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ALAMEDA POINT
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MAY 1989

DATA MANAGEMENT PLAN

REMEDIAL INVESTIGATION / FEASIBILITY STUDY
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

VOLUME 6

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0727

DATA MANAGEMENT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

Canonie Environmental

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DATA MANAGEMENT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
(RI/FS)
VOLUME 6 OF 8

DATED 01 MAY 1989

THIS RECORD CONTAINS MULTIPLE VOLUMES WHICH HAVE BEEN ENTERED SEPARATELY

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VOLUME 1B OF 8 – FINAL AIR SAMPLING PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000275**

VOLUME 2 OF 8 – FINAL HEALTH AND SAFETY PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000274**

VOLUME 2 OF 8 – REVISED FINAL HEALTH AND SAFETY PLAN, RI/FS DATED 5/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000351**

VOLUME 2 OF 8 – REVISED FINAL HEALTH AND SAFETY PLAN, RI/FS DATED 11/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000780**

VOLUME 3 OF 8 – FINAL QUALITY ASSURANCE PROJECT PLAN – QUALITY ASSURANCE / QUALITY CONTROL PLAN, RI/FS DATED 5/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000341**

VOLUME 3 OF 8 – FINAL QUALITY ASSURANCE PROJECT PLAN – QUALITY ASSURANCE / QUALITY CONTROL PLAN, RI/FS DATED 1/1/90 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000782**

VOLUME 4 OF 8 – COMMUNITY RELATIONS PLAN, RI/FS DATED 2/15/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000301**

VOLUME 5 OF 8 – FINAL PROJECT MANAGEMENT PLAN/SCHEDULE, RI/FS DATED 2/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000322**

VOLUME 7 OF 8 – FINAL PRELIMINARY PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION PLAN, RI/FS DATED 6/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000371**

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WORK PLAN ADDENDUM

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DATA MANAGEMENT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

1.0 INTRODUCTION

The Work Plan for the Remedial Investigation/Feasibility Study (RI/FS) at Naval Air Station (NAS) Alameda consists of the following planning documents:

Volume 1	Sampling Plan
Volume 1A	Sampling Plan: Solid Waste Assessment Test (SWAT) Proposal Addendum
Volume 1B	Air Sampling Plan
Volume 2	Health and Safety Plan
Volume 3	Quality Assurance Project Plan (QAPP), Quality Assurance/Quality Control Plan (QA/QC)
Volume 4	Community Relations Plan
Volume 5	Project Management Plan/Schedule
Volume 6	Data Management Plan
Volume 7	Public Health and Environmental Evaluation Plan
Volume 8	Feasibility Study Plan

This Data Management Plan is Volume 6 of the Work Plan and describes the general procedures for managing and storing data generated from the RI/FS for the NAS Alameda at Alameda, California. The plan has been prepared to conform with the following guidance document:

1. United States Environmental Protection Agency's (EPA) "Guidance for Conducting Remedial Investigations/Feasibility Studies (RI/FS) under CERCLA" (Draft, March 1988)

1.1 Objective

The purpose of the Data Management Plan (DMP) is to establish a set of procedures to use as guidance when collecting, reviewing, interpreting, or distributing information associated with the RI/FS at the NAS Alameda. The procedures are designed to see that the gathered data is precise, representative, comparable, and complete.

The Data Management Plan provides guidance and specifications to provide that:

1. All field determinations and results regarding data collection and analysis are valid through the implementation of preventive maintenance, equipment calibration, and approved analytical protocols;

2. Samples are monitored using a tracking system and chain-of-custody procedures which properly identify samples being collected and track those samples from field collection through analysis and data compilation;

3. Records are produced and retained as documentary evidence of the quality of data collected and analyzed, the validity of applied procedures, and the completeness of the work performed;

4. Generated data is validated and appropriately used in calculations;

5. Calculations, evaluations, and decisions completed or deduced during the execution of the phases are accurate, appropriate, and consistent with the objectives of this plan;

The specifications provided by the DMP are applicable to all activities and participants involved with the project at NAS Alameda.

The Project Technical Director will coordinate and will be responsible for all activities in the Work Plan which include field personnel, laboratory personnel, and technical and office support personnel. All documents will be reviewed by qualified personnel for completeness and accuracy. Field work will be reviewed by the field personnel and the project level personnel before being reviewed by the QA/QC team. All work will be reviewed by the Project Technical Director before review by the Project Manager. The QA/QC procedures to assess the technical and laboratory data are described in the QAPP, Volume 3 of the Work Plan.

1.2 Site Description

The NAS Alameda is located in Alameda, California (Figure 1-1). The station occupies the western tip of the island of Alameda along the eastern side of the San Francisco Bay. Most of the eastern half of the station is developed with office and industrial facilities. Runways and support facilities occupy the western part of the station. Twenty specific sites within the station are included in the RI/FS. A site plan of the Naval Air Station showing the specific sites is attached (Figure 1-2).

2.0 DATA MANAGEMENT AND STORAGE

2.1 Introduction

The RI will have a specific goal to determine that sufficient data of the appropriate type are gathered to select a remedy based on the objectives of the RI/FS. Data gathered from a variety of sources including past records, existing documents, and additional field work will need to be reviewed. Documents will be generated as part of the reporting process and must be tracked as part of inventory control. The FS will proceed concurrently with the RI but somewhat independently and involving two groups of personnel. The two groups, especially the project leaders, have to interact; and all information must be available to both groups to provide input for and substantiation of the recommended remedial actions.

Successful compilation and documentation of the generated material would be managed most effectively by in-house computer capabilities. A data base can be established which provides a comprehensive single source for all applicable data. Project planning and tracking also can be accomplished using available in-house capabilities.

2.2 Computer Capabilities

The computer capabilities in the office are distributed among four different disciplines; Engineering, Drafting, Accounting, and Word Processing. Engineering has five work stations: three Compaq 386/20 Deskpro and two Compaq 286/12 Deskpro computers. Drafting has two Compaq 386/20 work stations, and accounting also has two Compaq 386/20 work stations. The engineering work stations all have 40 megabyte tape drive backups. Additional hardware includes:

1. Full carriage 36-inch, continuous feed, 8-pen Zeta plotter;

2. Graphics and letter quality printers;

3. Hewlett-Packard 7475A 6-pen plotter;

4. Hewlett-Packard 24-inch throat, 8-pen plotter;

2.3 Project Planning and Tracking

Project planning and tracking can also be accomplished using in-house computer capabilities. Primavera is a software package which allows project management to overview the primary elements of the project; schedule, resources, and costs. The program is powerful enough to provide the needed detail and flexible enough to update the schedule if any of the activities (running concurrently or consecutively) are completed early or late.

2.3.1 Data Base

2.3.1.1 Main Frame

Presently large volumes of chemical and water level data are handled by the hardware, software, and personnel in our Porter, Indiana office. A Prime 9755 with 8 mb of main memory and 2.3 gigabytes of online disc storage compliment a wide range of industry specific software tools, both company developed and commercially available.

Over the past seven years Canonie has been building a library of programs for the input, verification, and reporting of chemical data. The heart of the system is a 3rd generation relational data base with the product name INFO.

Many data links have been established between INFO and PC based software products such as D-Base, Symphony, Excel, Surfer, and AutoCAD. This allows for very quick data transfer from a large data base being held on the Prime to a selected set of data for use with these products with virtually no error.

Results of the samples processed at our own laboratory in Stockton, California are electronically transferred to the Prime in a quick efficient manner. This makes data available both quickly and without error.

2.3.1.2 Personal Computer

D-Base is a data base management language which can be used to establish a permanent record of project data and can also provide the versatility needed to correlate, sort, report, and manage the volume of data generated for a project of this scope. The data would be divided into the 20 individual sites. The user would choose which site data to manage during a session. Site data would then be divided into sample or boring locations, water levels, chemical data, geologic information, drawings, activity logs, and QA/AC data. The water level and chemical data would all be imported from the Prime system thus ensuring accuracy through verification of the data. Because of the modular nature of the PC data base structure, additional site applications can easily be added with minimal effort. However, the structure of the data base is transparent to the user due to a series of user friendly pull-down menus which integrate the system together.

An in-house computer design group provides the necessary support to modify existing and create new programs. The available in-house programs will be modified as needed to tailor them for a direct application to the Alameda NAS project.

In addition verified accurate data from the Prime will be transferred down to the local data base management system on the PC. This local data base management system is completely compatible with the Zenith computers which NAS Alameda currently uses.

2.4 Computer Aided Design (CAD)

Computer Aided Design (CAD) capabilities are available using the in-house AutoCAD program. Two work stations are available and most two-dimensional

drawings can be prepared using AutoCAD. This allows alterations to be made quickly and efficiently. Most base maps are drawn by hand or photographed from an aerial photo onto mylar. Drawing numbers and general information will be part of the P.C. data base but the drawings will remain as part of AutoCAD.

2.5 Field-Generated Data

Data management is necessary to track the data generated from the field activities and to track and manage environmental samples. Field activities generate data from daily documentation, QA/QC procedures, and data security procedures. Sample management and tracking includes documentation of shipment receipts and QA/QC review. An example of sources of field data follows.

2.5.1 Outline of Sources of Data for West Beach Landfill

I Field Activities
- a) Daily Work Sheet
- b) Daily Field Log
- c) Daily Equipment Log
- d) Boring Logs
- e) Well Details
- f) Other

II QA/QC Procedures
- a) Records of Responsibility
- b) Adherence to Prescribed Protocol
- c) Corrective Measures

III Data Security
- a) Chain-of-Custody Records
- b) Sample Transportation Receipts
- c) Project Records
- d) Loss of Documentation

2.6 Further Sources of Data

Appendix A contains additional forms and documentation which generate more data that is project applicable but may or may not be site specific, such as:

1. Chain-of-Custody Forms;
2. Analyses to be performed by the laboratory;
3. Utility Clearance;
4. Permits;
5. Purchasing Log (on-site equipment or supplies of value less than $1000);
6. Purchase Order Requisition Forms;
7. Health and Safety Plan;
8. Emergency Facilities Locations (and phone numbers);
9. Accident Report Forms;
10. Field Backup (subcontractors, supplies);
11. Equipment Move Forms;
12. Water Level Logs;

The quantity of data generated, as suggested by this brief selection, can be overwhelming if not properly managed. Effective data management is a must and can be accomplished with the in-house capabilities using the combined capabilities of the Prime main frame system and the Personal Computer system. Above all, integrity and security of data should be maintained throughout the system.

3.0 PROJECT AND DATA ORGANIZATION

Canonie Environmental Services Corp. (Canonie) uses a matrix structure for project management and implementation. This effective use of manpower allows a single individual to oversee different facets of the project concurrently. This is especially useful for the project at the NAS Alameda with 20 individual sites, some of which overlap.

The project engineers or project scientists are responsible for initial data acquisition. After review by the project level personnel, a member of the Quality Review Team verifies the data. The Project Technical Director reviews all data and reports before final review by the project manager. All data input into the data base is reviewed after initial input. Any errors or corrections are noted and corrected by the initial data entry personnel.

Because the site remediation work has been divided into operational units with preliminary boundaries delineated for each of the study areas, many of the activities will overlap and others will parallel one another. Some dependent activities may begin before completion of earlier tasks and independent activities will proceed concurrently. This type of organization is handled easily with the Primavera software and coincides with Canonie's matrix organization. This type of organization allows for efficient project management and allows staggered tasks to be managed by a single individual resulting in an efficient, cost-effective program.

