	[illegible]											sandy shale
[illegible]	[illegible]	X						X				
[illegible]	[illegible]								X			
427	[illegible]	X										[illegible]
[illegible]	[illegible]			X								
[illegible]	[illegible]	X										
505	[illegible]	X		X								
[illegible]	544											rock

Work started 26 July, 1965 Completed 18 Dec, 1965

(14) PUMP:

Manufacturer's Name [illegible]
Type: Submergable H. P. 5
Depth to pump or bowles 400 feet

Well Driller's Statement:

This well was drilled under my supervision, and this report is true to the best of my knowledge and belief.

Name [illegible] (Person, firm, or corporation) (Type or print)
Address [illegible]
(Signed) [illegible] (Well Driller)
License No. [illegible] Date [illegible], 19[illegible]

USE OTHER SIDE FOR ADDITIONAL REMARKS

STRATA DATA INC.

NATURAL GAMMA/ NEUTRON LOG

FILE NO. 51520

COMPANY: EMCON ASSOCIATES

WELL: NDRD

FIELD: NORTH DAVIS REFUSE DISPOSAL SITE

COUNTY: DAVIS STATE: UTAH

LOCATION:

SEC: TWP: RGE:

OTHER LOGS: NONE

PERMANENT DATUM: TOP OF CASING

ELEVATION:

LOG MEASURED FROM: TOP OF CASING

RUN NO.	ONE			
DATE:	08/24/89			
DRILLER :				
DEPTH of BIT DIA.				
DEPTH of BIT DIA.				
CASING DPTH/SIZE	6" STEEL			
CASING DPTH/SIZE				
LOGGER :				
DEPTH	532'			
CASING DEPTH	532'			
BOT LOG INTERVAL	532'			
TOP LOG INTERVAL	0'			
TYPE FLUID IN HOLE	WATER			
Rm at TEMP	N/A			
SAMPLE SOURCE	N/A			
FLUID LEVEL	N/A			
TIME SI' CIRC.	N/A			
RECORD.	McDONALD WEIKEL			

LOGGING DATA

FUNCTION	RUN NO.	EQUIPMENT MODEL	EQUIPMENT PROBE S.N.	EQUIPMENT UPHOLE S.N.	LOGGING DIG INT FEET	LOGGING SPEED FT./MIN	DETECTOR TYPE	SPACING Tx—Rx FEET	SPACING Rx—Rx FEET	SOURCE TYPE	SOURCE SIZE CURIE	LOGGED INTERVAL FROM	LOGGED INTERVAL TO	LOGGED INTERVAL INT. FEET
Gamma	One	9258	27A20	105	0.5	20	Scint.	N/A	N/A	N/A	N/A	532	0	532
Neutron	One	9250	27USA13	105	0.5	20	Prop.	12 in.	N/A	AmBe	3.0	532	0	532

CALIBRATION FACTOR(S): Shop API Calibration.

DIGITAL FILE NAME(S): NDRD.LOG

REMARKS:

The Neutron log was recorded on a ... ate run.

DATE DRILLED	6-4-94
LOGGED BY	TO
REFERENCE ELEVATION	Not Determined
DRILL RIG	CME 4000
BOREHOLE DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	LITHOLOGY / WELL CONSTRUCTION
Silty fine SAND, damp Clayey SILT lenses	reddish brown	medium dense	SM	0–12	X				CEMENT 2-in SCHEDULE 40 PVC BLANK
Silty CLAY, damp	brown	stiff	CL	14–24	X X				CEMENT/BENTONITE GROUT
Clayey SILT, little Sand, damp	brown	stiff	ML	26–40	X				

(continued)

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES, THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: GW-EAST (1 OF 5)

DATE DRILLED	8 - 1 - 94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	CME 75
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Silty CLAY, little Sand, damp	olive	firm	CL	40 42 44 46 48	X				2" ø SCHEDULE 40 PVC BLANK; CEMENT BENTONITE GROUT
Silty fine SAND, damp	brown	medium dense	SM	50 52 54 56 58 60 62 64	X X				
Poorly graded fine SAND, little Silt, damp	brown	medium dense	SP	66 68 70 72 74 76 78 80	X X				

continued

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WELL LOG

WASATCH ENVIRONMENTAL, INC.

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: OW-EAST 2 OF 6

DATE DRILLED	8 - 2 - 94
LOGGED BY	CG
REFERENCE ELEVATION	Not Determined
DRILL RIG	CME 4000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	INSTALLED WELL CONSTRUCTION
Poorly graded fine SAND, little Silt, damp	brown	medium dense	SP	82					2-in SCHEDULE 40 PVC BLANK
				84					
				86					
				88					CEMENT-BENTONITE GROUT
(damp/dry)				90	X				
				92					
				94					
				96					
				98					
				100	X				
				102					
				104					
				106					
				108					
				110	X				
				112					
				114					
				116					
				118					
(continued)				120	X				

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: DW-EAST 6 OF 6

DATE DRILLED	[illegible]
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT
Poorly graded fine SAND, damp	brown	medium dense	SP					
				122				
				124				
				126				
				128				
				130	*			
				132				
				134				
				136				
				138				
				140				
				142				
				144				
(dry density @ 146 feet = 108.5 pounds per cubic foot)				146	X	40		21.4%
						29		21.8%
				148				
(wet)								
(five-gallon bucket sample collected @ 150 feet depth)				150				
				152				
				154				
				156				
(continued)				158				
				160				

WELL CONSTRUCTION

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: OW-EAST

DATE DRILLED	4-1-21
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	AP 1200
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Poorly graded fine SAND, wet	reddish brown	medium dense	SP	160					16/40 COLORADO SILICA SAND; 2" ID SCHEDULE 40 PVC 0.01" SLOTTED SCREEN
				164					
BOTTOM OF WELL @ 165 FEET				166					

— - Indicates Standard Penetration Drive Sampler

× - Indicates Grab Sample

⊻ - Indicates California Drive Sampler

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WELL LOG

WASATCH ENVIRONMENTAL, INC.

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: DW-EAST 5 OF 5

DATE DRILLED	5-5-94
LOGGED BY	TG
BOREHOLE ELEVATION	Not Determined
DRILL RIG	CME 4000
BORING DIAMETER	12 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE
Silty fine SAND, damp	reddish brown	medium dense	SM
Clayey SILT, damp	brown	firm	ML
Silty CLAY, damp	brown, black mottling	stiff	CL
Clayey SILT, little Sand, damp	brown	firm	ML
Silty CLAY, damp (continued)	brown/ yellowish brown	stiff	CL

DESCRIPTION AND CLASSIFICATION

DEPTH (FEET)

SAMPLER

BLOWS/FOOT

OVM (ppm)

WATER CONTENT

LOCATIONS

WELL CONSTRUCTION

2-in SCHEDULE 40 PVC BLANK

CEMENT/ BENTONITE GROUT

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: GW-SOUTH 1 OF 5

DATE DRILLED	5-5-94
LOGGED BY	TC
REFERENCE ELEVATION	Not Determined
DRILL RIG	CME 750
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Silty CLAY, damp	brown	stiff	CL	42 44 46					2-in SCHEDULE 40 PVC BLANK
Poorly graded SAND, little Silt, damp	brown	medium dense	SM	48 50 52 54 56 58	X				CEMENT/ BENTONITE GROUT
Silty Clay observed in cuttings				60 62 64 66 68 70 72 74 76 78	X				
(continued)				80	X				

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

WELL LOG

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: GW-SOUTH-2 2 OF 5

DATE DRILLED	5-6-94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	CME 75
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	USCS SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Poorly graded fine SAND, little Silt, damp	brown	medium dense	SP	80					
				82					
				84					
				86					
				88					6-in SCHEDULE 40 PVC BLANK
(dry				90	X				
				92					
				94					
				96					
				98					CEMENT/ BENTONITE GROUT
(damp				100	X				
				102					
				104					
				106					
				108					
				110	X				
				112					
				114					
				116					
				118					
(continued)				120	X				

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WELL LOG

WASATCH ENVIRONMENTAL, INC.

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: DW-SOUTH 3 OF 5

DATE DRILLED	5-4-94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	CP 1200
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLES	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	1150-4.GS4 WELL CONSTRUCTION
Poorly graded fine SAND, little Silt, damp	brown	medium dense	SM	122					CEMENT/BENTONITE GROUT
				124					
				126					2-in SCHEDULE 40 PVC BLANK
				128					
				130	X				BENTONITE
				132					
Silty Clay observed in cuttings, moist				134					
				136					
				138					2-in SCHEDULE 40 PVC 0.01" SLOTTED SCREEN
Silty Clay @ 140 feet to 140.8 feet, wet @ 140.6 feet				140		107			10/20 COLORADO SILICA SAND
				142		14			
				144					
				146					
				148					
				150	X				
				152					
				154					
				156					
Silty Sand and Silty Clay observed in cuttings @ 160 feet				158					
				160	X				

(continued)

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES, THE TRANSITION MAY BE GRADUAL

WELL LOG

WASATCH ENVIRONMENTAL, INC.

