

**MONITORING REPORT
PHASE IV - COMPOSITE SOIL COVER
ACID WASTE ROCK STUDY
HEATH STEELE MINES**

MEND Report 2.31.1bb

**This work was done on behalf of MEND and sponsored by
Noranda-Brunswick Mining and Smelting (Heath Steele) as well as
The Province of New Brunswick, and
The Canada Centre for Mineral and Energy Technology (CANMET)
Through the CANADA/New Brunswick Mineral Development Agreement (MDA)**

March 1996

FINAL REPORT ON
ACID WASTE ROCK STUDY
HEATH STEELE MINES,
MIRAMICHI, N.B.

File No. 28-3562-001.1

Submitted to:

Heath Steele Mines

on behalf of the

Mine Environmental Neutral Drainage Program
(MEND)

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Date: March, 1996

Executive Summary

The Heath Steele Waste Rock Study was initiated in the Spring of 1988 at the Heath Steele Mines (HSM) site in New Brunswick. The objectives of the study were to develop strategies for the long term management of acid generating waste rock, to evaluate the performance of a soil cover placed over an existing acid waste rock pile at HSM, and to assess the cover's effectiveness as a method for long term management of acid generating waste rock.

The project was carried out under the Mine Environment Neutral Drainage (MEND) Program, with funding provided by Brunswick Mining and Smelting Corporation, Noranda Technology Centre, New Brunswick Department of Natural Resources and Natural Resources Canada through the Canada/New Brunswick Mineral Development Agreement.

The project was developed and conducted in the following four phases:

- Phase I: Selection of four waste rock piles for monitoring and evaluation (June 1988 to November 1988);
- Phase II: Installation of monitoring equipment in the four piles identified in Phase I to define waste rock characteristics and background data (November 1988 to October 1990);
- Phase III: Geotechnical and column testing to evaluate the performance characteristics of potential covers (June 1990 to December 1992); and
- Phase IV: Placement of soil cover and performance monitoring at Pile 7/12 (July 1991 to December 1994).

The first phase identified the following four acid generating waste rock piles at Heath Steele for further study:

Pile	Estimated Tonnes	AP ^[1]	AC ^[2]
18A	3,250	80	1.5
18B	19,500	158	0.5
17	235,700	36	0.8
7/12	14,700	211	0.4

Note: [1]: Acid production potential (kg/tonne) of the waste rock
[2]: Acid consuming potential (kg/tonne) of the waste rock

Pile 7/12 was moved onto a prepared base with an impermeable synthetic membrane during Phase I. A composite soil cover was then placed on the pile during Phase IV.

Six or seven instrument clusters were installed at each of the four selected piles during Phase II. Each consisted of a piezometer, a pore gas measurement system for different depths, and an equivalent series of temperature sensors. Oxygen and temperatures were measured for each

sampling point at monthly intervals. Water volumes and qualities were monitored on Pile 7/12. Climatic data was also accumulated for the mine site.

In Phase III, the Noranda Technology Centre reviewed and tested a range of cover options and recommended, for Pile 7/12, a composite cover consisting of a 30 cm base granular layer, a 60 cm low permeability saturated glacial till layer, a 30 cm overlying coarse-grained granular layer, and a 10 cm erosion protection layer. One of the criteria was to use locally available soil material for the low permeability layer. A cover was placed on Pile 7/12 in late summer of 1991.

In Phase IV, monitoring of oxygen and temperature continued monthly at all piles. After placement of the cover at Pile 7/12, infiltration rates and leachate quality were also measured at that pile, as was the moisture content of the various soil layers of the cover.

The data collected over the 72 month period of the project demonstrated that in the uncovered piles, relatively uniform increases of temperature existed towards the centre bottom of the piles, and an associated drop in oxygen concentrations due to consumption of oxygen by the reaction. This was probably due to the exothermic oxidation reaction. The oxygen profiles however, varied more than those for temperature. Seasonal variations were observed in both temperature and oxygen. The project confirmed that uncovered acid waste rock piles provide an favorable environment for oxidation of the sulphide material and thus the generation of acid leachates.

The composite cover on Pile 7/12 resulted in a depletion of oxygen within the pile and a reduction of pile temperatures; the flow of leachate from the pile was reduced from approximately 3 m³ per year prior to the cover to only 0.1 m³ per year after placement of the cover; i.e. to less than 2 percent of total precipitation; and the glacial till layer within the cover maintained its moisture content at the level at which it was placed over the 36 months of the evaluation.

These results indicate that the composite soil cover was effective in reducing the oxidation reaction in the pile, and therefore, reducing the production rate of acidic leachate and at the same time lessening the impact caused by acidic waste rock on the environment. Performance of the cover depends on maintaining its integrity with respect to preventing damage by roots, burrowing animals or physical impacts. The glacial till layer must also remain saturated. Thus, low level of maintenance of a soil-covered pile would be required.

The total cost of constructing the cover on Pile 7/12 in 1991 was \$60,000 (Canadian currency), or about \$31 per square metre of the waste rock surface. For larger waste rock piles, this unit cost could be less because of larger quantities involved. The cost for engineering and construction quality control is not included because of the research nature of the project.

The results from the analytical leachate testing tend to indicate a decrease or no improvement in water quality immediately after construction of the cover. However, there was a well defined and steady improvement of water quality after 1994, which tends to indicate that the quality of the leachate is still improving. The pH of the leachate increased steadily since the placement of the cover, indicating that it had become less acidic. Although the concentrations and loadings were

greatly reduced, they still exceeded the criteria set by the regulatory agencies, thus dictating treatment of the leachate before discharge to the environment.

The piles at Heath Steele are small compared to waste rock piles at many other sites, and different gas transfer mechanisms might apply elsewhere. However, data collected in the project indicates that the cover system is an effective method of reducing oxygen ingress and thus, the oxidation rate. Despite the promising performance to date, additional monitoring of the cover is still required before its long-term stability can be properly assessed as a full-scale final closure measure.

Sommaire

Le projet intitulé “Heath Steele Waste Rock Study” est une étude des haldes des stériles acides de la mine Heath Steele au Nouveau-Brunswick. Les objectifs de l’étude consistent à développer des stratégies de gestion à long terme des stériles acides, à évaluer la performance de la couverture de sol placée au-dessus d’une halde de stériles acides à la mine Heath Steele, et à évaluer l’efficacité de la couverture de sol comme méthode de gestion à long terme des haldes de stériles acides.

Ce programme de recherche a été réalisé dans le cadre du Programme de neutralisation des eaux de drainage dans l’environnement minier (NEDEM), avec la participation financière de la Brunswick Mining and Smelting Corporation, du Centre de technologie Noranda, du ministère des Ressources naturelles du Nouveau-Brunswick et du ministère des Ressources naturelles du Canada par le biais de l’entente Canada/Nouveau-Brunswick sur le développement minéral.

Le projet fut développé et effectué selon les quatre phases suivantes:

- Phase I: Sélection de quatre haldes de stériles pour en faire la surveillance et l’évaluation (juin 1988 à novembre 1988);
- Phase II: Installation de l’équipement de surveillance à l’intérieur des quatre haldes de stériles identifiées lors de la phase I afin de définir les caractéristiques et les propriétés de base des haldes (novembre 1988 à octobre 1990);
- Phase III: Essais géotechniques et essais en colonne afin d’évaluer les caractéristiques et la performance de différentes configurations de couvertures de sol (juin 1990 à décembre 1992); et
- Phase IV: Mise en place d’une couverture de sol multicouche sur la halde 7/12 et surveillance de la performance de cette dernière (juillet 1991 à décembre 1994).

La première phase identifia les quatre haldes de stériles suivantes à la mine Heath Steele pour une étude plus détaillée:

Halde	Tonnes Estimées	PA ^[1]	CA ^[2]
18A	3,250	80	1.5
18B	19,500	158	0.5
17	235,700	36	0.8
7/12	14,700	211	0.4

Note: [1]: Potentiel de production d’acide (kg/tonne) des stériles
[2]: Potentiel de consommation d’acide (kg/tonne) des stériles

Durant la Phase I, la halde 7/12 fut déplacée sur une fondation préparée avec une membrane imperméable synthétique. Une couverture de sol composite fut ensuite placée sur la halde lors de la phase IV.

Six ou sept groupes d'instruments furent installés sur chacune des quatre haldes durant la phase II. Chaque groupe comportait un piézomètre, un système d'échantillonnage d'oxygène gazeux à différentes profondeurs et une série de senseurs pour la température. La concentration d'oxygène et la température furent mesurées mensuellement à chaque point d'échantillonnage. Le volume et la qualité des lixiviats furent mesurés à la halde 7/12. Des données climatiques ont aussi été récoltées pour le site.

Lors de la phase III, le Centre de technologie Noranda élaborera diverses options pour une couverture et recommanda une couverture composite de sol pour recouvrir la halde 7/12. La couverture consiste d'une couche de fondation de sable de 30 cm d'épaisseur, une couche compactée de 60 cm d'épaisseur de till glaciaire saturé ayant une faible perméabilité, une couche de 30 cm d'épaisseur de sol granulaire grossier, et finalement, une couche d'une épaisseur de 10 cm servant de protection contre l'érosion. Un des critères pour la couche peu perméable était d'utiliser un sol qui était disponible localement. La couverture de sol fut construite sur la halde 7/12 à la fin de l'été 1991.

Durant la phase IV, les mesures des concentrations d'oxygène et de la température se poursuivirent sur une base mensuelles à chacune des quatre haldes. Après la mise en place de la couverture sur la halde 7/12, la quantité d'infiltration et la qualité du lixiviat furent aussi mesurées, ainsi que la teneur en eau des différentes couches de sol de la couverture.

Les données recueillies sur une période de 72 mois indiquèrent que dans les haldes non recouvertes, des augmentations de température relativement uniformes existaient en profondeur vers le centre de la halde. Ces augmentations de température corroborèrent avec les réductions des concentrations en oxygène observées aux mêmes endroits. Ceci est probablement dû à la consommation d'oxygène causée par la réaction exothermique de l'oxydation. Les variations saisonnières furent observées pour la température et l'oxygène. Le projet confirma que les haldes de stériles non recouvertes procurent un environnement favorable à l'oxydation des matériaux sulfureux, et ainsi, la production de lixiviats acides.

La couverture composite sur la halde 7/12 entraîna un épuisement de l'oxygène à l'intérieur de la halde et une réduction des températures; l'écoulement des lixiviats provenant de la halde passa d'environ 3 mètres cubes par année avant la mise en place de la couverture à 0.1 mètre cube par année après la construction de la couverture, c'est-à-dire moins de deux pour-cent de la précipitation totale; et la couche de till glaciaire de la couverture composite conserva, au cours de la période d'évaluation de 36 mois, sa teneur en eau au même niveau auquel elle fut placée.

Ces résultats indiquent que la couverture composite de sol fut efficace à réduire la réaction d'oxydation dans la halde, d'où une réduction du taux de production du lixiviat acide, et par le fait même, une réduction de l'impact sur l'environnement causé par les stériles acidogènes. La performance de la couverture dépend de sa capacité de maintenir son intégrité par rapport aux

dommages causés par les racines, les animaux creusant des trous ou les impacts physiques. Le till glaciaire doit aussi demeurer saturé. Donc, un niveau d'entretien peu élevé de la halde recouverte serait requis.

Le coût total de la construction de la couverture sur la halde 7/12 était de \$60 000 (dollars canadiens) en 1991, ou environ \$31 par mètre carré de stériles. Pour des haldes de plus grandes dimensions, ce coût unitaire pourrait être inférieur parce que les quantités des matériaux d'emprunt seraient supérieures. Les coûts d'ingénierie et du contrôle de qualité sur le terrain ne sont pas inclus dans ce montant, étant donné la nature expérimentale du projet.

Les résultats des essais analytiques du lixiviat démontrent une diminution ou aucune amélioration de la qualité de l'eau immédiatement après la construction de la couverture. Il y a cependant une amélioration constante et bien définie de la qualité de l'eau après 1994, indiquant que la qualité du lixiviat s'améliore toujours. Le pH du lixiviat augmenta constamment depuis la mise en place de la couverture, indiquant que le lixiviat est devenu moins acide. Malgré que les concentrations et les charges des contaminants furent grandement réduites, elles dépassent toujours les concentrations permises par les agences réglementaires. Ceci indique qu'il est nécessaire de traiter les lixiviats avant qu'il soient déversés dans l'environnement.

Les haldes de la mine Heath Steele sont petites lorsque comparées aux nombreuses haldes de stériles présentes à d'autres mines, et certains mécanismes des transferts des gaz pourraient être différents dans ces haldes de grandes dimensions. Cependant, les données prélevées durant le projet indiquent que la couverture composite est une méthode efficace pour réduire la progression de l'oxygène vers les stériles, d'où la réduction du taux d'oxydation. Malgré les bonnes performances obtenues à date, une surveillance prolongée de la couverture est encore requise avant que la stabilité à long terme de la couverture puisse être évaluée convenablement en prévision des mesures de fermeture permanente à pleine échelle.

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1. INTRODUCTION

1.1 The Project

The Heath Steele Mines (HSM) site is 50 km north of Newcastle in New Brunswick (N.B.) and is situated in the headwaters of the Northwest Miramichi River, well known for its excellent salmon runs and sport fishing (see Figure 1-1). The initial mine and mill at the site were developed in the mid-1950s to recover base metals (zinc, copper, lead and silver) from the massive sulphide deposits in the mine area. At that time, the implications of acid mine drainage (AMD) resulting from the exposure of massive sulphide material were not known and waste material was used extensively for the infrastructure at the site and there were more than 20 acid generating waste rock piles constructed on the site.

By the late-1960s, the implications of acid drainage from the site on the receiving waters were recognized and an extensive contaminated drainage control system was installed. This system is still functioning well. By the mid-1980s, it had been recognized by the government and industry that long term solutions to the management of acid generating wastes should be sought collectively in Canada. The Heath Steele site was then identified as an ideal site at which to investigate practical control or prevention measures for such waste piles.

Resulting from this sequence of events, the “Heath Steele Waste Rock Study” was initiated in the spring of 1988. The objectives of the study were to develop strategies for the long term management of acid generating waste rock, to evaluate the performance of a soil cover placed over an existing acid waste rock pile at HSM, and to assess the cover’s effectiveness as a method for long term management of acid generating waste rock.

The project was carried out under the Mine Environment Neutral Drainage (MEND) Program. The project was funded by Brunswick Mining and Smelting Corporation (BMS), Noranda Technology Centre (NTC), New Brunswick Department of Natural Resources and Energy, and Natural Resources Canada through the Canada/New Brunswick Mineral Development Agreement.

The project was developed and conducted in four phases:

- Phase I: Selection of four waste rock piles for monitoring and evaluation
- Phase II: Installation of monitoring equipment in the four piles identified in Phase I to define waste rock characteristics and background data
- Phase III: Geotechnical and column testing to evaluate the performance characteristics of potential covers
- Phase IV: Placement of soil cover and performance monitoring at Pile 7/12

Phase I was completed in the Summer and Fall of 1988 with Phases II and III completed at the end of 1992. Phase IV was approved in July 4, 1991 and is the subject of this report.

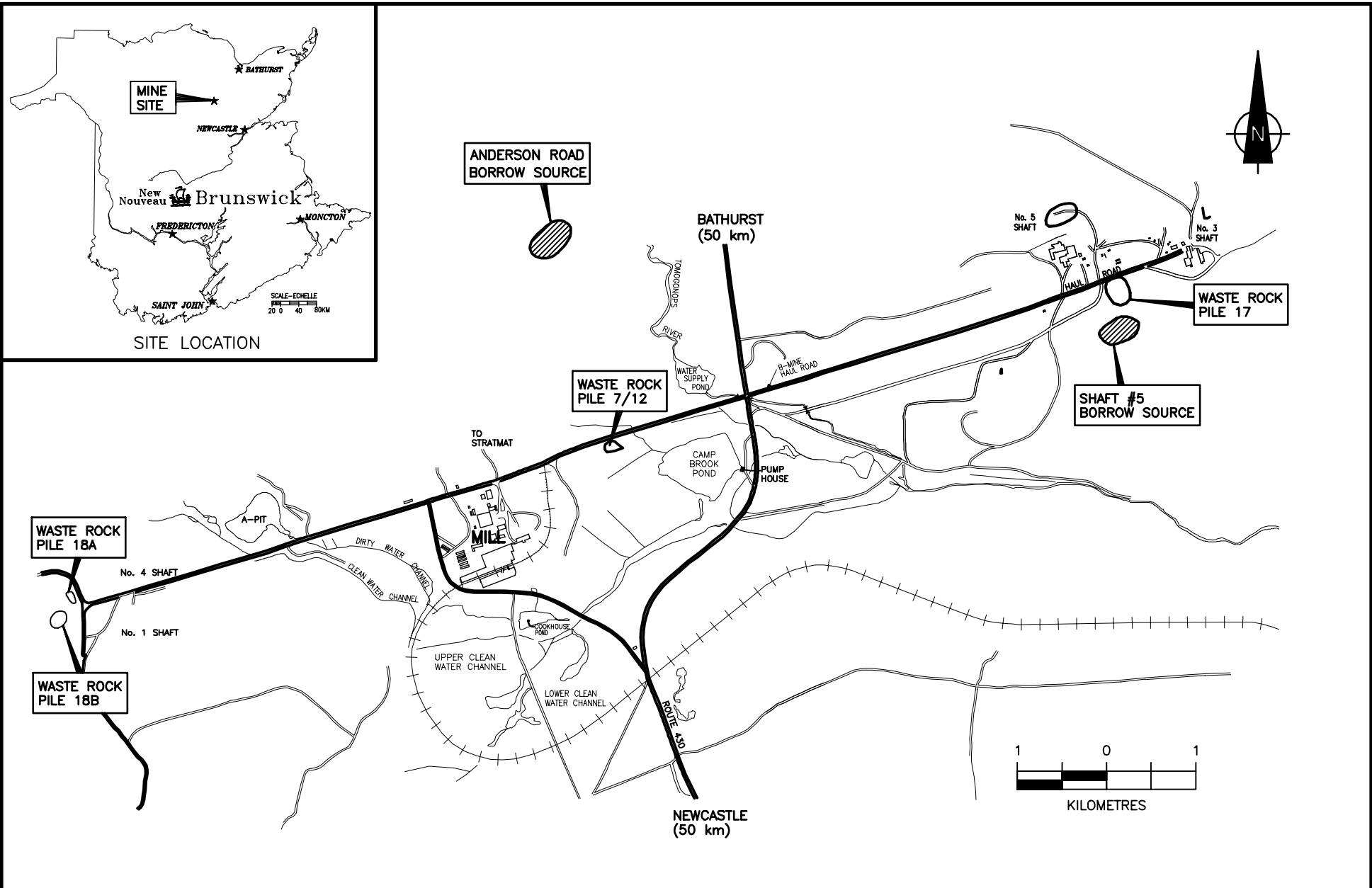


FIGURE 1-1

SITE PLAN - HEATH STEELE MINES



ADI NOLAN DAVIS

The following reports were submitted throughout the project:

- “Heath Steele Waste Rock Study, Phase I - Interim Report” (1989)
- “Heath Steele Waste Rock Study, Phase II Report” (December 1990)
- MEND Project 2.31.1a - Heath Steele Waste Rock Study, Phase I, II and III (March, 1992)
- MEND Project 2.3.1b “Engineering Design and Construction, Phase IV - Composite Soil Cover, Heath Steele Mines” (January 1995)

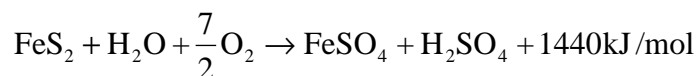
An additional report entitled “Assessment of Gas Transfer - ANSTO Model at Heath Steele Mines” was submitted to MEND in July, 1994 (MEND Project 1.22.1) under separate contract. The project also included the preparation of a field procedure manual entitled “Field Procedures Manual, Gas Transfer Measurements, Waste Rock Piles, Heath Steele Mines” that was submitted in May 1993. The objectives of the gas transfer project were to develop an understanding of the processes governing the pyrite oxidation rates in acid waste rock piles at Heath Steele using both field data and the numerical model FIDHELM developed by the Australian Nuclear Science & Technology Organisation (ANSTO). Details are provided in the MEND Report.

This report provides an overview of the entire covers project including the presentation of all the monitoring data collected since the project implementation.

1.2 Acid Mine Drainage (AMD)

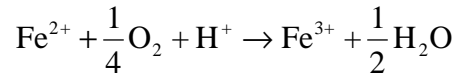
AMD is the most important environmental problem facing the Canadian mining industry today. When reactive sulphide minerals, in particular pyrite and pyrrhotite, are exposed to an environment containing oxygen and water, sulphide is converted to sulphate. The contact of these minerals with water generates acidic drainage with elevated levels of heavy metals and dissolved salts. As the oxidation reactions continue, temperature and acidity increase, in turn accelerating the reactions. As rainfall and snow melt infiltrate waste rock piles, acidic drainage is released to surface and groundwater, contaminating the environment.

The basic chemistry of the oxidation process is described by the following equation:

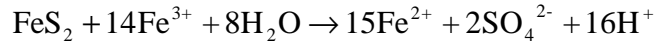


At pH levels above about 4, the reaction is purely chemical and proceeds quite slowly. However, over time, the generation of acid causes the pH to fall and the concentration of ferrous ions (Fe^{2+}) also builds up. These conditions permit the oxidation to proceed as a two stage process, which yields the same net chemical conversion as above but can proceed at a much faster rate. The first stage is the oxidation of ferrous ions (Fe^{2+}) to ferric (Fe^{3+}); this rate of chemical reaction falls

quickly with decreasing pH, but bacterial action at lower pH values can counteract this effect and cause the reaction to proceed quickly, as follows:



At pH values below about 2.5, ferric ions remain in solution, and are available to oxidize pyrite in the second stage. This chemical reaction proceeds rapidly.

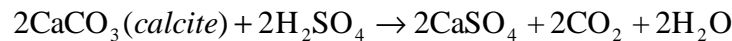


The in situ rates of sulphide oxidation within waste rock piles depend on innumerable micro and macro environmental factors. In general, engineered covers are designed to limit the rate of oxygen transport to the sulphide minerals, thereby minimizing the rate of sulphide oxidation.

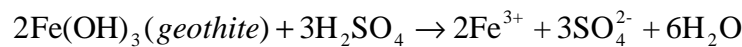
Secondary minerals may dissolve or precipitate during the acid generation process. These dissolution and precipitation processes may result in the neutralization of mineral acidity, the exchange of metallic cations for hydrogen ions, and/or result in the blockage or exposure of sulphide reaction sites.

Common bases include carbonates, oxyhydroxides, and alumino-silicate minerals. Some common neutralization reactions include:

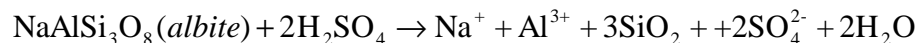
- dissolution of calcite and other carbonate minerals,



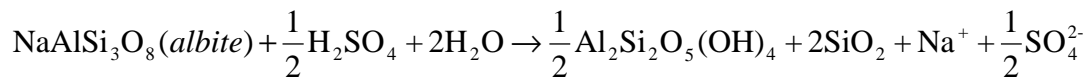
- dissolution of goethite, or other oxyhydroxides,



- dissolution of albite, or other alumino-silicates,



The reaction of alumino-silicates with acids may also result in the formation of other insoluble secondary minerals, as illustrated below for the formation of kaolinite from albite:



Such reactions result in some reduction in acidity and the formation of “new” precipitates.

These and many other reactions, which occur as the pH of the medium decreases below approximately 4, are an important factor with respect to the overall rate of acid generation and the quantity of acidity that is produced per unit of waste rock or other reactive sulphide material.

2. PILE SELECTION AND CHARACTERIZATION

2.1 Pile Selection

Phase I involved the selection of four acid-generating waste rock piles, which would be the most amenable to monitoring and evaluation of remedial measures. At the start of the project, the Heath Steele site contained at least 20 identifiable waste rock piles. Selection criteria and weighting factors, as summarized in Table 2-1, were established in consultation with regulatory and mine personnel, and fifteen waste rock piles were selected at the mine site for preliminary evaluation. The eight most favorable piles from this initial ranking were examined in greater detail, and were again ranked using a revised weighting and scoring system. Waste rock Pile 17 was initially screened out as being too large, but was reconsidered as a possible candidate for further investigation. Following the evaluation, waste rock Piles 17, 7/12, 18A and 18B were selected as being most suitable.

Table 2-1
Criteria Used in Waste Rock Pile Assessment
Heath Steele Mines

Criteria	Components
Morphology	Size of pile Shape of pile
Material gradation and type	Size gradation Mineral composition (including acid-base characteristics and particle surface chemistry) Moisture content Permeability Surface infiltration rate Void ratio
Segregation	Isolation of piles Boundary effects and interactions
Ease of monitoring	Accessibility Ability to install instrumentation Anticipated effectiveness of instrumentation and monitoring
Background data	Available data on history, materials, mine records and other studies of waste rock piles

2.2 Pile Characterization

A field reconnaissance program was defined to characterize the piles selected as best candidates. The characteristics included the vertical profile through the centre of each pile to bedrock, composition and mineralogy of material, acid production over consuming ratio, geophysical characteristics, and topography. A CME auger and diamond drill rig were used to bore exploratory holes through each of the piles and into the underlying bedrock. Two additional holes were drilled beside Piles 18B and 17 to further investigate overburden and bedrock characteristics. Waste rock and bedrock samples were collected, field permeability tests were conducted, and piezometers were installed to monitor water levels. The results of the falling head permeability tests carried out in the boreholes ranged from 10^{-2} to 10 cm/s. A seismic geophysical survey was undertaken to define the base profile of each rock pile. The key characteristics of each pile are summarized in Table 2-2 and Table 2-3.

The particle size distribution within the waste rock piles varies considerably from silt and clay sizes to cobbles and boulders. The particle size distribution, which was based on surface distribution from a test pit put down in Pile 7/12, was estimated at 34 percent boulders, 33 percent cobbles, 22 percent gravel, 7 percent sand and 3 percent clay and silt size particles. A void ratio of 31 percent was estimated for Pile 7/12 and is considered to be within the lower range typical for piles of blasted rock. The bulk specific gravity of the broken waste rock is estimated to range from 1.8 to 2.3. Additional details on waste rock pile characteristics determined as part of the waste rock study are contained in the MEND Report 2.31.1b.

Pile 7/12 was to be moved as part of the ongoing site reclamation program, and it was decided to take the opportunity to reconstruct the pile on an impermeable synthetic membrane base. Relocation of the pile was carried out in May, 1989. This permitted the evaluation of the water balance before and after placement of the cover.