4.0 DATA QUALITY OBJECTIVES

4.1 General

The quality of the data acquired during the Work Plan process will be determined by the following characteristics: representativeness, precision, accuracy, completeness, and comparability. Specific objectives for each characteristic are established to identify applicable documentation. These objectives are established from site conditions, objectives of the project, and knowledge of available measurement systems. The subsequent use of these measurements in calculations and evaluations is also subject to aspects of this Data Management Plan as described in the following sections.

4.2 Representativeness

Measurements will be made so that analytical results are as representative of the actual field conditions as possible. Field protocols will be utilized to see that collected samples are representative of the media present in the field. Sample handling protocols, including such tasks as storage, transportation, and preservation, will be used to protect the representativeness of the samples gathered during the project. Proper documentation in the field and the laboratory will establish that protocols have been followed and that sample identification and integrity have been preserved.

4.3 Precision and Accuracy

Precision is the characteristic which reflects the ability to replicate a previously obtained value using identical testing procedures, while accuracy is the characteristic which reflects the ability to obtain a value which equals, or approaches within certain predetermined limits, the true value of a certain phenomenon. Each of these two characteristics are addressed in all data gathering and reporting conducted by Canonie. Data

quality objectives for precision and accuracy are established for each major parameter to be measured during the project. These objectives are based upon prior experience in executing remedial activities for wastes similar to those present or anticipated at this site, on prior knowledge of the capabilities of the measurement system to be employed during activity at the site, and on the limitations which are presented in execution of the task. The precision and accuracy requirements for certain data gathering and reporting activities may vary with the anticipated use of the information. For example, the precision and accuracy requirements of data gathered during surveying to locate ground water monitoring wells will not be as strict as the requirements imposed on analytical data, which is used to establish whether treated ground water is clean enough to discharge.

In general, the precision and accuracy requirements for the program will be met by assuring that at least 10 percent of the samples gathered for analytical evaluation in each matrix type (ie, soil, water, etc.) during each sampling episode are duplicates, so that field sampling precision may be evaluated. Since standard sampling procedures are stipulated for all sampling episodes, no additional duplicates are required due to changes in sampling team personnel. In the laboratory, 10 percent of the samples of each matrix will be analyzed as replicates to evaluate laboratory precision. Duplicate and replicate samples will be chosen at random, unless the criticalness of the sampling would suggest duplicate sampling or replicate sampling would be appropriate.

Calculations performed with the data gathered or generated during the project are also checked for accuracy by the Design Coordinator or his designee, and precision, ie, the comparability of calculation techniques between various tasks, is confirmed through review by the Quality Assurance Team.

4.4 Completeness

The characteristic of completeness is a measure of the amount of valid data obtained compared to the amount that was specified to be obtained under normal conditions. The amount of valid data specified is established from the measurements required to accomplish project objectives. For sample collection, the extent of completeness must be reviewed on a relative basis because the required amount of valid data anticipated prior to sampling episodes may not accurately define the amount of data necessary to render a correct decision.

4.5 Comparability

The characteristic of comparability reflects both the internal consistency of data collected with regard to a single parameter and the expression of data in units which are consistent with the units of data gathered by other organizations measuring the same parameter. Comparability of data gathering and measuring procedures should also be addressed if data gathered is to be reliably compared. Thus, the characteristic of comparability implies that the personnel involved in data acquisition and reduction must operate measurement systems within the calibrated range of the particular instrument(s) used and use analytical methodologies which produce comparable results.

When comparison of data sets indicates certain values within one or more sets are not consistent with the totality of the data acquired, these values, known as "outliers," must be reassessed prior to use in the decision-making process. Statistical analysis is often required to define whether or not the "outliers" represent significant values requiring recognition in the decision-making process.

5.0 DOCUMENTATION OF SAMPLES

A program of sample chain-of-custody procedures, shall be established to confirm that sample integrity is maintained and that data generated through the analysis of the samples is applicable to the site. This program shall be followed during sample collection and handling in both the field and the laboratory. The program is designed to account for each sample at all times. To maintain the highest degree of control in sample handling, preprinted labels will be used so that all necessary information is retained with the sample. Chain-of-custody records and shipping manifests will be used to document access to and the destination of samples during shipment from the location of sample collection. Additionally, proper completion of field sample logs, accession books, tracking sheets, and extraction logs by appropriate field and laboratory personnel will provide for thorough monitoring of the samples from collection through analysis and final reporting.

The sample identification, custody, and monitoring procedures shall provide that:

1. All samples collected are uniquely labeled for identification purposes throughout the analytical process;

2. Samples are correctly analyzed and that results are traceable to field records;

3. Important sample characteristics are preserved;

4. Samples are protected from loss, damage, or tampering;

5. Any alteration of samples (eg, filtration, preservation, or damage due to shipment or other processes) is documented;

6. A record of sample integrity and analytical fate is established for legal purposes.

5.1 Sample Monitoring Forms

The use of the indicated forms listed above accomplishes one or more of the specific objectives of sample custody, identification, or control. The use of each of the listed forms is discussed below.

5.1.1 Sample Log

The sample log is completed in the field by the individual physically in charge of the sample collection. The sample log correlates the assigned sample designation to a specific well or sample location or other distinguishing feature or attribute (ie, dummy sample, replicate sample, purge evaluation sample, etc.). The sample log also contains information concerning date and time of sampling, type of sample (water or soil), sample location and depth for wells and soil, purge volume, meter identification, and calibration method, procedures utilized to preserve the sample for analysis (if necessary), and the sequence in which sampling was completed. Other relevant information, such as weather conditions, may also be included.

5.1.2 Chain-of-Custody Record

The chain-of-custody record is completed in the field by the individual physically in charge of the sample collection. The chain-of-custody record may be completed contemporaneously with the sample log or prior to the shipment of samples to the laboratory. The chain-of-custody record contains information regarding the date of sample collection, the sampler, the project name and number, laboratory project number, the number of containers of each sample being shipped, and an itemization of the analyses requested for each sample together with any remarks about the sample prior to shipment. The chain-of-custody record is enclosed in a sealed plastic bag with the samples after it has been signed by the sampler. The record

is then signed by the persons relinquishing and receiving the sample, each time possession of the samples changes. In addition, the time of exchange is indicated on the record. A sample chain-of-custody form is in Appendix A.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction is the process of converting measurement system outputs to an expression of the parameter which is consistent with the comparability objective identified in Section 4.5 of this plan. Calculations completed during data reduction of analytical results shall be in accord with approved EPA analytical methods and procedures.

Field data collection and validation will be in accord with the following described process. Once the data is obtained, it is reviewed and assessed for overall adequacy by the Project Engineer. If it is determined that the initial data collection activity, or a portion thereof, did not provide adequate data, the activity will be repeated.

Calculations performed during data reduction shall be reviewed by the chemist performing the analysis, by the engineer/scientist/technician collecting data in the field, or by the engineer/scientist evaluating data in the laboratory prior to the reporting of any data, thus assuring that reporting errors are kept to a minimum.

Analytical results reported for each sample shall be verified for proper identification by comparing the original sample collection logs with the chain-of-custody forms and the various laboratory log books. Based upon the results of this validation procedure, the laboratory shall certify that the results are in compliance with the quality assurance objectives for accuracy and precision. Upon certification by the laboratory manager, the reported values shall be received and reviewed by the technical staff and the Quality Assurance Leader, if deemed necessary.

Field or analytical data entered into the computer data base for storage, analysis, or report generation shall be initially submitted to the Manager of Data Processing or this manager's designee. Data submitted for entry shall have been checked and verified by the engineer, scientist, chemist, or technician as being accurate and complete and as meeting the quality

assurance criteria established for the phase of work in which the data was developed. Data are then entered into the computer by data entry operators using standardized entry forms developed especially for the type of data submitted.

After entry of the data into the computer, a hard-copy printout of the data is generated and the printout compared directly with the original data sheets. A data entry operator who was not involved in the original entry of the data to the computer reviews the hard-copy printout. Each entry is reviewed and inaccurate entries are highlighted. After review is complete, the hard-copy printout is returned to the original data entry operator and the noted inaccuracies are corrected. A final printout of the data is generated by the computer and the corrected version of the data base is reviewed. After all corrections have been made to the data base, the original data sheets are stamped "POSTED," and filed in the office's central file.

Data, information, or designs submitted to the drafting department for development are initially prepared by the engineer or scientist responsible for creation of a graphical representation. The sketch or graphic representation is then reviewed by that engineer or scientist and the chief draftsman for format, content, and consistency with prior work. The drawing is then assigned a unique project drawing number, the number and title of the drawing is entered into the drafting department log, and a draftsman is assigned to formally develop the drawing. After completing the initial presentation of the drawing, a paper check print is produced for review by the originating engineer or scientist. All information on the check print is reviewed; and approved information is highlighted with a yellow highlighter marker, while incorrect information, changes, or additions are noted in red ink. The check print is then returned to the draftsman for correction, and a final check print is issued for review. Upon approval of the final check print, the originating engineer or scientist signs and dates the mylar original. The drawing is then reviewed by the Task Leader or Project Manager for consistency with project

objectives, and then the Task Leader or Project Manager signs and dates the original mylar.

Revisions to previously approved mylar drawings are submitted to the drafting department on paper prints of the original mylar. Revisions are made to the mylar, with the same review process as noted previously for original work. When the revisions are finally approved, a notation of the revision scope is noted in the margin of the drawing, and the dated, revised drawing is then signed by the individual approving the revision as presented.

7.0 CORRECTIVE ACTION

Corrective or preventive action is required when potential or existing conditions are identified that may have an adverse impact on data quantity or quality. Corrective action could be immediate or long term. In general, any member of the program staff who identifies a condition adversely affecting quality can initiate corrective action by notifying in writing his or her supervisor and the Quality Assurance Leader. The written communication will identify the condition and explain how it may affect data quality or quantity. Corrective action in the field is the responsibility of each individual of the on-site staff, with review of procedures to be used occurring prior to sampling episodes and a check of the procedures implemented taking place after the sampling episode is completed. Corrective actions with regard to laboratory analyses are the responsibility of the designated laboratory. The acceptance or rejection of analytical data is contingent upon the results of analysis presented for the quality control and calibration standards. The plotting of quality control data on a chart allows for continued tracking of quality control procedures and results, with this information as well as all analytical results retained in the files for future reference and review.

7.1 Immediate Corrective Action

This type of corrective action is usually applied to spontaneous, non-recurring problems, such as an instrument malfunction. The individual who detects or suspects nonconformance to previously established criteria or protocol in equipment, instruments, data, methods, etc. will immediately notify his/her supervisor. The supervisor and the appropriate Task Leader will then investigate the extent of the problem and take the necessary corrective steps. If a large quantity of data is affected, the Task Leader must prepare a memorandum to the Project Manager, the client, and the Quality Assurance Leader. These individuals will collectively decide on a course of action to correct the deficiencies while the project proceeds. If the problem is limited in scope, the Task Leader will decide on the

corrective action measure, document the solution in the appropriate workbook, and notify the Project Manager, the client, and the Quality Assurance Leader by memorandum.

7.2 Long-term Corrective Action

Long-term corrective action procedures are devised and implemented to prevent the recurrence of a potentially serious problem. The Quality Assurance Leader will be notified of the problem and will conduct an investigation to determine the severity and extent of the problem. The Quality Assurance Leader will then file a corrective action request with the Project Manager and Quality Review Team. In case of dispute between the Quality Review Team and the Project Manager, the Responsible Corporate Officer will make a final determination with the Naval Coordinator.