DAVIS COUNTY LANDFILL

PROJECT #: 1150-4 WELL #: DW-SOUTH 4 OF 5

11504056

DATE DRILLED	8-5-94
LOGGED BY	TG
REFERENCE ELEVATION	Not Determined
DRILL RIG	[illegible] 1000
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT	WELL CONSTRUCTION
Poorly graded SAND, little Silt, wet	brown	medium dense	SP	162 164					SCHEDULE 40 PVC 0.01" SLOTTED SCREEN 60/40 COLORADO SILICA SAND
BOTTOM OF WELL @ 165 FEET				166					

— Indicates Standard Penetration Drive Sampler

x - Indicates Grab Sample

⧖ - Indicates California Drive Sampler

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WELL LOG

WASATCH ENVIRONMENTAL, INC.

DAVIS COUNTY LANDFILL

PROJECT #: 1160-4 WELL #: OW-SOUTH 6 OF 6

DATE DRILLED	[illegible] 94
LOGGED BY	TG
SURFACE ELEVATION	Not Determined
DRILL RIG	[illegible] 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	PID (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (TSF)
Silty fine SAND, damp	reddish brown	dense/ medium dense	SM	0						
				2						
				4						
				6	X					
				8						
	brown			10		40		18.9	98.9	
	light brown			12						
				14	X					
				16						
Sandy SILT, damp	brown	very stiff	ML	18						
				20		29		4.6		
(61.7% passing No. 200)				22						
				24						
				26	X					
				28						
	brown/ reddish brown			30		40		4.5	90.1	
				32						
	brown			34						
				36	X					
(continued)				38						
				40						

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: SB-NORTH [illegible]

DATE DRILLED	5-9-94
LOGGED BY	TG
SURFACE ELEVATION	Not Determined
DRILL RIG	AR 1000
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	1150-SM2 WATER CONTENT (%)	1150-SM2 DRY DENSITY (PCF)	1150-SM2 SHEAR STRENGTH (KSF)
Sandy SILT, damp (66.2% passing No. 200)	brown	very stiff	ML	40 42 44 46	X	34		9.1		
Silty CLAY, moist (LL = 59%, PI = 29%)	reddish brown	stiff	CL	48 50	X	68		30.9	94.7	
Poorly graded fine SAND, little Silt, damp	brown	dense	SP	50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80	X X X X	94 61		20.5 8.0	94.6	

(continued)

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO. 1150-4 BORING NO. B-NORTH 1 OF 2

DATE DRILLED	[illegible]
LOGGED BY	RD
SURFACE ELEVATION	Not Determined
DRILL RIG	[illegible]
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
Poorly graded SAND, little Silt, damp	brown	dense	SP	82		38		10.3		
(thin interlayered Silty Clay lenses)	reddish brown			84	X					
(wet @ 88 feet)				88						
				90		40		22.1	100.3	
	reddish brown			94	X					
				98						
		medium dense		100		24		27.8		
BOTTOM OF BORING @101.5 FEET				102						

X - Indicates Grab Sample

[ ] - Indicates Standard Penetration Drive Sampler

[X] - Indicates California Drive Sampler (2-1/2 Inch I.D.)

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES, THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO. 1150-4 BORING NO. SB-NORTH [illegible]

DATE DRILLED	6-1-94
LOGGED BY	TG
SURFACE ELEVATION	Not Determined
DRILL RIG	CME 75
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL CLASS	DEPTH (FEET)	SAMPLES	BLOWS/FOOT	PID (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
Silty fine SAND, damp	brown	dense	SM	0						
(Silty Clay observed in cuttings @ 5 feet)	light brown			4						
						52		6.0	94.2	
		medium dense		8		24		15.2		
Poorly graded fine SAND, little Silt, damp Silty Clay lenses	brown	medium dense	SP	30		23		22.4	98.4	
Silty fine SAND, damp and Silty CLAY	brown	medium dense	SM CL	34						
(continued)				38						
				40						

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES; THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO. 1151-4 BORING NO. SB-MW1 SHEET

DATE DRILLED	[illegible] 94								[illegible]504SS2	
LOGGED BY	[illegible]									
SURFACE ELEVATION	Not Determined									
DRILL RIG	AP 1000									
BORING DIAMETER	10 Inches									
DEPTH TO GROUNDWATER	Not Determined									

DESCRIPTION AND CLASSIFICATION										
DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
Sandy SILT, damp	brown	stiff	ML			16		9.8		
				42						
				44						
					X					
				46						
				48						
				50						
(silty Clay observed in tip of split-spoon)					X	50		8.1	90.7	
				52						
(little Silty Clay observed)				54						
					X					
				56						
				58						
				60						
						25		10.3		
				62						
				64						
				66						
				68						
				70	X					
				72						
				74						
				76						
(continued)				78						
				80	X					

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL.

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1150-4 BORING NO.: [illegible] [illegible] OF [illegible]

DATE DRILLED	[illegible]
LOGGED BY	RD
SURFACE ELEVATION	Not Determined
DRILL RIG	[illegible]
BORING DIAMETER	10 inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR	STRENGTH (TSF) UNCONFINED COMP.
Silty fine SAND, damp	brown	medium dense	SM	0							
				5	X						
(very moist)				10	X						
(wet @ 105 feet)				15	X						
(continued)				20	X						

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES; THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO.: 1161-4 BORING NO.: SB-[illegible] OF [illegible]

DATE DRILLED	[illegible]
LOGGED BY	TG
SURFACE ELEVATION	Not Determined
DRILL RIG	[illegible]
BORING DIAMETER	10 Inches
DEPTH TO GROUNDWATER	Not Determined

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL CLASS.	DEPTH (FEET)	SAMPLER	BLOWS/FOOT	OVM (ppm)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
Silty fine SAND, wet	brown	medium dense	SM	122						
				124						
	dark brown/ gray			128	X					
				130	X					
Silty CLAY, Clayey SILT, moist, low plasticity	dark brown		CL/ ML	132						
				134						
Sandy SILT, trace Clay, moist	dark brown	very stiff	ML	136	X	41		19.5	107.8	
BOTTOM OF BORING @ 136 FEET				138						

— – Indicates Standard Penetration Drive Sampler

x – Indicates Grab Sample

– Indicates California Drive Sampler (2 1/2 Inch O.D.)

NOTE: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN MATERIAL TYPES. THE TRANSITION MAY BE GRADUAL

WASATCH ENVIRONMENTAL, INC.

EXPLORATORY BORING LOG

DAVIS COUNTY LANDFILL

PROJECT NO: 1160-4 BORING NO: SB-SOUTH-4 [illegible]

(based on data provided by Davis County Health Dept.)

WELL #3 CONSTRUCTION

	Slot Size	Gravel Pack
0-49' Solid PVC		
19-64' PVC	.030	
64-70' Solid PVC w/end cap no water encountered		12/40

(based on data provided by Davis County Health Dept.)

SOIL LOG WELL #3

5'	sand with gravel to 17.5, slight color change
19'	less gravel noted, slight color change to
23'	thin clay lens, sand with gravel to
35'	thin clay lens, sand with gravel to
43'	6" clay layer; samples taken at 5' intervals, but not logged after 43' to 74'

(based on data provided by Davis County Health Dept.)

WELL #4 CONSTRUCTION

	Slot Size	Gravel Pack
0-35' Solid PVC		
35-50' Slotted PVC Screen	.030	
50-60' Solid PVC w/end cap no water encountered		12/40

(based on data provided by Davis County Health Dept.)

SOIL LOG WELL #4

Collected at 5' intervals, but were not logged.