Table 2-2
Waste Rock Mineralogy and Acid Production

Pile	Surface Area ^[1] (m ²)	Average Depth (m)	Maximum Depth (m)	Estimated Volume (m ³)	Estimated Tonnes ^[2]	Foundation Condition ^[3]	Mineralogy ^[4]			
							AP (kg/tonne)	AC (kg/tonne)	Sulphides Present	Percent
18A	1,210	1.6	3.4	1,900	3,250	Thin OB ^[4] over rock	79.6	1.5	Pyrite Galens Sphalerite	5-7 <1 <1
18B	3,570	2.3	6.7	8,300	19,500	Thin OB over rock	158.4	0.5	Pyrite Pyrrhotite Sphalerite Galena Chalcopyrite	7-10 7-10 <1 <1 <1
17	25,640	3.9	10.5	100,300	235,700	Thin OB over rock	35.7	0.8	Sphalerite Pyrite Arsenopyrite Chalcopyrite	7-10 <1 <1 <1
7/12 ^[6]	1,875 1,930 ^[7]	2.9	5	6,200	14,700	Impermeable membrane base	210.7	0.4	Pyrite Pyrrhotite Galena Chalcopyrite Arsenopyrite Sphalerite Pyrrhotite	7-10 5-7 <1 <1 <1 <1 <1

Note: [1]: Surface area based on plan view (flat surface).
 [2]: Based on assumed waste rock density of 2.35 tonnes/m³.
 [3]: Based on geophysical, borehole and field observations.
 [4]: AP & AC: Theoretical Acid Production & Acid-Consuming (refer to Table 2-3).
 [5]: OB=Overburden.
 [6]: Pile as relocated (June 1989).
 [7]: Surface area of the waste rock pile (3D surface).

Table 2-3
Waste Rock Acid Consuming Potential

Sample	Sulphur ^[1] (%)	Acid Production ^[2] (kg/tonne)	Acid Consuming ^[2] (kg/tonne)	AP-AC ^[3] (kg/tonne)	Theoretical Acid Producer
Pile 18A					
BH 1 9'6"-10' Waste Rock	2.60	79.6	1.47	78.1	Yes
BH 1 10'-12' Bedrock	0.22	6.8	1.47	5.3	Yes
Pile 18B					
BH 2 5' - 7' Waste Rock	3.94	120.7	<0.5	120.4	Yes
BH 2 15'-17' Waste Rock	6.40	196.0	0.74	195.3	Yes
Beside Pile 18B ("PAD")					
BH 3 0-1' Outwash	0.15	4.6	0.5	4.1	Yes
Pile 7/12					
BH 4 4' - 5' Waste Rock	6.69	204.9	<0.3	204.6	Yes
BH 4 14'6"-15'9" Waste Rock	7.07	216.5	0.49	216.0	Yes
Beside Pile 7/12					
Bedrock Sample 0-1'	4.98	152.5	1.72	150.8	Yes
Pile 17					
BH 5 15'-17' Waste Rock	1.28	39.2	1.23	38.0	Yes
BH 6 5' - 7' Waste Rock	1.05	32.2	<0.3	31.9	Yes

Note: [1]: Sulphur (%) = total pyritic sulphur
 [2]: kg[H₂SO₄]/tonne
 [3]: AP = all sulphur oxidizable by iron oxidizing bacteria
 AC = acid consumption as determined by titration with sulphuric acid
 Analyses by Research and Productivity Council, Fredericton, N.B.

3. PILES 18A, 18B and 17 (UNCOVERED PILES)

3.1 Site Preparation

Site preparation consisted of recontouring each of the waste rock piles (18A, 18B and 17) to maximum side slopes of approximately 3H:1V. This slope was chosen mainly to facilitate the grading of the piles with conventional equipment. Each pile was thereby isolated from the influence of any neighbouring topographical or other local features and to reduce any shape induced effects on the monitoring results.

The investigations carried out in Phase I indicated that the bedrock surface is highly fractured, with a relatively high hydraulic conductivity. This prevented the collection of samples and seepage quantities of pore water seeping through the piles, thus making impossible the determination of water and contaminant balances for the three piles. However, diversion and collection ditches were constructed around the piles to minimize the inflow of surface water and to collect surface runoff from the piles.

After recontouring the three study piles, holes were drilled using an air track percussion drill for the installation of instrumentation in each pile. This drilling method probably disturbed the gas balance within the waste rock piles, but because of the relatively high porosity of the piles, equilibrium conditions would have been rapidly reestablished. Figure 3-1 and 3-2 show the site layout of Piles 18A and 18B, and Pile 17 respectively. Figures 3-3, 3-4 and 3-5 show the cross-section through the piles.

3.2 Instrumentation

Six instrument clusters were installed in each of the three piles to provide for the following:

- Pore gas measurements;
- Temperature measurements; and
- Piezometric levels.

The location of the instrument clusters are shown in Figures 3-1 and 3-2.

Climatic data was obtained by a monitoring station at the mine site. Details on these systems are described in the following sections.

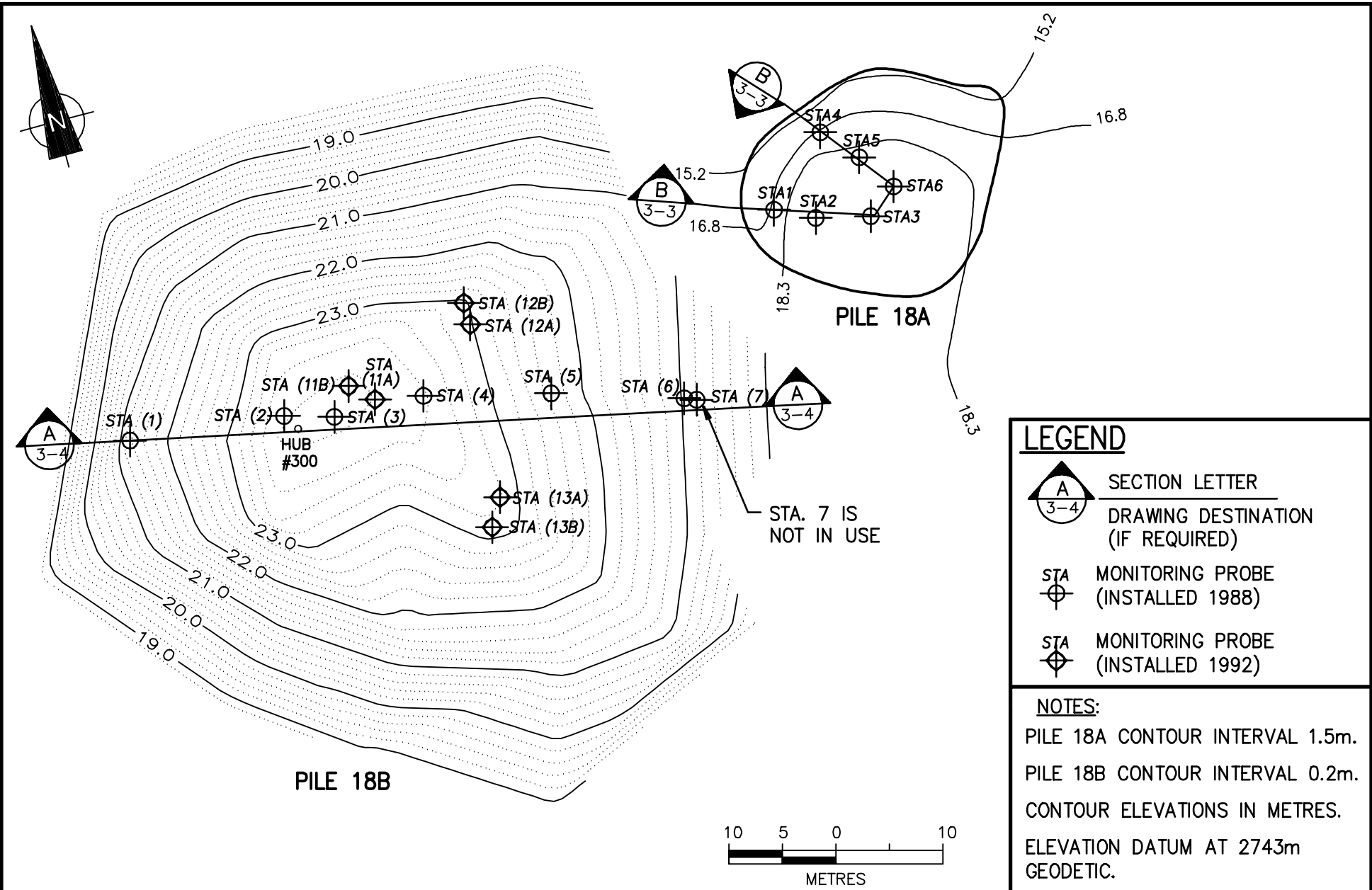
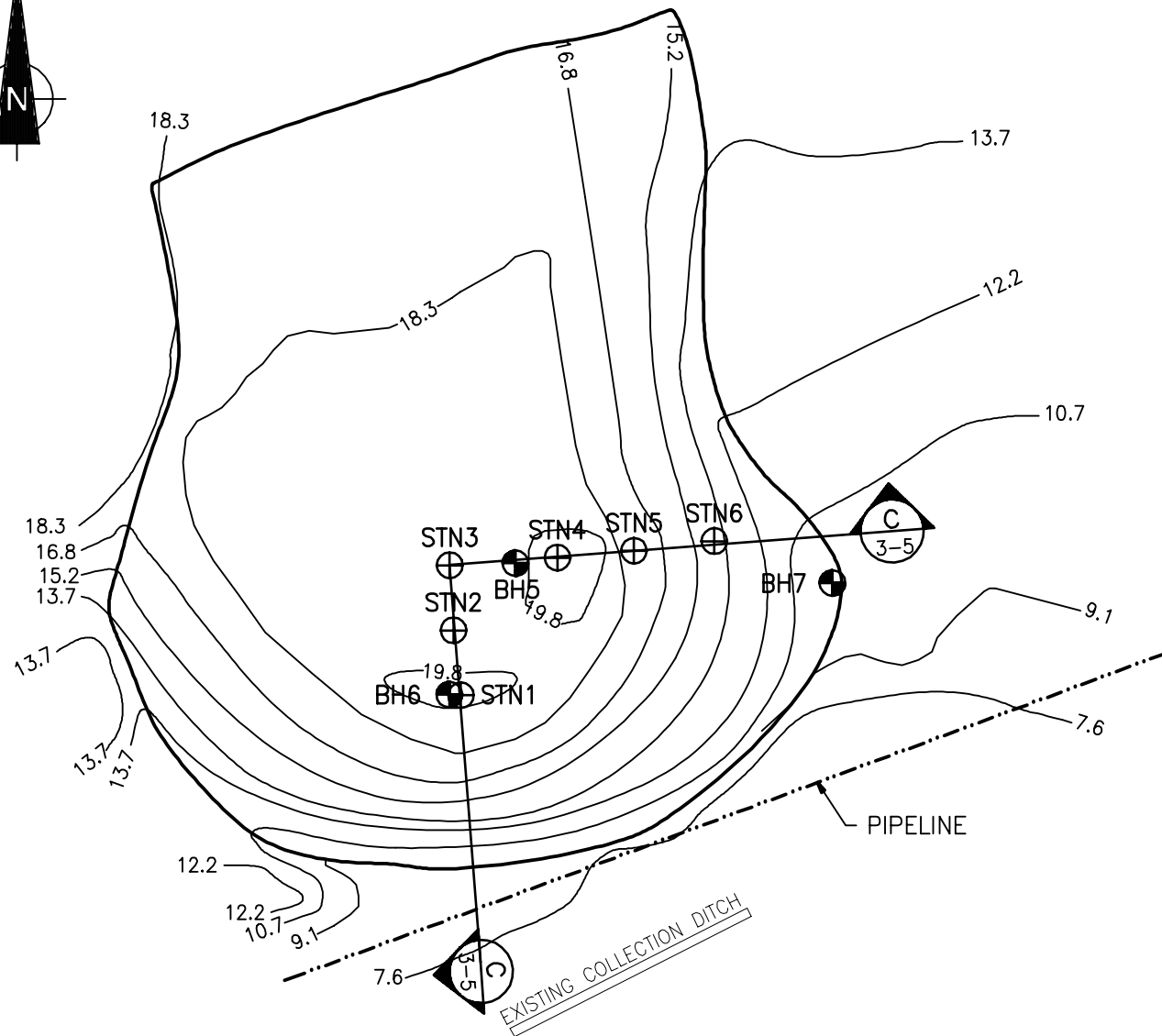
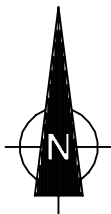


FIGURE 3-1






SITE PLAN AND INSTRUMENT CLUSTER LOCATIONS – PILES 18A AND 18B



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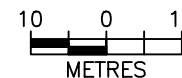


LEGEND

-  PHASE 1 BOREHOLE
-  PHASE 2 MONITORING STATION
-  LIMIT OF PILE
-  ELEVATION CONTOUR LINE
-  SECTION LETTER DRAWING DESTINATION (IF REQUIRED)

NOTE:

- CONTOUR INTERVAL 1.5m.
- CONTOUR ELEVATIONS IN METRES.
- ELEVATION DATUM AT 2713m GEODETIC.



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FIGURE 3-2

SITE PLAN AND INSTRUMENT CLUSTER LOCATIONS – PILE 17

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LEGEND

- T TEMPERATURE PROBE
- o OXYGEN PROBE

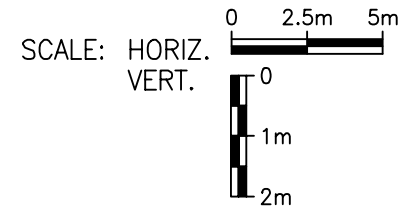
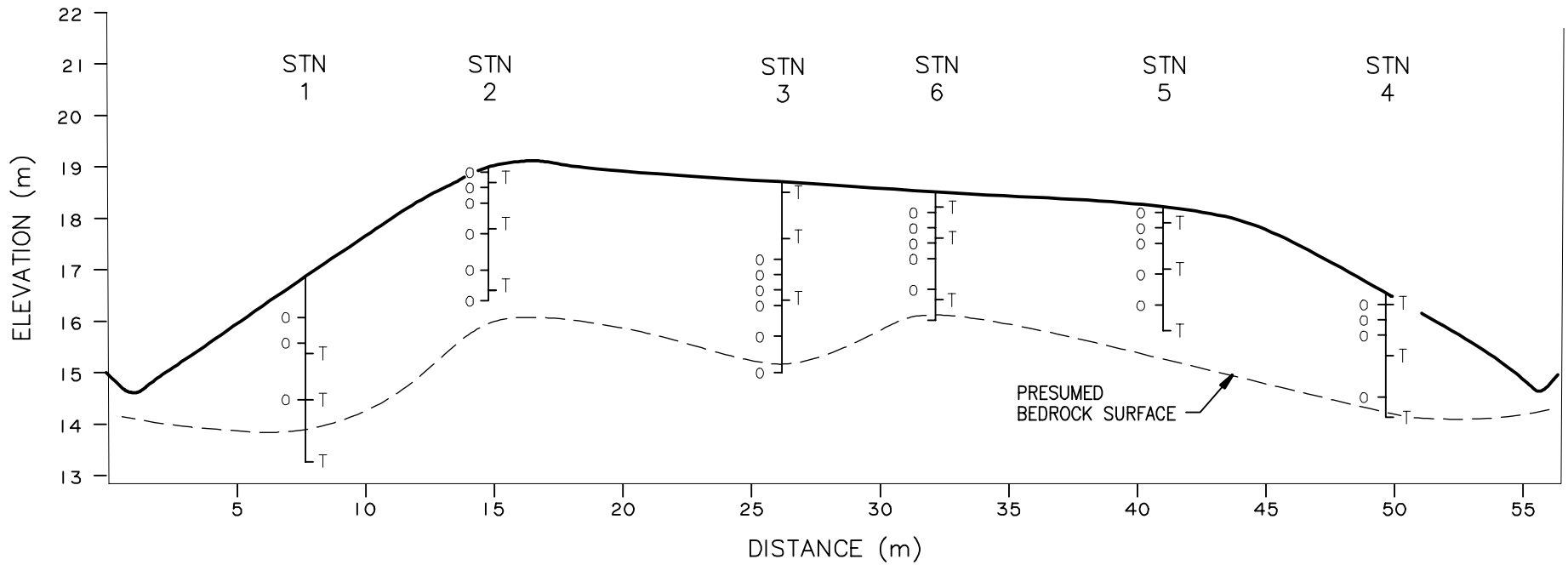
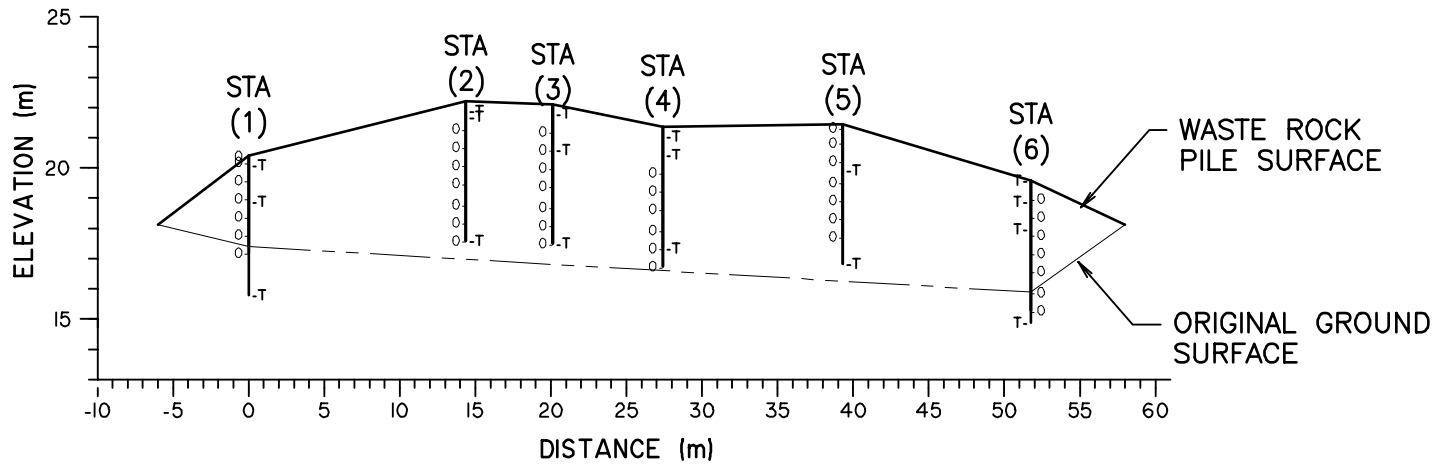


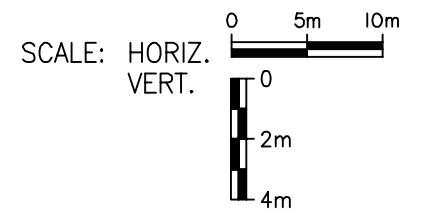
FIGURE 3-3
CROSS SECTION - PILE 18A

LEGEND

- T TEMPERATURE PROBE
- o OXYGEN PROBE



SECTION A



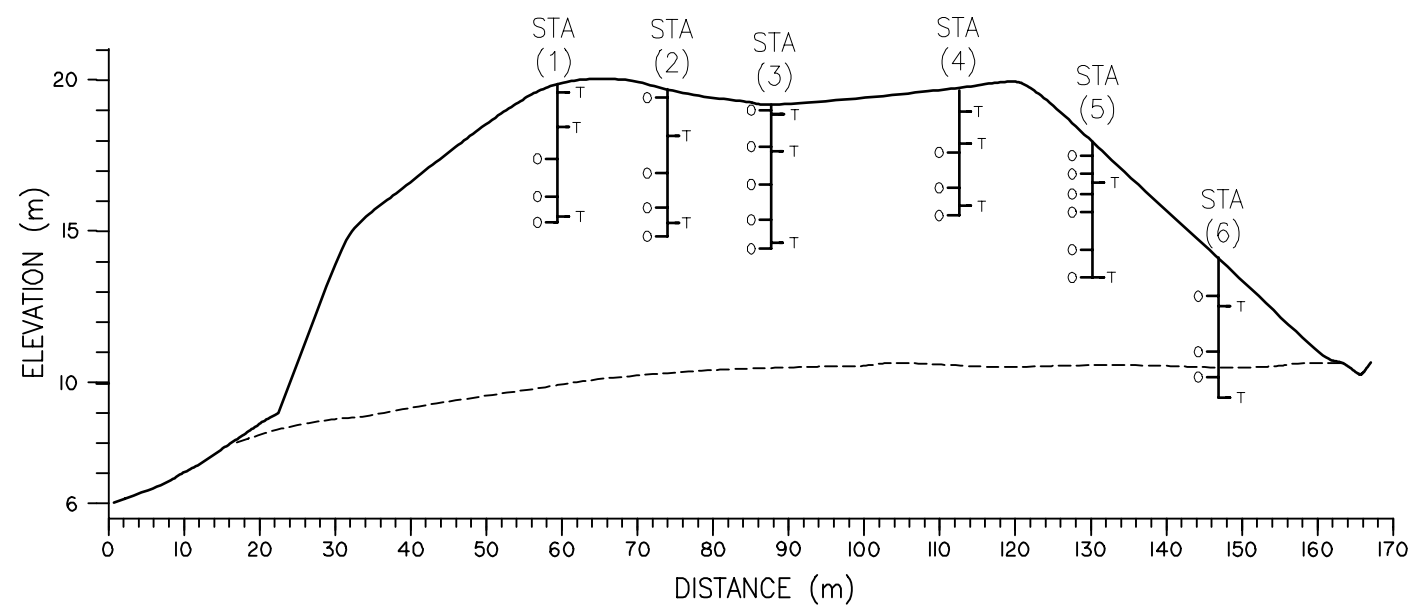
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FIGURE 3-4
CROSS SECTION - PILE 18B

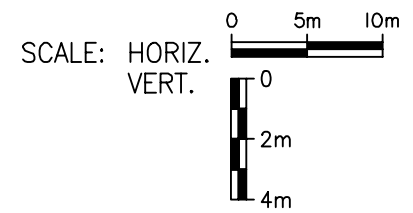
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LEGEND

- T TEMPERATURE PROBE
- o OXYGEN PROBE



SECTION C



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FIGURE 3-5
CROSS SECTION — PILE 17

APR. 1995

3.2.1 Instrumentation Clusters

The typical instrumentation cluster assembled at each sampling location consisted of a 38 mm inside diameter PVC piezometer with a series of neoprene pore gas monitoring tubes installed on the outside wall of the piezometer. The piezometers were installed to the bottom of the pile at the bedrock interface or to a maximum depth of 5 m. Bentonite pellets were placed around the PVC pipe extensions for about 0.5 m in thickness at the surface to insure a seal between the future cover and the piezometer to prevent preferential air movement along the pipe. Temperature probes were installed in a separate hole within one metre of the piezometer. Figures 3-6 and 3-7 show the details of a typical installation for the pore gas monitoring tubes and the temperature probes.

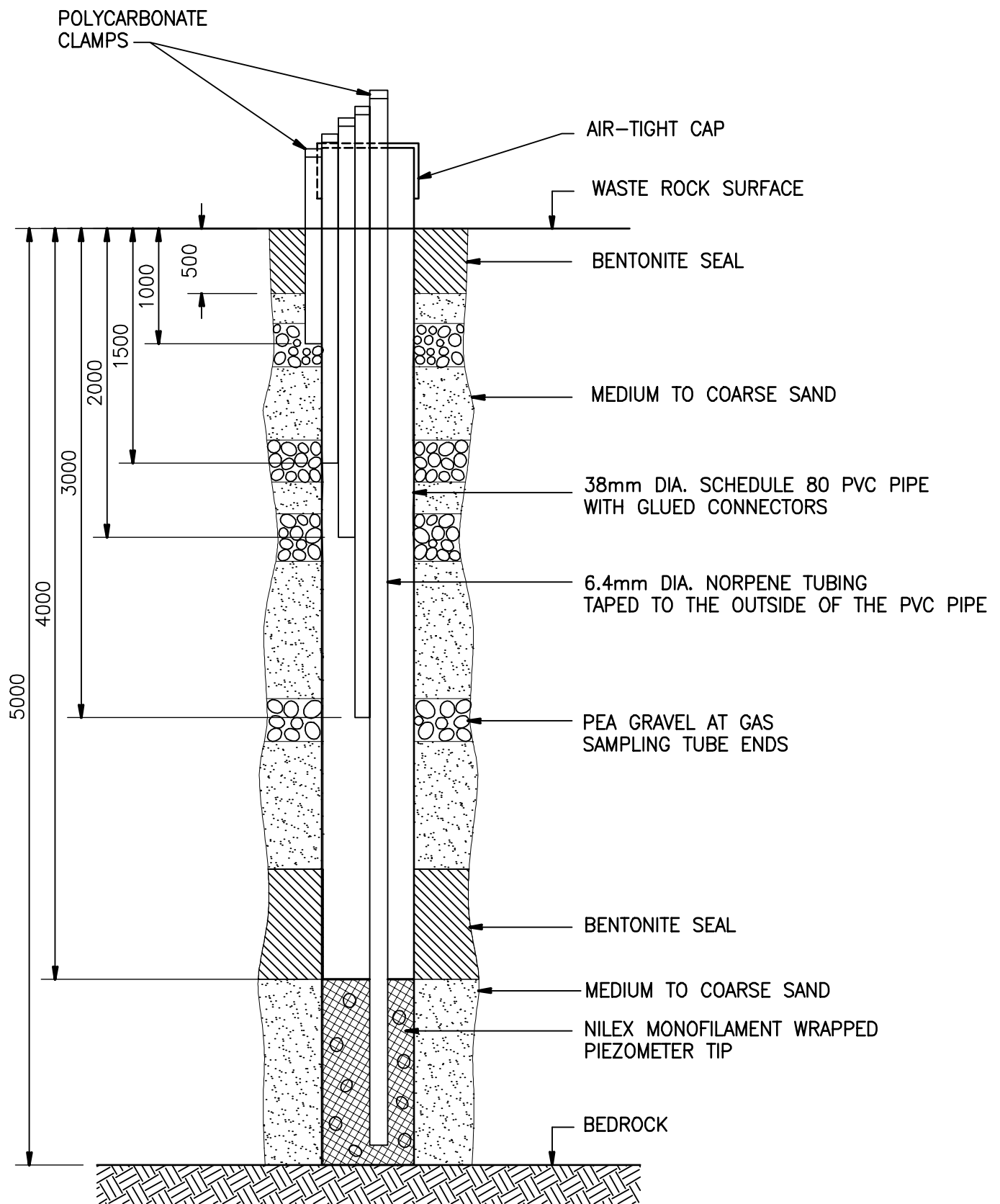
3.2.2 Pore Gas Measurement

A series of flexible non-collapsing neoprene rubber tubes attached to the outer circumference of the PVC piezometer were used to measure pore gas. Sampling ports were located at depths of approximately 1.0, 1.5, 2.0, 3.0, 4.0 and 5.0 m below the surface of the waste rock pile. The ends of the neoprene tubing extending above the cover were clamped closed at all times except during sampling events. The gas phase oxygen and carbon dioxide (CO₂) present in the pore gases were measured using low-volume portable analyzers. During each monitoring event, the instrument was connected to the neoprene tubing and the tube clamp released. The instrument drew air through the tubing to the sensors located within the analyzer. The gas phase oxygen was measured using a Teledyne Model 320A while the CO₂ was measured with a Telaire CO₂ meter. Both units required operating temperatures warmer than -5°C which prevented measurements from being taken during the winter months.