Corrective actions may also be initiated as a result of other activities including:

1. Performance audits;

2. System audits;

3. Laboratory/field comparison studies;

4. Quality Assurance/Quality Control program audits conducted by the Quality Review Team.

The Quality Assurance Leader will be responsible for documenting all notifications, recommendations, and final decisions. The Project Manager and the Quality Assurance Leader will be jointly responsible for notifying program staff and implementing the agreed upon course of action. The Quality Assurance Leader will be responsible for verifying the efficiency of the implemented actions. The development and implementation of preventive and corrective actions will be timed, to the extent possible, to minimize any adverse impact on project schedules and subsequent data

generation and processing activities. However, scheduling delays will not override the decision to correct the data collection deficiencies or inaccuracies before proceeding with additional data collection. The Quality Assurance Leader will also be responsible for developing and implementing routine program controls to minimize the need for corrective action.

8.0 REPORTS TO MANAGEMENT

Periodic summary reports will be prepared to inform management of the project status. The reports will include:

1. Periodic assessment of measurement data accuracy, precision, and completeness;

2. Results of performance audits and/or systems audits;

3. Significant QA/QC problems and recommended solutions;

4. Status of solutions to any problems previously identified.

Additionally, any incidents requiring corrective action will be fully documented. Procedurally, the Quality Assurance Leader will prepare the reports to management. These reports will be addressed to the Project Manager and the Quality Review Team. The summary of findings shall be factual, concise, and complete. Any required supporting information will be appended to the report.

REFERENCES

REFERENCES

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_____, 1988, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," draft, OSWER-9355.3-01.

TABLES

TABLE 1

SAMPLING INFORMATION

SITE (1, 2, 3,..., 20)
MATRIX (A)ir, (S)oil, (W)ater
Sample Identification
Laboratory Identification
Location (northings and eastings)
Date Sampled
Duplicates or Splits
Sampler
Calibration Method
Collection Method (grab, bail, pump)
Purge Volume
Number of Containers
Volume of Container (40 ml, liter)
Time of Sample
Transportation Method
Analyzing Laboratory
Analytical Method
Turnaround time
Analyses
Depth to Sample
Preservation Method
Total Dissolved Solids
pH
Temperature
Other (visual, odor)

Priority Pollutant Inorganics

Antimony
Arsenic
Beryllium
Cadmium
Chromium III & IV
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc

Priority Pollutant Volatile Organics

Benzene
bis(Chloromethyl)ether
Bromoform
Bromodichloromethane
Bromomethane

TABLE 1

SAMPLING INFORMATION
(Continued)

Priority Pollutant Volatile Organics (Continued)

Carbon tetrachloride
Chlorobenzene
Chloroethane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Dibromochloromethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
Trans-1,2-Dichloroethene
Trans-1,3-Dichloropropene
1,2-Dichloropropane
Ethylbenzene
Methylene Chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethene
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
Vinyl Chloride

Priority Pollutant Semivolatile Organics

Acenapthene
Acenapthylene
Anthracene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether
bis(2-Chloroisopropyl)ether
4-bromophenyl phenyl ether
Butyl benzyl phthalate
2-Chloronapthalene
4-Chlorophenyl phenyl ether
Chrysene
Dibenzo(a,h)anthracene
1,2-Dichlorobenzene
1,3-Dichlorobenzene

TABLE 1

SAMPLING INFORMATION
(Continued)

Priority Pollutant Semivolatile Organics (Continued)

1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
Diethyl phthalate
Dimethyl phthalate
Di-n-butyl phthalate
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octyl phthalate
1,2-Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3)pyrene
Isophrone
Napthalene
Nitrobenzene
N-Nitroso-dimethylamine
N-Nitroso-di-N-propylamine
N-Nitrosodiphenylamine
Phenanthrene
Pyrene
1,2,4-Trichlorobenzene
4-Chloro-3-methylphenol
2,-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
4,6-Dinitro-2-methylphenol
2,4-Dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorphenol
Phenol
2,4,6-Trichlorophenol

Pesticides/PCBs

Aldrin
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
Chlordane
4,4'-DDD
4,4'-DDE

TABLE 1

SAMPLING INFORMATION
(Continued)

Pesticides/PCBs (Continued)

4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Toxaphene
PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260

Miscellaneous*

Gross Alpha and Beta
Radioactivity
Uranium 266 and Uranium 228
Chemical Oxygen Demand (COD)

*other chemicals may be analyzed if a need is recognized

TABLE 2

DOCUMENT INVENTORY CONTROL

Title of Document
Type of Document (Preliminary, Draft)
Reviewer
Review Date
Project Technical Advisor
Date
Number of Copies
Addressees and Date Sent
Returned with Comments
Additional Review
Project Manager Review
Resubmitted
Submitted to Whom
Copy Number
In-House Copies

Daily Worksheet
Field Logs
Equipment Logs
Water Levels
Boring Logs
Well Details
Sampling Logs
Chain of Custody
Sample Transportation Receipt
Project Record
Loss Documentation
Corrective Measures

TABLE 3

GEOLOGIC/HYDROGEOLOGIC DATA

General Topography
Distinguishing Landmarks

Geologic Conditions
Hydrologic Conditions

TABLE 4

DRAFTING

Computer Assisted Drawing (CAD) or Hand Drawing
Drawing Number
Drawing Description
Date Complete
Drawing Type (Preliminary, Draft)
Checked by, Date
Project Technical Director, Date

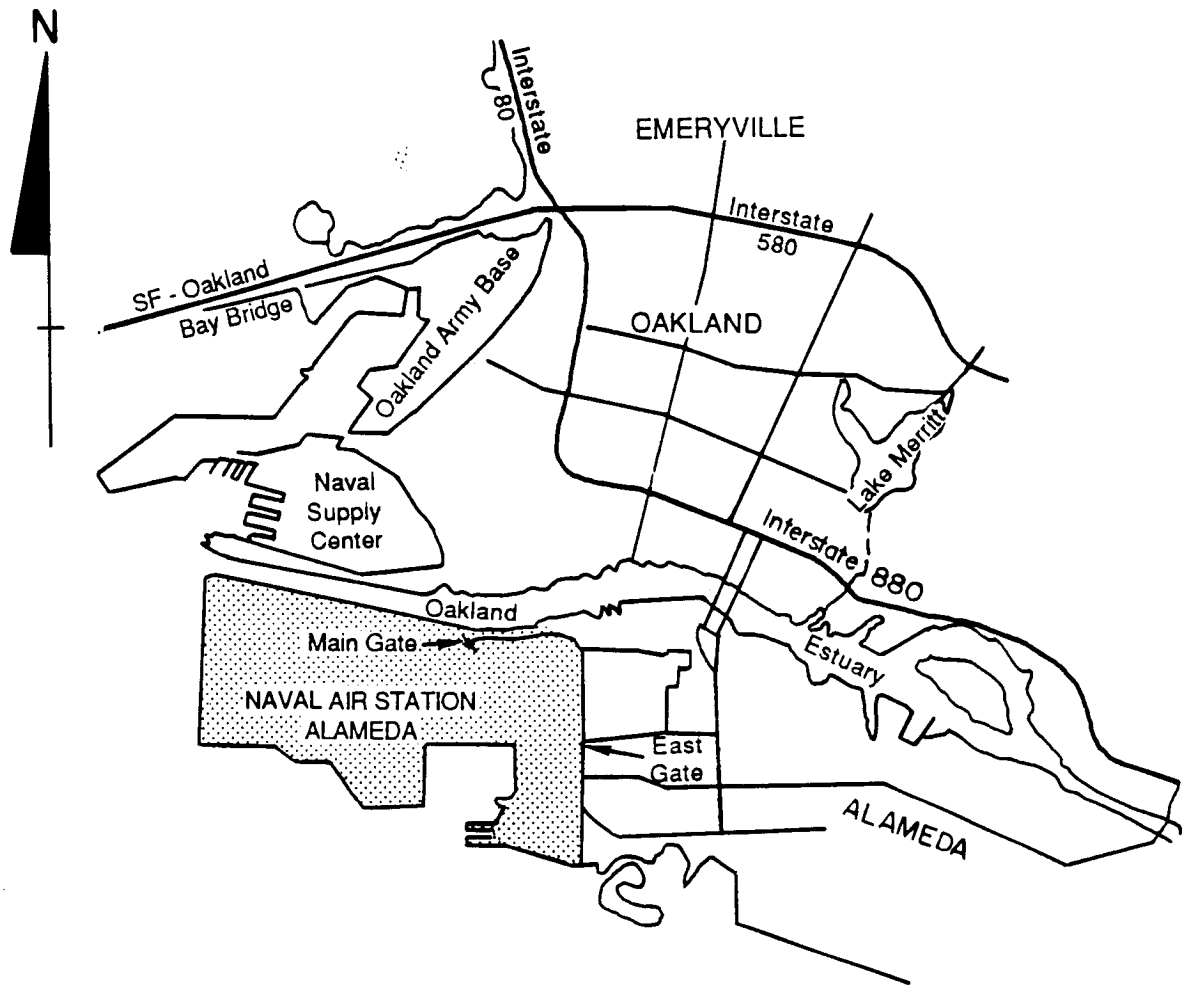
N00236.000361
ALAMEDA POINT
SSIC NO. 5090.3

FIGURES

DATA MANAGEMENT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

DATED 01 MAY 1989

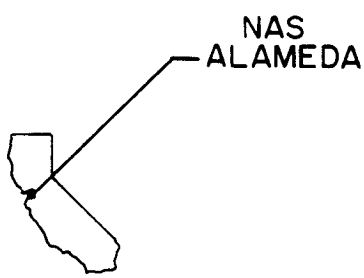
113525



SITE LOCATION

SCALE

6000 0 6000 FEET



SITE LOCATION PLAN
NAVAL AIR STATION
ALAMEDA, CALIFORNIA

PREPARED FOR

WESTERN DIVISION
NAVAL FACILITIES ENGINEERING
COMMAND

Canonie Environmental

DATE: 5-4-88	FIGURE 1-1	DRAWING NUMBER
SCALE: AS SHOWN		86-018-A1

DRAWING NUMBER 86-018-A1

DRAWN BY LEH 5-4-88

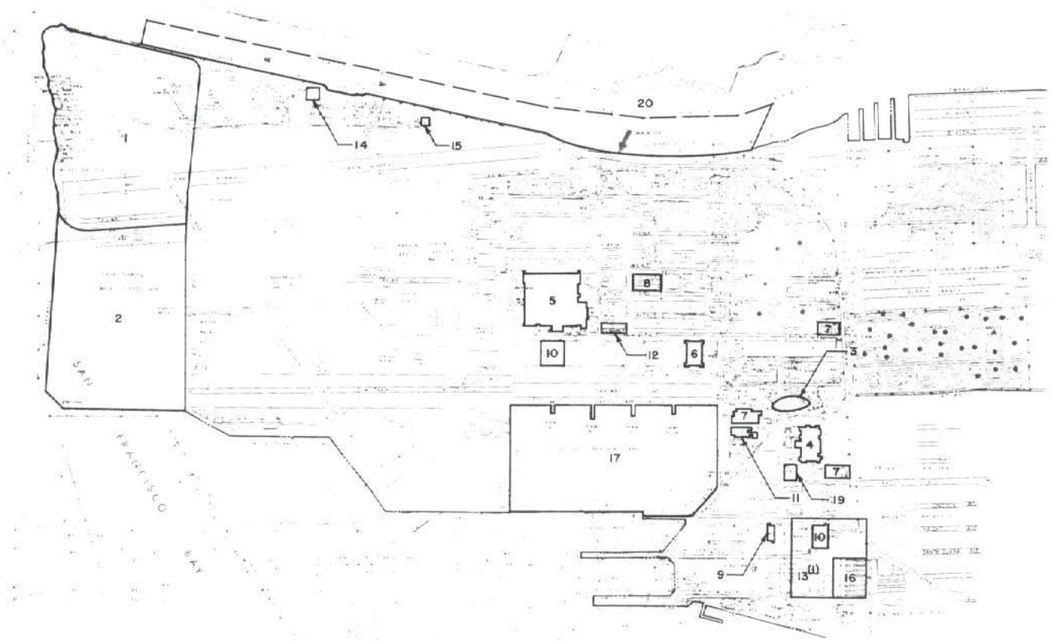
CHECKED BY

APPROVED BY

REVISIONS NO. DATE

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
E2	LEA 7-27-88		86-018-E3

N



NOTES:

1. THE AREA OF SITE 13 INCLUDES THE AREAS OF SITES 10 AND 16.

LEGEND:

Site No.	Site Description
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation Gasoline Tanks)
4	Building 360 (Plating Shop, Engine Cleaning Shop, Paint Shop, and Paint Stripping Shop)
5	Building 5 (Plating Shop, Paint Stripping Shop, Cleaning Shop, and Paint Shop)
6	Building 41 (Aircraft Intermediate Maintenance Dept.)
7	Buildings 162, 459, and 547 (Service Stations)
8	Building 114 (Pest Control Area and Separator Pit)
9	Building 410 (Paint Stripping)
10	Buildings 400 and 530 (Missile Rework Operations)
11	Building 14 (Engine Test Cell)
12	Building 10 (Power Plant)
13	Oil Refinery
14	Fire Training Area
15	Buildings 301 and 389 (Storage Area)
16	Cans C-2 Area
17	Seaplane Lagoon
18	Station Sewer System (Not on Site)
19	Yard D-13 (Hazardous Waste Solvents)
20	Estuary (Oakland Inner Harbor)

SCALE
1000 0 1000 2000 FEET

REFERENCE:
U.S. NAVY MAP

REMEDIAL INVESTIGATION/FEASIBILITY STUDY SITES
NAVAL AIR STATION
ALAMEDA, CALIFORNIA

PREPARED FOR

WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA

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REVISIONS NO.	DATE

DATE: 7-27-88	FIGURE 1-2	DRAWING NUMBER 86-018-E3
SCALE:		

86-018-E2

APPENDIX A

DATA GATHERING AND MANAGEMENT FORMS

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LABORATORY PERMEABILITY TEST

PROJECT NAME ______________________ PROJECT No. ______________

SAMPLE I.D. ______________ SAMPLE DEPTH ______________ PERMEANT ______________

DATE	TIME	ELAPSED TIME (hrs.)	PRESSURE (PSI)			BURRETTE READINGS		INCREMENTAL		CUMULATIVE			AVG. FLOW RATE (cc/sec)	PORE VOLUME RATIO	K (cm/sec)
			INFL	EFFL	CELL	INFLUENT No.___	EFFLUENT No.___	INFL (cc)	EFFL (cc)	TIME (hrs)	INFL (cc)	EFFL (cc)			

SAMPLE LENGTH (cm)	______
DIAMETER (cm)	______
AREA (cm x cm)	______
TOTAL VOLUME (cc)	______
POROSITY	______
PORE VOLUME	______

SAMPLE WEIGHT (gms)	BEFORE	AFTER
WET		
WET		
DRY		
WT. OF WATER		

SPECIFIC GRAVITY (circle one): 2.60, 2.65, 2.70, 2.75, OTHER ______

COMMENTS: ______________________________

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Sample Control Record
Refigerator_____

Lab. ID. #	LP. #	Accession By:	Date And Time Removed	*Reason Code	Section: Requested By:	Date And Time Returned

*Reason Code
1= INITIAL STORAGE 2= SAMPLE PREPARATION 3= SAMPLE ANALYSIS 4= DISPOSAL 5= OTHER

CADFORM 19-87

Canonie Environmental

ACCESSION LOG BOOK

RECEIVED FROM	DATE RECEIVED RECEIVER	COMMENTS ANALYZED	DISPOSED	LABEL	LAB. NUMBE

TAT

Client:

Report to:

cc:

Purchase Order No.:

Billing:

LP No.:

Project No.:

Source: E L R

Quote No.:

Date Sampled:

Date Received:

Sampling Charges — Total

Sampling Hrs @ 38.00 — Milage @ 0.30

Miscellaneous Charges

# of Samples	Matrix	Analysis Code	Analysis	Sec-tion	Verbals Date	Lab Work Date Due	Report Date Due	Cost/ Sample	Total

Login Entry Initials

Data Entry Initials

Analysis Comments

Outside work:

Lab	Analysis	# Samples	Charge	Total
			Grand Total	

☐ CANONIE ENVIRONMENTAL LABORATORY SAMPLE TRACKING SHEET | LP #:

CLIENT:
PROJECT #:

ANALYSIS:
MATRIX:

DATE SAMPLED:
DATE RECEIVED:
COST:

COMMENTS:

SAMPLER I.D.	LAB I.D.	CONTAINER

SAMPLE VOL/WGT:	FINAL EXTRACT VOL:
SAMPLE I.D.: LINE 1	LINE 2
LAB I.D.:	DATE PREP'D:
UNITS:	DATE ANAL:

		COLUMN					
		DATE					
		DILUTION					
		WORKER					
		LAB I.D.					
MDL	ANALYTE(S)	FINAL					

PROJ. NO.	PROJECT NAME
L.P. NO.	SAMPLERS: (Signature)

DATE	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS												REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Remarks

Canonie Engineers 83 W. March Lane, Stockton, Ca. 95207

White - Sampler Canary - Return Copy To Shipper Pink - Lab Copy

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Water Content Determination

PROJECT _____ TESTED BY _____ DATE _____

PROJECT NO. _____ CALC. BY _____ DATE _____

BORING NO. _____ CHKD BY _____ DATE _____

TARE NO.					
WEIGHTS	TARE + WET SOIL				
	TARE + DRY SOIL				
	TARE				
	DRY SOIL				
	WATER				
WATER CONTENT					
SAMPLE					
COMMENTS					

TARE NO.					
WEIGHTS	TARE + WET SOIL				
	TARE + DRY SOIL				
	TARE				
	DRY SOIL				
	WATER				
WATER CONTENT					
SAMPLE					
COMMENTS					

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Hydrometer Analysis
152 H

PROJECT _____ TESTED BY _____ DATE _____

PROJECT NO. _____ CALC. BY. _____ DATE _____

BORING NO. _____ CHKD. BY _____ DATE _____

SAMPLE _____ DEPTH _____

SOIL SAMPLE WEIGHT

TARE NUMBER _____

WT. TARE + DRY SOIL (g) _____

WT. TARE (g) _____

WT. DRY SOIL, W (g) _____

SPECIFIC GRAVITY _____

SODIUM HEXAMETAPHOSPHATE SOLUTION CORRECTION -7.0

MENICUS CORRECTION +1.0

$P = (a/W)\,R =$ _____ R

$D = K\sqrt{L/T} =$ _____ $\sqrt{L/T}$

P = PERCENTAGE FINER IN SOLUTION (%)
a = CORRECTION FACTOR FOR SPECIFIC GRAVITY, FROM TABLE 1
W = WEIGHT OF SOIL IN SOLUTION (g)
R = CORRECTED HYDROMETER READING (g/l)

D = DIAMETER OF PARTICLES (mm)
K = CONSTANT DEPENDING ON TEMP. AND SPECIFIC GRAVITY, FROM TABLE 3.
L = EFFECTIVE DEPTH, FROM TABLE 2 OR FIG. 1 (cm)
T = ELAPSED TIME (MIN.)

$P' = (\#10)P =$ _____ P

P' = PERCENTAGE FINER OF TOTAL SAMPLE (%)
#10 = PERCENTAGE OF TOTAL SAMPLE FINER THAN #10 (%)
P = PERCENTAGE FINER IN SOLUTION (%)

DATE	TIME	ELAPSED TIME, T (MIN)	ACTUAL HYDRO-METER READING (g/l)	TEMP (°C)	COMPOSITE CORREC-TION (FIG. 2)	CORRECTED HYDRO-METER READING, R (g/l)	P (%)	L (CM)	D (MM)	P (%)
		0								
		1/4								
		1/2								
		1								
		2								
		2								
		5								
		15								
		30								
		60								
		240								
		1440								

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SIEVE ANALYSIS

PROJECT _____ TESTED BY _____ DATE _____

PROJECT NO. _____ CALC. BY _____ DATE _____

BORING NO. _____ CHKD BY _____ DATE _____

SAMPLE NO. _____ DEPTH _____

SOIL DESCRIPTION _____

WATER CONTENT

TARE NO	
WT. TARE + WS	
WT. TARE + DS	
WT. TARE	
DRY SOIL	
WATER	
WATER CONTENT	

WT. OF TOTAL SAMPLE WET = _____ gm

WT OF TOTAL SAMPLE DRY = A _____ gm

WT OF TOTAL (+200) SAMPLE = B _____ gm

WT. OF TOTAL (-200) SAMPLE = C = A − B _____ gm

SIEVE	SIEVE OPENING	ACCUMULATIVE WT. OF SOIL RETAINED (gm)	PERCENT FINER
3"	75.0		
1 1/2"	37.0		
3/4"	19.0		
3/8"	9.5		
#4	4.75		
#10	2.00		
#20	0.85		
#40	0.425		
#80	0.177		
#200	0.075		
PAN	——		