APPENDIX C

Sample Documentation Forms

Wasatch Integrated Waste Management
Groundwater Monitoring Data Sheet

Date: _____ Well ID/Sampling Location: _____

Project Number: _____ Time of Arrival at Well: _____

Owner: _____ Air Temperature: _____

Site Description: _____

Weather Conditions: _____

Sampled By: _____

Sampling Equipment: _____

_____

Depth to Well Bottom (ft): _____ Time Pump On: _____

Depth to Groundwater (ft): Presampling: _____ Time Pump Off: _____

Postsampling: _____ Purge Volume (gal): _____

Purge Flow Rate (L/min): _____

Sample Flow Rate (L/min): _____

Well in good condition?	Y	N
Was box secured upon arrival?	Y	N
Is well operating correctly?	Y	N

Explain any problems that may exist:

_____

_____

_____

Time	pH	Spec. Conductivity/Corrected	Temp
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Receiving Laboratory: _____ Date Received: _____

Comments:

_____

_____

_____

Sampler's Initials: _____

Client_____

Address_____

_____
City State Zip

Phone_____ Fax_____

Contact_____

E-mail_____

Project Name_____

Project Number/P.O.#_____

Sampler Name_____

CHAIN OF CUSTODY

(801) 263-8686
(888) 263-8686
Fax (801) 263-8687
Email:awal@awal-labs.com

Lab Sample Set # _____

Page _____ of _____

Turn Around Time (Circle One)

1 day 2 day 3 day 4 day 5 day Standard

Sample ID	Date/Time Collected	Matrix	Number of Containers (Total)											COMMENTS

QC LEVEL

1 2 2+

3 3+ 4

Relinquished By: *Signature*	Date	Received By: *Signature*
PRINT NAME	Time	PRINT NAME
Relinquished By: *Signature*	Date	Received By: *Signature*
PRINT NAME	Time	PRINT NAME
Relinquished By: *Signature*	Date	Received By: *Signature*
PRINT NAME	Time	PRINT NAME
Relinquished By: *Signature*	Date	Received By: *Signature*
PRINT NAME	Time	PRINT NAME

Special Instructions:

LABORATORY USE ONLY

SAMPLES WERE:

1 Shipped or hand delivered
Notes:

2 Ambient or Chilled
Notes:

3 Temperature _____

4 Received Broken/Leaking (Improperly Sealed)
Y N
Notes:

5 Properly Preserved
Y N
Notes:

6 Received Within Holding Times
Y N
Notes:

COC Tape Was:

1 Present on Outer Package
Y N NA

2 Unbroken on Outer Package
Y N NA

3 Present on Sample
Y N NA

4 Unbroken on Sample
Y N NA
Notes:

Discrepancies Between Sample Labels and COC Record?
Y N
Notes:

Attachment #4
Landfill Gas Monitoring Plan

EXPLOSIVE LANDFILL GAS MONITORING PLAN FOR THE DAVIS LANDFILL

Prepared For:

WASATCH INTEGRATED WASTE MANAGEMENT DISTRICT
P.O. Box 900
1997 East 3500 North
Layton, UT 84041-0900

Prepared By:

INTERMOUNTAIN GEOENVIRONMENTAL SERVICES, INC.
4153 South Commerce Drive
Salt Lake City, Utah 84107

April 16, 2015

INTRODUCTION

This document presents a revised Explosive Landfill Gas Monitoring Plan (Plan) for the Davis Landfill (Landfill), currently owned and operated by Wasatch Integrated Waste Management District (WIWMD). Since the preparation and submittal of the previous plan in August 1997 additional facility construction and well installation have taken place at the Landfill. The intent of this revised plan is to formalize the required monitoring of new structures and include the new wells/well locations into quarterly monitoring efforts. This plan was written to satisfy the requirements of R315-303-2(2) and R315-303-3(5) of the Utah Division of Solid and Hazardous Waste (DSHW) Permitting and Management Rules which sets maximum allowable methane concentrations as summarized in the following table, and requires quarterly sampling.

MAXIMUM ALLOWABLE METHANE CONCENTRATIONS		
Location	**Media**	**Allowable Concentration**
Property Boundary	Soil Gas	Lower Explosive Limit
Within On-site Structures	Ambient Air	25% of Lower Explosive Limit
Off-site Structures	Ambient Air	Lower Explosive Limit

Below the explosive or flammable range the mixture is too lean to burn and above the upper explosive or flammable limit the mixture is too rich (oxygen deficient) to burn. The limits are commonly called the "Lower Explosive or Flammable Limit" (LEL/LFL) and the "Upper Explosive or Flammable Limit" (UEL/UFL). The LEL for methane is recognized as 5% (50,000 ppm).

METHODOLOGY

This Plan addressed two types of methane gas monitoring for determination of compliance status: (1) sampling at permanent gas monitor probes located along the property boundaries, and (2) ambient air sampling within onsite structures. Bothe types of monitoring will provide data for determination of compliance with the Rules. Methods to be used in each type for sample collection are described below.

Sampling Equipment

A Landtec model Gem-2000® gas analyzer (or equivalent technology) will be used for collection and analysis of gas samples from landfill gas monitor probes and onsite structures. The instrument shall be properly maintained and calibrated before each sampling event, and a record of instrument calibration(s) and maintenance shall be available upon request.

Gas Monitor Probe Sampling

Gas monitor probes will be sampled to determine methane concentrations in the soils along the west, south and northeast boundaries of the Landfill. Each probe will be sampled during every quarterly sampling event. If for some reason a probe cannot be

sampled, the sampler will document the reason on the field form, and appropriate action will be taken to rectify the problem prior to the next sampling event. The following procedure will be followed by the sampler:

- The locking cap will be removed and the condition of the probe and surface completion will be noted on an Explosive Landfill Gas Sampling Form (Exhibit 1).
- Soil gas will be withdrawn from the probe and analyzed directly using the Landtec Gem-2000® gas analyzer. Data to be recorded on the field sampling form includes:
    1) Methane content, expressed in percentage by volume, and as a percentage of the LEL
    2) Oxygen content expressed as percentage by volume, and
    3) Carbon dioxide content, expressed as percentage by volume.

Instrument readings will be allowed to stabilize over a period of 1 to 5 minutes; maximum and stabilized readings will be recorded.

Structure Sampling

Methane concentration in ambient air within structures will be sampled to determine compliance with the Rules, as follows:

- Ambient air within the structures will be collected and analyzed directly using the Landtec Gem-2000® model gas analyzer. Ambient air will be sampled by moving slowly throughout the structure over a 1-5 minute period, carefully sampling all spaces within the structure. Because the office/maintenance facility is large, it will be broken into smaller sampling regions which will each be sampled over a 1-5 minute period.

- Instrument readings will be continuously monitored. Methane, oxygen and carbon dioxide content will be recorded on an Explosive Landfill Gas Sampling Form. Stabilized readings will be recorded on the Form.

SAMPLE LOCATIONS

Gas Monitor Wells

Monitoring wells have been installed at 12 different locations around the site; the names and installed depths of each probe are shown in the following table:

Sample Location	Installed Depth (ft)
MW-1	150
MW-4	150
G-2	20
G-7	40
G-7	60
G-7	100
G-6	30
G-6	60
G-6	90
G-8	80
G-9	80
G-10	80

The locations of these probes are shown on Figure 1 – Explosive Landfill Gas Monitoring Locations. A diagram of the typical gas monitor probe completions are included in Figures 2a-2c.

Structure Sampling

Currently there are three structures located on the site: the scale house, the Recycling Center, and the office/maintenance facility. The scale house facility is approximately 4,800 ft^2 in size and ambient air sampling will occur over a single 1-5 minute period.

The Recycling Center is a single story structure that is approximately 6,500 ft^2. Complete sampling of the structure can be completed in a single 1-5 minute sampling period.

The office/shop facility is a single story structure with interior walls which divide the building into hallways, restrooms, locker rooms and the equipment maintenance shop. The sampling of this facility will be split up in two areas; office and shop. Both areas will be sampled at different locations in-order to make a complete assessment. The total building footprint occupies ~14,700 ft^2 and complete sampling of the structure can be completed in a single 1-5 minute sampling period.

There are currently no off-site structures considered appropriate for ambient air sampling. If methane is detected in the perimeter samples, adjacent off-site structures may be monitored as deemed necessary.

SAMPLING SCHEDULE

Explosive landfill gas monitoring will be conducted quarterly as set forth in R315-303-3-(5)(a) of the Rules. A report of the explosive landfill gas monitoring results will be kept onsite in the operating record and submitted to the DSHW in the annual report.

In the event that the concentration of gases exceeds the standards set in subsection R315-303-2(2)(a) Wasatch will first take all necessary steps to ensure protection of human health and, within 24 hours or the next business day, notify the Executive Secretary.

In the event that explosive landfill gas is detected above the allowable levels Wasatch will proceed in accordance to R315-303-3(5)(b). Wasatch will also enter a period of accelerated sampling to determine the daily variation in methane concentration. The accelerated sampling period will consist of two sampling events each day for a period of 5 days, with samples collected in the morning and in the later afternoon. Subsequent sampling events will be performed during the time of day identified with generation of maximum methane concentrations.