The accuracy of the Teledyne unit is: ± 2 percent of full scale at constant temperature; and ± 5 percent of reading or ± 2 percent of full scale, whichever is greater, throughout the operating temperature. The sensitivity of the Teledyne unit is 0.5 percent of full scale. The Telaire CO₂ meter has a measurement range of 0 to 20 percent with an accuracy of ± 3 percent of full scale.

3.2.3 Temperature Measurement

To monitor temperature within the waste rock, type K thermocouples were attached to the PVC piezometers at depths of approximately 0.3, 1.5 and 4.6 m below the surface of the waste rock piles. The type K thermocouples were fabricated to meet specific requirements for acid resistance and were certified as long-lasting and suitable for burial in contact with water. The type K thermocouples were well-suited to operate within the temperature conditions expected at the site. The thermocouples were calibrated for direct temperature reading in degree centigrade (°C) using conventional K type thermocouple direct meter.



NOT TO SCALE

ALL DIMENSIONS ARE IN MILLIMETRES
UNLESS INDICATED OTHERWISE



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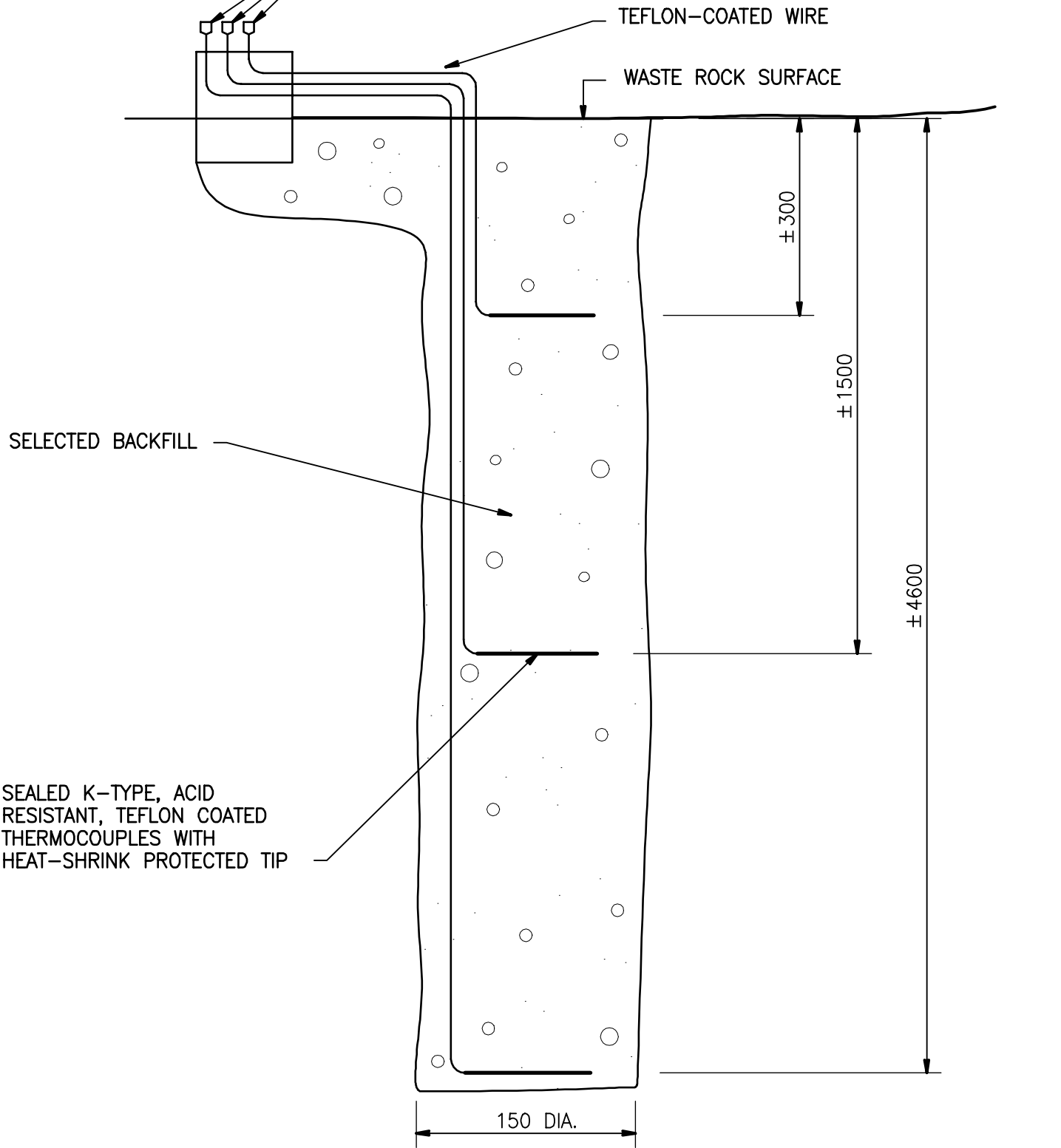
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FIGURE 3-6

TYPICAL INSTRUMENTATION CLUSTER - PORE GAS MONITORING

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THERMOCOUPLE PLUGS
TAPED TO ADJACENT PIEZOMETER



NOT TO SCALE

ALL DIMENSIONS ARE IN MILLIMETRES
UNLESS INDICATED OTHERWISE



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FIGURE 3-7

TYPICAL INSTRUMENTATION CLUSTER - TEMPERATURE MONITORING

APR. 1995

3.2.4 Climate

Temperature and precipitation data were collected at an Atmospheric Environment Service (AES) climate station located near the mine security gate at HSM, identified as the Little River Mine Station, and operated between 1956 and 1983, with the exception of a two year gap from 1958 to 1960. Wind data was collected from 1974 to 1983. The station was reactivated for Phase II and a standard Class A evaporation pan was added to the monitoring equipment. Additional information was also collected at Pile 7/12 with the datalogger system and is presented in Appendix I.

3.3 Data Collection

Data collection and sampling were generally carried out on a monthly basis throughout the project. However, the limitation of monitoring equipment prevented measurements of oxygen and CO₂ during the winter months. Recovery of water samples was also not possible during winter. Climatic data collected on a daily basis during Phase II included precipitation, evaporation and ambient temperature.

Monitoring data was recovered from December 1988 to November 1994, a period of 72 months. Appendices II to IV contain the collected data for Pile 18A, 18B and 17.

3.4 Results

3.4.1 Pile 18A

3.4.1.1 Description

Pile 18A was the smallest of the four piles instrumented and had an estimated volume of 3,250 tonnes of highly acid-generating sulphidic waste rock situated on fractured bedrock. The maximum depth of the pile was 3.4 m. It was initially joined to the adjacent pile (18B) but was isolated during recontouring. Key characteristics of Pile 18A was presented in Table 2-2.

The pile was instrumented with six sets of thermocouples and gas ports to provide two profiles through the pile as shown in Figures 3-1 and 3-3.

The monitoring data for Pile 18A is included in Appendix II.

3.4.1.2 Oxygen

The oxygen concentrations measured at Pile 18A are plotted over time in Figures II-1 to II-6 and are also tabulated in Table II-1 in Appendix II.

The oxygen concentrations were influenced by seasonal variations and depletion of oxygen occurred at depth year-round. Concentrations were considerably higher in late winter and spring than during the fall. The change in oxygen concentration at depth were affected by seasonal cycle as indicated in Figures 3-8. There is a reversed correlation between the temperature and oxygen

levels with the lowest oxygen levels associated with the highest temperatures. This would be expected due to the depletion of oxygen by the oxidation reaction and its exothermic nature.

The vertical distribution of the oxygen concentrations showed far less uniform distribution than the temperature data (see Section 3.4.1.3). For example, at Station 3 in the centre of the pile, the variation at 3.0 m depth (the bottom of the pile being at a depth of about 3.4 m) was from 17.8 percent in May 1989 to a low of 0.8 percent in September 1989, as indicated in Figure 3-9. It is not clear whether the low values measured at Stations 3 and 4 (see Figures II-3 and II-4 of Appendix II) reflected a local low due to a zone of low permeability or a local region of particularly active pyrite oxidation.

Low oxygen concentrations (2.2 percent and 0.5 percent) occurred only 0.1 and 0.2 m below the surface at Stations 2 and 4 of Pile 18A, and increased towards the base of the pile. It is possible that these low oxygen concentrations at shallow depths reflect the presence of zones with low air permeability and thus high levels of oxygen depletion. The high oxygen concentrations at depth could indicate that convective or advective transport was bringing oxygenated air into the lower parts of the pile through more permeable zones in the waste rock pile. Wind could enhance the transport of air as this pile faces north. These higher oxygen concentrations at depth could also be an indication of lower oxidation rates of the waste rock.

Figure 3-8
Gas Phase Oxygen and Temperature, Pile 18A, Stations 3 and 6

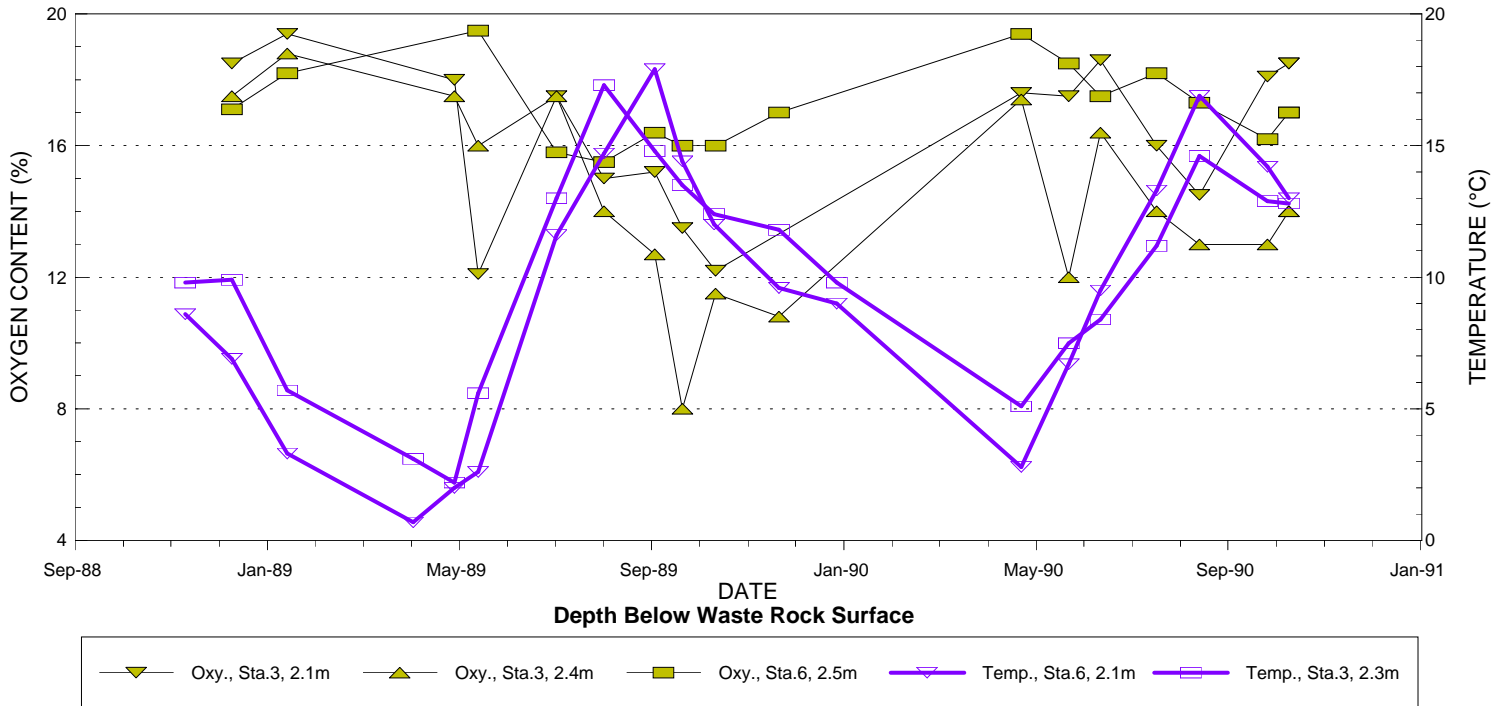
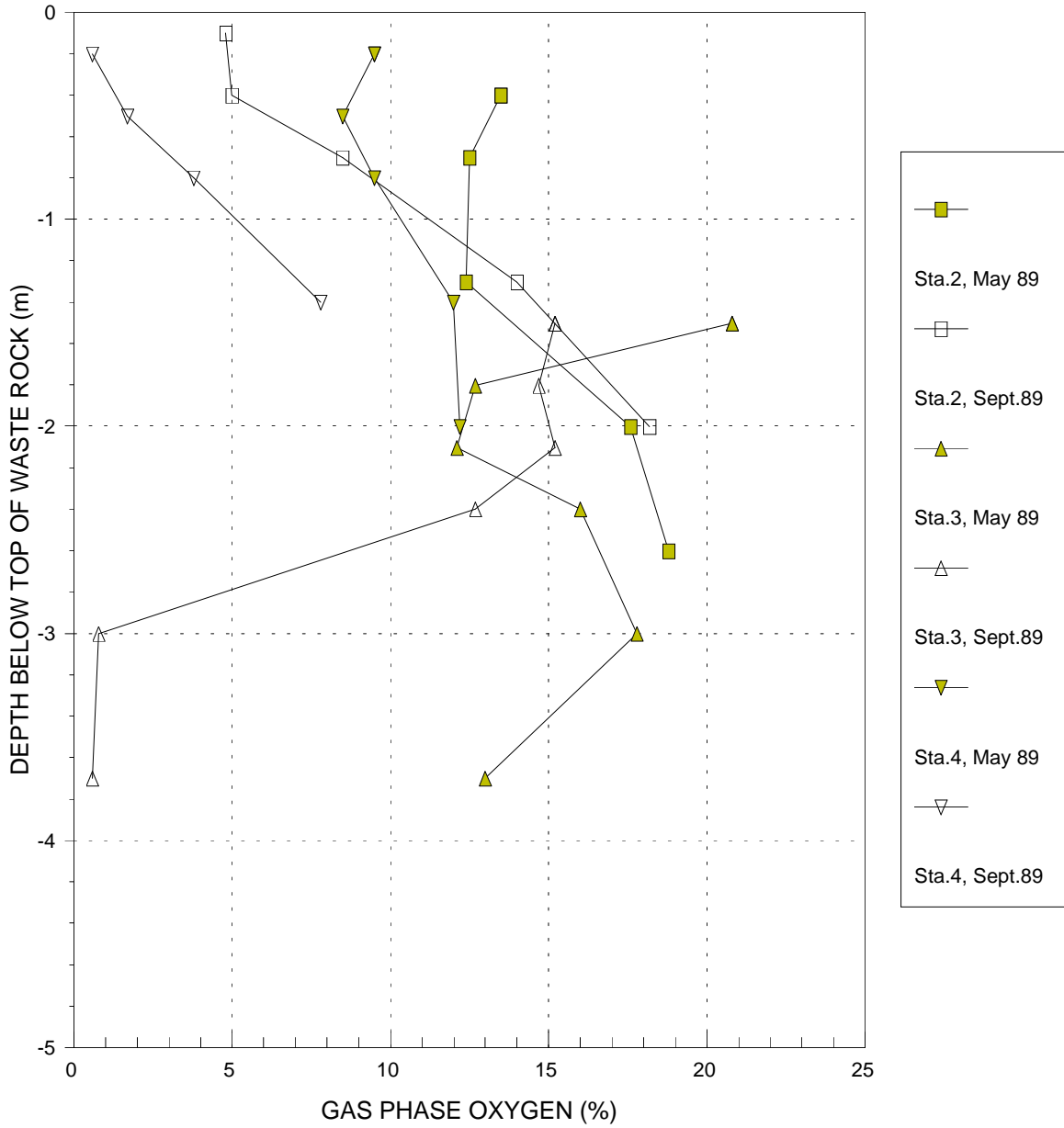


Figure 3-9
Gas Phase Oxygen Profiles, Pile 18A, Stations 2, 3 and 4



3.4.1.3 Temperature

The temperatures measured at Pile 18A are plotted over time in Figures II-7 to II-12 and the corresponding data was tabulated in Table II-2 in Appendix II.

The temperature readings clearly show the seasonal variation in temperature within the pile as indicated in Figures 3-8 and 3-10. It shows the temperature at the bottom of the pile warming in response to increased summer surface temperatures to the point where the gradient is reversed from May through October. The temperature generated from the waste rock exothermic oxidation process is very difficult to determine because of the relatively wide range of ambient temperatures encountered throughout the year. However, as indicated in Figure 3-8, the pile temperature at depth was generally high when the oxygen concentration was low, both of which would be indicative of a strong oxidation reaction. The vertical temperature distributions within the pile were relatively consistent between the stations as indicated by the temperature profiles in Figure 3-11.

Figure 3-10
Temperature Data, Pile 18A, Station 3

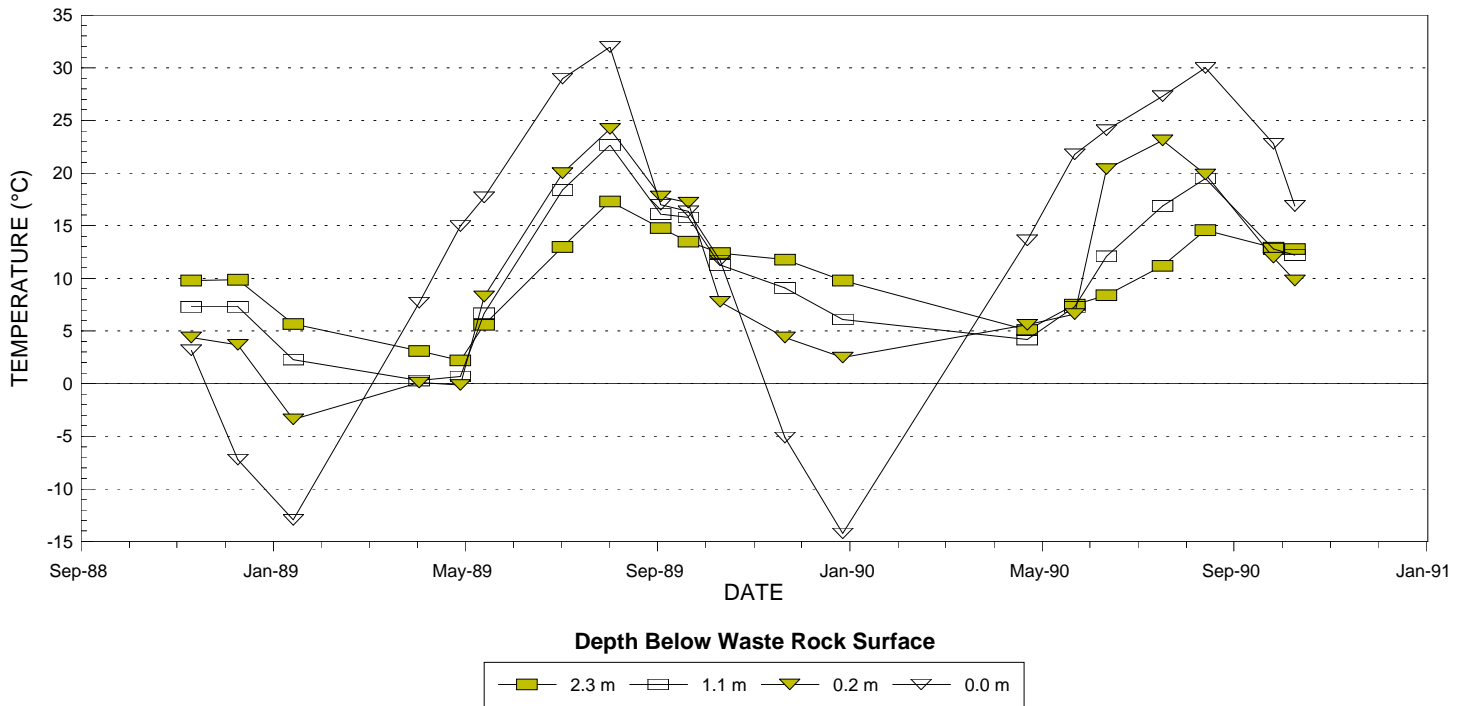
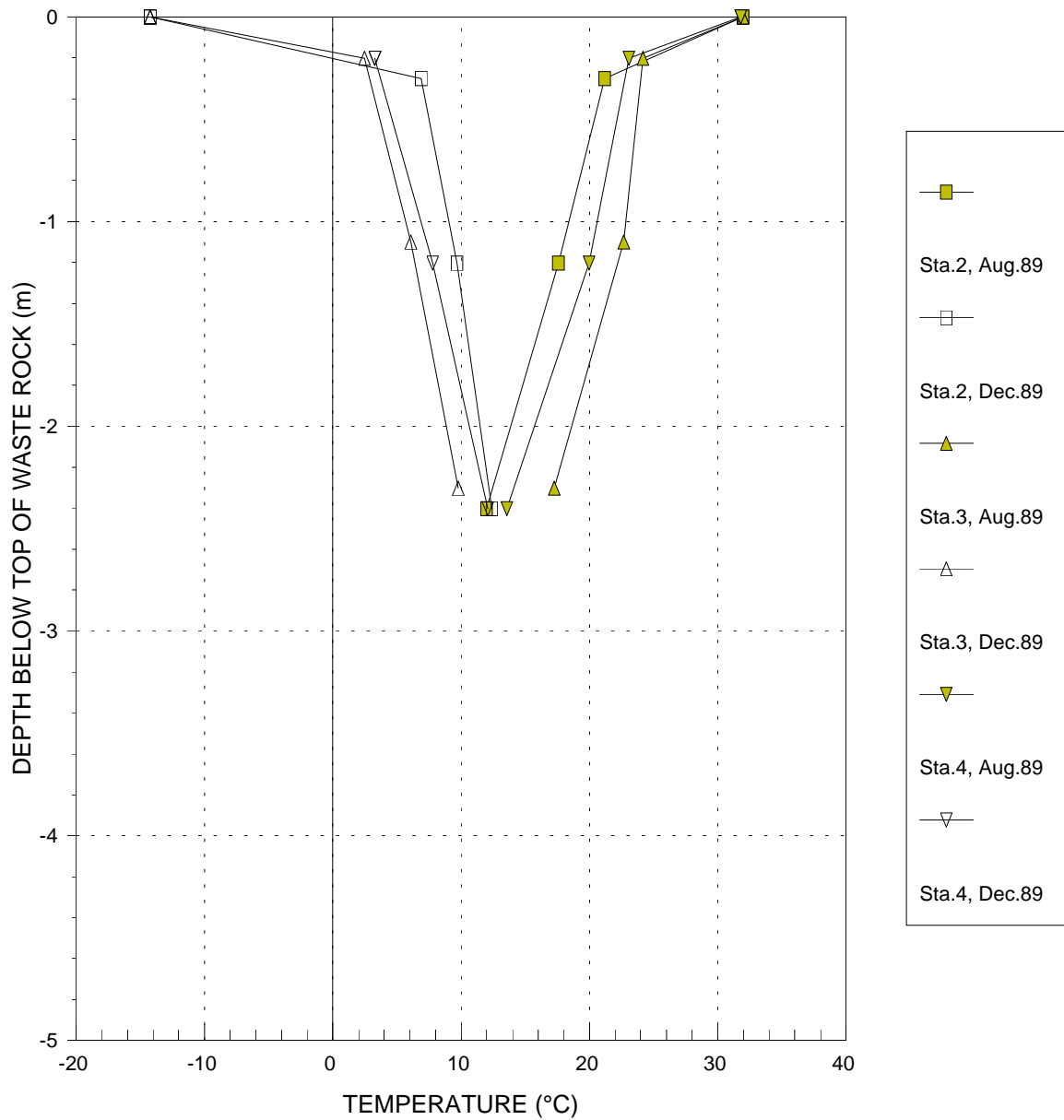


Figure 3-11
Temperature Profiles, Pile 18A, Stations 2, 3 and 4



3.4.2 Pile 18B

3.4.2.1 Description

Pile 18B was immediately adjacent to 18A but was significantly larger. It was estimated at 19,500 tonnes of acid generating waste rock, containing pyrite, pyrrhotite, sphalerite, galena and chalcopyrite, as indicated in Table 2-3. Its maximum depth was 6.7 m.