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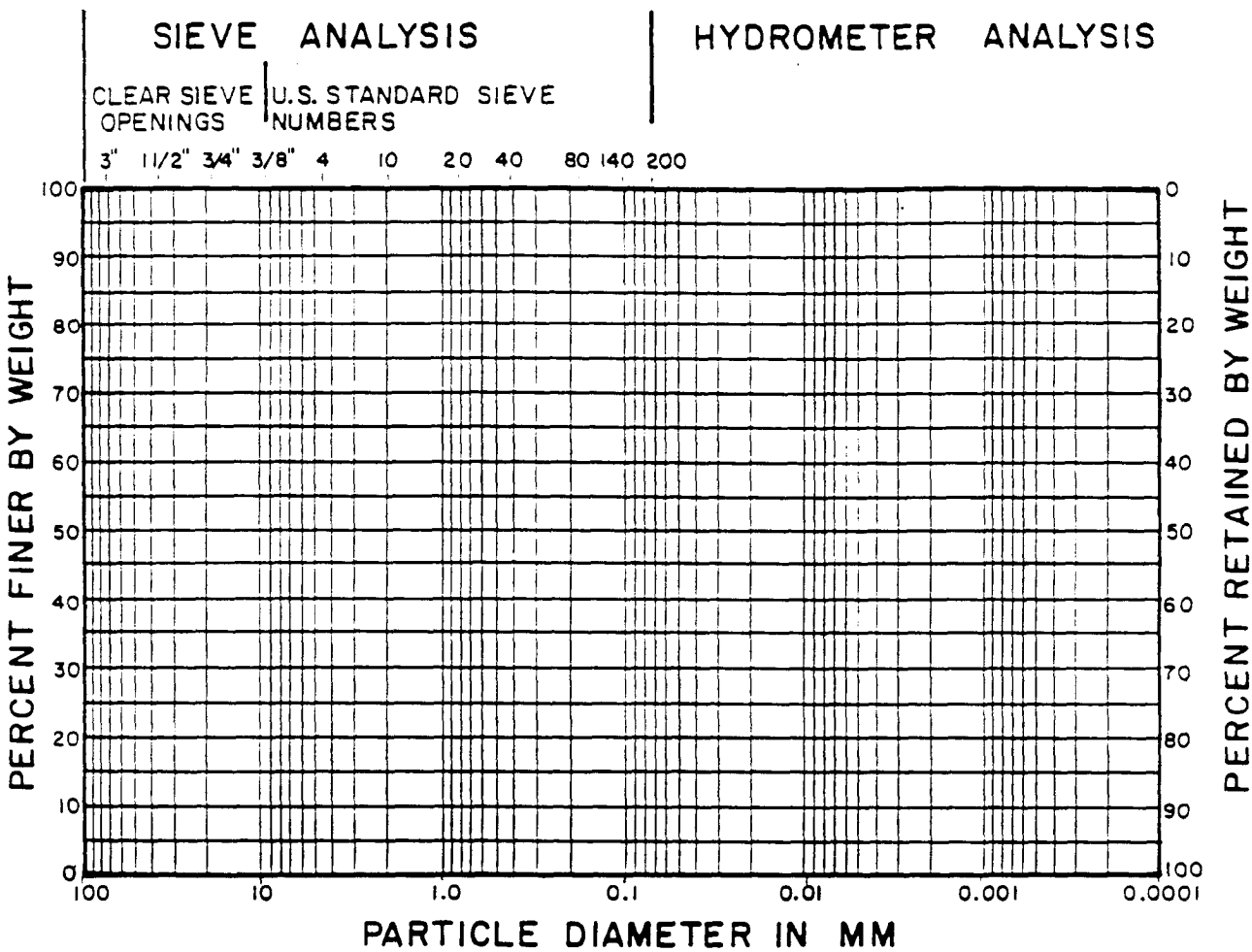
Particle Size Distribution

PROJECT _____ PLOTTED BY _____ DATE _____

PROJECT NO. _____ CLASSIFIED BY _____ DATE _____

BORING NO. _____ CHECKED BY _____ DATE _____



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%

Rev 6-86

Canonie Environmental

FIELD PERMEABILITY TESTS·FALLING HEAD

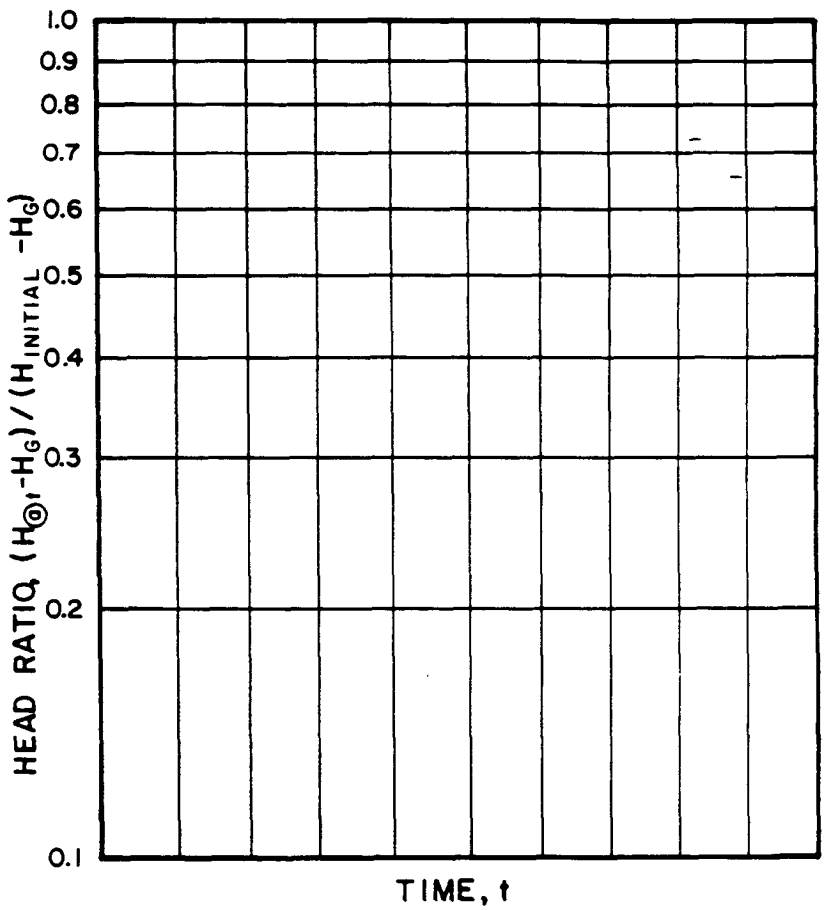
TESTED BY _____ DATE _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____

PROJECT _____
PROJECT No. _____
BORING No. _____

DIAMETER OF CASING, d _____ PERMEABILITY, K _____
DIAMETER OF TEST BORING, D _____
HEIGHT OF CASING (REF. LEVEL)
ABOVE GROUND SURFACE, H_c _____
DEPTH TO BOTTOM OF TEST POCKET, L_1 _____
DEPTH TO TOP OF TEST POCKET, L_2 _____
DEPTH TO GROUND WATER TABLE
FROM TOP OF CASING, H_G _____

* CASED HOLE, UNCASED OR PERFORATEED EXTENSION OF LENGTH, L_1-l_2

ELAPSED TIME t SEC.	DEPTH TO WATER IN CASING H FEET



$$K = \frac{d^2 \ln\left(\frac{4mL}{D}\right)}{8L(t_2 - t_1)} \ln H_1/H_2$$

H_1 = DEPTH TO WATER IN CASING FROM TOP OF CASING AT TIME, t_1
H_2 = DEPTH TO WATER IN CASING FROM TOP OF CASING AT TIME, t_2

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CONSOLIDATION TEST DATA (CONT.)

PROJECT _____ TESTED BY _____ DATE _____

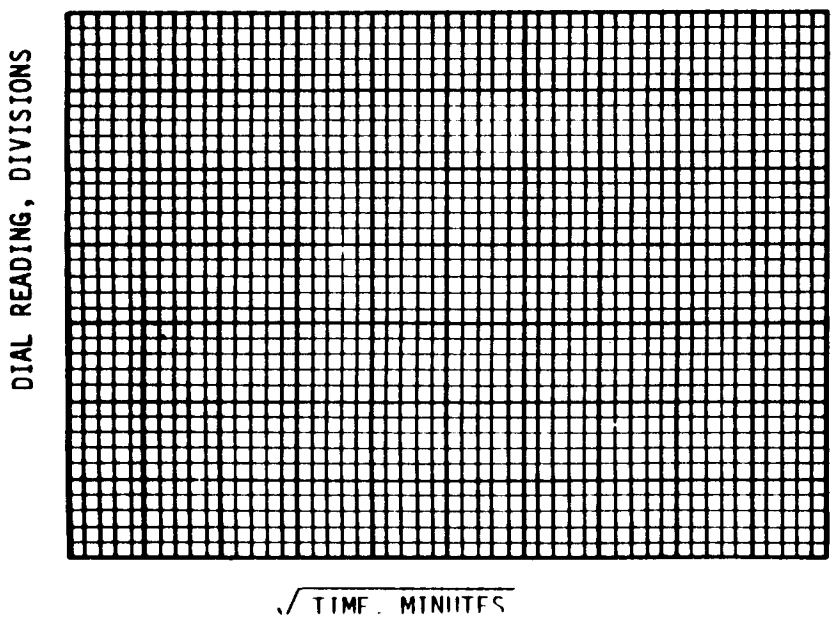
PROJECT NO. _____ CALC. BY _____ DATE _____

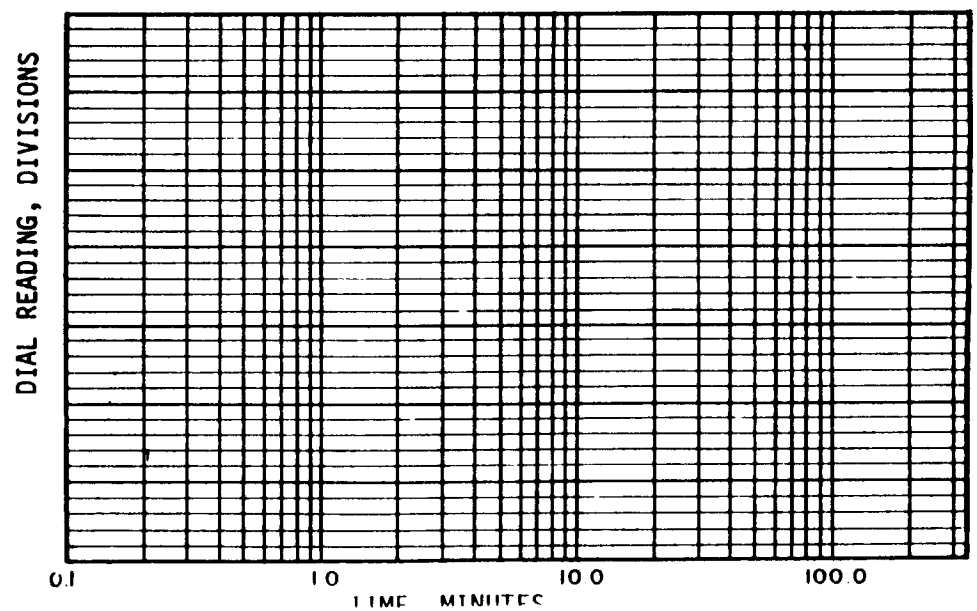
BORING NO. _____ DEPTH _____ CHECKED BY _____ DATE _____

TEST LOAD _____

DATE	TIME	ELAPSED TIME, t, min.	$\sqrt{t}$, $\sqrt{\text{min.}}$	COMPRESSION DIAL, DIV.

DATE	TIME	ELAPSED TIME, t, min.	$\sqrt{t}$, $\sqrt{\text{min.}}$	COMPRESSION DIAL, DIV.





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CONSOLIDATION TEST DATA

PROJECT _____ TESTED BY _____ DATE _____

PROJECT NO. _____ CALC. BY _____ DATE _____

BORING NO. _____ CHECKED BY _____ DATE _____

DEPTH _____

SAMPLE DATA		
SAMPLE DIAMETER	=	IN.
CONSOLIDATION RING NO.	=	
WT. WET SAMPLE + CONSOL. RING	=	GM.
WT. CONSOL. RING	=	GM.
WT. WET SAMPLE	=	GM.
WT. DRY SAMPLE	=	GM.
INITIAL HEIGHT = IN.	FINAL HEIGHT =	IN.