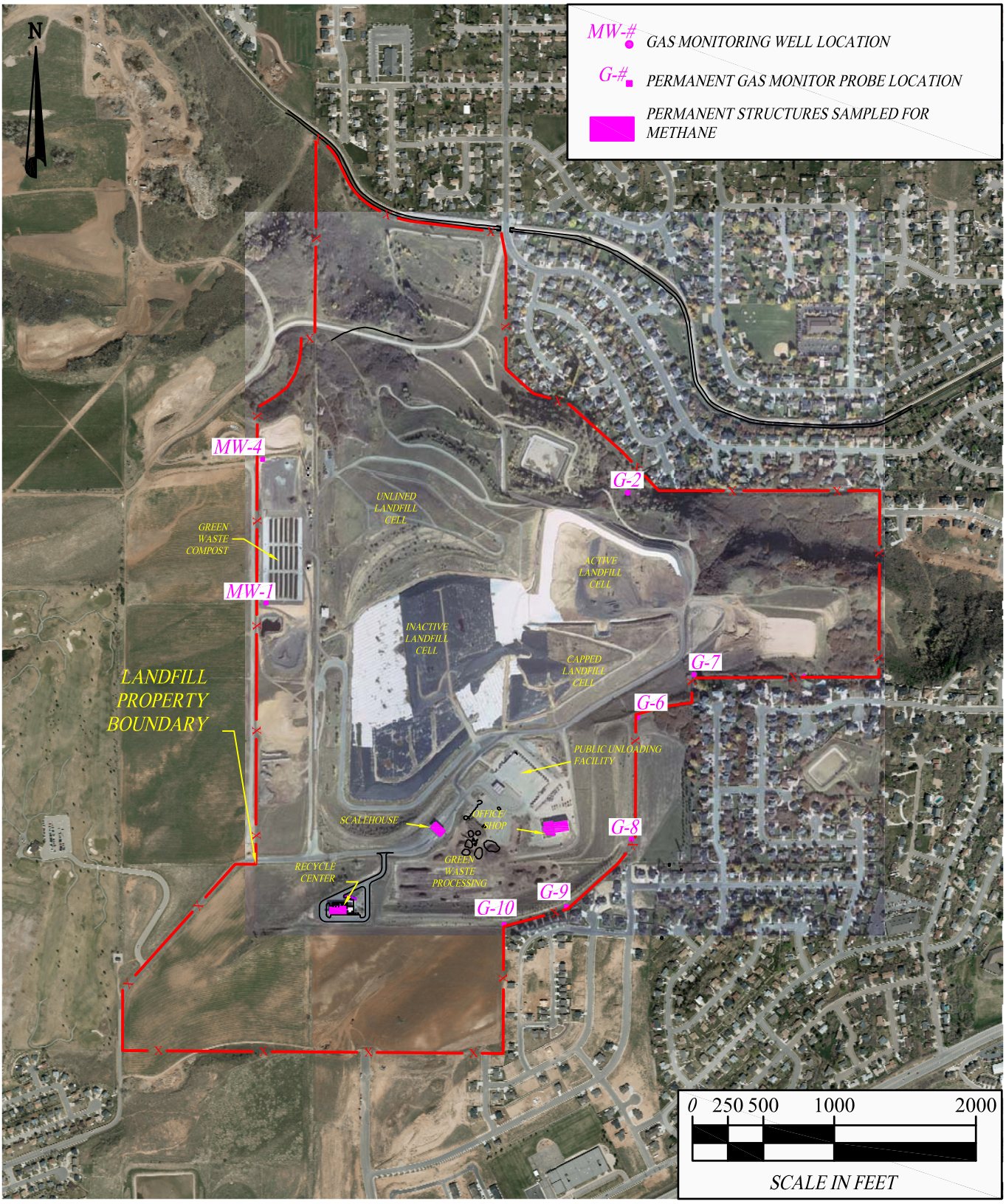
QUALITY ASSURANCE/QUALITY CONTROL

Prior to each sampling event the gas analyzer will be calibrated and a clean particulate filter will be installed. A record of instrument calibration and maintenance will be kept and made available upon request.

Exhibit 1

Davis Landfill
Explosive Landfill Gas Sampling Report (Example)

LdflShop	6/8/2010 5:39	0	0	19.9	80.1	25.17	-0.02	0	25.17
LdflOffce	6/8/2010 5:47	0	0	19.9	80.1	25.16	-0.04	0	25.16
Scalehse	6/8/2010 6:19	0	0	19.3	80.69	25.08	31.29	0	25.08
LdflRcycl	6/8/2010 6:35	0	0	19.5	80.5	25.09	1.61	0	25.09
MONWELL1	6/8/2010 7:22	0	10.3	9.7	80	25.1	8.53	0	25.1
MONWELL4	6/8/2010 7:25	0	1	18.6	80.4	25.11	-2.13	0	25.11
G2000000	6/8/2010 8:12	0	0.5	19.8	79.69	25.13	5.28	0	25.13
G7000040	6/8/2010 8:25	0	0.5	19.9	79.6	25.13	2.04	0	25.13
G7000060	6/8/2010 8:41	0	0.7	19.5	79.8	25.12	3.48	0	25.12
G7000100	6/8/2010 9:06	0	0.8	19.4	79.79	25.08	2	0	25.08
G6000030	6/8/2010 9:22	0	0.6	19.5	79.9	25.09	1.55	0	25.09
G6000060	6/8/2010 9:40	0	0.6	18.8	80.6	25.08	5.31	0	25.08
G6000090	6/8/2010 11:33	0	4.7	6.7	88.6	25.03	0.59	0	25.03
G8_____	6/8/2010 11:55	0	9.8	6.7	83.5	25.05	3.86	0	25.05
G9_____	6/8/2010 12:24	0	2	16.2	81.8	25.05	1.32	0	25.05
G10_____	6/8/2010 12:43	0	0.7	18.5	80.8	25.06	4.09	0	25.06



Davis Landfill
1997 East 3500 North
Layton, Utah

Project Number 00169-087

Explosive Landfill Gas Monitoring Locations

FIGURE 1

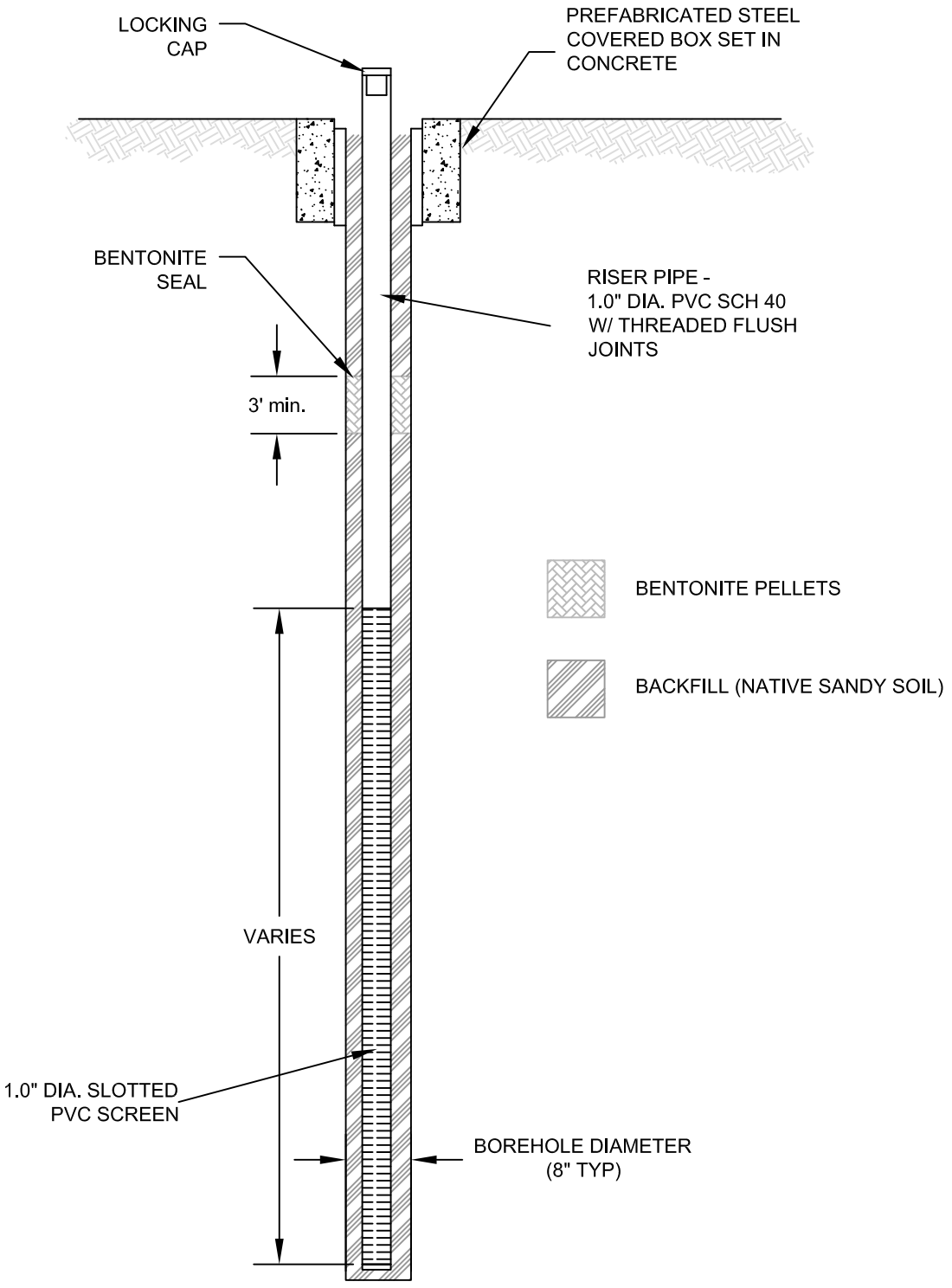
No. | Revision/Issue | Date | Drawing Notes