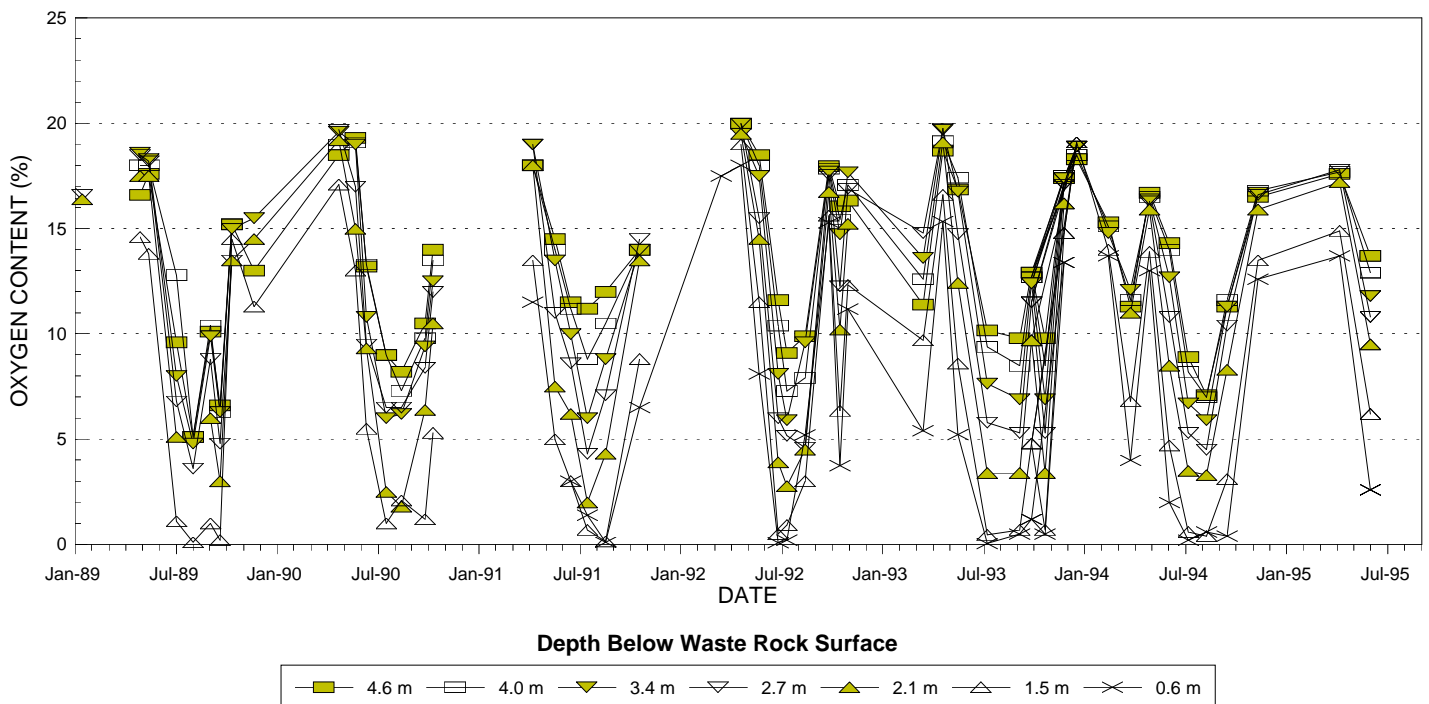
Pile 18B was instrumented along a single section through the centre of the pile with six sets of thermocouples and gas ports as shown in Figures 3-1 and 3-4. The data for Pile 18B is presented in Appendix III of this report.

3.4.2.2 Oxygen

The oxygen concentrations measured at Pile 18B and plotted over time are shown in Figures III-1 to III-12 and the corresponding data is tabulated in Table III-1 in Appendix III.

The oxygen concentrations measured in Pile 18B exhibited a cycle that was mainly dependent on climatic conditions, and to a lesser extent, on the oxidation rate of the waste rock, as indicated in Figure 3-12, which shows the variation of the oxygen concentration over time for Station 4. The seasonal variation in the oxygen concentrations could indicate that the rate of oxidation of the reactive waste rock is temperature dependent. Also, oxygen concentrations were observed to decrease during winter which could indicate that the snow cover restricted the flux of gaseous oxygen reaching the reactive waste rock.

Figure 3-12
Oxygen Data, Pile 18B, Station 4



Figures 3-13 and 3-14 show the oxygen concentrations over time at shallow depths (1.5 m) and deeper depths (4.6 m), respectively. These two figures show that the variability of the oxygen concentrations generally diminish with depth. However, the variability was higher and the oxygen concentrations were lower towards the edge of the pile as indicated by the measurements at Stations 4 and 5.

In Figures 3-15 and 3-16, the oxygen concentrations are plotted with the corresponding temperature measurements. These two figures indicate that the reversed correlation between the oxygen levels and the temperature is more pronounced near the surface than at depth. This would tend to confirm the importance of the ambient temperature on the rate of oxidation.

Figure 3-17 shows the vertical distribution of the gas phase oxygen for Stations 1 to 6 as measured in September 1993. The vertical distribution of the oxygen concentrations at that time show that oxygen was being consumed at depth within the waste rock pile towards the edge of the pile while the oxygen content increased with depth towards the middle of the pile. Also, the oxygen content was globally lower along the southern part of the pile.

The higher oxygen concentrations at depth in the northern toe of the pile could be attributed to advective transport of gas by the wind, or to differences in material properties, or a combination of both. The prevailing northwest wind would tend to generate air flow in the pile from the north to the south and could explain the presence of high oxygen levels near the base on the northern side but not on the south. Also, the oxygen pattern could be explained by a combination of oxidation near the surface when temperatures were high enough, continuous oxidation at depth, thermal convection in the winter, prevailing wind from the north and, perhaps, variability in the distribution of oxidizable material.

3.4.2.3 Temperature

The temperatures measured at Pile 18B are plotted over time in Figures III-13 to III-24 and the corresponding data are tabulated in Table III-2 in Appendix III.

The size of the waste rock pile was such that the entire pile was effected by the seasonal temperature variations as indicated in Figures 3-15 and 3-16. These two figures also show that the temperature variation is more a function of depth than the position of the station relative to the edge of the waste rock pile, and that the climatic affects are attenuated with depth. The temperature profiles collected at Pile 18B in September 1993, which are plotted in Figure 3-18, indicate that the temperature generally decreased with depth.

A preliminary conclusion is that the temperature distribution and the relatively high aeration throughout Pile 18B (particularly in the northern toe) could be affected by prevailing north-westerly winds. However, it is difficult to separate the temperature rise due to internal heating from the oxidation process or from insulation provided by the outer layer of the waste rock pile.

Figure 3-13
Gas Phase Oxygen, Pile 18B, Stations 2, 3 and 4
Shallow Depth (1.5 m)

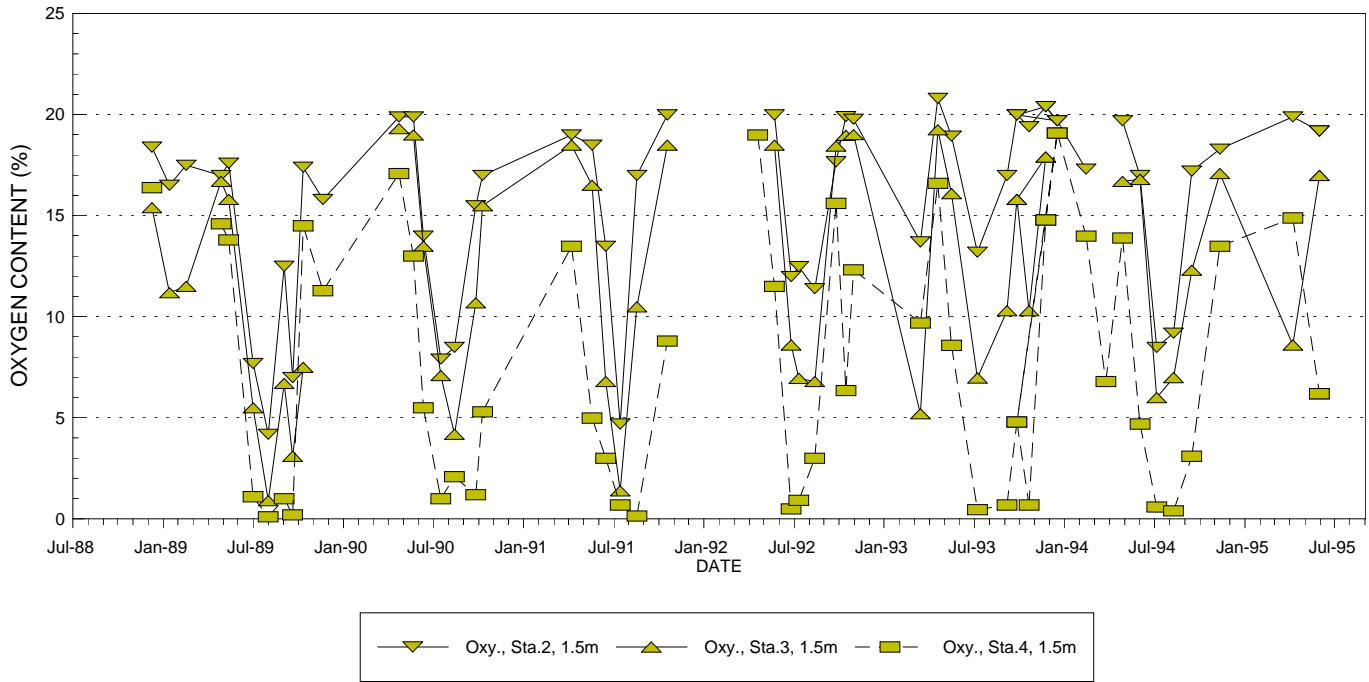


Figure 3-14
Gas Phase Oxygen, Pile 18B, Stations 2, 3 and 4
Deep depth (4.6 m)

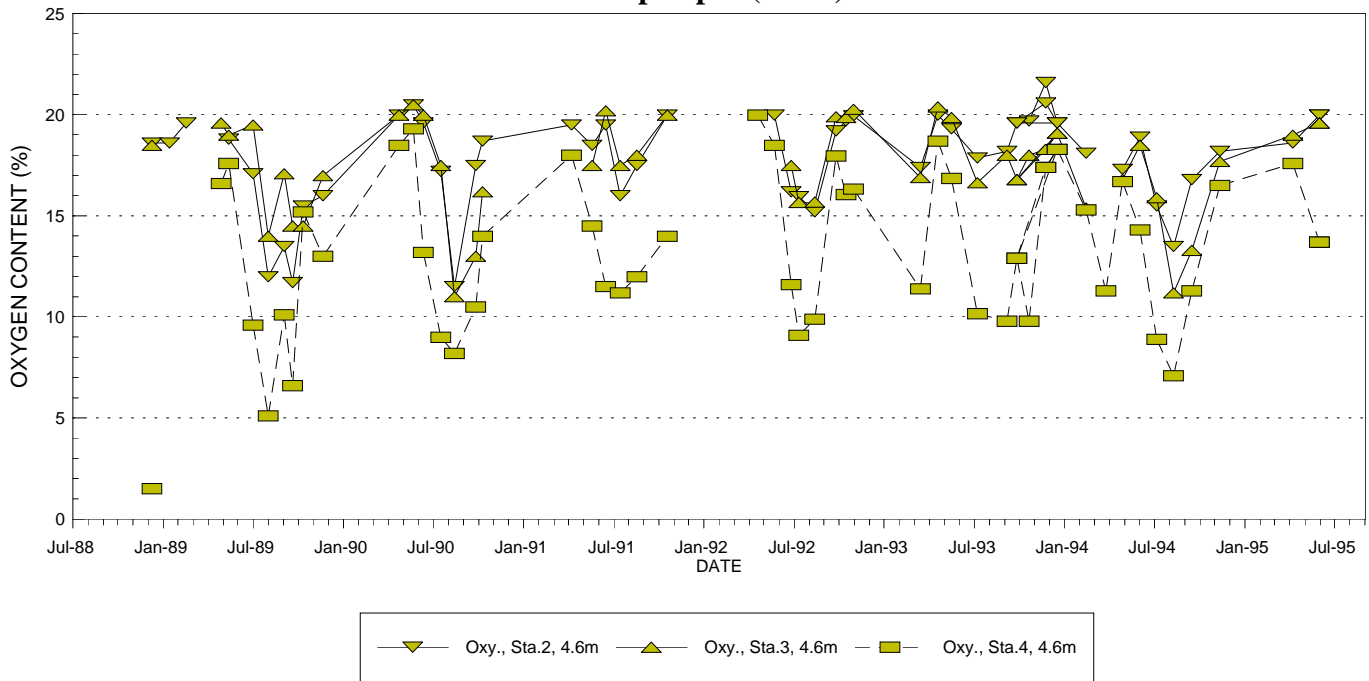


Figure 3-15
Gas Phase Oxygen and Temperature,
Pile 18B, Stations 2, 3, 4 and 5, Shallow Depth (0.9 to 1.6 m)

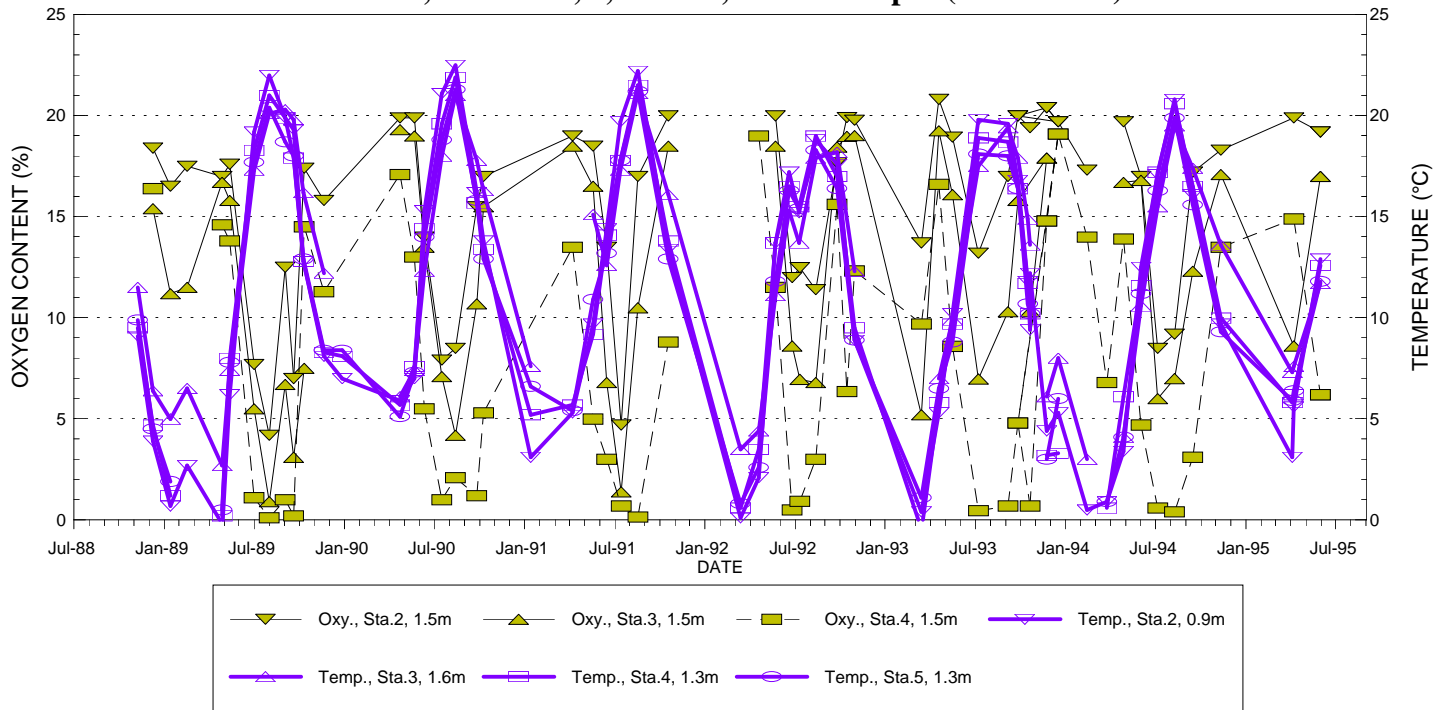


Figure 3-16
Gas Phase Oxygen and Temperature
Pile 18B, Stations 2, 3, 4 and 5, Near Bottom of Pile (Depth of 4.0 to 4.6 m)

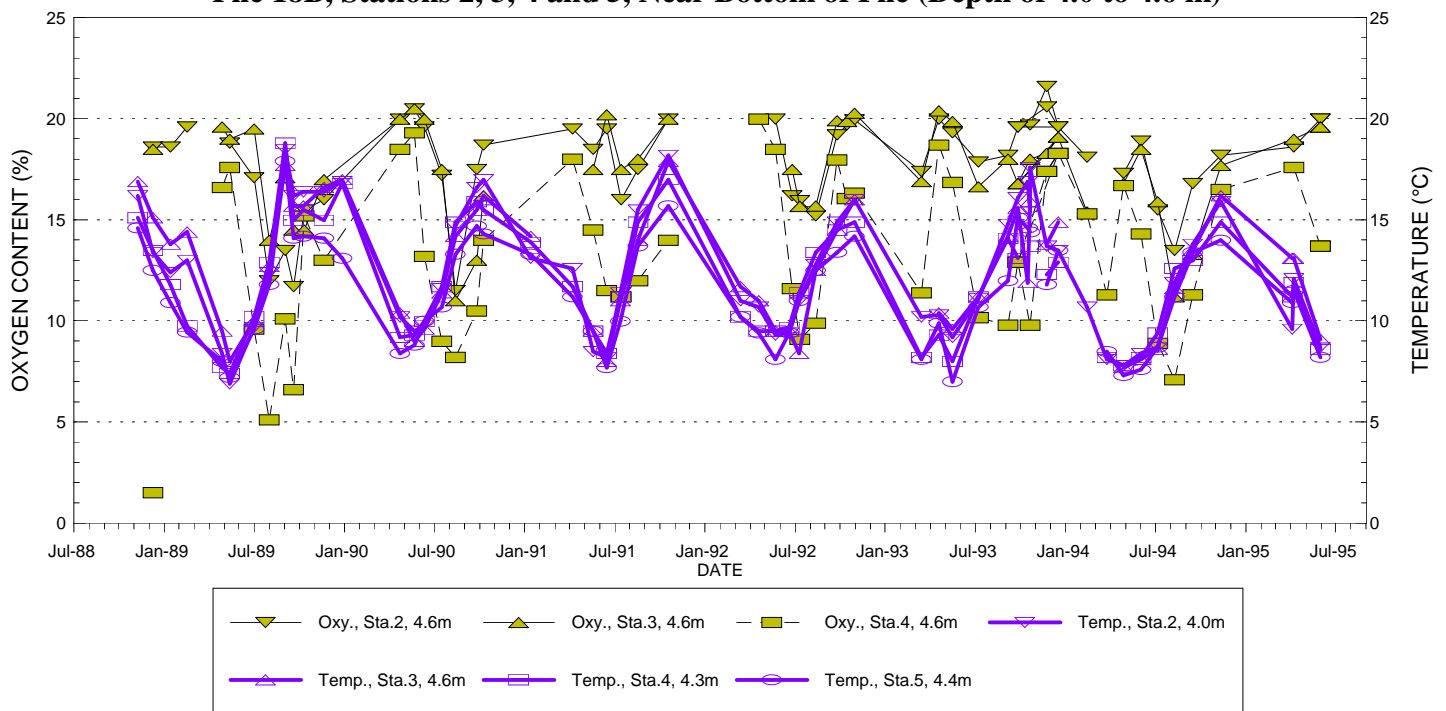


Figure 3-17
Gas Phase Oxygen Profiles, Pile 18B, September 1993

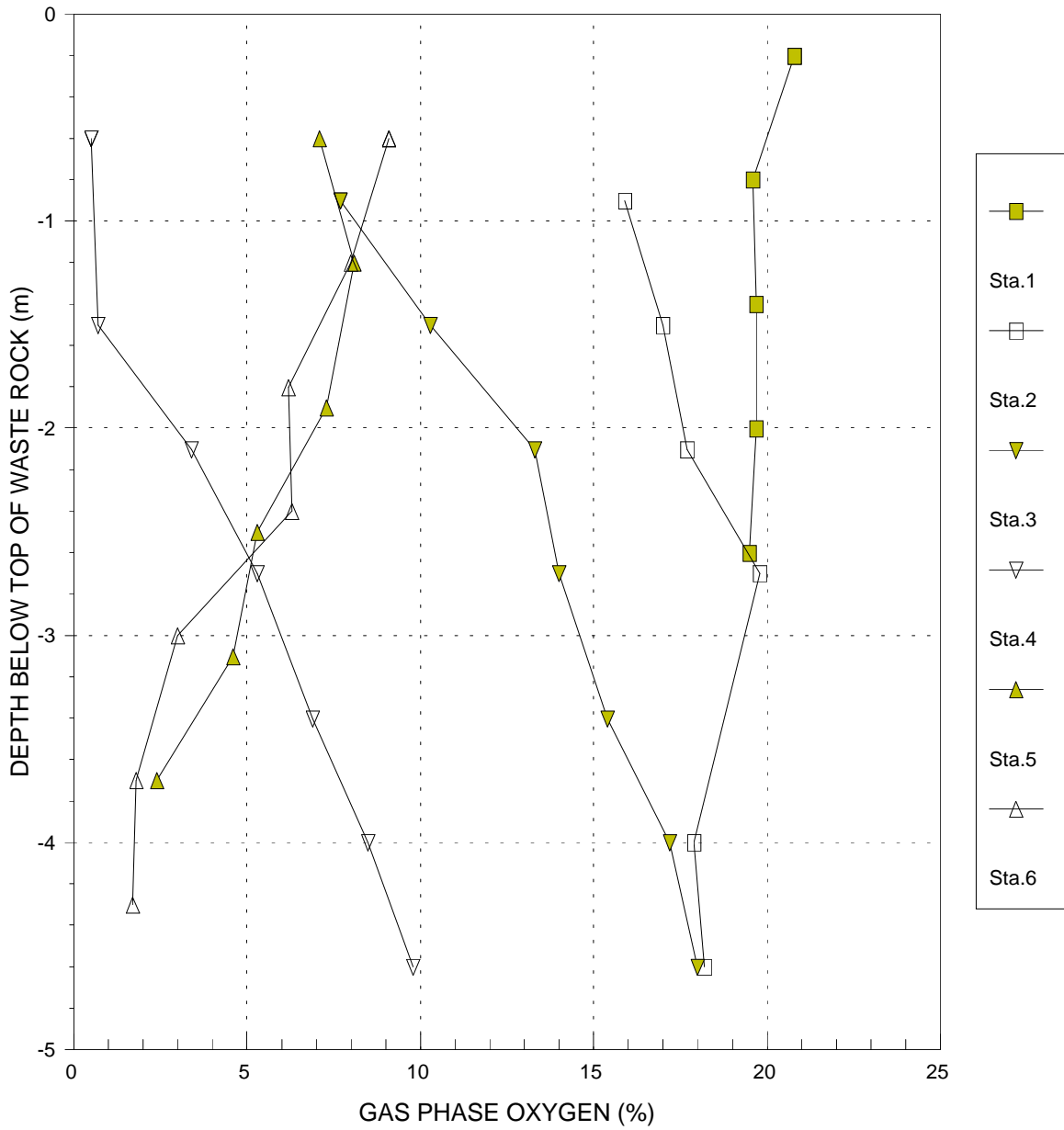
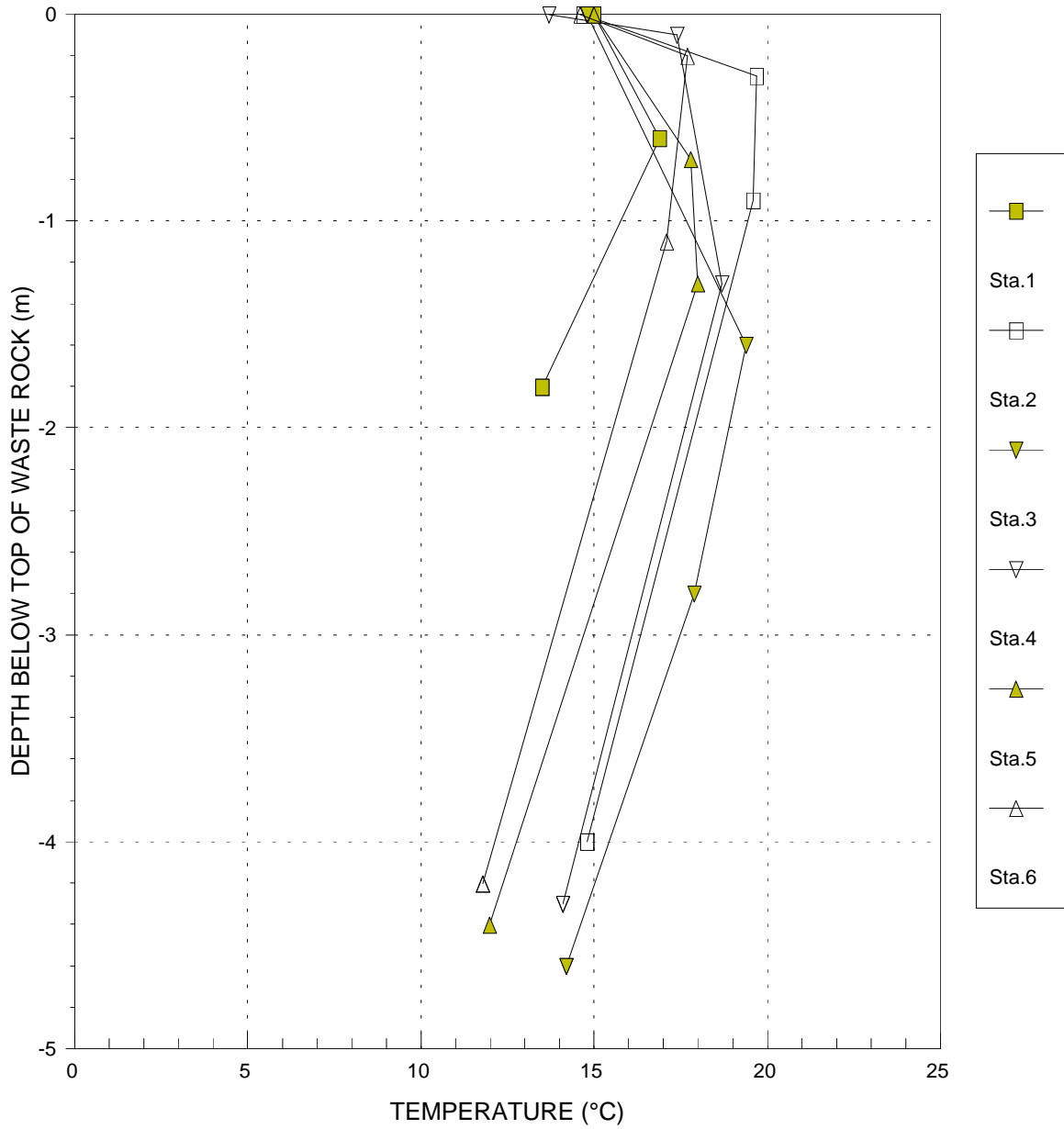


Figure 3-18
Temperature Profiles, Pile 18B, September 1993



3.4.2.4 Gas Phase Carbon Dioxide

Measurements of carbon dioxide were initiated in November 1993, at the request of the steering committee. Data were recorded for Piles 18B and 7/12 (refer to section 4.6.4). Data for Pile 18B are given in Appendix III.

Gas phase concentrations of CO₂ ranged from 0.00 to 5.43 volume percent within Pile 18B. 90 percent of the recorded concentrations were greater than 0.13 volume percent. The concentration of carbon dioxide in atmospheric air is approximately 0.033 volume percent.