WC BEFORE TEST

TARE NUMBER	
WT. TARE + WS, gm.	
WT. TARE + DS, gm.	
WT. WATER, gm.	
WT. TARE, gm.	
WT. DS, gm.	
WC %	

WC AFTER TEST

TARE NUMBER	
WT. TARE + WS, gm.	
WT. TARE + DS, gm.	
WT. WATER, gm.	
WT. TARE, gm.	
WT, DS, gm.	
WC %	

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Canonie Environmental

COMPACTION TEST

PROJECT _____ TESTED BY _____ DATE _____
PROJECT No. _____ CALC. BY _____ DATE _____
BORING No. _____ CHKD BY _____ DATE _____
SAMPLE No. _____ DEPTH _____
SOIL DESCRIPTION _____

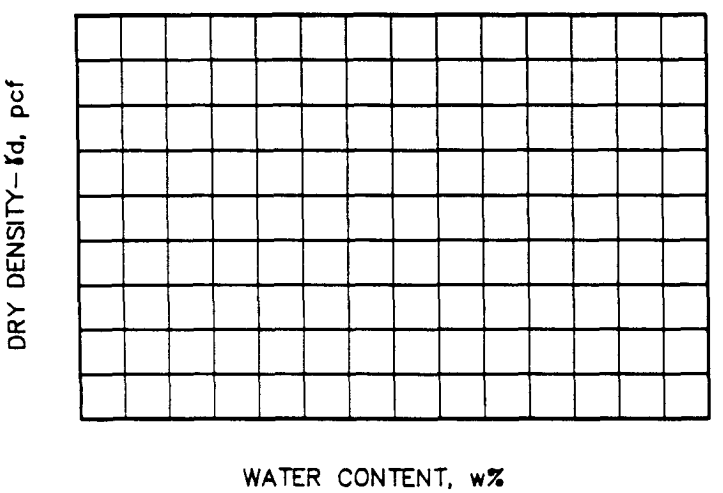
BLOWS/LAYER _____ No. OF LAYERS _____ WT. OF HAMMER _____ lb
MOLD DIMENSIONS: DIA. _____ ft. Ht. _____ ft. Vol. _____ cu ft.

WATER CONTENT DETERMINATION

SAMPLE No.	1	2	3	4	5	6
MOISTURE CAN No.						
WT. OF CAN + WET SOIL						
WT. OF CAN + DRY SOIL						
WT. OF WATER						-
WT. OF CAN						-
WT. OF DRY SOIL						
WATER CONTENT, w%						

DENSITY DETERMINATION

ASSUMED WATER CONTENT						
WATER CONTENT, w%						
WT. OF SOIL + MOLD						
WT. OF MOLD						
WT. OF SOIL						
WET DENSITY γ,pcf						
DRY DENSITY γd, pcf						



$\gamma d = \gamma/(1 + w)$ (DRY DENSITY EQUATION)

ZERO AIR VOIDS CURVE

$\gamma d = G_s \gamma w/1 + (wG_s/S)$ G_s _____
(ZERO AIR VOIDS EQUATION $S \simeq 100\%$)

w	γd

OPTIMUM MOISTURE = _____%
MAXIMUM DRY DENSITY = _____pcf

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NUCLEAR RELATIVE COMPACTION TEST DATA

PROJECT NAME _____ TESTED BY _____
PROJECT No. _____ CALCULATED BY _____
DATE _____ CHECKED BY _____

TEST NUMBER										
N-S COORD.										
E-W COORD.										
ELEVATION										
MODE & DEPTH										
COMPACTION METHOD										
NUMBER OF PASSES										
LIFT THICKNESS										
DENSITY COUNT										
WET DENSITY (PCF)										
MOISTURE COUNT										
MOISTURE (PCF)										
DRY DENSITY (PCF)										
% MOISTURE										
OPTIMUM DRY DENSITY										
OPTIMUM MOISTURE										
% RELATIVE COMPACTION										
MATERIAL DISCRIPTION										

STANDARD COUNT	
DENSITY	MOISTURE

REMARKS:

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NUCLEAR DENSITY GAUGE STANDARD COUNTS RECORD

PROJECT NO. ____________ BY ______________

PROJECT NAME ______________________________

TROXLER MODEL NO. ____________

SERIAL NO. ________________

STANDARD COUNTS		
DATE	DENSITY	MOISTURE

STANDARD COUNTS		
DATE	DENSITY	MOISTURE

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Canonie Engineers

ATTERBERG LIMITS TESTS

PROJECT _____ TESTED BY _____ DATE _____

PROJECT NO. _____ CALC. BY _____ DATE _____

B. H. NO _____ SAMPLE _____ CHECKED BY _____ DATE _____

SAMPLE DEPTH _____

SOIL DESCRIPTION _____

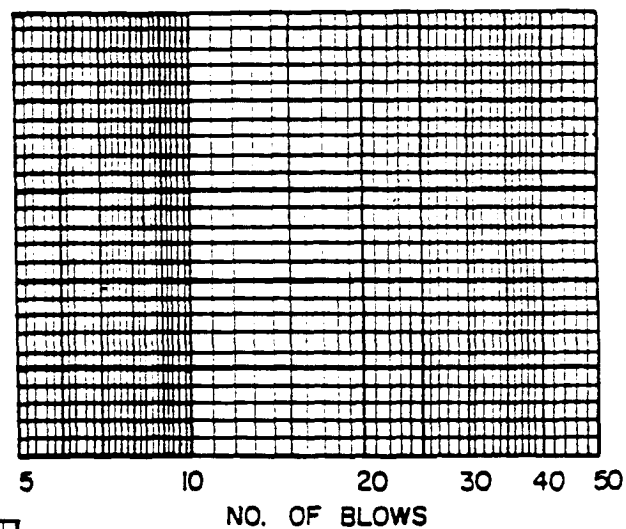
LIQUID LIMIT

Determination No.	1	2	3	4	5
Container No.					
Wt. of Container + Wet Soil, gm					
Wt. of Container + Dry Soil, gm					
Wt. of Water, W_w, gm					
Wt. of Container, gm					
Wt. of Dry Soil, W_s, gm					
Water Content, w, %					
No. of Blows					

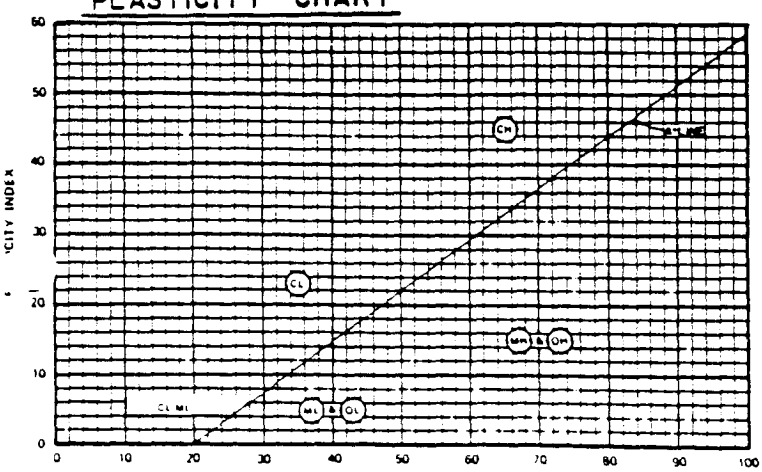
PLASTIC LIMIT

Determination No.	1	2	3
Container No.			
Wt. of Container + Wet Soil, gm			
Wt. of Container + Dry Soil, gm			
Wt. of Water, W_w, gm			
Wt. of Container, gm			
Wt. of Dry Soil, W_s, gm			
Water Content, w, %			

FLOW CURVE

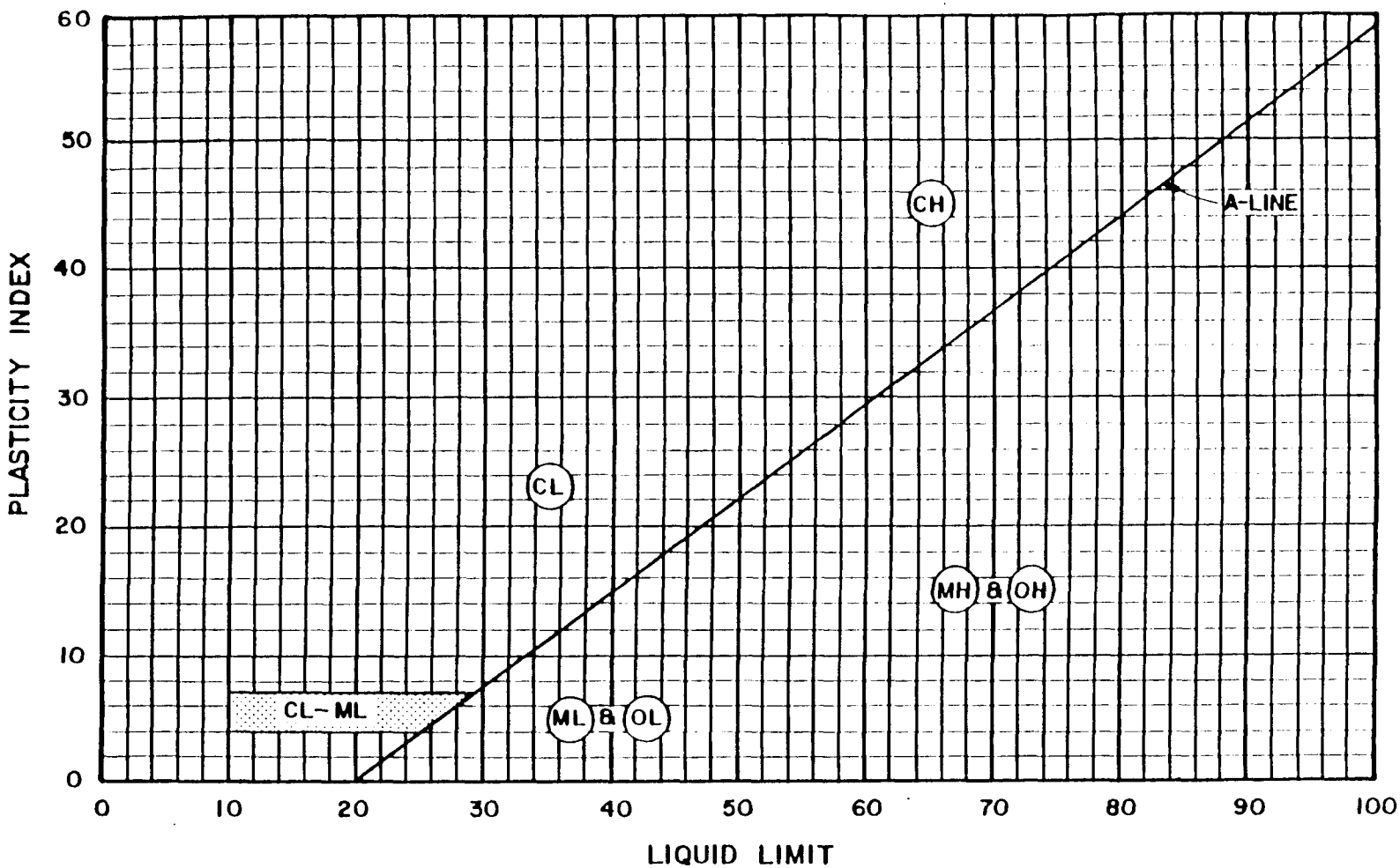


PLASTICITY CHART



SUMMARY OF RESULTS

LIQUID LIMIT	
PLASTIC LIMIT	
PLASTICITY INDEX	
NATURAL WATER CONTENT	
USCS SYMBOL	



PLASTICITY CHART

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TRIAXIAL CELL PERMEABILITY COMPUTATIONS

PROJECT _____ TESTED BY _____ DATE _____
PROJECT No. _____ CALC. BY _____ DATE _____
BORING No. _____ CHKD BY _____ DATE _____
SAMPLE No. _____ SAMPLE DEPTH _____