I:\projects\ 00169-087\drafting\autoCAD\site map.dwg

06/21/10

iah

METHANE PROBE INSTALLATION
BY AUGER



Wasatch Integrated Waste Managment District
Davis Landfill-Explosive Gas Monitoring Plan
Layton, Utah

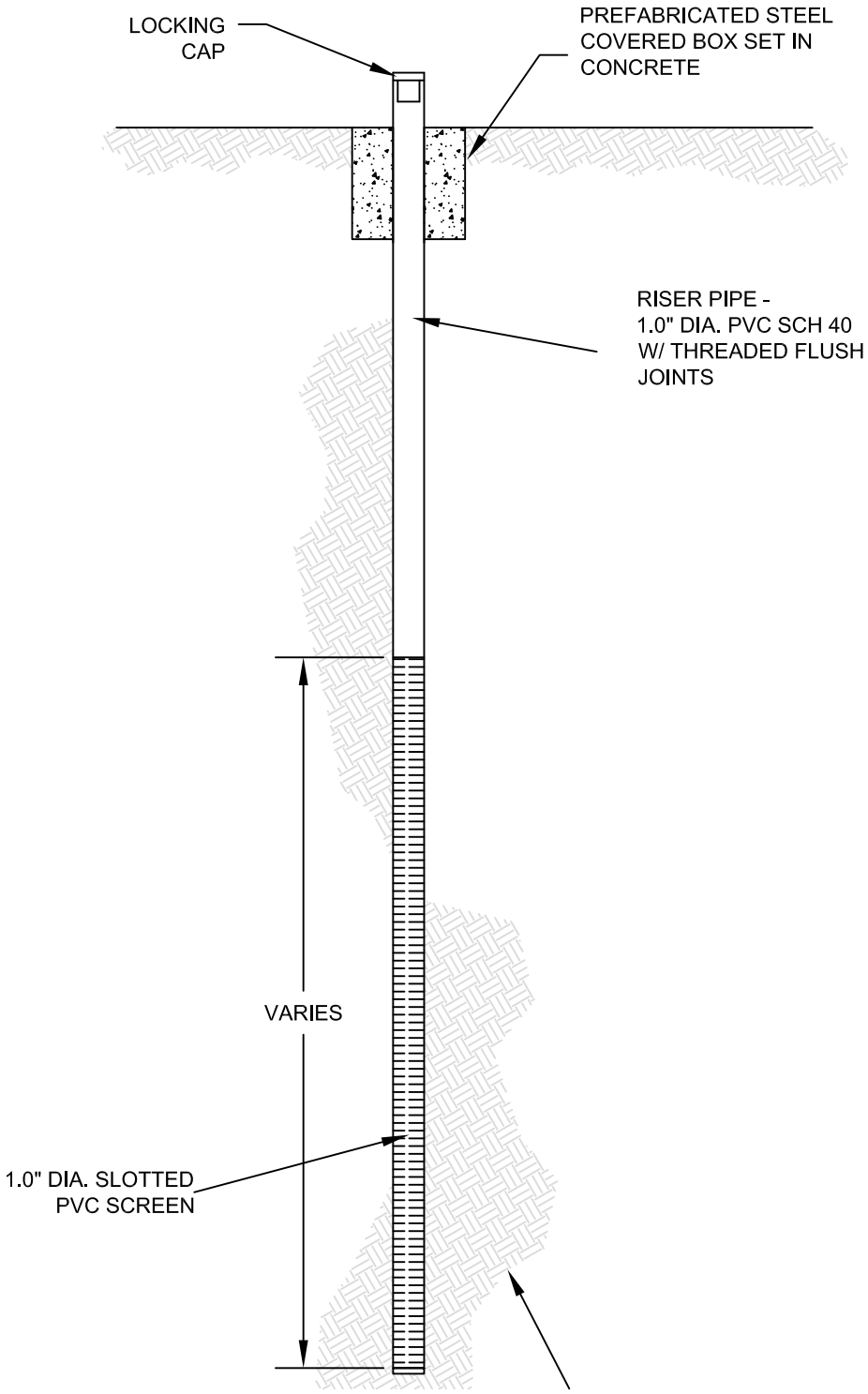
Project Number 00169-087

Methane Probe Installation

FIGURE 2a

I:\projects\ 00169\087\PROBE INSTALL.dwg
06/21/2010
jah

METHANE PROBE INSTALLATION
BY DIRECT PUSH



Wasatch Integrated Waste Managment District
Davis Landfill-Explosive Gas Monitoring Plan
Layton, Utah

Project Number 00169-087

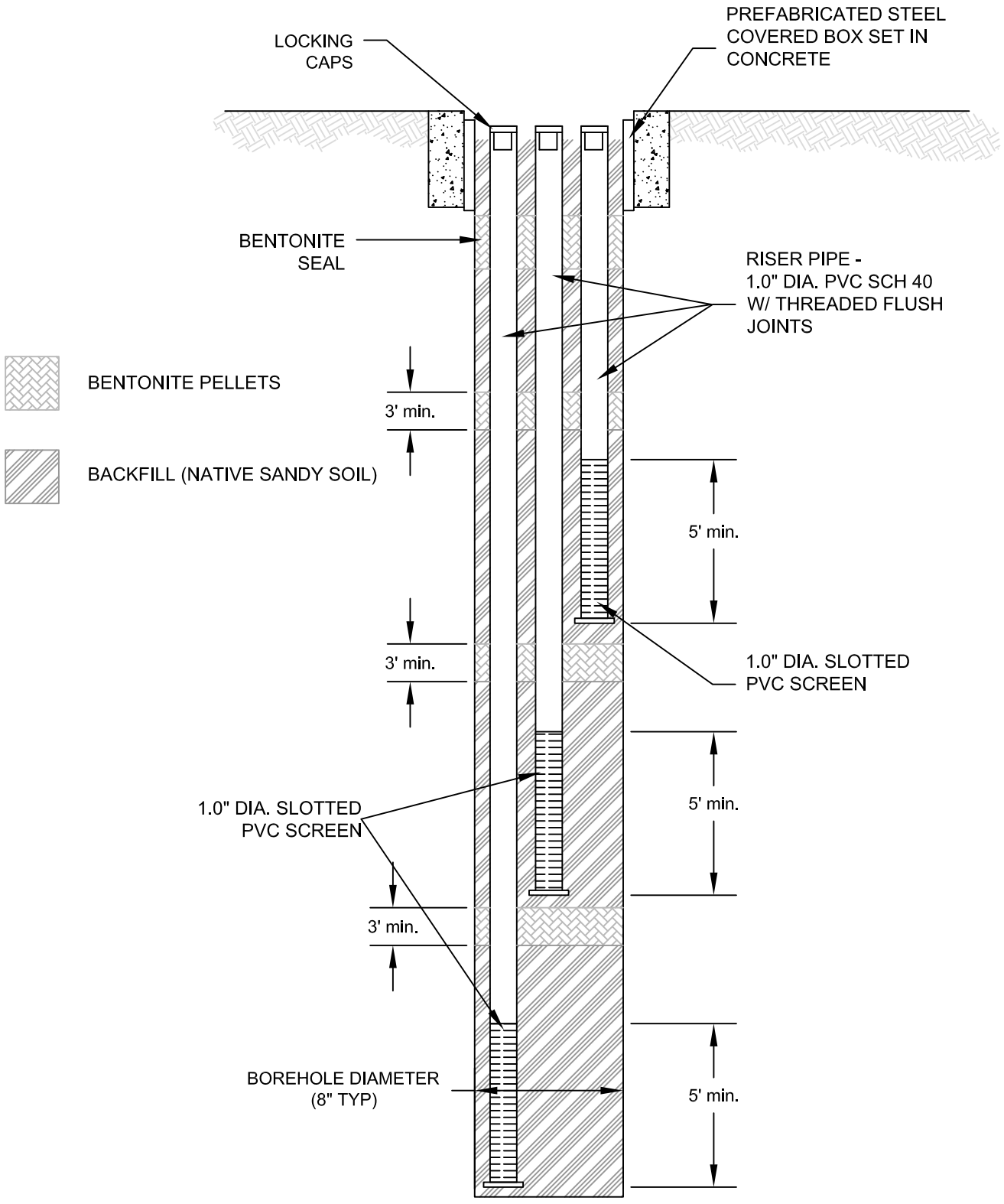
Methane Probe Installation

FIGURE 2b

No. | Revision/Issue | Date | Drawing Notes

I:\projects\ 00169\087\PROBE INSTALL.dwg
06/21/2010
jah

NESTED METHANE PROBE INSTALLATION DETAIL



Wasatch Integrated Waste Managment District
Davis Landfill-Explosive Gas Monitoring Plan
Layton, Utah