The primary source of elevated levels of CO₂ in a waste rock pile is the reaction between acid generated in the pyritic oxidation reaction and carbonates in the gangue minerals. Levels of CO₂ in a waste rock pile would be expected to be related to its rate of generation, and therefore, be indicative of acid and carbonate consumption. However, limited unpublished data tend to indicate that CO₂ continues to be produced in waste rock piles even after the drainage has become acid. This would not be expected if the acid/carbonate reaction is fast. As long as there is readily available carbonate anywhere in the system, the acid should be neutralized and the drainage should be near pH 7. The fact that this is not so implies that the transit time of acid through the dump is faster than the reaction rate of acid with carbonate. This conclusion has important consequences when it comes to modelling the chemistry of waste rock piles and suggests that, as well as Intrinsic Oxidation Rate (IOR), there is a bulk material property which might be called the "acid reaction rate" which should also be measured. However, there is very limited information on this subject. Although the CO₂ data collected to date may not be used immediately, it may become a valuable parameter for the evaluation of the rate of the acid reaction present in waste rock piles in the future.

3.4.3 Pile 17

3.4.3.1 Description

Pile 17 is the largest of the piles monitored with approximately 236,000 tonnes of sphalerite bearing waste. The pile was instrumented with six sets of thermocouples and gas ports arranged on two perpendicular axes as shown in Figure 3-2 and 3-5. Data was collected until October 1991.

3.4.3.2 Oxygen

The oxygen concentrations measured at Pile 17 are plotted over time in Figures IV-1 to IV-6 and the corresponding data is tabulated in Table IV-1 in Appendix IV.

The oxygen data for this pile show far less variation than that for the other piles and the oxygen concentration values are, in general, higher with the lower concentration being about 10 percent towards the end of the summer. The spatial and seasonal variations of the oxygen concentrations obtained for Piles 18A and 18B also appear to have existed in Pile 17, but the magnitude of the

variation was not as high. Figure 3-19 shows the oxygen concentrations measured at Station 3, which is typical for this pile.

According to the data collected in September 1989 at Stations 1 to 6 (Figure 3-20), the oxygen concentrations were relatively constant or showed a small variation with a slight increase with depth. This could be an indication of a well aerated pile. The lack of water reaching the reactive waste rock at depth may be another factor that could explain the relatively high and uniform oxygen concentrations measured throughout the pile. The slightly lower oxygen concentrations near the surface may be the result of densification during end dumping, coupled with weathering and compaction of the surface material over time.

Figure 3-19
Gas Phase Oxygen, Pile 17, Station 3

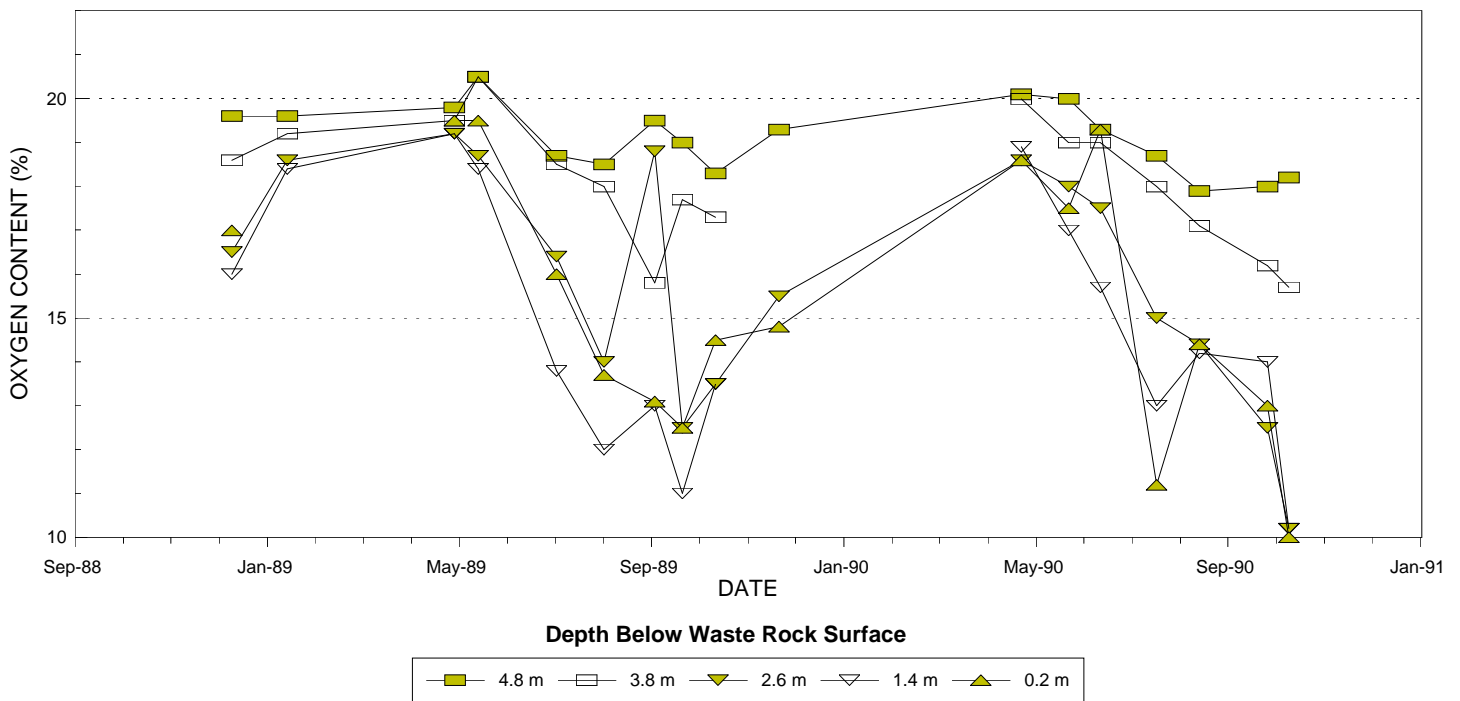
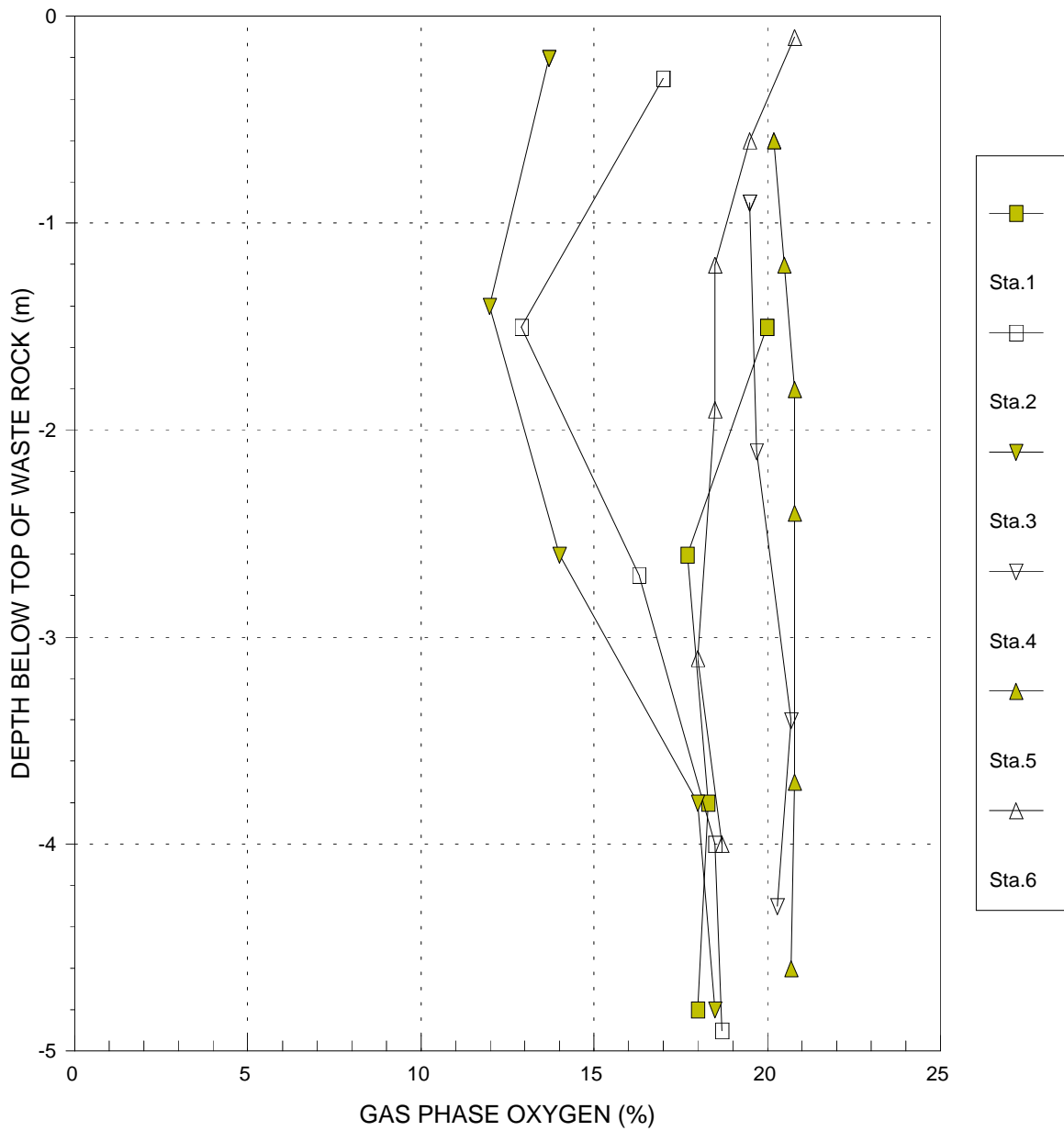


Figure 3-20
Gas Phase Oxygen Profiles, Pile 17, September 1989

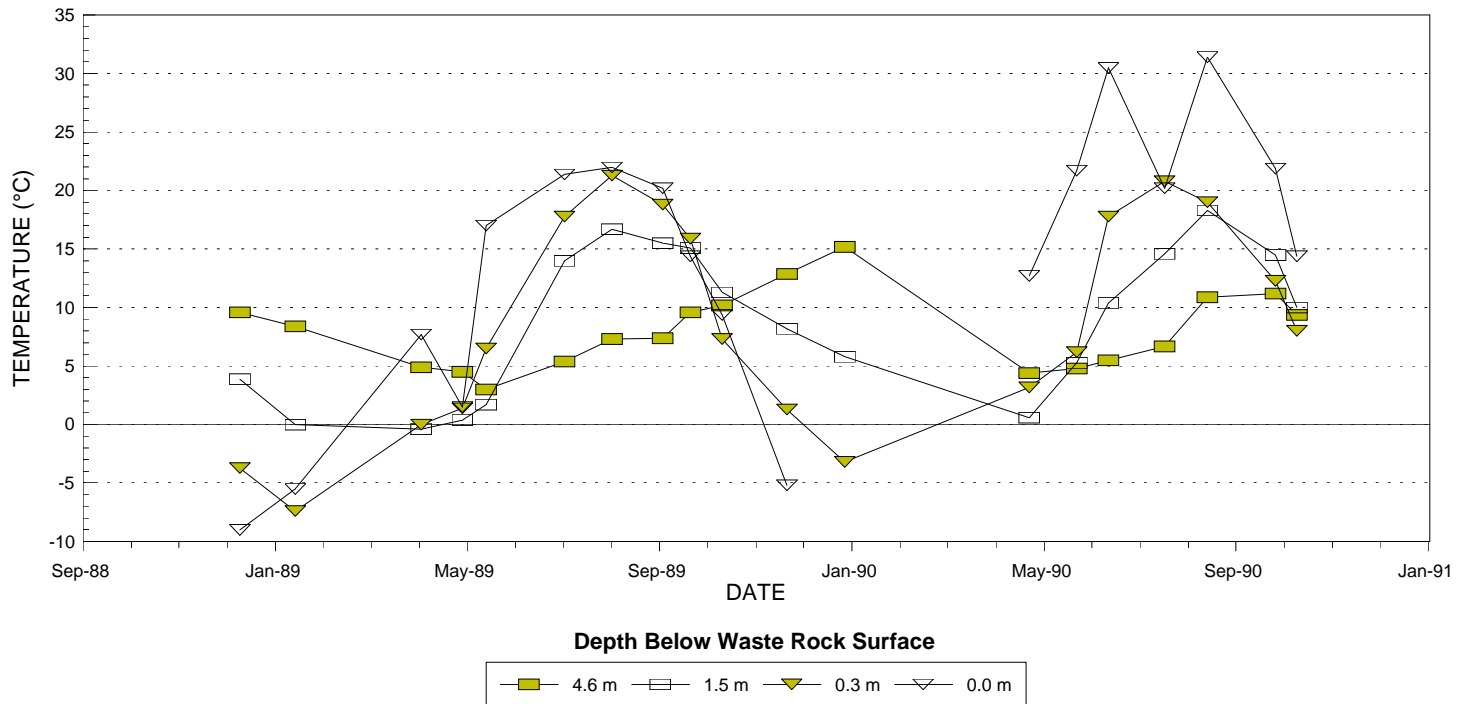


3.4.3.3 Temperature

The temperatures measured at Pile 17 are plotted over time in Figures IV-7 to IV-12 and the corresponding data is tabulated in Table IV-2 in Appendix IV.

The lowest internal temperatures occurred in May, which is illustrated in Figure 3-21. The spatial and seasonal variations of the temperature described for Piles 18A and 18B appear to have existed in Pile 17 as well.

Figure 3-21
Temperature Data, Pile 17, Station 3



3.4.3.4 Leachate

Water quality was monitored until April 1990 in a downgradient collection ditch located at the toe of Pile 17. Available data for the period from February 1987 to April 1990 are presented in Table VI-1 of Appendix VI. The analyses consisted of measuring the pH and concentrations of zinc (Zn), copper (Cu) and lead (Pb).

Water quality data for the downgradient collection ditch provides some indication of the combined surface runoff and leachate from the pile, although it must be kept in mind that drainage from neighbouring areas also report to the ditch. Since January 1988, the pH has been fairly constant at about 2.1 and over the study period copper averaged 120.5 mg per litre, lead 0.36 mg per litre and zinc 258.1 mg per litre. The metal levels generally decreased during the winter months, and demonstrated a sharp peak during April/May, and more prolonged elevated levels during late summer and fall. This pattern is typical of local runoff characteristics from

acid-generating areas. The observed concentrations could also reflect the flushing of AMD plus the dissolving the soluble secondary minerals present in the waste rock.

3.4.4 Climate

The mean annual precipitation at the Little River Mine Station is 1134 mm, of which 762 mm is rainfall. The station records an average of 93 days per year with rain and 47 with snowfall. The coldest months are January and February with mean daily temperatures of -12.5 and -11.5°C, respectively. July is the warmest month with a daily mean of 17.9°C. Winds are predominantly from the northwest. A summary of the historical available climate data are presented in Table 3-1.

The climate at the Heath Steele site can be described as Maritime continental, with hot, relatively dry summers and cold, snowy winters.

Table 3-1
Historical Climate Data

LITTLE RIVER MINE 47° 17'N 66° 4'W	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Daily Maximum Temperature (°C)	-7.4	-5.9	-0.1	5.6	13.5	20.7	23.3	22.2	16.8	10.2	2.8	-4.2
Daily Minimum Temperature (°C)	-17.5	-17.0	-10.5	-4.3	2.0	9.0	12.5	10.9	6.0	0.7	-5.1	-13.2
Mean Daily Temperature (°C)	-12.5	-11.5	-5.3	0.7	7.8	14.9	17.9	16.6	11.4	5.5	-1.2	-8.7
Standard Deviation, Daily Temperature	2.2	1.8	2.0	1.1	1.8	1.2	1.6	1.2	1.4	1.4	1.9	2.6
Maximum Temperature (°C)	12.2	10.0	20.0	21.7	31.7	33.3	33.3	35.0	30.0	24.5	19.4	13.3
Years of Record	20	21	21	22	22	21	20	21	20	20	20	20
Minimum Temperature (°C)	-37.2	-35.0	-29.4	-19.4	-15.0	-5.0	1.1	-1.1	-6.7	-10.6	-20.0	-29
Years of Record	21	21	22	22	23	21	20	21	20	21	21	21
Mean Rainfall (mm)	16.4	9.9	23.9	43.5	90.4	85.6	100.7	83.9	95.5	104.7	74.0	33.8
Mean Snowfall (mm)	76.0	58.1	72.3	43.5	5.7	0.0	0.0	0.0	0.0	4.2	35.6	81
Mean Total Precipitation (mm)	91.1	68.0	96.1	86.8	96.4	85.6	100.7	83.9	95.5	108.8	105.8	115.6
Standard Deviation, Total Precipitation	45.9	26.7	36.3	51.0	49.3	47.4	48.5	41.7	43.0	47.3	45.9	42.7
Maximum Rainfall in 24 hours (mm)	49.3	42.9	44.5	76.2	68.6	50.5	55.4	99.6	99.3	86.6	52.8	58.4
Years of Record	19	22	20	23	21	22	22	22	21	22	18	22
Maximum Snowfall in 24 hours (mm)	43.2	34.8	35.6	50.8	20.3	0.0	0.0	0.0	0.0	17.8	35.6	48.3
Years of Record	22	20	21	21	23	22	23	22	22	22	22	22
Maximum Precipitation in 24 hours (mm)	49.3	42.9	44.5	76.2	68.6	50.5	55.4	99.6	99.3	86.6	52.8	58.4
Years of Record	22	21	21	22	21	22	22	22	21	22	21	23
Days with Rain	2	1	4	6	12	12	13	11	11	11	7	3
Days with Snow	9	8	9	5	1	0	0	0	0	1	5	9
Days with Precipitation	10	9	12	11	13	12	13	11	11	11	11	11

Note: Climatic data from 1956 to 1983; no data collected from 1958 to 1960.

4. PILE 7/12 (COVERED PILE)

4.1 Relocation of Pile 7/12

The relocation of Pile 7/12 was a component of the ongoing reclamation program at HSM. The relocation of the pile provided an opportunity to place the pile on an impermeable liner which would allow the collection of leachate through the pile before and after the placement of the cover. The installation of the pad and the impermeable membrane, and the relocation of Pile 7/12 was completed in June 1989.

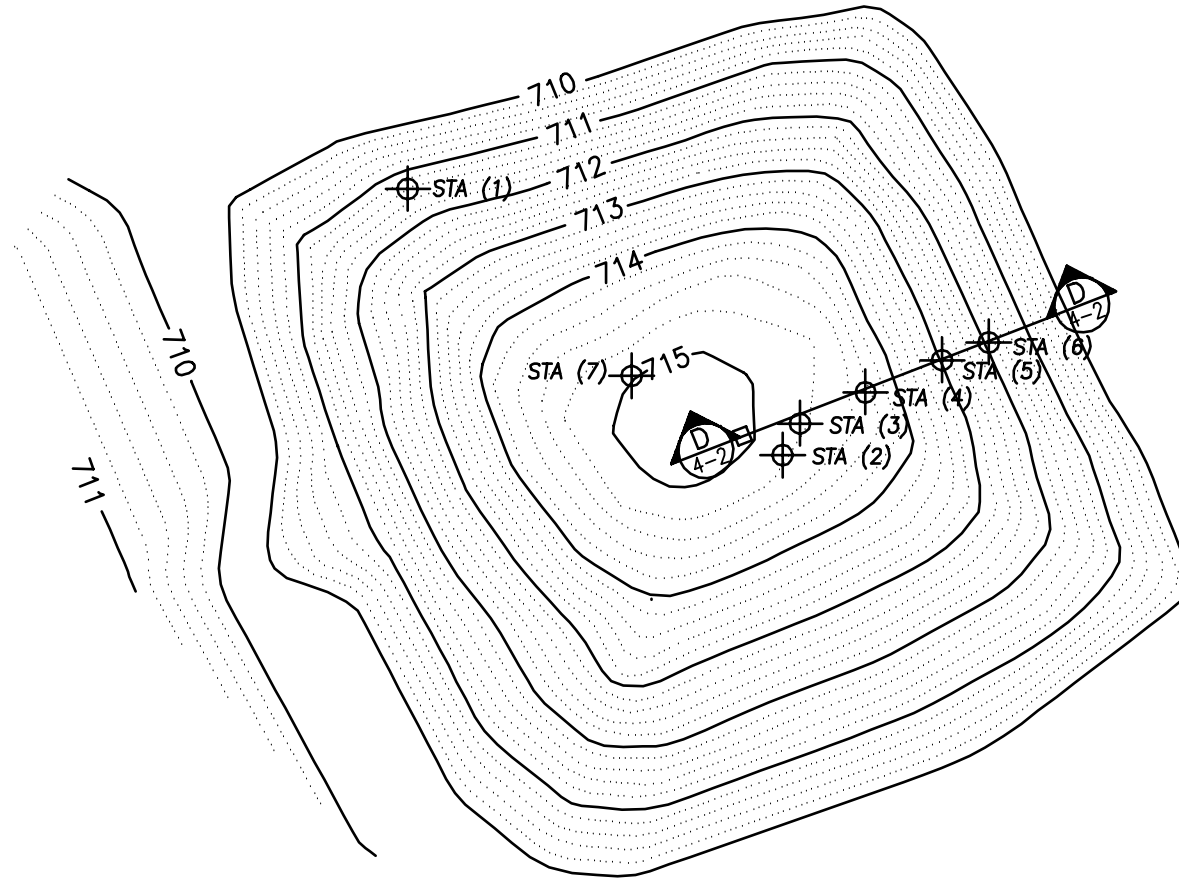
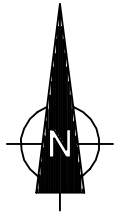
The impermeable membrane was fabricated from Fabrene fabric strips glued together into three large panels in the mine mill shop. The panels were then assembled at the site on a prepared sand base and glued together. The sand base consisted of a compacted sand layer to eliminate any protrusions that could puncture or damage the membrane. The membrane was folded over in 0.6 m strips at several locations to allow for expansion, movement or tension that could develop from settling, thermal expansion/contraction or traffic during placement of the waste rock.

A 150 mm sand layer was placed on top of the membrane to act as a protective filter for the underdrain system, and to protect the liner from penetration by the waste rock. An underflow drainage collection system consisting of 50 mm diameter PVC drain pipe was installed within the upper sand filter. The outlet of this system was installed with a "U-Bend" water trap to prevent air from being drawn into the base of the waste pile.



The waste rock material was placed to a height of approximately 5 m, with the sides at a 3H:1V slope. During construction, 150 mm diameter vertical pipes were set into the waste rock. After contouring the pile, the pipes were pulled out, thus creating a vertical hole into which the instrumentation was placed.

4.2 Phase II Instrumentation

The Phase II instrumentation at Pile 7/12 followed the same methodology presented in Section 3.2 for the uncovered piles. The instrumentation consisted of seven sets of thermocouples and six sets of gas monitoring ports. Because of space limitations on Pile 7/12, both pore gas and temperature probes are mounted on the piezometer, instead of being installed in separate holes. Figures 4-1 and 4-2 show the site plan of Pile 7/12 and a cross-section through the pile. The specific details of both the pore gas and temperature installations are described in Section 3.2.



LEGEND

-  STA MONITORING PROBE
-  SECTION LETTER
DESTINATION DRAWING No.
(IF REQUIRED)

NOTES:

- CONTOUR INTERVAL 0.2m.
- CONTOUR ELEVATIONS IN METRES.
- ELEVATION DATUM AT 2713m
GEODETIC.



METRES

FIGURE 4-1

WASTE ROCK PILE 7/12 - HEATH STEELE MINES



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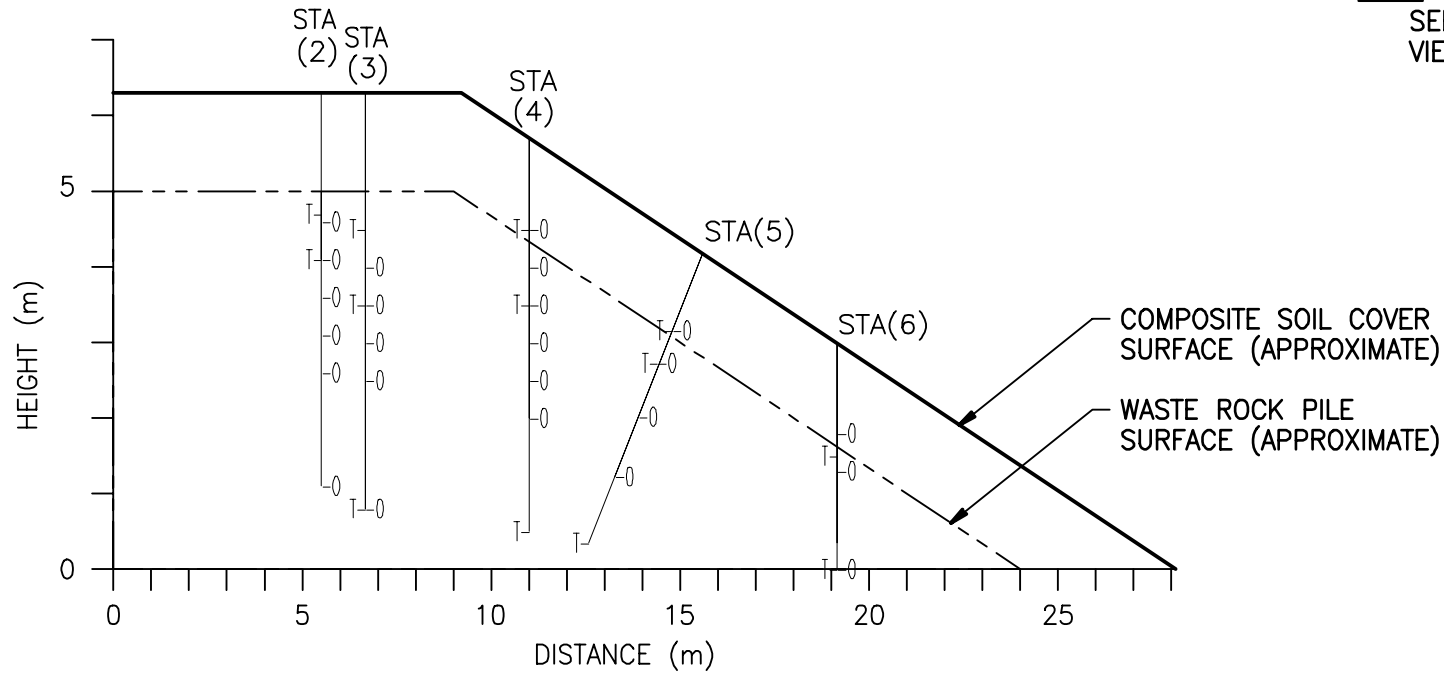
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LEGEND

- T TEMPERATURE PROBE
- O OXYGEN PROBE

NOTE:

SEE FIGURE 4-1 FOR PLAN VIEW OF PILE 7/12.