SAMPLE DATA

	BEFORE TEST	AFTER TEST	% DIFF.
L=LENGTH (cm)			
AVG. DIAMETER (cm)			
TOP AVG. (cm)			
MID AVG. (cm)			
BOT. AVG. (cm)			
A=AREA=$\pi D^2/4$ (cm^2)			
L/A			
V=VOLUME=AxL (cm^3)			

	BEFORE TEST	AFTER TEST	% DIFF.
TARE No.			
TARE + WET SOIL (gm)			
TARE + DRY SOIL (gm)			
TARE (gm)			
DRY SOIL (gm)			
WATER (gm)			
WATER CONTENT (%)			
WET SOIL (gm)			
SOIL WET UNIT WT. γ (gm/cm^3)			
SOIL DRY UNIT WT. γd (gm/cm^3)			
SOIL DRY UNIT WT. γd (PCF)			
SATURATION $S(\%)=V_W/V_V$			

SPECIFIC GRAVITY (G_s)= _____

VOID RATIO, e = _____

POROSITY, n = e/1+e _____

PORE VOLUME = SAMPLE VOLUME x n
= _____ cm^3

PERMEABILITY COMPUTATIONS

L = SAMPLE LENGTH	cm
A = CROSS-SECTIONAL AREA	cm^2
INITIAL TIME, t_1	hr.
FINAL TIME, t_2	hr.
ELAPSED TIME, ΔT	hr.
VOLUME OF INFLUENT	cm^3
VOLUME OF EFFLUENT	cm^3
AVERAGE VOLUMETRIC FLOW =	cm^3
Q = AVAERAGE VOLUMETRIC FLOW RATE = $V/\Delta T$ (cm^3/hr)	cm^3/hr
Q, cm^3/sec = $V/(\Delta T \times 3600\ sec/hr)$	cm^3/sec
PRESSURE DIFFERENTIAL, ΔP	lb/in^2
H = DIFFERENTIAL HEAD, cm = $\Delta P/\gamma w$ = $\frac{(\quad lb/in^2)(144\ in^2/ft^2)(30.48\ cm/ft)}{62.4\ lb/ft^3}$	cm
COEFFICIENT OF PERMEABILITY = QL/AH (CONSTANT HEAD EQUATION)	k = cm/sec

DAILY WORK SHEET

Page ___ of ___

Project Name _____
Date _____
Project Number _____

Approval _____
(Canonie Supervisor)

Approval _____
(Client Representative)

TRAVEL

Per Diem _____ Other _____ Other _____

SAFETY

Level ____ Protection Number of Men _____
Level ____ Protection Number of Men _____
Level ____ Protection Number of Men _____

CANONIE LABOR

Name	Category	TIME Start	TIME Finish	Hours ST	Hours OT

OTHER LABOR

Name	Category	TIME Start	TIME Finish	Hours ST	Hours OT

EQUIPMENT

Description	Hours	DISPOSAL Manifest Number	DISPOSAL Quantity Tons/CY

SUPPLIES

Description	Quantity	Description	Quantity

DAILY TIME SHEET

DATE _____ '9 ____

TIME	CLIENT	DETAIL OF WORK
9:00		
9:15		
9:30		
9:45		
10:00		
10:15		
10:30		
10:45		
11:00		
11:15		
11:30		
11:45		
12:00		
12:15		
12:30		
12:45		
1:00		
1:15		
1:30		
1:45		
2:00		
2:15		
2:30		
2:45		
3:00		
3:15		
3:30		
3:45		
4:00		
4:15		
4:30		
4:45		
5:00		
5:15		
5:30		
5:45		

TOPS FORM 1251

MADE IN U.S.A.

Canonie Engineers

Daily Field Activity Log

PROJECT No. ______________

DATE ______________

PAGE ________ OF ________

PROJECT NAME ____

FIELD ACTIVITY SUBJECT ____

WEATHER ______________________________ LOGGED BY ______________

DAILY ACTIVITIES AND EVENTS:

TIME	ACTIVITY

MATERIALS / EQUIPMENT ____

COMMENTS ____

Canonie Environmental

DAILY FIELD ACTIVITY LOG

PROJECT NAME _____ PROJECT NO. _____

FIELD ACTIVITY SUBJECT _____

LOCATION _____

DAILY ACTIVITIES AND EVENTS:

DATE _____

SHEET _____ of _____

Boring Log Legend

SAMPLE

No: (Number) Soil samples are numbered consecutively from the ground surface. Core samples are numbered consecutively from the first core run.

Type: SS= Split-Spoon (2" O.D.) ST= Shelby Tube A= Auger Cuttings
PT= Piston Tube CR= Core Run

Interval: The depth of sampling interval in feet below ground surface.

BLOW COUNT

The number of blows required to drive a 2-inch O.D. split-spoon sampler with a 140 pound hammer falling 30-inches. When appropriate, the sampler is driven 18 inches and blow counts are reported for each 6-inch interval. The sum of blow counts for the last two 6-inch intervals is designated as the standard penetration resistance (N) expressed as blows per foot.

RECOVERY IN INCHES

The length of sample recovered by the sampling device.

U.S.C.S SOIL TYPE

The Unified Soil Classification System symbol for recovered soil samples determined by visual examination or laboratory tests. Refer to ASTM D2487-69 for a detailed description of procedure and symbols. Underlined symbols denote classifications based on laboratory tests (ie: ML), all others are based on visual classification only.

PERCENT MOISTURE

Natural moisture content of sample expressed as percent of dry weight.

qu,TSF

Unconfined compressive strength in tons per square foot obtained by Hand Penetrometer. Laboratory compression test values are indicated by underlining.

CONTACT DEPTH

The contact depth between soil layers is interpreted from significant changes in recovered samples and observations during drilling. Actual changes between soil layers often occur gradationally and the contact depths shown on the boring logs should be considered as approximate.

SOIL DESCRIPTION AND REMARKS

Soil descriptions include consistency or density, color, predominant soil types, and modifying constituents.

COHESIVE SOILS			GRANULAR SOILS	
Consistency	qu (TSF)	Blows/Ft.	Density	Blows Per Foot
Very Soft	less than 0.25	0-1	Very Loose	4 or less
Soft	0.25 to 0.50	2-4	Loose	5 to 10
Medium Stiff	0.50 to 1.00	5-8	Medium Dense	11 to 30
Stiff	1.00 to 2.00	9-15	Dense	31 to 50
Very Stiff	2.00 to 4.00	15-30	Very Dense	over 50
Hard	more than 4.00	Over 30		

PARTICLE SIZE DESCRIPTION

Boulder= Larger than 12 inches.
Cobble= 3 to 12 inches.
Gravel= 0.187 to 3 inches.
Sand= 0.074 mm to 4.76 mm.
Silt and Clay= Smaller than 0.074 mm

DEFINITION OF TERMS

Trace= 5 to 12 percent by weight.
Some= 12 to 30 percent by weight.
And= Approximately equal fractions.
( )= Drillers observation.

PIEZO.

(Piezometer) Screened interval of the piezometer installation is denoted by cross-hatching.

GENERAL NOTE

The boring logs and related information depict subsurface conditions only at the specific locations and dates indicated. Soil conditions and water levels at other locations may differ from conditions occurring at these boring locations. Also the passage of time may result in a change in the conditions at these boring locations.

SOIL TEST BORING REFUSAL

Defined as any material causing a blow count greater than 100 blows/6 inches. Such material may include bedrock, "floating" rock slabs, boulders, dense gravel seams, or cemented soils. Refusal is usually indicated in fractional notation showing number of blows as the numerator and inches of penetration as the denominator.

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Soil Boring Log

PROJECT No. _____
BORING No. _____
LOGGED BY _____

PROJECT NAME: _____
BORING LOCATION: _____ SURFACE ELEV. _____
DRILLER: DATE: START FINISH

DEPTH	SAMPLE No.	SAMPLE TYPE	SAMPLE INTERVAL FROM	SAMPLE INTERVAL TO	BLOW COUNT 0" 6"	BLOW COUNT 6" 12"	BLOW COUNT 12" 18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER	DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
5															
10															
15															
20															
25															
30															
35															
40															

Canonie

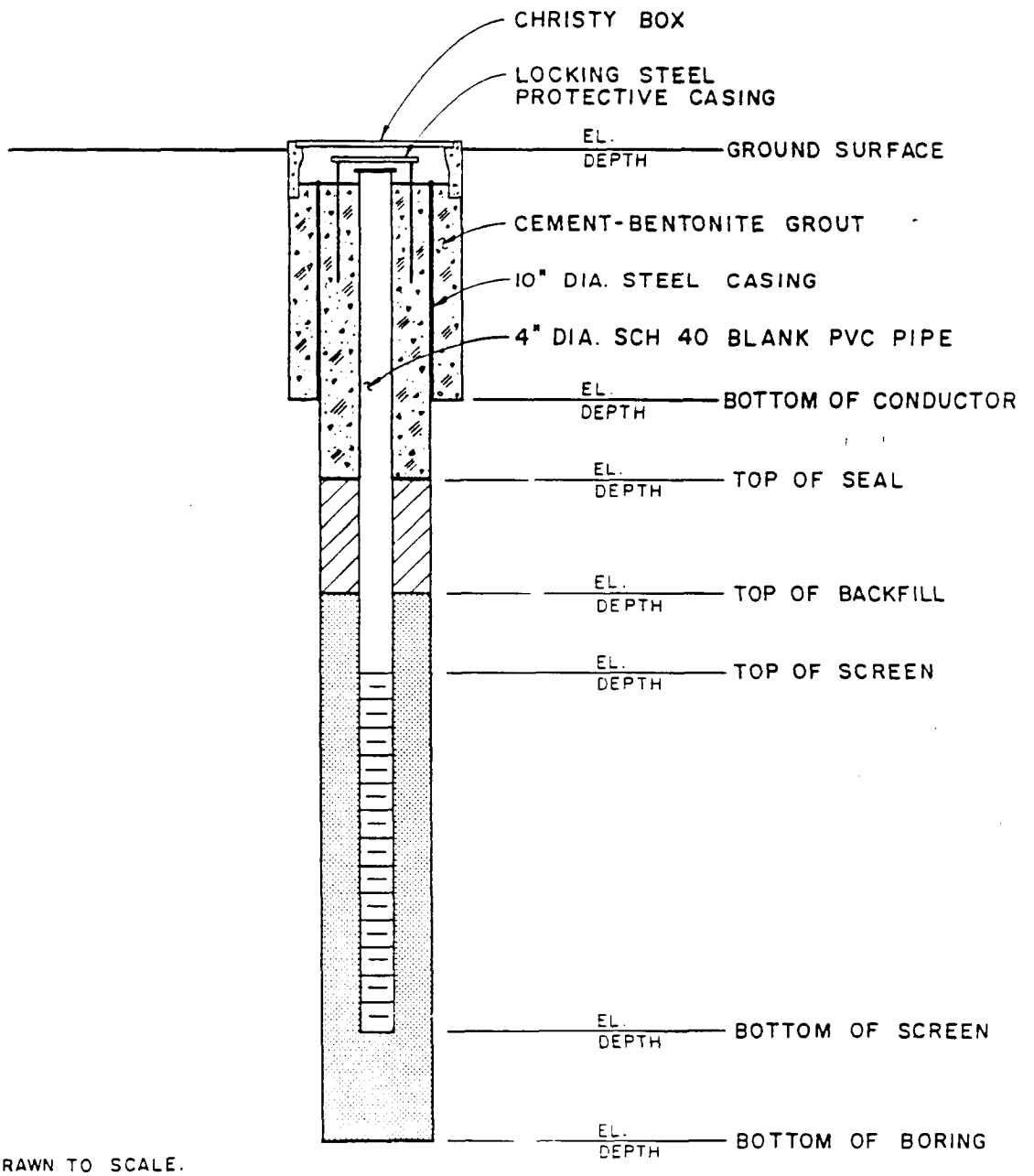
Observation Well Details

PROJECT No. _____

WELL No. _____

PROJECT NAME _____

BORING LOCATION _____ DATE _____ BY _____



NOTES:

1. NOT DRAWN TO SCALE.
2. SEE BORING LOG FOR DETAILED SOIL DESCRIPTION.

86-018-B29

Canonie

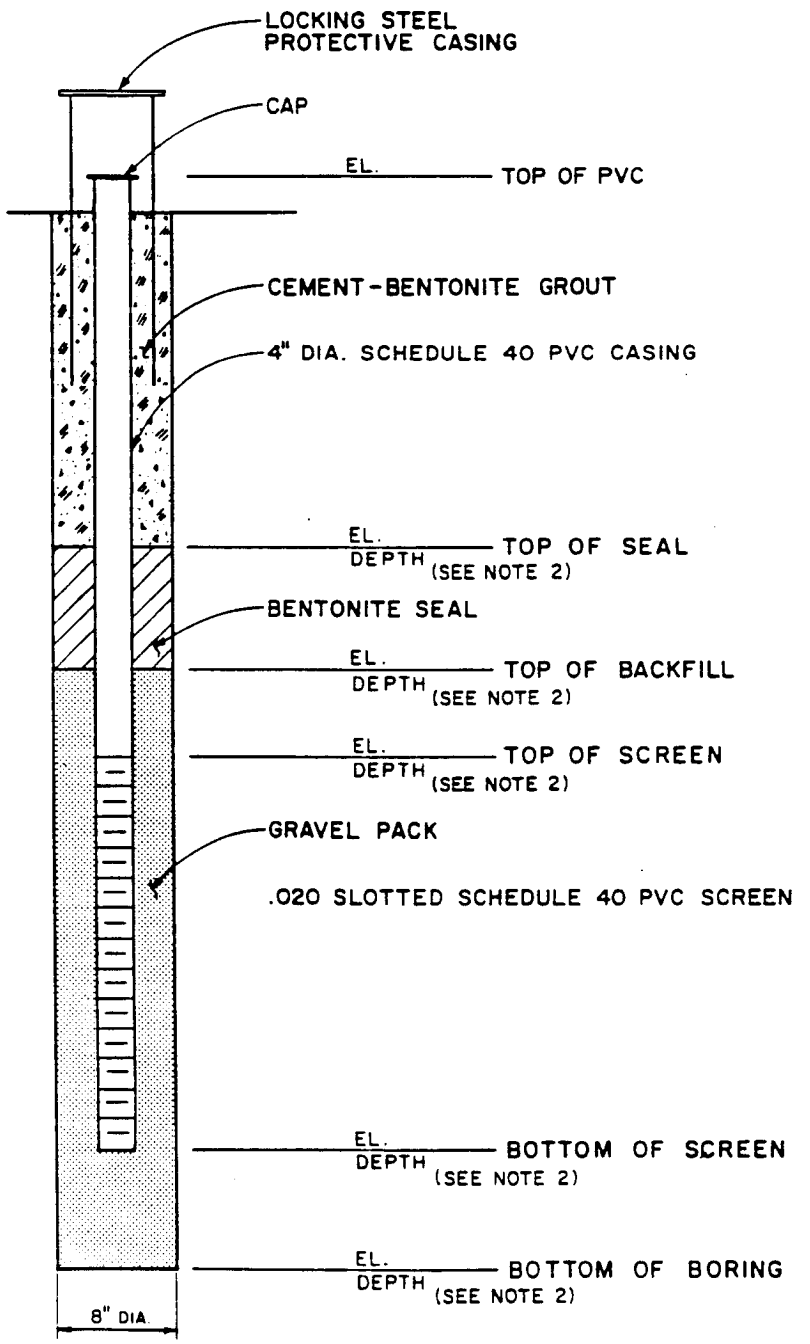
Observation Well Details

PROJECT No. 86-018

WELL No. _____

PROJECT NAME NAVAL AIR STATION, ALAMEDA, CALIFORNIA

BORING LOCATION _____ DATE _____ BY _____



NOTES:

1. NOT DRAWN TO SCALE.
2. SEE BORING LOG FOR DETAILED SOIL DESCRIPTION.

FIGURE 3-4

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DRUM INVENTORY LOG

PROJECT NO. _____ DATE _____

SITE _____ LOGGED BY _____

NO UNITS	TYPE	COLOR	GROUP	COMMENTS

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CES 82-023-02

Drill Cuttings
Tracking Sheets

DATE: _____

JOB NUMBER: _____

NAME OF FIELD PERSONNEL: _____

WELL/BORING #: _____

SAMPLES TAKEN: YES/NO

DEPTH: _____

VOLUME OF CUTTINGS (GALLONS): _____

CHEMICAL CONCENTRATION: _____

TOTAL CHEMICAL EMISSIONS (LBS): _____

[ppb] * [gal] x 8.34 lbs/gal x $1/1x10^9$ = lbs.

**To be filled out and returned every day by all field personnel.

#2571A

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Record Of Pump Test

PROJECT No. _____

OBSERVATION WELL No. _____

PAGE _____ OF _____

PROJECT _____

DATE STARTED _____ TIME STARTED _____ PUMPING WELL No. _____

DISTANCE FROM OBSERVATION WELL TO PUMPING WELL _____

STATIC WATER LEVEL _____ ELEVATION OF DATUM _____

CONTRACTOR _____ TESTED BY _____

PUMPED WELL

Depth of Base of Well _____
Depth of Top of Screen/Unlined Hole _____
Length of Screen/Unlined Hole _____
Depth of Base of Aquifer _____
Depth of Top of Aquifer _____
Thickness of Aquifer _____
I.D. of Screen/Unlined Hole _____
O.D. of Gravel Pack _____
Type of Well Screen/Perf. Casing: _____
Pump _____
Pump Setting _____
Electrical Equip. _____

OBSERVATION WELL

Depth of Base of Well _____
Depth of Top of Screen/Unlined Hole _____
Length of Screen/Unlined Hole _____
Depth of Base of Aquifer _____
Depth of Top of Aquifer _____
Thickness of Aquifer _____
I.D. of Perf. Casing/Unlined Hole _____
I.D. of Standpipe _____
Type of Observation Well: ☐ Open Hole,
☐ Cased Hole, ☐ Hole Cased to El.,
☐ Standpipe Piezometer (open),
☐ Standpipe Piezometer with grout seal at top of filter length.

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Record Of Pump Test

PROJECT NO. _____

OBSERVATION WELL NO. _____

PAGE _____ OF _____

PROJECT _____

DATE STARTED _____ TIME STARTED _____ PUMPING WELL NO. _____

DISTANCE FROM OBSERVATION WELL TO PUMPING WELL _____

STATIC WATER LEVEL _____ ELEVATION OF DATUM _____

MEASURING POINT _____

TESTED BY _____

DATE	TIME	ELAPSED TIME (MINUTES)	WATER LEVEL BELOW MEASURING POINT(FT.)	BY (INITIALS)	PROBE	DRAWNDOWN (FT.)	DISCHARGE (GPM)	CUMULATIVE DISCHARGE (GALLONS)	REMARKS

WATER LEVEL RECORD

PROJECT _____ PIEZOMETER No. _____

LOCATION _____

DATE / TIME	DEPTH TO WATER	ELEV. OF WATER SURFACE	REMARKS	LOG elev.	LOG depth

DEPTH TO WATER IS MEASURED IN FEET FROM TOP OF PIPE. INCLUDE ALL DEWATERING EQUIPMENT IN OPERATION AT TIME OF OBSERVATION IN REMARKS SECTION.

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Water Levels

PROJECT No. _____
MEASURED BY _____
INSTRUMENT TYPE _____
INSTRUMENT No. _____
PAGE _____ OF _____

WELL NUMBER	ELEVATION TOP OF	DEPTH TO WATER	GROUND WATER ELEVATION (FT., MSL)	DATE/TIME	NOTES

CANONIE

FIELD WATER LEVEL FORM

NAME: pg. of

WELL NUMBER	ELEVATION TOP OF PROTECTIVE CASING	DEPTH TO WATER	GROUND WATER ELEVATION	DATE	TIME	NOTES

Canonie Field Sample Log Project _____

Site	Date / /	Type Pumped Grab	Sampler

Times	Start Purge	Stop Purge	Sample Taken	Type of Sample ( ) 3 - 40 ml. VOA ( ) Other _____
Water Levels	Before Purge	Other		Type of Analysis ( ) Mt. View Scan ( ) Palo Alto Scan ( ) _____
Purge Volume	Calculated			Laboratory ( ) Canonie ( ) _____
Water Conditions	Time	PH	Temp.	Conduct	Field Conditions Air Temp. _____ Wind Speed _____ Weather _____ Preservatives ( ) None Type _____
Special Items	Duplicate Sample Number	Cleaning Water Sample Taken Yes ☐ No ☐			

Water Level Indicator
( ) MV7 (Ser. No. 12100)
( ) MV3 (Ser. No. 11093)
( ) Other _____

pH/Conductivity Meter
( ) MV6 (Ser. No. 27636)
( ) MV4 (Ser. No. 5187)
( ) Other _____

Site	Date / /	Type Pumped Grab	Sampler

Times	Start Purge	Stop Purge	Sample Taken	Type of Sample ( ) 3 - 40 ml. VOA ( ) Other _____
Water Levels	Before Purge	Other		Type of Analysis ( ) Mt. View Scan ( ) Palo Alto Scan ( ) _____
Purge Volume	Calculated			Laboratory ( ) Canonie ( ) _____
Water Conditions	Time	PH	Temp.	Conduct	Field Conditions Air Temp. _____ Wind Speed _____ Weather _____ Preservatives ( ) None ( ) Type _____
Special Items	Duplicate Sample Number	Cleaning Water Sample Taken Yes ☐ No ☐			

Water Level Indicator
( ) MV7 (Ser. No. 12100)
( ) MV3 (Ser. No. 11093)
( ) Other _____

pH/Conductivity Meter
( ) MV6 (Ser. No. 27636)
( ) MV4 (Ser. No. 5187)
( ) Other _____

Canonie Environmental

Purchase Requisition

Canonie Environmental Services Corp.
800 Canonie Drive
Porter, Indiana 46304

Phone: 219-926-8651

Requisition No.

Requisition Date

Proposed vendor	Deliver Material to

Requisitioned by	Approved by	Project No.	Delivery Date

Shaded Area is For Purchasing Department Use Only

Confirming ☐ Verbal ☐ Phone ☐ Other | To | From | Date | Buyer Approval

Sales Tax ☐ Applicable ☐ Not Applicable | Ship Via | F.O.B. | Terms | P.O. Assigned

Item No	Cost Code	T	Quantity	Unit	Item Description	Unit Price	Extended Price

CLIENT: _____

PROJECT NO. _____

DRAWING SIZE: _____

DRAWING LOG

DWG NO.	FIG NO.	DRAWING TITLE	COMMENTS	OVERLAY

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