Project Number 00169-087

Methane Probe Installation

FIGURE 2c

Attachment #5
Inspection Forms

WASATCH INTEGRATED waste management district

Training Roster

Subject : _____ Location: _____ Date: _____

Instructor(s): _____ ☐ Monthly Safety ☒ Specialized ☐ Certification ☐ Re-Certification

(Sign) NAME (Print)		(Sign) NAME (Print)	
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	
Instructor/Safety Signature: _____		Start Time: _____ End Time: _____ Total Hrs: _____	

Comments:

WASATCH INTEGRATED
waste management district

Inspector Information
Name: Date: Time:

Area Inspection Conducted: ☐ LF-Face ☐ LF-Citizen Pad ☐ PLT-Tipping Floor ☐ Other (Specify)

Commercial
Company Name:

Vehicle Type: ☐ Semi-Truck ☐ Panel Truck ☐ Pick-up ☐ Front Loader ☐ Side Loader ☐ Roll-Off ☐ Other_____

Vehicle ID No.: _____ Route No.: _____ Ticket No.: _____ City:_____

License Plate No.:_____

Residential
Vehicle Type: ☐ (Circle) Car/Van/Truck ☐ Truck (w/trailer) ☐ Panel Truck ☐ Car (w/trailer) ☐ Other_____

Ticket No.: _____ City: _____

License Plate No.:_____

Signature
(Signature hereon denotes that operator of the vehicle being inspected was present during routine waste screening inspection and does not admit confirm or identify liability)

_____ _____

(PRINT) Operator's Signature Inspector's Signature

_____

(SIGN) Operator's Signature

CONTAINERS		Yes	No
Full	If YES #		
Partial	If YES #		
Empty	If YES #		
Crushed	If YES #		
End Removed	If YES #		
FREE LIQUID			
MEAT			
HAZ MTLS			
PCB			

	QUANTITY
Lead Acid Batts	
Tires	
Oil	
Metal	
Appliances	
CFC Applncs	
Paints	
HseHld Cleaners	
Fuels	
Sod/Soil/Grass	
Bldg. Matls.	
Cement/Rocks	
Animal	
Other:	

	Yes	No
POWDERS/DUST		
Known		
Unknown		
BioMedical Waste		
Radioactive Waste		
Asbestos		
Ash		
Labeled Hazardous		
Unusual Odors		
Strong		
Faint		
This load is:		
Non-Hazardous		
Suspect		
Probable		
Confirmed		

Wasatch Integrated Waste Management District
P.O. Box 900
650 East Highway 193
Layton, UT 8401-0900

Stormwater Pond Operation, Maintenance, and Management Inspection Checklist

Project: _____
Location: _____
Site Status: _____

Date: _____
Time: _____

Inspector: _____

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Embarkment and emergency spillway (Annual, After Major Storms)		
1. Vegetation and ground cover adequate		
2. Embarkment erosion		
3. Animal burrows		
4. Unauthorized planting		
5. Cracking, bulging, or sliding of dam		
a. Upstream face		
b. Downstream face		
c. At or beyond toe		
downstream		
upstream		
d. Emergency spillway		
6.Pond, toe & chimney drains clear and functioning		
7.Seeps/leaks on downstream face		

Maintenance Item	Satisfactory / Unsatisfactory	Comments
8.Slope protection or riprap failure		
9. Vertical/horizontal alignment of top of dam "As-Built"		
10. Emergency spillway clear of obstructions and debris		
11. Other (specify)		
2. Riser and principal spillway (Annual)		
Type: Reinforced concrete _____ Corrugated pipe _____ Masonry _____ 1. Low flow orifice obstructed		
2. Low flow trash rack. a. Debris removal necessary		
b. Corrosion control		
3. Weir trash rack maintenance a. Debris removal necessary		
b. corrosion control		
4. Excessive sediment accumulation insider riser		
5. Concrete/masonry condition riser and barrels a. cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebars exposed)		
d. Joint failures		
e. Water tightness		
6. Metal pipe condition		

Maintenance Item	Satisfactory / Unsatisfactory	Comments
7. Control valve a. Operational/exercised		
b. Chained and locked		
8. Pond drain valve a. Operational/exercised		
b. Chained and locked		
9. Outfall channels functioning		
10. Other (specify)		
3. Permanent Pool (Wet Ponds) (monthly)		
1. Undesirable vegetative growth		
2. Floating or floatable debris removal required		
3. Visible pollution		
4. Shoreline problem		
5. Other (specify)		
4. Sediment Forebays		
1.Sedimentation noted		
2. Sediment cleanout when depth < 50% design depth		
5. Dry Pond Areas		
1. Vegetation adequate		
2. Undesirable vegetative growth		
3. Undesirable woody vegetation		
4. Low flow channels clear of obstructions		
5.Standing water or wet spots		

Maintenance Item	Satisfactory / Unsatisfactory	Comments
6. Sediment and / or trash accumulation		
7. Other (specify)		
6. Condition of Outfall into Ponds (Annual , After Major Storms)		
1. Reprap failures		
2. Slope erosion		
3. Storm drain pipes		
4.Endwalls / Headwalls		
5. Other (specify)		
7. Other (Monthly)		
1. Encroachment on pond or easement area		
2. Complaints from residents		
3.Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Any public hazards (specify)		
8. Constructed Wetland area (Annual)		
1. Vegetation healthy and growing		
2.Evidence of invasive species		
3. Excessive sedimentation in Wetland area		

Comments:

Actions to be Taken:

WASATCH
INTEGRATED
waste management district

1997 East 3500 North
Layton, Utah 84040
801.614.5600

DAVIS LANDFILL
Monthly Operations Checklist

Date: _____

Inspector: _____

√ = Adequate
X = Action Necessary (detail action proposed and taken on weekly log)

Entrance

- ☐ Signs Posted
- ☐ Acceptable Appearance/Cleanliness
- ☐ Entrance Secured When Facility Closed

Personnel

- ☐ Attendant Present When Facility Open
- ☐ Safety Equipment Available and In Use

Disposal Area

- ☐ Unloading Area Clearly Marked
- ☐ Public and Commercial Operation Separated
- ☐ Working Face As Small As Possible
- ☐ Litter Fences in Use
- ☐ Odor Problems
- ☐ Dust or Litter Blowing
- ☐ Daily Cover Applied
- ☐ Final Cover and Vegetation In Place

Fire Protection

- ☐ No Smoking Rules in Force
- ☐ Water Available at Working Face
- ☐ Stockpile Soil Available
- ☐ Fire Extinguishers on All Equipment
- ☐ Radio or Telephone On-Site

Green Waste

- ☐ Acceptable Appearance/Cleanliness
- ☐ Products/Processing Acceptable
- ☐ Re-Sale Products Available
- ☐ Odor Problems
- ☐ Dust or litter blowing

Salvage Practices

- ☐ No Scavenging Policy Enforced
- ☐ Non-Process Area Free of Litter and Vermin

Water Quality

- ☐ Working and Filled Areas Graded to Prevent Pooling
- ☐ Run-Off From Adjoining Areas Diverted From Site
- ☐ Leachate Collection Performing as Intended
- ☐ Leachate Discharge Performing as Intended

Vector Controls

- ☐ Rodent Problem
- ☐ Bird Problem
- ☐ Insect Problem

Gas Collection

- ☐ Condensate System Performing as Intended
- ☐ Air-Supply Performing as Intended
- ☐ No Odors or Leaks Detected
- ☐ Flare Station Operating

Documents

- ☐ Permit or License on Display
- ☐ Development Plans Available
- ☐ Operational Plans Available

Citizen Drop Off

- ☐ Acceptable Appearance/Cleanliness
- ☐ Tipping Floor Cleared
- ☐ Non-Process Bins Emptied Daily
- ☐ Recycle Bins Accessible
- ☐ Odor Problems
- ☐ Dust or Blowing Litter

HHW

- ☐ Acceptable Appearance/Cleanliness
- ☐ Products Labeled and Stored
- ☐ Processing tables clean/accessible
- ☐ Storage Area Clean/Accessible

Problems/Actions

- ☐ Slide
- ☐ Storm Drainage

Other

- ☐ Gas Extraction Records On File
- ☐ Gas Migration Records On File
- ☐ Compost Readings On File
- ☐ On-Site Training Available
- ☐ Waste Screening Records on File
- ☐ Safety Meeting Records on File

Area Landfilling

- ☐ GPS

General Comments:

Wasatch Integrated Waste Management District
Davis Landfill

Dust Control Record - Paved Roads

The paved road shall be periodically swept or sprayed clean as dry conditions warrant or as determined necessary by the executive secretary.