SECTION D-D

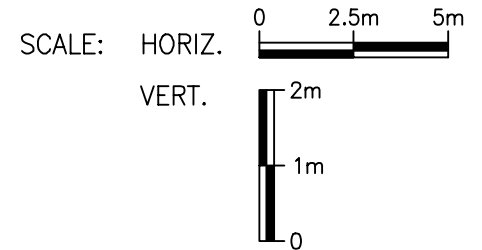


FIGURE 4-2

CROSS SECTION - PILE 7/12



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4.2.1 Leachate

The relocation of Pile 7/12 provided the opportunity of independently monitoring both seepage and surface runoff for flow and quality. An automated water sampler (ISCO Model 2900 with water level sampler activator Model 1640) and automated water level recorder (Richards type) were installed at the outlet weirs and were only used during Phase II.

Water samples were analyzed for the following parameters: pH, acidity, iron, copper, zinc and sulphate. Supplementary analyses for lead and total solids were also conducted.

4.3 Cover Design and Construction

4.3.1 Design

The cover options for Pile 7/12 were reviewed and assessed by Noranda Technology Centre (NTC) in Phase III. An evaluation of potential cover materials was undertaken concurrently with Phase II. The work involved the development of an appropriate soil cover design based on the performance characteristics of natural soils in the vicinity of HSM. The design of a saturated soil cover system required the development of methodologies for predicting the long term hydraulic and diffusive behavior of the low permeability soil layer.

An engineered soil cover was subsequently proposed for Pile 7/12. The objective was to design a cover that was effective in reducing the gas phase oxygen flux, water infiltration into the underlying pile, and to remain saturated over dry periods. The final design was a three-layer composite cover system consisting of a 60 cm thick saturated fine-grained soil layer sandwiched between two 30 cm thick, coarse grained soil layers. The coarse layers serve as capillary barriers to minimize moisture losses in the fine layer due to evaporation and drainage. Modelling of gas phase oxygen transport, using laboratory-measured diffusion coefficients, suggested that the flux through such a cover would be low because of potentially high water saturation of the fine layer. The potential for the fine layer to remain nearly fully saturated, even under an evaporative flux, was confirmed by modelling. The requirements of high water saturation and low hydraulic conductivity for the fine layer can both be achieved by placing and compacting it at a water content slightly higher than the optimum value and about 95 percent of the maximum Modified Proctor density.

The three-layer cover system concept was extensively evaluated in the laboratory and by modelling, and field studies involving acid-generating mill tailings in Northwest Québec. The results of the evaluations indicated that the system would be effective in reducing acid generation by at least 90 percent.

The design of the composite cover for Pile 7/12 was reported by Yanful et al. 1993, and a copy of the reference is included in Appendix VII.

At the completion of the Phase III, NTC proposed a composite soil cover consisting of a fine grained saturated glacial till sandwiched between two coarse grained granular layers as an effective oxygen barrier based on the following rationale:

- The base granular material would drain to residual saturation before the till. At residual saturation, the granular layer is unsaturated, thus minimizing the hydraulic conductivity and maintaining saturation of the till during dry periods.
- The fine grained glacial till compacted at a moisture content slightly wet of optimum would be expected to have a low hydraulic conductivity while acting as an effective moisture and oxygen barrier.
- The overlying coarse grained granular layer would be acting as a recharge layer to the underlying till thus preventing the till layer from drying out at the surface.
- A surficial coarse-grained granular layer would be added for erosion protection.

Figure 4-3 shows the details of the composite soil cover. The layer thicknesses are designed to maintain saturation in the glacial till for a minimum of 50 days without precipitation. The engineering design also involved the preparation of engineering drawings and project specifications for the actual construction of the cover based on the design criteria provided by NTC. Three drawings were produced and are included in Appendix X at the end of this report. The three drawings are:

- No. F91-057-1: Site plan, results of the site surveys carried out on July 12, 1991;
- No. F91-057-2: Construction details - soil cover;
- No. F91-057-3: Construction details - instrumentation.

The project specifications prepared by ADI Nolan Davis defined the specific requirements for the following:

- Borrow source;
- Surface preparation;
- Sand base;
- Impermeable cover;
- Granular cover;
- Erosion protection; and
- Leachate collection.

Details are provided in the following sections.

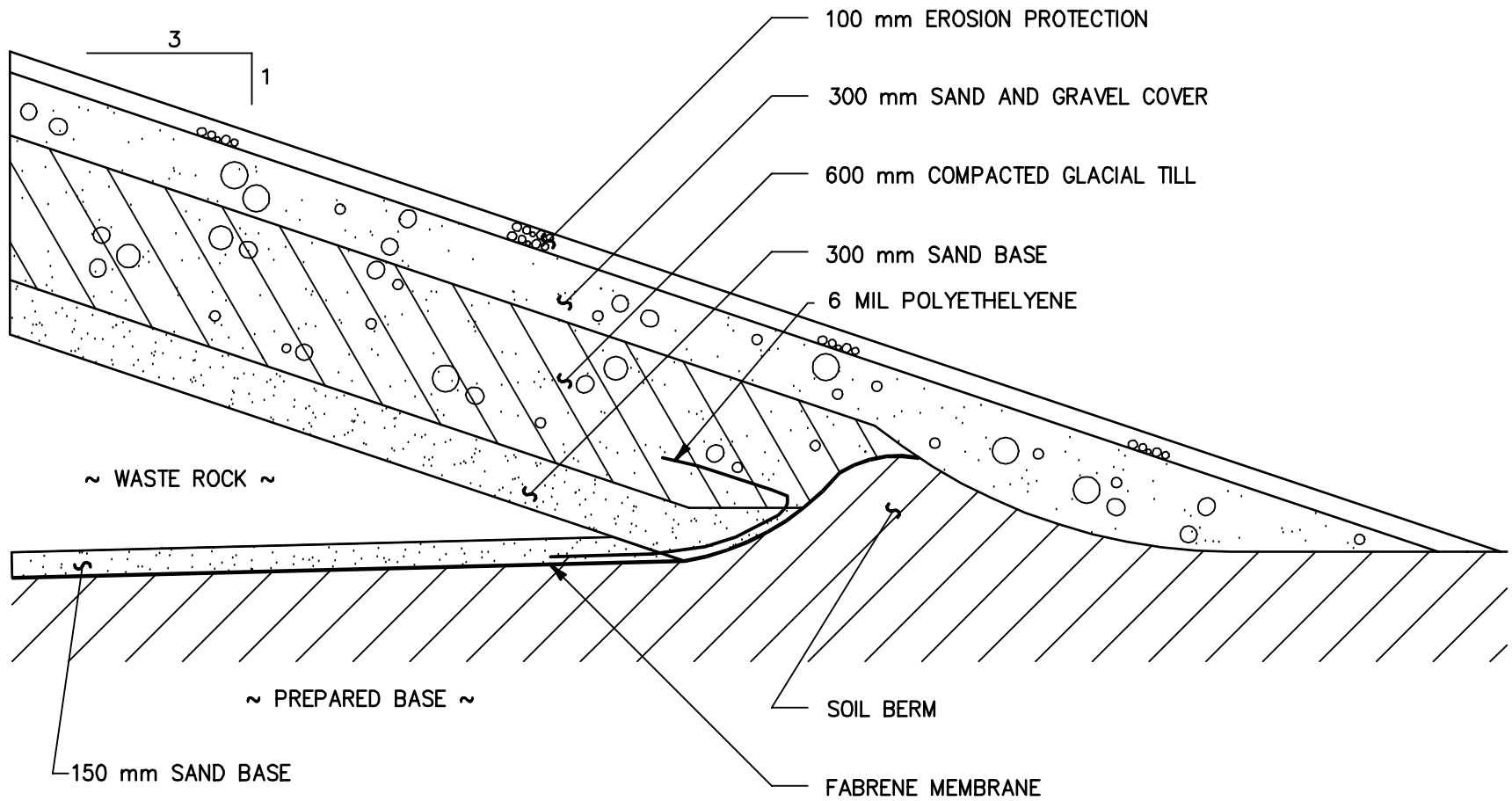


FIGURE 4-3

COVER CONSTRUCTION DETAIL



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4.3.2 Construction

The composite soil cover was constructed on Pile 7/12 from August 28 to September 19, 1991. Daily records of site activities were maintained, the soil layers were inspected as placed and in situ density testing and laboratory testing were carried out as required.

4.3.2.1 Quality Control

The quality control procedures were implemented during construction to ensure project specifications were achieved. This included:

- Laboratory testing was carried out at an on-site temporary laboratory to ensure that the soils provided met project requirements for gradation. The glacial till was also tested for moisture content and Atterburg limits.
- Moisture density relations tests were conducted prior to the placement of each of the soils to determine the soil's maximum dry density and optimum moisture content. In the case of the glacial till, a second test was carried out during construction.
- On-site stockpiles of each material were visually inspected on a regular basis for consistency of quality before placement.
- The thickness of each layer was regularly measured prior to placement of the next layer using survey level equipment.
- In-situ density testing using a nuclear density gauge was conducted during the placing operations to ensure that all soils were properly compacted at the specified moisture contents and required density.
- The calibration of the nuclear density gauge was verified daily, prior to use.

The results of the laboratory testing are summarized in the following sections and are included in Appendix VIII. In situ density test results are presented in Appendix IX.

4.3.2.2 Borrow Source

To provide a cost effective cover, the construction of the cover required that a local source of glacial till be found for the saturated fine layer. The selected borrow source was identified by HSM.

Nine potential borrow sources for the granular material (e.g. sand base, gravel cover) were tested for acid generating potential by NTC. The test results indicated that the granular materials were not acid generating material. The granular material selected for the sand base, granular cover and erosion protection were screened aggregates from the Shaddick Lake deposit located 15 km from the site.

4.3.2.3 Surface Preparation

The initial task in the placement of the composite soil cover was the surface preparation of Pile 7/12. This included filling all depressions and large voids on the side slopes and top of the pile while removing any high points by grading. Depressions and large voids were filled with about 50 tonnes of crushed rock or waste rock from other areas of the pile. The final prepared surfaces of Pile 7/12 were relatively flat.

Two holes, each measuring about 3.5 x 2 x 1.2 m (length x width x depth) were excavated at the top of the pile for the placement of two lysimeters. The excavated material was used for filling the voids around the lysimeters.

As part of the surface preparation, sand and gravel around the perimeter of the pile was excavated manually to expose approximately 0.3 m of membrane at the base of the pile. A double-layered six mil polyethylene was placed over the exposed Fabrene membrane and keyed into the glacial till core of the composite soil cover, as indicated on Figure 4-3. The polyethylene was placed as an additional measure to improve the seal between the composite soil cover and the Fabrene membrane

4.3.2.4 Sand Base

The surface of Pile 7/12 was covered with a 30 cm minimum thick layer of medium to coarse sand from the Shaddick Lake deposit. The compacted sand base met the design criteria as specified by NTC for gradation. The sand was placed with a front end loader, spread with a small Case 310 tractor, and compacted with a 5-tonne vibratory compactor. A minimum of four passes were used to compact the sand base with water applied to assist in the compaction to the required 92 percent Modified Proctor density. In areas near the outer edges of the pile, a layer of greater than 30 cm thickness was provided to maintain the required grades.

4.3.2.5 Impermeable Cover

The impermeable cover was specified as a local glacial till soil meeting the following specifications:

- **Grain Size (ASTM D 422)**
 - Maximum particle size of 30 mm
 - Minimum percent finer than 0.075 mm particle size of 40% by dry weight
 - Minimum percent finer than 0.002 mm particle size of 10% by dry weight
 - D₁₀ ranging between 0.001 and 0.003 mm particle size
- **Moisture Content (ASTM D 2216)**
 - 2 to +4% of optimum moisture content
- **Atterberg Limits (ASTM D 4318)**
 - Liquid Limit > 30 and Plasticity Index > 15

- **Moisture Density Relations (ASTM D 1557)**
Soil compacted to 95% of maximum dry Modified Proctor density at a moisture content of -2 to +4% of optimum.
- **Hydraulic Conductivity (ASTM D 2434)**
Coefficient of permeability (k) 1×10^{-7} cm/sec or less.

Specifications required that the glacial till cover be placed in maximum 20 cm thick lifts and compacted to 95 percent of its Modified Proctor density with the final compacted surface of the glacial till to be flat with surface irregularities within ± 25 mm of average grade.

The source of glacial till, is located 2.5 km east of Pile 7/12 (Figure 1-1), and is referred to as the Shaft No. 5 Borrow Source. Testing carried out by NTC prior to construction found this source suitable for use in cover construction.

Prior to placement of the glacial till on Pile 7/12, a field test strip measuring approximately 5 x 10 m in plan was constructed at the southwest corner of Pile 7/12 to test the placement method and the number of passes needed for compaction. The results of the in situ density tests indicated that, for maximum 20 cm thick lifts, a minimum of six passes of the 5-tonne vibratory compactor would be required to achieve the specified Modified Proctor density.

The material was trucked to Pile 7/12 where it was stockpiled at the base of the pile. The moisture content of the glacial till at the source was found to be 5 percent or more above the optimum. Consequently, the glacial till was allowed to dry prior to placement. Cobbles and boulders found in the glacial till were removed manually, both from the stockpiled area and as the till was being placed. Approximately 1500 m³ of glacial till was placed and compacted on Pile 7/12 from September 4 to September 14, 1991.

The glacial till was compacted to an average of 96 percent Modified Proctor density at moisture contents ranging between 1 and 4 percent above optimum. Grain size analyses of the glacial till found the material to generally meet project specifications for gradation with the exception of several samples which had less than the minimum percentage of clay size particles. These samples, however, had above the minimum specified total silt and clay size content.

The results of two Moisture Density Relations (ASTM D1557) tests carried out on representative samples of the glacial till indicated the optimum moisture content to be 13.5 percent with a maximum dry density of 1965 kg/m³. The results of three Atterburg limit tests carried out on the glacial till samples indicate the soil to have a liquid limit of 27-28 and a plasticity index of 5-6.

The glacial till met the design criteria as specified by NTC for Atterburg limits and generally, NTC gradation requirements. Three of the samples tested had a percentage material finer than 0.002 mm particle size (clay size) less than the specified 10 percent while exceeding the minimum 40 percent specified minimum total fines (silt and clay size particles) content. With the high percentage of total fines, the low percentage clay size particles it is not expected to impact on the long term cover performance.

4.3.2.6 Granular Cover and Erosion Protection

The 30 cm thick granular cover was specified as a well graded pit run sand and gravel or equivalent crushed rock meeting the following requirements: maximum particle size of 50 mm, and maximum percent finer than 0.075 mm size of 8 percent by weight. Specifications also required the granular cover to be placed in 15 cm thick lifts and compacted to 92 percent of its Modified Proctor density (ASTM 1557).

The sand and gravel was placed in 15 cm thick lifts and compacted to a minimum 92 percent of its maximum dry Modified Proctor density. This sand and gravel arrived on site in a dry condition, making it necessary to add moisture during placement to achieve the specified in situ density. The in situ testing on the in-place material indicated an average of 93.2 percent for Modified Proctor density and with a moisture contents averaging 5.5 percent.

The erosion protection layer placed over the complete granular cover was specified as a minimum 10 cm thick layer of coarse gravel or crushed rock having a maximum particle size of 75 mm and 15 percent by weight finer than 4.75 mm.

The final 100 mm erosion protection layer, consisting of a well graded gravel having a maximum particle size of 75 mm, was placed over the pile and compacted with several passes of the vibratory roller.

4.3.2.7 Lysimeter Installation

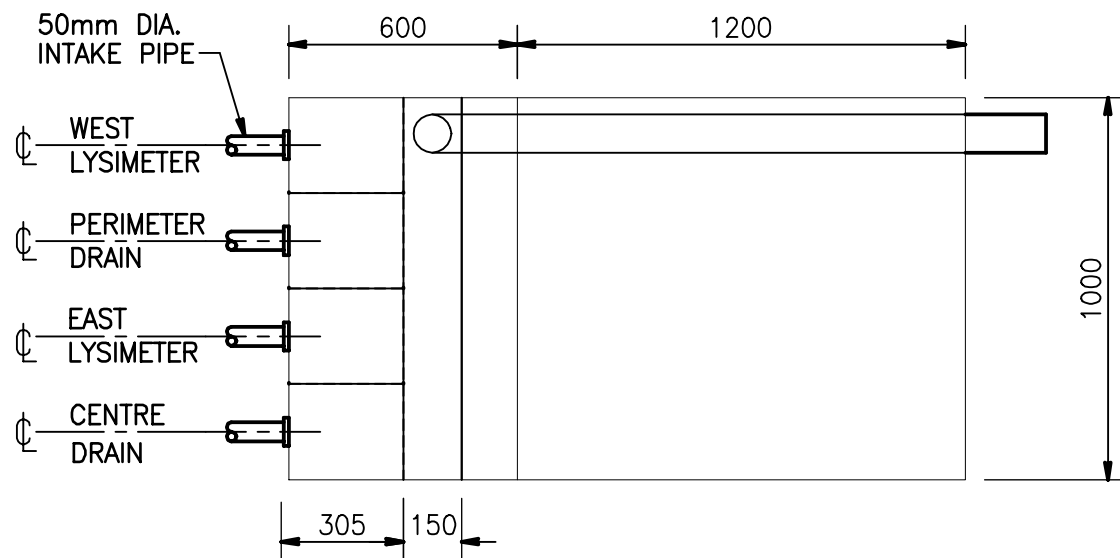
Prior to placement of the sand base, two lysimeters constructed of half sections of two metre diameter acid-resistant high density polyethylene pipe were installed in excavations on top of Pile 7/12 at the northeast and northwest corners. The lysimeters, each measuring 2.0 x 3.1 m in plan with the longer dimension orientated in the north-south direction, were sloped downward at a 2 percent gradient to promote drainage to the outfall structure at the north side of the pile. The lysimeter excavations were lined with sand to protect the lysimeters. The interior of the lysimeter located in the northeast corner of the pile was backfilled with sand while the lysimeter in the northwest corner was backfilled with a clean crushed stone. Material in both lysimeters was saturated before the sand base was placed overtop. Piping from both lysimeters was trenched into the sand base layer to the base of Pile 7/12 for connection to the outfall structure.

4.3.2.8 Outfall Structure and Leachate Collection

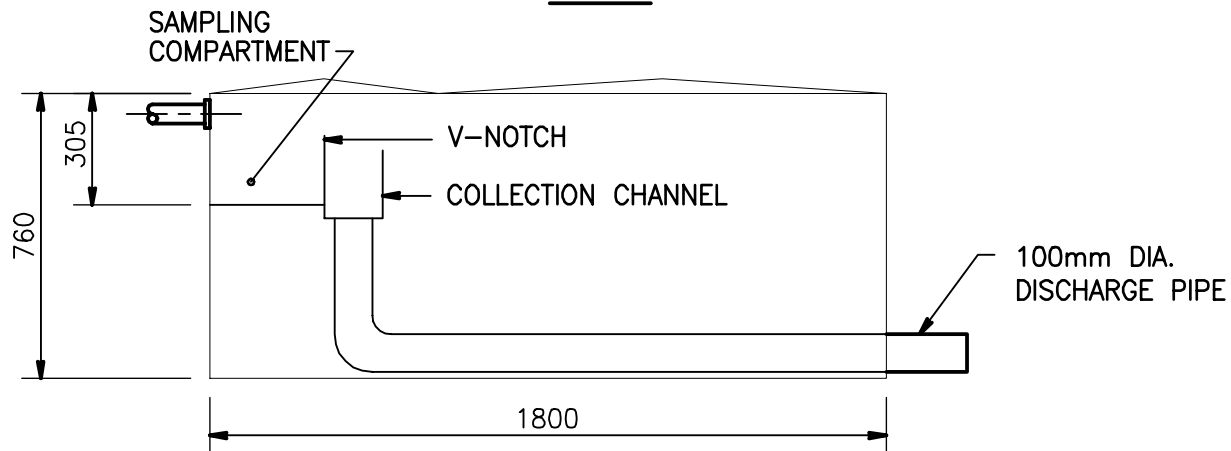
A fabricated steel outfall structure was installed at the base of the pile on the north side to which four collection pipes from within the pile were connected. The four 50 mm diameter collection pipes included two draining the lysimeters, one from the perimeter ditch at the base of the pile and one from the centre of the pile. Traps and a PVC gate valve were installed on each of the collection pipes at the entrance of the outfall structure to ensure oxygen free condition for collected samples.

The outfall structure, with overall dimensions of 1.8 x 1.0 x 0.7 m high, has four internal compartments, each approximately 0.2 x 0.3 x 0.3 m, into which the pipes drain. The cover of the outfall structure is insulated with 50 mm Styrofoam while all internal exposed surfaces are

covered with fiberglass epoxy. The outfall structure is shown on Figure 4-4. The separate chambers in the outfall structure enables the discharge and chemistry from each pipe to be monitored individually. Overflow from the outfall structure is collected and gravity fed to the Camp Brook Pond via a 100 mm diameter drainage pipe.



PLAN



ELEVATION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL INTERIOR SURFACES COVERED WITH FIBERGLASS RESIN.



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FIGURE 4-4

OUTFALL STRUCTURE

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4.4 Phase IV Instrumentation

During construction, sensors were installed by NTC within the composite soil cover to measure soil moisture content, temperature and matric (or pressure) potential (soil suction). The instrumentation was installed in the till layer, the granular cover and the sand base at two locations of the waste rock pile. A summary of the sensors and depth location below the surface of the composite soil cover is provided in Table 4-1.

**Table 4-1
 Monitoring Sensors, Pile 7/12**

MONITORING SENSOR	PARAMETER MONITORED	LAYER	DEPTH BELOW COVER SURFACE (m)
TDR	Moisture Content	Granular Cover	0.1 to 0.4
		Glacial Till	0.4 to 0.6
		Glacial Till	0.8 to 1.0
		Base Sand	1.0 to 1.3
Thermocouples	Temperature	Glacial Till	0.4
		Glacial Till	0.7
		Glacial Till	0.9
		Base Sand/Waste Rock Interface	1.3
Heat Dissipation (Agwa Blocks)	Soil Suction	Granular Cover	0.3
		Glacial Till	0.6
		Glacial Till	0.9
		Base Sand	1.2
Gypsum Block	Soil Suction	Granular Cover	0.3
		Glacial Till	0.4
		Glacial Till	0.6
		Glacial Till	0.9
		Base Sand	1.0
		Base Sand/Waste Rock Interface	1.3

4.4.1 Soil Moisture Content

The soil moisture content of the glacial till cover was measured using Time-Domain Reflectometry (TDR). TDR is a radar technique in which a fast rise time voltage pulse is propagated through the soil and its reflection measured. The pulse is guided through the soil by stainless-steel rods of known dimensions. The measurement of travel time (t) yields an estimate of "apparent" dielectric constant (K_a) of the soil. The volumetric soil-moisture content (θ_v) is then calculated using a relation developed by Topp et al. (1980), or other soil-specific relations. The TDR transmission lines were fabricated by NTC, based on a three-rod design. The rods were 30 cm long in the sand layers and 20 cm long in the till. The probes were placed in each layer horizontally as the cover was being constructed. The application of the voltage pulse and measurement of t were performed with a Tektronix 1502B TDR metallic cable tester.

The moisture sensors were calibrated by NTC during installation. As an additional calibration check the field moisture content results were compared to the in-situ moisture content measurements as determined by ADI Nolan Davis with a nuclear density gauge and found to be in agreement.

4.4.2 Temperature

Thermocouples, similar to the type K previously placed in the waste rock, were also installed throughout the cover to measure the temperature in each of the cover materials.

4.4.3 Soil Suction

Four heat-dissipation sensors were installed at each monitoring station to provide an indication of soil suction. One was located in each sand layer and two in the till. Six gypsum blocks were also installed, one in each sand-till contact. All sensors were installed as each lift was placed. Following compaction, a small-diameter (25 mm) hole was augered and the sensor installed in a soil slurry. The hole was then backfilled and sealed to the surface with bentonite.

4.4.4 Meteorological Data

A meteorological station was installed on Pile 7/12 in June, 1992. The rainfall, evaporation, temperature, relative humidity and wind were recorded on a continuous basis.

4.4.5 Automated Monitoring System

An automated monitoring system was installed on Pile 7/12 to collect and store the large volume of data generated by the sensors. The system consisted of two Campbell Scientific data loggers, Model CR10, with three Campbell Scientific multiplexers. The three multiplexers consisted of two AM416's for the soil suction and thermocouple sensors and one SDMX50 for the TDR probes. The data acquisition system was programmed to record data from the sensors at regular time intervals, varying from hourly to daily readings. Meteorological data from the weather station is also recorded and stored in the dataloggers.

A summary of the instrumentation for Pile 7/12 is presented in Table 4-2. Additional details on instrumentation and monitoring of waste rock piles are presented in the Field Procedures Manual, MEND Report 1.22.1.

**Table 4-2
 Instrumentation, Pile 7/12**

PARAMETER	METHOD
Cover and Pile	
Soil suction	(1) Heat-dissipation sensors (2) Electrical-resistance sensors (gypsum blocks)
Moisture content	Time-domain reflectometry (TDR)
Gaseous oxygen and CO ₂	Portable oxygen and CO ₂ meters in conjunction with permanently in-placed sampling tubes
Temperature	Thermocouple sensors
Seepage through cover	Two collection-basin lysimeters, each 2.0 x 3.1 m, 6.2 m ² surface area, 9.8 m ³ volume, semicylindrical, acid-resistant, high-density polyethylene
Water Quality	Outflow collection and laboratory analysis: (i) Lysimeters (seepage through the cover) (ii) Pile perimeter drain (pile runoff, through the cover's granular base above the waste rock) (iii) Pile base (seepage through the cover and the pile)
Meteorology	
Rainfall	Tipping-bucket rain gauge
Evaporation	U.S. Class A evaporation pan
Air temperature	Thermistor sensors
Relative humidity	Surface resistivity (of impervious solid) sensor
Wind speed	Three-cup anemometer
Automated System	
Parameters measured	Soil suction, moisture content, soil and air temperature, relative humidity, wind, rainfall, and pan evaporation
Data acquisition	Two Campbell Scientific, model CR10 dataloggers Three Campbell Scientific multiplexers: AM416 multiplexer for soil suction sensors, AM416 multiplexer for thermocouple sensors, and SDMX50 multiplexer for TDR probes
TDR measurement	Tektronix 1502B TDR metallic cable tester
Data retrieval	Computer modem or direct connection
Power	12 V dc (110 V ac source)

4.5 Data Collection

Manual sampling and data collection were carried out on a monthly basis throughout the project. Limitations of the monitoring equipment prevented measurements of oxygen and CO₂ during the winter months. Recovery of water samples was not possible during winter because the drain pipes were frozen.