Date	Time	Description of Cleaning

This document has been designed to meet recordkeeping requirements for fugitive dust control - UDAQ

Wasatch Integrated Waste Management District

Quarterly Inspection Checklist

Location: _____

Site Status: _____

Date: _____

Time: _____

Inspector: _____

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout Inlet in Detention Basin		
Basin Bottom Clear of Debris		
Inlet Clear of Debris		
Outlet Clear of Debris		
2. Sediment Traps or Forebays In the Citizen Drop Off Area		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Vegetation		
Methane Stress		
No evidence of erosion		

Operation, Maintenance & Management Checklist Infiltration Basin

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Inlets		
Good condition		
No evidence of erosion		
5. Outlet/Overflow Spillway		
Good condition, no need for repair		
No evidence of erosion		
6. Structural Repairs (If Not Any Skip to 7)		
Embankment in good repair		
Side slopes are stable		
No evidence of erosion		
7. Fences/Access Repairs (Take Particular Concern of Leachate Area)		
Fences in good condition		
No damage which would allow undesirable entry		
Lock and gate function adequate		
Access point in good condition		

Wasatch Integrated Waste Management District
Davis Landfill

Dust Control Record - Water

All unpaved roads and other unpaved operational areas that are used by mobile equipment shall be water sprayed to control fugitive dust. Treatment shall be of sufficient frequency any quantity to maintain the surface material in a damp/moist condition unless it is below freezing. The opacity shall not exceed 20% during all times the areas are in use. Records of water treatment shall be kept for all periods when the plant is in operation.

Date	Time	Loads	Area Treated

This document has been designed to meet recordkeeping requirements for fugitive dust control - UDAQ

DAVIS LANDFILL
&
GREEN WASTE RECYCLING FACILITY

Weekly Operations Checklist

Date _____

Inspector _____

√ = Adequate

X = Action Necessary

Entrance

Signs Posted?

Appearance and Cleanliness Acceptable

Entrance Secured When Site Not Operating?

Personnel

Attendant Present When Site Is In Use?

Safety Equipment Available and In Use?

Disposal Area

Unloading Area Clearly Marked?

Public and Commercial Operation Separated?

Is the Working Face As Small As Possible?

Litter Fences in Use?

Odor Problems?

Dust or Litter Blowing?

Daily Cover Applied?

Final Cover and Vegetation In Place?

Salvage Practices

Scavenging Prohibited?

Non-Process Area Free of Litter and Vermin?

Water Quality

Working and Filled Areas Graded to Prevent Ponding?

Run-Off From Adjoining Areas Diverted From Site?

Leachate Collection Performing as Designed?

Leachate Discharge Performing as Designed?

Vector Controls

Any Rodent Problem?

Any Bird Problem?

Any Insect Problem?

Gas Collection

Condensate System Performing as Designed?

Air-Supply Performing as Designed?

No Odors or Leaks Detected?

Fire Protection

No Smoking Rules in Force?

Water Available at Working Face?

Stockpile Soil Available?

Fire Extinguishers on All Equipment?

Radio or Telephone On-Site?

Green Waste

Site Pleasing to the Eye?

Products Processing Acceptable?

Re-Sale Products Available?

Documents

Permit or License on Display?

Development Plans Available?

Operational Plans Available?

Other

Gas Extraction Records On File?

Gas Migration Records On File?

Compost Readings On File?

On-Site Training Available?

Waste Screening Records on File?

Safety Meeting Records on File?

General Comments

Attachment #6
Closure and Post Closure Care Plan

I.d.14 Closure & Post - Closure Plan

This section describes the final cover construction, site capacity, schedule of closure implementation, estimated costs for closure, and final inspection procedures for the existing landfill operations and future closure stages of the Davis Landfill.

I.d.14.A Closure Strategy

The unlined landfill cell has been closed and was capped in the summer of 2000 except for the south-facing slope, which will be capped in conjunction with future closure stages of the lined landfill. Final cover will be placed over the lined landfill in a series of events. When sufficient area of the lined landfill cell has reached final elevation to allow for economical placement of

final cover, that portion of the cell will be closed. Sufficient intermediate cover will be placed over the areas that reach final design elevation prior to closure. The landfill cover construction Stage A has been completed. The projected date of final closure of the entire landfill, based on current waste streams, is 2024-2025. It is projected that approximately 8.9 million cubic yards of airspace capacity remains above the existing MSW surface.

The Director will be notified in writing at least 60 days prior to the anticipated last receipt of waste in accordance with R315-302. Implementation of the closure plan will begin within 30 days after last receipt of waste. Closure will be completed within 180 days of implementation of closure activities, unless an extension has been granted by the Director.

I.d.14.B Final Cover Design and Installation

The conceptual design of the final cover system of the lined landfill cell has been completed as part of a previous landfill permit renewal. A final design package consisting of specifications, QA/QC plan and drawings for construction of the cover system for each of the closure Stages will be prepared and submitted to the State of Utah DWMRC for review and approval prior to each cover placement event. A final design package will be issued for construction prior to closure of the facility to ensure compliance with federal and state regulations effective at the time of closure.

The conceptual final cover design described herein is in accordance with current State of Utah regulations and RCRA Subtitle D criteria. The final cover system is designed to control the emission of landfill gas, promote the establishment of vegetative cover, minimize infiltration and percolation of water into the waste, and prevent erosion of the waste throughout the post-closure care period and beyond. Drawings showing the conceptual final cover contours are provided in Appendix K.

I.d.14.C Unlined Landfill

The unlined landfill cell is located immediately north of Phase III of the lined landfill cell. The unlined landfill cell has been closed and most the landfill was capped in the summer of 2000. The unlined landfill extends to an approximate elevation of 4900 feet. Due to the date of waste placed in the old landfill, the landfill cap was only required to extend down to approximately the 4900-foot contour line. However, the cap was extended down to an approximate elevation of 4865 feet on the north side of the old landfill to ensure full compliance with regulations. The south face of the old landfill was inspected will be covered as part of the final cover associated with future closures.

The final cover for the old portion of the landfill consisted of the following constituents beginning from bottom to top:

- At least 12 inches of native soil cover.
- A 40 mil textured polyethylene liner (LLDPE).
- A geocomposite drainage layer (geonet sandwiched between two geotextile filter fabrics).

- A 30-inch soil protective cover layer.
- A 6-inch vegetation layer of native soils suitable for plant growth.

I.d.14.D Lined Landfill

The final cover construction for the remainder of the landfill, will involve the south face of the unlined landfill and areas that has not received final cover defined by the liner Phases I, II, III, IV, and V. Final Cover of the eastern end of the lined landfill and was completed in 2006. The general arrangement of the final landfill closure is indicated in the drawings contained in Appendix K.

The following final cover constituents are conceptually planned, beginning from bottom to top:

- A minimum of 12 inches of intermediate native soil cover
- A reinforced GCL
- A 60 mil textured HDPE membrane
- A geocomposite drainage layer (geonet sandwiched between two geotextile fabrics)
- A 30-inch soil protective cover layer.
- A 6-inch vegetation layer of native soils suitable for plant growth.

I.d.14.E Seed, Fertilizer and Mulch

The 6-inch vegetative layer of the cover will be seeded with a mixture of grasses suitable for fast growth in the region, fertilized, and mulched. A local, experienced agronomist was retained to develop an appropriate seed mixture for the final cover at the Davis Landfill. The seed mix maybe changed in the future should the need arise. The current seeding, fertilizing and mulching requirements are outlined below:

CURRENT SEED MIXTURE		
COMMON NAME	SCIENTIFIC NAME	PLANTING RATE (pls)
Grasses		
Slender Wheatgrass	Agropyron Trachucaulum	5.0
Crested Wheatgrass	Agropyron Cristatum	5.0
Western Wheatgrass	Agropyron Smithii	5.0
Thickspike Wheatgrass	Agropyron Dasystachyum	2.0
Streambank Wheatgrass	Agropyron Riparium	2.0
Sand Dropseed	Sporobolus Cryptandrus	2.0
Kentucky Bluegrass	Poa Pratensis	3.0
Sheep Fescue	Festuca Ovina	3.0
Mountain Brome	Bromus Marginatus	3.0
Forbs/Wildflowers		
Blue Flax	Linum Perenne Lewisii	2.0
Rocky Mountain Penstemon	Penstemon Strictus	1.0

Western Yarrow	Achillea Millefoium	2.0
Sterile Cover Crop		
	Triticum Elongatum	25.0
Total		**60**

The grass seed would be planted at a minimum rate of 60 pure live seed pounds (pls) per acre. These grass species were selected based on their capability of surviving in a low nutrient soil with little or no requirement for nutrient addition. These species also require little maintenance (mowing), provide protection for storm water runoff, and are hardy, fast growing species that are tolerant of poor site conditions such as steep slopes.

Fertilizing requirements based on the recommended seed mixture and an analysis of our onsite soils should consist of 60 pounds of Phosphorus (P), 200 pounds of Potassium (K) and 50 pounds of Nitrogen (N) per acre. The fertilizer should have fifty percent of the elements derived from organic sources.

Mulch will be manufactured or purchased by Wasatch. Where applicable, the side slopes will be initially covered with turf reinforcement mats to prevent erosion and allow complete growth of the vegetative cover. Turf reinforcement mats may be used in areas of concentrated runoff and/or drainage channels.

Early establishment of vegetation on the landfill's final slope surface will impede soil erosion and promote evapotranspiration. Wasatch personnel will periodically evaluate vegetative growth, vigor, and color so that the integrity of the final cover system is maintained. If signs of vegetative stress are observed as a result of landfill gas or leachate seeps, they will be noted and the problem will be corrected. Corrective procedures will be conducted based on current design recommendations and will be built consistent with construction specifications.

Wasatch personnel will inspect the vegetative cover during cover inspection. Wasatch staff or a licensed landscape contractor will make repairs, as necessary.

I.d.14.F Landscaping

The landfill facility, including all surrounding grounds, will be maintained in conjunction with scheduled maintenance activities (i.e., grass cutting, road improvements, etc.). The landscape of the landfill will be designed to be both functional and aesthetically pleasing.

I.d.14.G Contouring

The landfill's final grades will be inspected and maintained to ensure its integrity and conformity with the conceptual final cover contours that are included in Appendix K.

Areas where water has collected (ponded) will be regraded. Erosion damage resulting from extremely heavy rainfall will be repaired. Wasatch personnel will inspect the final grading no less than quarterly.

I.d.14.H Quality Assurance/Quality Control (Qa/Qc) Procedures

Prior to the actual final landfill cover construction, activities associated with each of the closure stages: drawings, specifications and QA/QC procedures will be developed and submitted to the DWMRC for review and approval. Drawings, specifications and QA/QC procedures will be similar to those completed and previously approved by the DWMRC.

I.d.14.I Closure Cost Estimates

Detailed cost estimates for closure is provided in Appendix L.

I.d.14.J Certification of Closure and Record Keeping

A civil engineer registered in the State of Utah will design and observe the closure of the lined landfill. The registered civil engineer will be employed by Wasatch, or will be a hired contractor and will certify the landfill was closed per the closure plan. Any amendment or deviation to the closure plan will be approved by the Director and any associated permit modifications will be made. As part of the certification process, the civil engineer shall also provide closure as-built drawings to the Director within 90 days following completion of closure activities.

Additionally, the final plats and the amount and location of waste will be recorded on the site title. Wasatch will file the notarized plat with the county recorder within 60 days following certification of closure.

I.d.14.K Post-Closure Plan

Post closure activities will begin when closure has been approved by the Director. The following presents the post-closure plan for the Davis Landfill.

I.d.14.L Monitoring Program

The following subsections offer a description of the monitoring program, which includes groundwater monitoring systems and leachate and gas collection systems.

I.d.14.M Groundwater Unlined and Lined Landfill

Groundwater is currently monitored as detailed in the approved Groundwater Monitoring Plan. Wasatch will continue a groundwater monitoring program in conformance with Section R315-308, Ground Water Monitoring Requirements of the Utah Administrative Code.

I.d.14.N Surface Water

Although no surface water sampling activities are scheduled for the Davis Landfill, Wasatch personnel will inspect the drainage system no less than quarterly. Wasatch or a licensed general contractor will repair or replace drainage facilities, if necessary.

I.d.14.O Leachate Collection and Treatment

I.d.14.O.1 Unlined Landfill

A leachate collection system was neither required nor installed during construction of the unlined landfill.

I.d.14.O.2 Lined Landfill

The leachate collection system has been approved by DWMRC and completed in phases. The final phase was completed in 2012. Once leachate is routed to the leachate collection; leachate is piped to the publicly owned treatment works. The lined landfill is equipped with a composite liner and leachate collection system that is designed and constructed to maintain less than 30 centimeters (12 inches) of leachate over the liner.

Leachate and gas condensate collected as part of any recovery operations at the Davis Landfill has historically been applied to the surface of the lined landfill cell to accelerate evaporation and augment free surface evaporation of leachate. Since the construction of a leachate disposal line to public owned treatment works; the need to surface apply the leachate over the lined landfill is minimal.

Leachate can be surface applied for dust control within the boundaries of the lined landfill cell, evaporated, or disposed of at a publicly owned treatment works.

I.d.14.P Landfill Gas

Soil gas monitoring probes have been installed around the entire landfill site to monitor explosive landfill gas emissions from both the unlined and lined landfill. The gas monitoring probes, as well as all structures at the site, are monitored quarterly to ensure compliance with State regulations regarding explosive landfill gas at landfills (R315-303-3). Wasatch has also developed an Explosive Landfill Gas Monitoring Plan for the Davis Landfill (Intermountain Geoenvironmental Services, April 2015) which describes the monitoring network and sampling procedures in detail. A copy of the Explosive Landfill Gas Monitoring Plan is included in Appendix H.

During post-closure, Wasatch landfill personnel will be responsible for the inspection and sampling of all methane gas monitoring stations, facility structures, and facility landmarks as described in accordance with the current Explosive Landfill Gas Monitoring Plan. Monitoring will occur no less often than quarterly and will be conducted more often if the need arises. If a sample exceeds the regulatory level, Wasatch will notify the DWMRC immediately and undertake appropriate corrective actions.

As outlined in R315-303, Wasatch will take all the necessary steps to protect human health and will immediately notify DWMRC of explosive gas levels detected above allowable levels and actions to be taken. Also, within 7 days of incident, Wasatch will place in the operating record documentation of the explosive gas levels detected and a description of the interim steps taken to protect human health. Within 60 days of detection, Wasatch personnel will implement a remediation plan for the explosive gas releases, place a copy of the plan in the operating record, and notify DWMRC that the plan has been implemented. The remediation plan will describe the nature and extent of the problem and the proposed remedy.

I.d.14.Q Maintenance Program

The following subsections offer a description of the maintenance of installed equipment, including groundwater monitoring systems and leachate and gas collection systems.

I.d.14.Q.1 Groundwater

All current and future groundwater monitoring wells will be inspected for signs of failure or deterioration during each sampling event. If damage is discovered, the nature and extent of the problem will be recorded. A decision will be made to replace or repair the well. Possible repairs include redevelopment, chemical treatment, partial casing replacement or repair, sealing the annulus, or pumping and testing. If a well needs to be replaced, the old one will be properly abandoned.

I.d.14.Q.2 Surface Water

Drainage control problems can result in accelerated erosion of a particular area. Differential settlement of drainage control structures can limit their usefulness and may result in a failure to properly direct storm water.

Implementation of a post-closure maintenance program will maintain the integrity of the final drainage system throughout the post-closure maintenance period. The final surface water drainage system will be evaluated and inspected for ponded water and blockage of and damage to drainage structures and swales. Where erosion problems are noted or drainage control structures need repair, proper maintenance procedures will be implemented as soon as site conditions permit so that further damage is prevented. Damaged drainage pipes and broken ditch linings will be removed and replaced.

Wasatch personnel will inspect the drainage system no less than quarterly. Temporary repairs will be made until permanent repairs can be scheduled. Wasatch or a licensed general contractor will replace drainage facilities.

I.d.14.Q.3 Leachate Collection and Treatment

The leachate control and recovery system must be maintained so that it operates during the post-closure maintenance period. The system will be inspected no less than quarterly by Wasatch personnel for signs of deterioration. Wasatch or a licensed contractor will make required repairs.

I.d.14.T Landfill Gas

The landfill gas monitoring system will be regularly inspected in conjunction with the scheduled monitoring tasks. The system will be repaired and parts replaced as required to maintain system capabilities. The landfill gas monitoring system will be inspected no less than quarterly throughout the post-closure period.

I.d.14.U Facility and Structures

Required support facilities and structures for post-closure care will be maintained.

I.d.14.V Cover and Run-On/Run-Off Systems

The final grades and capping system will incorporate features to manage storm water, minimize erosion, and provide for efficient removal of storm water collected in the drainage layer. The

Drawings in Appendix K and Appendix F show proposed final grades and illustrate the extent of storm water collection and surface water and erosion control systems on the surface of the final cover.

The final cover will convey collected water via earthen drainage channels and piping to the storm water retention basins.

Placement of all permanent drainage facilities will be completed in conjunction with the construction of the final cover.

I.d.14.W Schedule of Post-Closure Activities

Post-closure activities, consisting of monitoring and maintaining the final cover and permanent drainage facilities, will be implemented periodically as areas of the landfill are filled to final grade.

I.d.14.X Changes to Record of Title, Land Use, and Zoning

Wasatch will notify the Davis County Recorder's Office at any such time when there is a change to the Record of Title, land use plan, or zoning restrictions. In addition, Wasatch will notify the Recorder at that time when the post-closure care period has expired and when a final site use has been accepted by the DWMRC.

I.d.14.Y Recordkeeping

Wasatch will record and retain in the operating record all documentation made with respect to the closure and post-closure care plans as allowed by State of Utah Administrative Rule R315-302-3.

I.d.14.Z Cost Estimates and Financial Assurance Documentation

Wasatch will record and retain in the operating record all documentation made with respect to the cost estimates and financial assurance documentation as allowed by State of Utah Administrative Rule R315-309.