The datalogger installed during Phase IV was programmed to record hourly or daily average values, depending of the parameter being measured. The daily averages were calculated using hourly readings.

The meteorological data collected with the datalogger is presented in Appendix I while the monitoring data for Pile 7/12 is presented in Appendix V.

4.6 Results

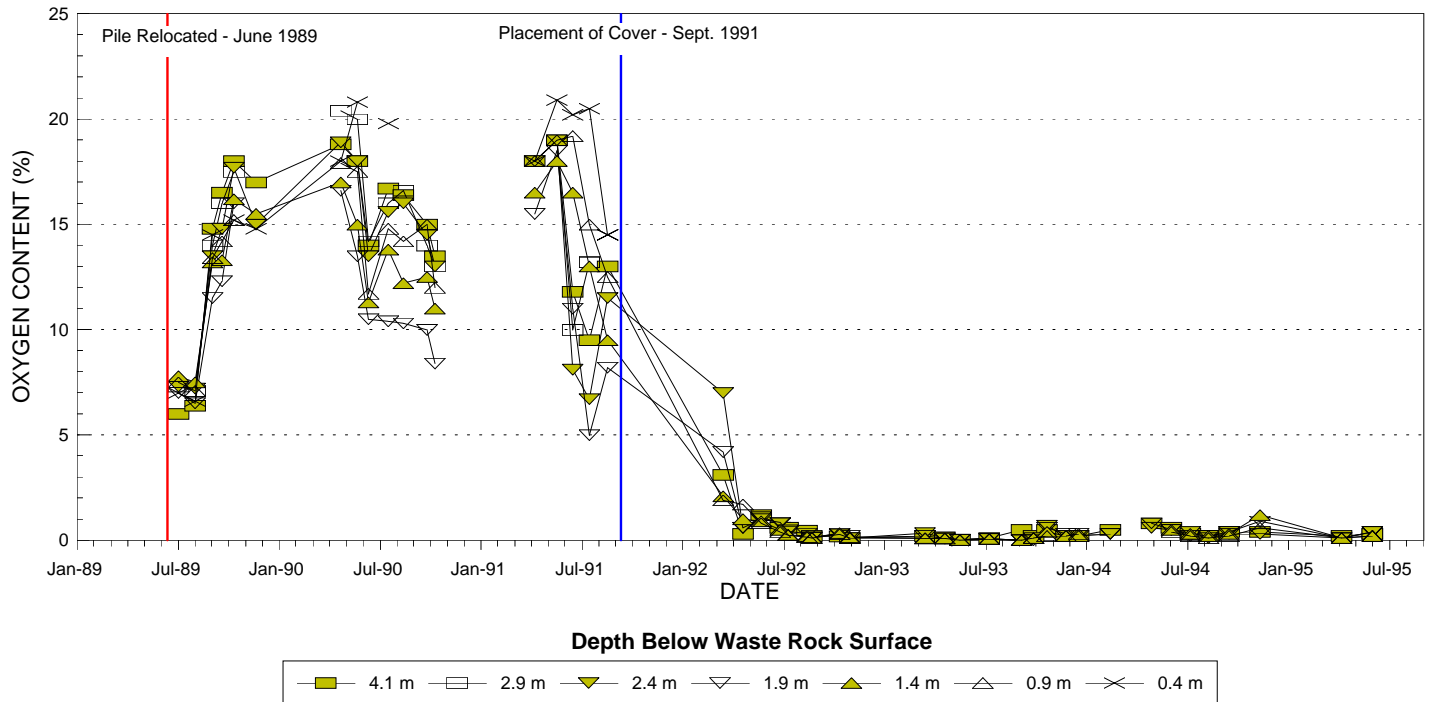
4.6.1 Oxygen

The oxygen concentrations measured since 1989 for Pile 7/12 are summarized in Table V-1 of Appendix V and shown graphically over time in Figures V-1 to V-12 for each of the monitoring stations.

In the early stage, following the relocation of Pile 7/12, completed in June 1989, low oxygen concentrations (less than 10 percent) were observed at three stations towards the middle of the pile (Stations 2, 3 and 4) which indicate that reconstruction had disturbed the steady state of gas / oxygen transport expected in such piles. The oxygen concentration at these two locations increased rapidly to much higher values (14 to 17.6 percent), about three months after relocation. Figure 4-5 shows the variation of the gas phase oxygen over time at Station 3 following the relocation of Pile 7/12.

A possible explanation might be that very high levels of oxygen existed immediately after placement and were quickly consumed due to availability of fresh reaction surfaces. As temperatures in the pile increased, thermal convection of air into the pile increased oxygen levels with time.

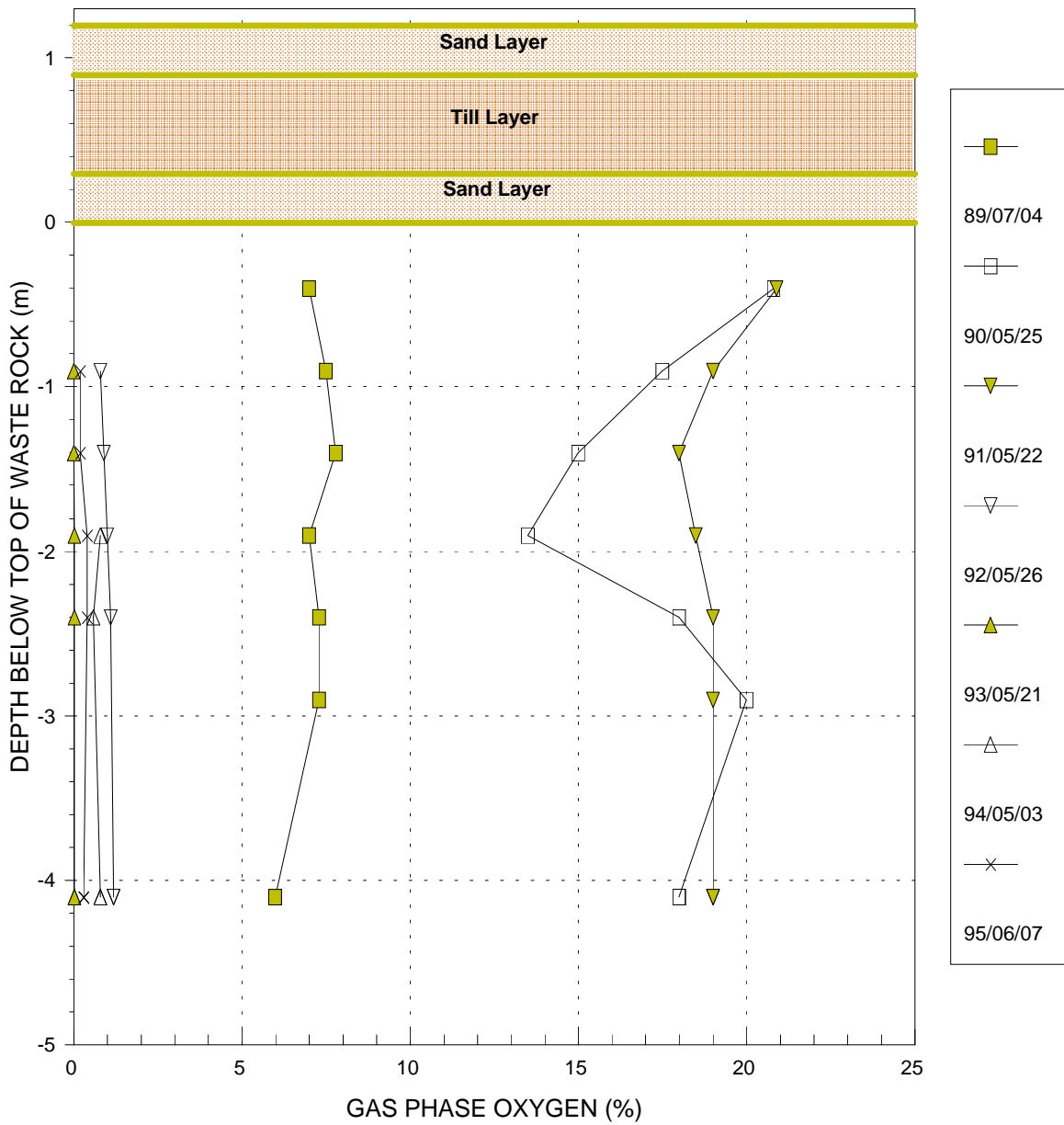
Figure 4-5
Gas Phase Oxygen, Pile 7/12, Station 3



Once the oxidation process was somewhat stable, after the relocation of the pile, oxygen concentrations in Pile 7/12 remained between 15 and 20 percent. Oxygen levels near the surface of the pile are particularly influenced by the weather. In the summer as temperatures in the pile increase, thermal convection of oxygen into the pile caused oxygen levels to increase. The high oxygen content could indicate that the pile was relatively well aerated, and oxygen can easily reach the waste rock at depth.

After cover placement in September 1991, there was a dramatic decrease in oxygen concentrations throughout Pile 7/12 as indicated in Figure 4-5. As of October 1993, oxygen concentrations the pile were measured at less than 1 percent. The magnitude of the change in oxygen concentration in Pile 7/12 is clearly illustrated in Figure 4-6, where the oxygen profiles are plotted for May 1990 and 1991 (prior to cover placement) and May 1992 and 1993 (after cover placement). It is apparent from Figure 4-5 that the most significant decrease in oxygen occurred within seven months after cover placement. However, monitoring results indicate that oxygen within the system was still being depleted through to 1994. The oxygen concentration in Pile 7/12 dropped from about 20 percent in May 1991 to about one percent in May 1992 and to 0.2 percent or less in May 1993. However, there was an increase in the oxygen content of 0.7 percent in May 1994 but this dropped back to a value of 0.3 percent in June 1995 as indicated in Figure 4-6.

Figure 4-6
Gas Phase Oxygen Profiles, Pile 7/12, Station 3

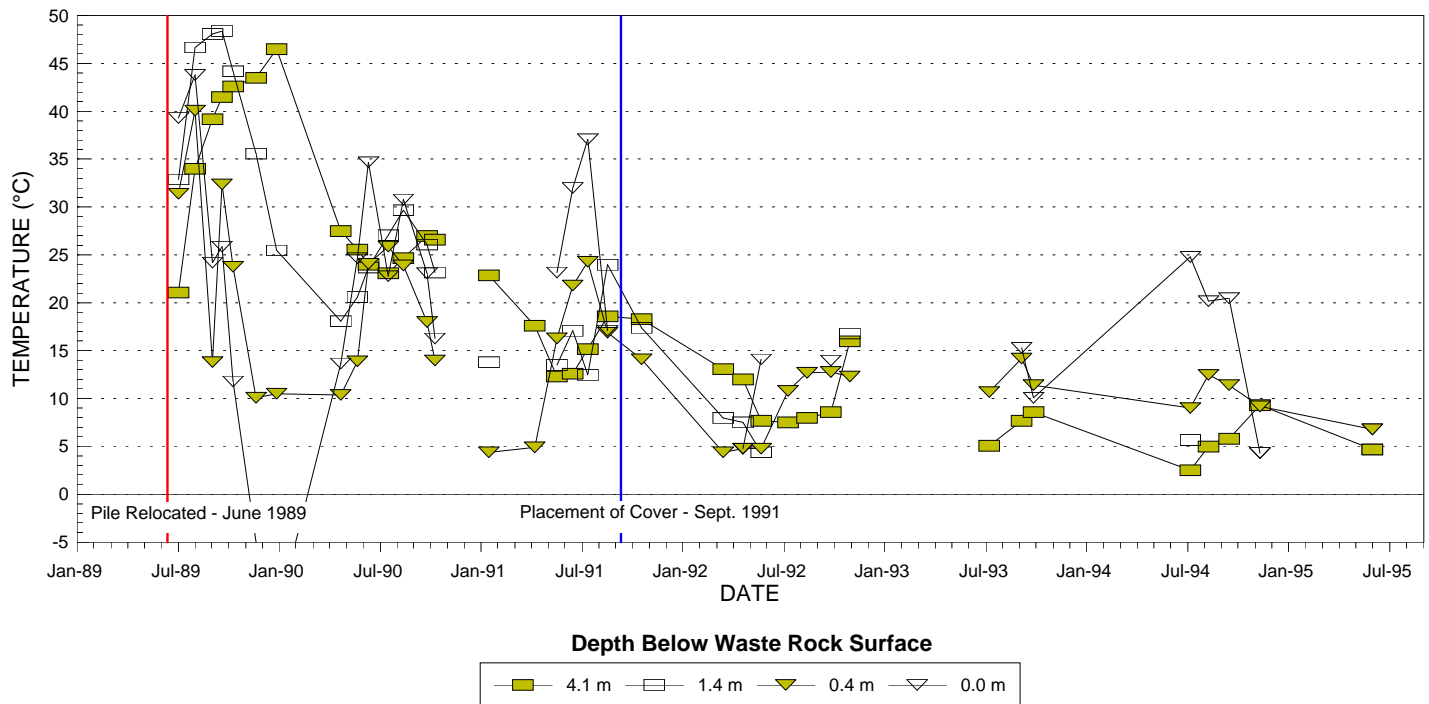


4.6.2 Temperature

The temperatures measured since 1989 for Pile 7/12 are summarized in Tables V-2 and V-3 of Appendix V and shown graphically over time in Figures V-13 to V-33 for each of the monitoring stations.

Figure 4-7 shows a typical temperature variation over time at Station 3. During the initial months after the pile was relocated, prior to placement of the cover, temperatures at the centre were typically over 40°C, resulting in a temperature difference over the 5 metres depth of the pile in December 1990 of almost 60°C. However, in 1990 the average temperature had dropped to 25°C resulting in an average temperature difference relative to surface over the sampling period of approximately 2°C. This would appear to indicate the very rapid establishment of the exothermic oxidation process after relocation of the pile followed by a period of stabilization. Also, this increase of oxidation likely resulted in an increase in metal loadings generated by the waste rock pile. This conclusion is consistent with the observation of strong air drafts in the instrumentation holes prior to packing. Snow cover appeared to melt from the bottom up during the winter 1989/90.

Figure 4-7
Temperature Data, Pile 7/12, Station 3



As with the oxygen concentrations, the most significant temperature decreases occurred within several months after cover placement as indicated in Figure 4-7. At Station 3 for example, the temperatures immediately prior to placement of the cover ranged from 17.1°C to 24.0°C. One month after cover placement, temperatures dropped from 14.1°C to 18.3°C. In Figure 4-8, which

shows the temperature profiles at Station 3 over a period of three years, the temperatures continued to decrease through 1993, although the temperature decreased at a much reduced rate than what was observed in the early stage after the cover was placed. Since 1993, the temperature distribution within the pile appeared to depend more on climate conditions than the exothermic reaction generated by the oxidation of the waste rock, which has been inhibited by the composite soil cover.

4.6.3 Gas Phase Carbon Dioxide

The concentrations of carbon dioxide for Pile 7/12 are given in Appendix V and ranged from 0.92 to 12.19 volume percent. 90 percent of the recorded concentrations were greater than 7.12 volume percent. As noted in section 3.4.2.4, the elevated concentrations of CO₂ were most likely due to the neutralization of residual carbonates within the waste rock.

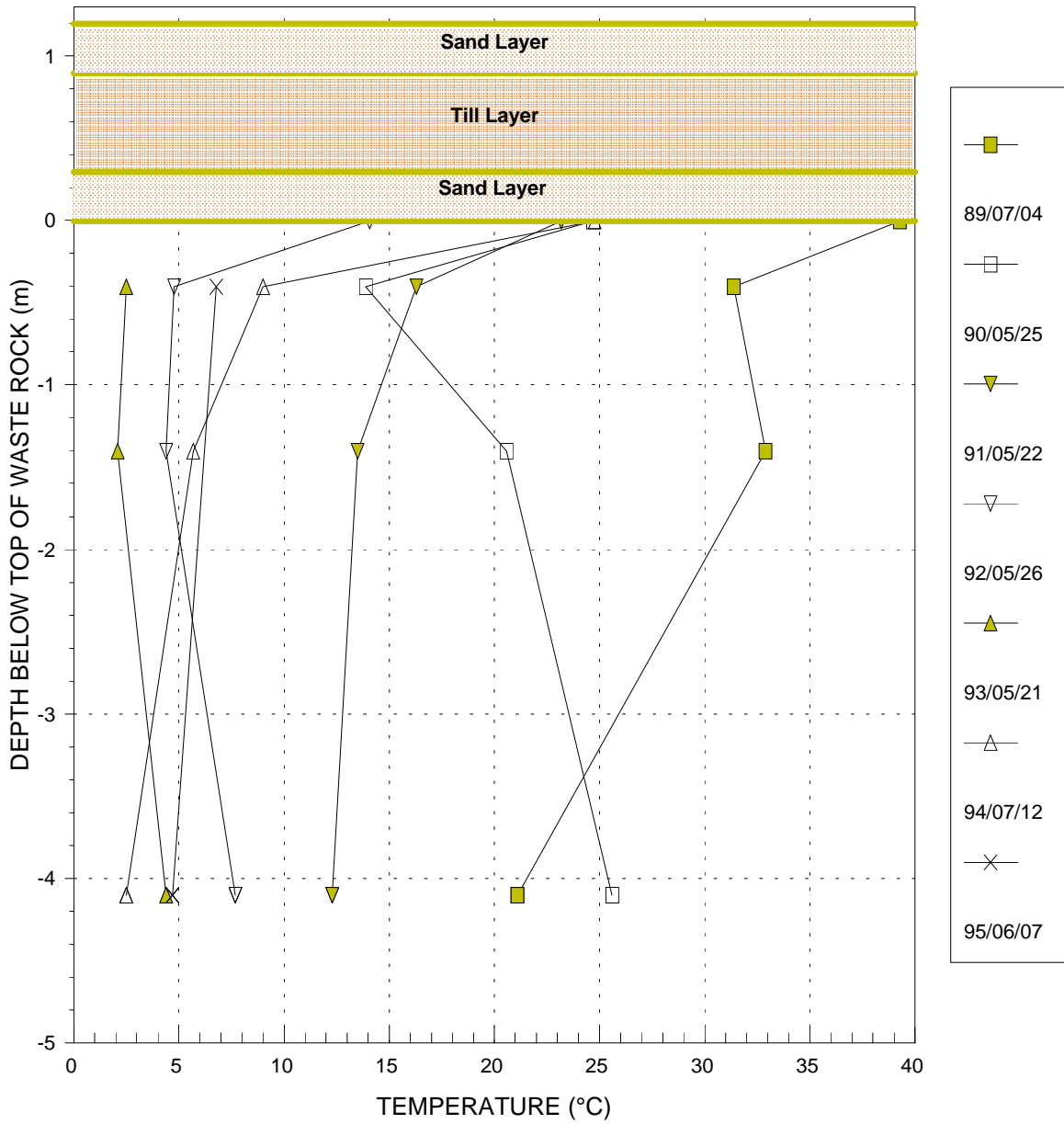
Concentrations of CO₂ within Pile 7/12 were substantial and greater than those recorded for Pile 18B as indicated in Table 4-3 below.

Table 4-3
Gas Phase CO₂ Measurement Summary, Piles 7/12 and 18B

Pile	Range (CO₂ volume %)	90 Percentile	Number of Samples
18B	0.00 - 5.43	0.13	175
7/12	0.92 - 12.19	7.12	143

As discussed in Section 3.4.2.4, the primary source of elevated levels of CO₂ in a waste rock pile is the reaction between acid generated in the pyritic oxidation reaction and carbonates in the gangue minerals. Also, the elevated concentrations recorded in Pile 7/12 most likely reflect the diffusion barrier posed by the composite liner.

Figure 4-8
Temperature Profiles, Pile 7/12, Station 3



4.6.4 Leachate

The membrane system under Pile 7/12 enabled the evaluation of water and contaminant balances. Before the cover placement, the surface runoff was intercepted by perimeter ditches and by the impervious liner underlying the waste rock pile. However, the setup did not allow for direct continuous measurement of flow. With the placement of the composite soil cover, Pile 7/12 became a closed system: any moisture which entered the system by seepage through the soil cover was collected either in one of the two lysimeters (northeast lysimeter and northwest lysimeter), the perimeter ditch at the base of the pile (perimeter drain), or a collection drain which extended into the middle of Pile 7/12 (centre drain) and flowed to the outfall structure. Table V-7 of Appendix V presents the quantity of leachate recovered from the outfall structure.

The collected water samples were analyzed for the following components: aluminum (Al), calcium (Ca), copper (Cu), iron (Fe), potassium (K), magnesium (Mg), manganese (Mn), sodium (Na), lead (Pb), sulphur (S), zinc (Zn), chloride (NaCl), conductivity, pH, acidity as CaCO₃ and sulphate (SO₄). This data is presented in Table VI-2 of Appendix VI.

An assessment of the water quality data collected before the cover was placed indicated that:

- New precipitation was initially stored within the pile and did not necessarily result in water immediately leaving the pile.
- Concentrations of contaminants could be very high in both the surface runoff and underdrainage. Acidity concentrations of over 30,000 mg/L were characteristic of the collected water.
- Concentrations of contaminants in the water leaving the pile often increased with time following a precipitation event.
- Surface runoff from the pile could be as high as 30 percent during a storm event.

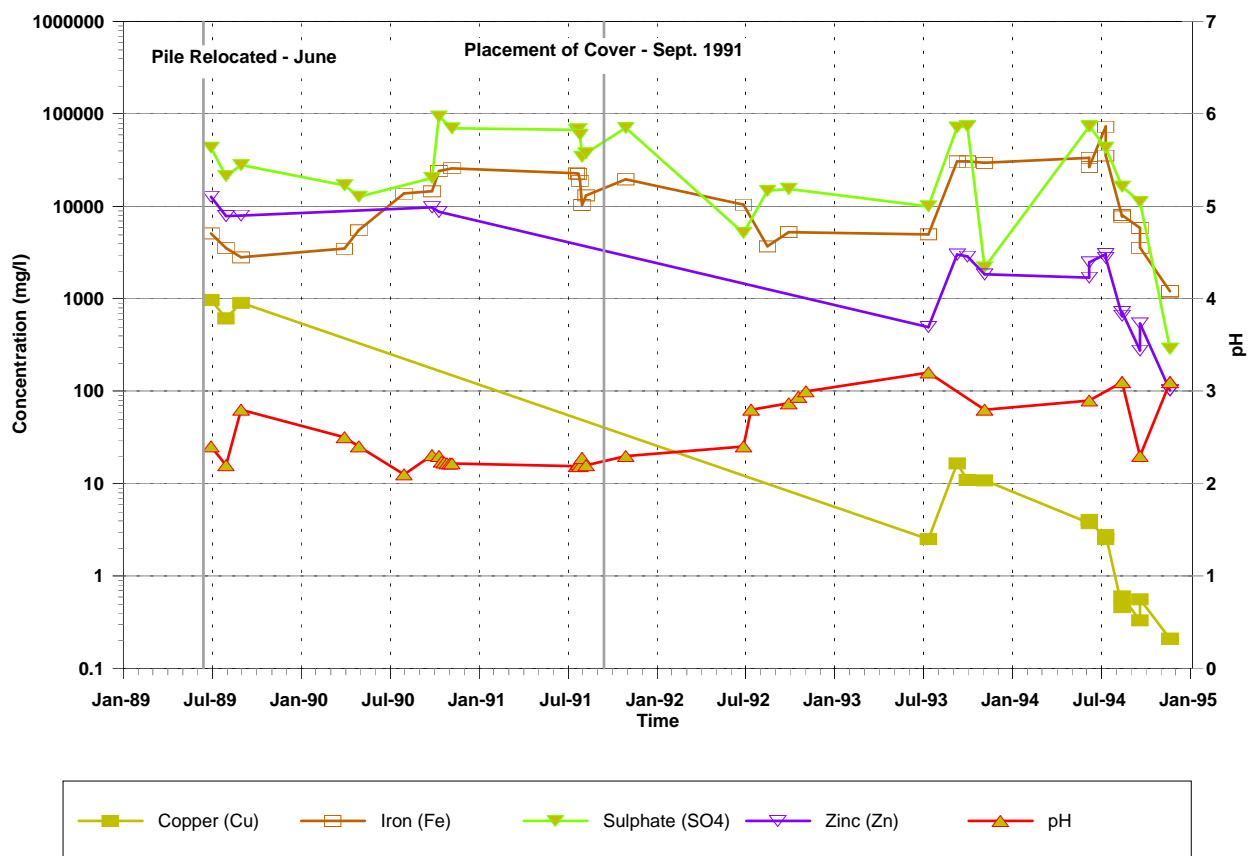
In the two years after the placement of the cover, a total of about 1,600 litres of water was recovered from the four sources. The volume collected in the two lysimeters was about 600 litres and represents the seepage through the cover in the area above the two lysimeters, which corresponded to an infiltration of less than 2 percent of precipitation (Table 4-4). The water collected from the two lysimeters did not come in contact with waste rock and hence was not considered AMD. However, according to the chemical analyses presented in Table VI of Appendix VI, the quality of the water that seeped through the cover into the lysimeters did not meet the Canadian Water Quality Guidelines (CWQG) (CCREM 1987) for freshwater aquatic life and the Guidelines for Canadian Drinking Water Quality (GCBWQ) (Health and Welfare Canada 1989) for drinking water.

The water collected from both the centre and perimeter drains had come in contact with the waste rock and hence was considered as leachate. The total volume of leachate collected in the outfall structure after cover placement was about 1025 litres which is a combination of both leachate trapped within the pile at the time the cover was placed, plus any seepage which had passed

through the composite soil cover and then through the waste rock pile to the only discharge point at the outfall structure.

The results from the analytical leachate testing tend to indicate a decrease or no improvement in water quality after construction of the cover, as shown in Figure 4-9. However, there was a well defined and steady improvement of water quality since 1994, which tends to indicate that the quality of the leachate is still improving. The pH of the leachate increased steadily since placement of the cover, indicating that it had become less acidic.

Figure 4-9
Water Quality, Leachate, Concentrations, Pile 7/12, Centre Drain



Since there was no direct infiltration flow measurements before placement of the cover, an infiltration rate of 50 percent of the total precipitation was used as a reasonable approximation. This approximation indicates that the cover reduced the infiltration by a factor of 25. Thus, for the same concentration value, the contaminant loading in terms of mass was reduced by 25 times by the cover relative to the uncovered pile. Figure 4-10 shows the yearly average concentrations and the corresponding loadings for copper (Cu) and zinc (Zn) using an infiltration rate of 50 and 2 percent before and after placement of the cover. This figure clearly shows that the cover contributed to reduce the concentration levels and especially the loadings generated by the waste

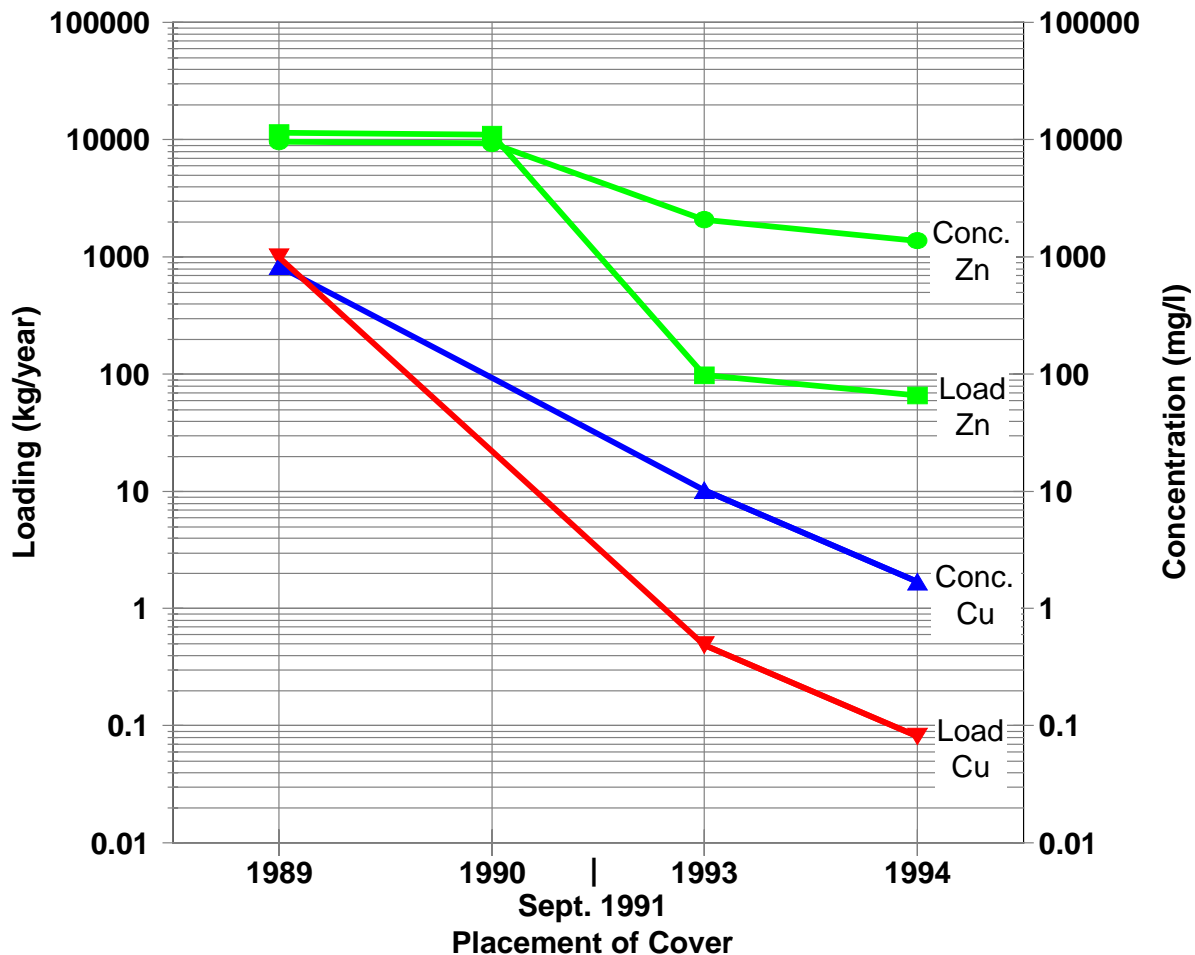
rock pile. Although the concentrations and loadings were greatly reduced, they were still exceeding the criteria set by the regulatory agencies. However, the results obtained in 1994 indicate that water quality is still improving.

Table 4-4
Lysimeter Measurements, Pile 7/12

Date	Rainfall		Lysimeters	
	Depth, mm	Volume, litre	Volume, litre	Ratio, %
June 24 - August 18, 1992	198	2455.2	50.3	2.0%
May 21 - July 13, 1993	188	2331.2	20.0	0.9%

Note : Total areal surface of lysimeters = 12.4 m²

Figure 4-10
Water Quality, Leachate, Yearly Average Concentrations and Loadings, Pile 7/12, Centre Drain



4.6.5 Composite Soil Cover

4.6.5.1 Soil Suction

The results of the soil suction or matric potential measurements from the heat dissipation blocks (Agwa blocks) and the gypsum blocks are presented in Tables V-5 and V-6, respectively. The measurements taken with the heat dissipation blocks were considered to be not representative because of unstable measurements and constant oscillation. The gypsum blocks appear to be reliable since the measurements were relatively consistent with the volumetric moisture content. Neither the dissipation nor the gypsum block worked in frozen soil. Soil suction measurements are presented in Figures V-40 to V-47.

The results indicate that the matric potential of the lower section of the glacial till and the base sand were relatively stable, which is indicative of a consistent moisture content. Variations in the soil suction measurements of the granular cover and upper glacial till were consistent with the variations in moisture content due to wetting and drying which would be expected in these zones.

4.6.5.2 Moisture Content

Monitoring of the moisture content of the various layers in the composite soil cover by TDR as described in Section 4.4.1 indicated that the cover performed as designed. The volumetric moisture contents in the glacial till and sand base, showing little change from those taken immediately after cover placement. However, the data collected in 1994 tend to indicate that the upper zone of the glacial till layer lost some moisture. This small decrease of about 8 percent in moisture content exceeds the estimations considered for the design, but could be attributed to the dry climatic conditions when the readings were taken. Monitoring of the volumetric water content over a longer period is required before the ability of the cover to retain moisture can be assessed with more assurance. Table 4-5 summarizes the volumetric moisture content measurements for five periods, namely fall 1991, spring and summer 1992, and numerous measurements in 1994. Figures 4-12 and 4-13 shows variation of the volumetric moisture content for the top and bottom 20 cm of the glacial till layer.

Table 4-5
Volumetric Water Content - Composite Soil Cover, Pile 7/12

Date	Granular Cover		Glacial Till		Glacial Till		Sand Base	
	Entire Layer		Top 20 cm		Bottom 20 cm		Entire Layer	
	West	East	West	East	West	East	West	East
91/10/31	12	8	30	32	34	30	12	12
92/05/31	8	7	25	30	27	26	12	11
92/08/26	9	8	NA	36	31	30	13	12
94/06/08	15.99	11.02	31.63	34.52	32.83	29.70	15.38	14.54
94/07/12	9.11	5.23	21.99	31.31	27.65	26.16	11.66	NA
94/08/15	10.95	8.44	23.51	29.62	28.45	22.03	14.07	11.19
94/09/20	8.88	9.34	23.89	NA	31.31	30.95	14.07	11.66
94/11/16	9.11	NA	23.89	NA	30.95	NA	17.55	NA

Figure 4-11
Volumetric Water Content (TDR Method), Composite Soil Cover,
Upper Zone, Glacial Till Layer, Pile 7/12

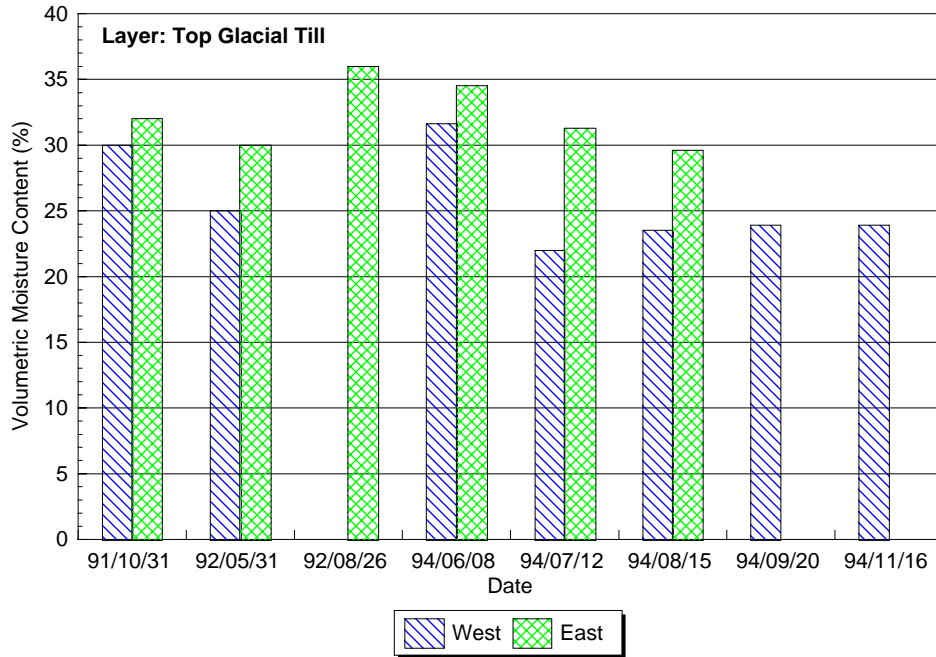
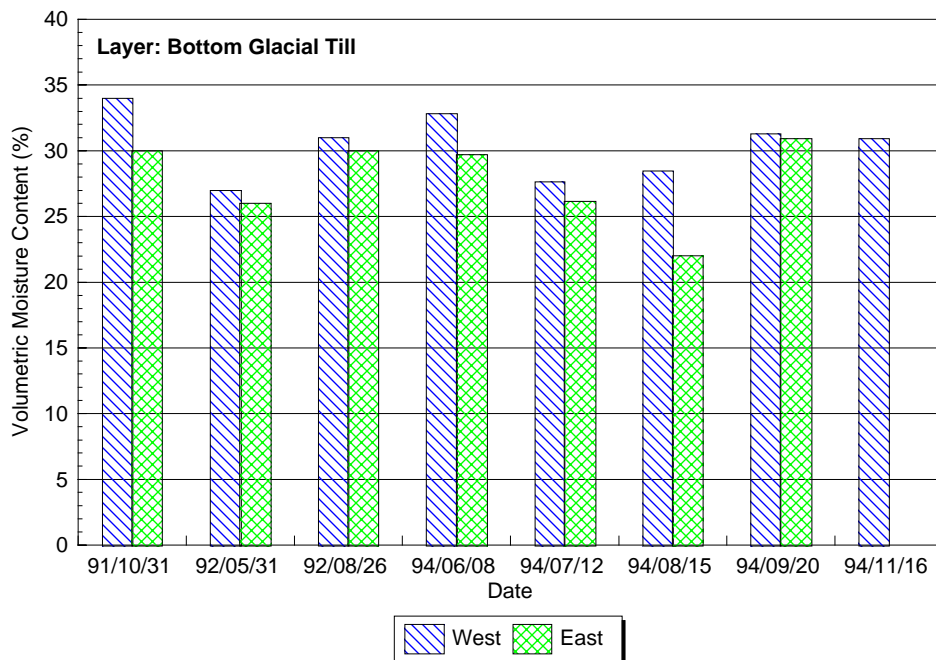


Figure 4-12
Volumetric Water Content (TDR Method), Composite Soil Cover,
Bottom Zone, Glacial Till Layer, Pile 7/12



5. DISCUSSIONS AND CONCLUSIONS

5.1 Behaviour of Uncovered Acid Waste Rock Piles

5.1.1 Temperature

All four uncovered piles (i.e. Piles 18A, 18B, 17 and 7/12) demonstrated periods where elevated temperatures were recorded as a result of the exothermic pyrite oxidation reaction occurring. Pile 7/12 showed the most noticeable increase in temperature immediately after it was relocated. However, the relatively small sizes of the waste rock piles prevented the isolation of the temperature change, caused by the oxidation process from those caused by climatic changes. Also, the collected temperature data tend to indicate that the temperature variation is more a function of depth than the position of the station relative to the edge of the waste rock, and that the climatic effects are attenuated with depth. Climatic effects would be less apparent in larger and deeper acid waste rock piles.

Consideration should be given to deriving an Intrinsic Oxidation Rate (IOR) for the waste rock piles from the data to define the oxidation characteristics of the waste rock. Since the thermal conductivity of the waste rock material is now known and data is available for the temperature profiles, it should be possible to derive an IOR from the temperature data (Harries and Ritchie, 1981). For successful extraction of the IOR, good quality temperature data is required at near monthly intervals throughout the year, particularly through the colder parts of the year. However, the amount of temperature data collected to date for Pile 18B does not allow for an accurate evaluation of its IOR using the method presented (Harries and Ritchie, 1981).

5.1.2 Oxygen

In general, the oxidation reaction occurring in each of the piles resulted in a drop of oxygen concentrations towards the centre of the pile, although the oxygen concentration profiles measured during the project varied dramatically. The variation of the oxygen concentrations was generally more pronounced where the temperature varied the most. The variation may also be due to local variations in dump permeability, and mineralogy, or a combination of both.

Seasonal variations in oxygen concentrations is also noticeable near the surface at many locations. Low oxygen concentrations in the top few metres tended to occur in the summer when the temperature of the waste rock was above 10°C. This suggests that the rate of the oxidation process, which consumes oxygen, was greatly reduced by low temperatures during the winter. The reduction of water reaching the reactive waste rock during winter may be another factor that contributes to inhibit the oxidation process.

A contributing process to the higher oxygen concentrations in winter could have been thermal convection which would transport oxygen into the piles. In winter, there would be a large difference between temperatures in the piles and those in the surrounding air and would increase the driving pressure for thermal convection. However, the air flow due to thermal convection would depend on how much the air flow was restricted by snow and frozen ground. For instance, the snow cover appeared to melt from the bottom up during the winter of 1989/90.

Winds at the site were predominately from the northwest which increased pressures on the northwest side of piles and reduced pressures on the southeast side. The wind effects could have contributed to the asymmetry which occurred in the oxygen concentrations across Pile 18B.

5.1.3 Conclusion

It can be concluded that uncovered acid waste rock piles provide a favorable environment for the oxidation of sulphide material and thus the generation of acid drainage. This is due to the favorable temperatures maintained towards the centre of the pile by the exothermic reaction and the ample availability of air due to the high porosity of the pile to the atmospheric. Similarly, the porosity of the piles were high enough to enable the reaction products to be readily flushed from the pile by precipitation events (the bulk porosity of Pile 7/12 was estimated at 24 percent, which is considered to be within the lower range typical for piles of blasted rock). It is possible that some of the spatial variability evident in the temperature and oxygen distributions could have been due to differences in the levels of pyrite and other properties in the waste rock.

5.2 Composite Waste Rock Cover

The total cost of constructing the cover on Pile 7/12 in 1991 was \$60,000 (Canadian currency), or about \$31 per square metre of waste rock surface to cover. For larger waste rock piles, this unit cost could be less because of larger quantities involved. The cost for engineering and construction quality control is not included because of the research nature of the project.

Although differential settlement in Pile 7/12 would be much smaller than those associated with larger piles, other aspects of the cover performance evaluation, such as the effects of freezing and thawing and reductions in temperature resulting from cover placement, would be applicable to other piles. Seismic effects were not considered during the design of the soil cover.

The project has demonstrated that composite soil covers, can be an effective way to reduce the acid generation reaction in acid waste rock piles. The placement of the cover resulted in a depletion of oxygen within the pile and a reduction in pile temperatures, indicating that the oxidation process within the pile was greatly reduced. However, it was not totally extinguished over the 39-month period that the cover was in place.

The cover not only controlled the access of air to the sulphide material, but also greatly reduced the availability of water to flush the reaction products from the pile. The flow of AMD from the pile was reduced from approximately 3 m³ per year prior to the cover to only 0.1 m³ per year after placement of the cover; i.e. to less than 2 percent of total precipitation. Although the concentrations and loadings were greatly reduced following the placement of the soil cover, they were still above the criteria set by the regulatory agencies. However, the results obtained in 1994 indicate that water quality was still improving.

The glacial till layer within the cover maintained its moisture content at the level at which it was placed throughout the 39 month evaluation.

The piles at Heath Steele are small compared to waste rock piles at many other mine sites, and different gas transfer mechanisms might apply in such larger piles. However, the data collected to date by this project indicate that the cover system is an effective method of reducing oxygen ingress, and thus oxidation rate.

5.2.1 Conclusion

Composite soil covers are an effective way to reduce the oxidation reaction in acid waste rock piles and thus significantly lessen their impact to the environment. To achieve this, the low permeability layer must be designed, constructed and maintained so that its integrity and moisture content are maintained. Composite soil covers can be effective in areas where precipitation enables the active layer to maintain its moisture content. Although the concentrations and loadings of the leachate were reduced after the soil cover had been placed, it would still have to be treated before being discharge to meet the criteria set by the regulatory agencies. Ongoing maintenance would also be required to prevent the establishment of trees or shrubs on the cover as root penetration would threaten the integrity of the cover. Thus, in a full-scale application for final closure, an ongoing effort would be required to maintain the integrity of the cover over the long term.

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APPENDIX I

Meteorological Data

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Figure I-1
Ambient Temperature, Daily Average, Pile 7/12

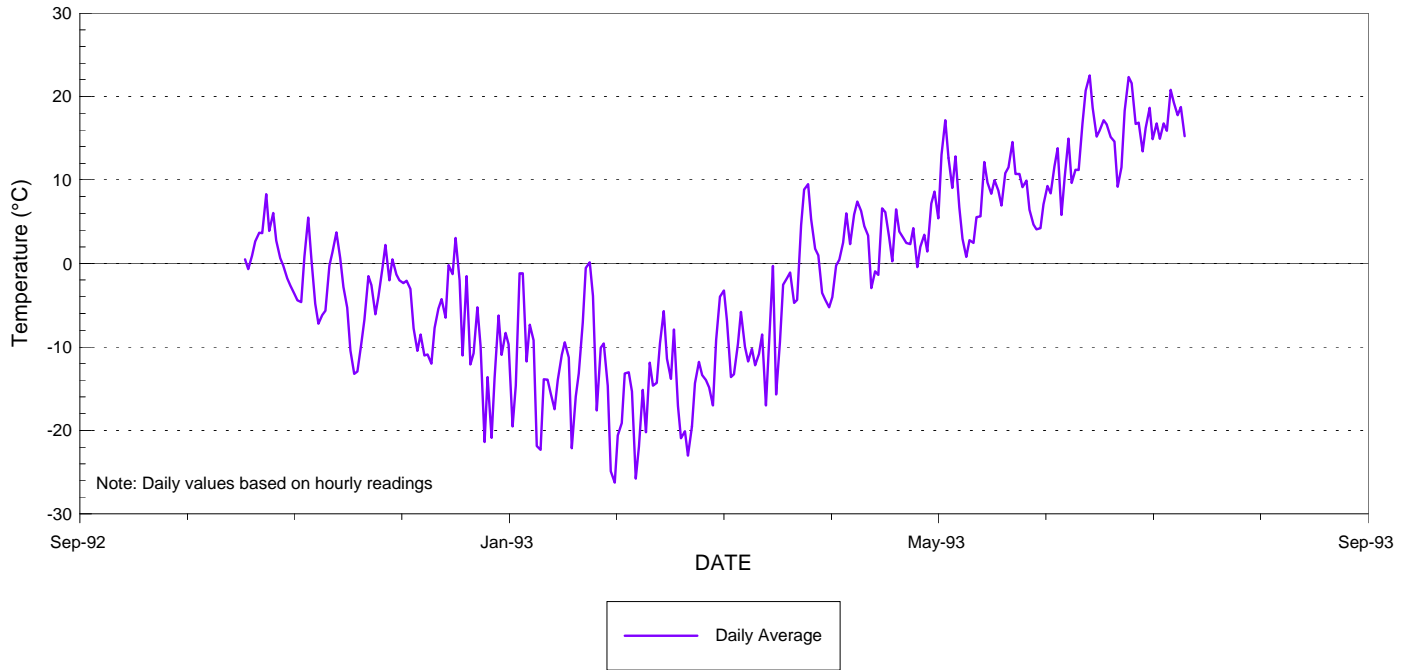


Figure I-2
Ambient Relative Humidity, Daily Average, Pile 7/12

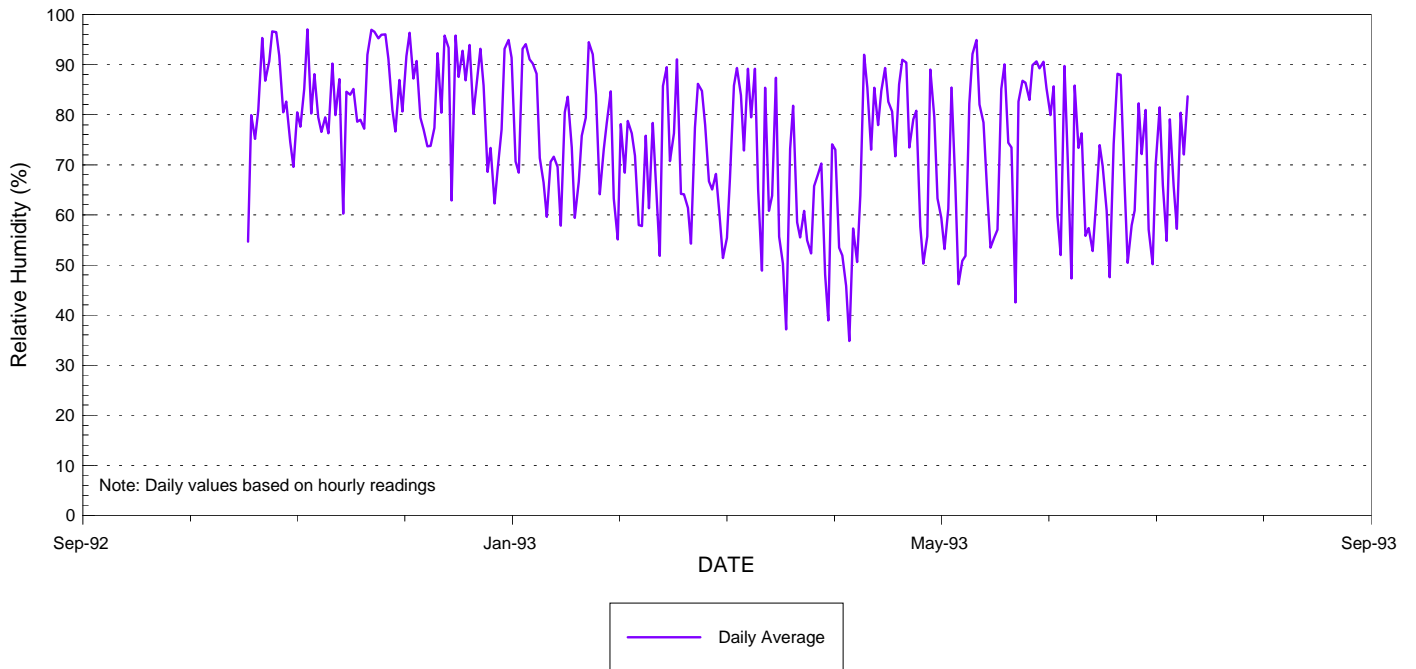


Figure I-3
Wind Speed, Daily Average, Minimum and Maximum, Pile 7/12

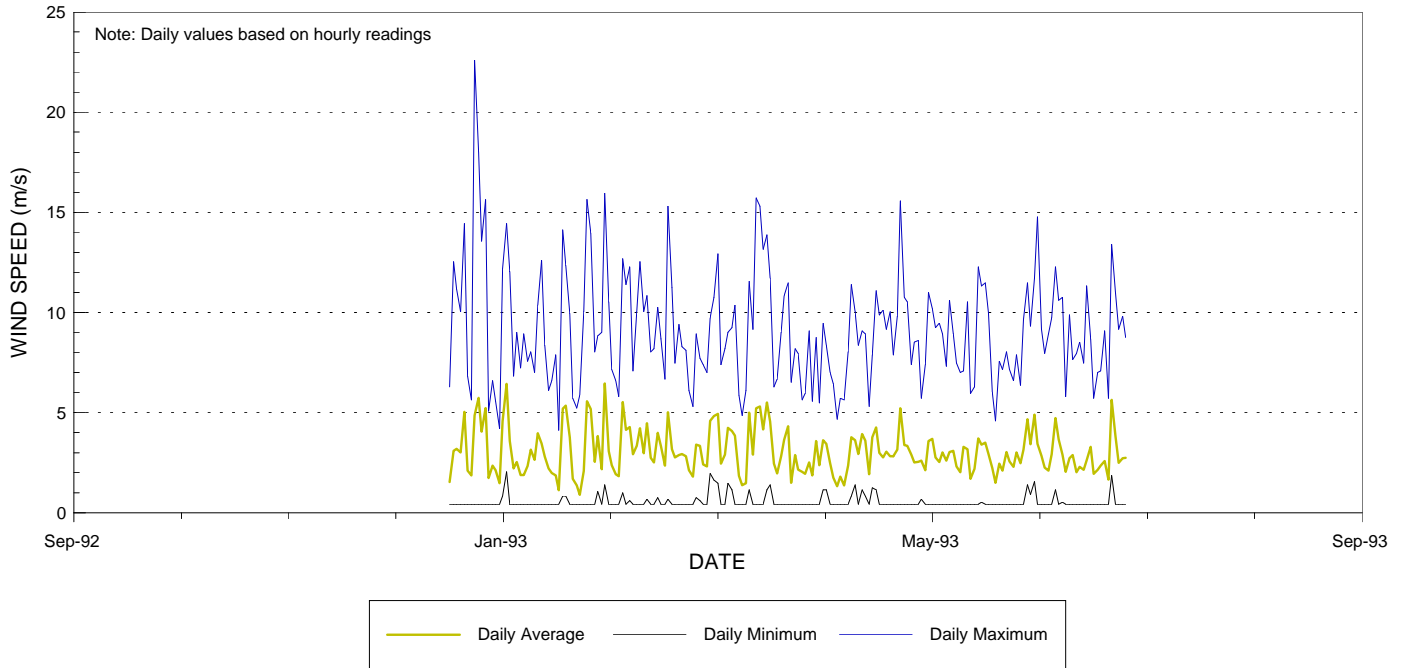


Figure I-4
Precipitation and Evaporation Data, Pile 7/12

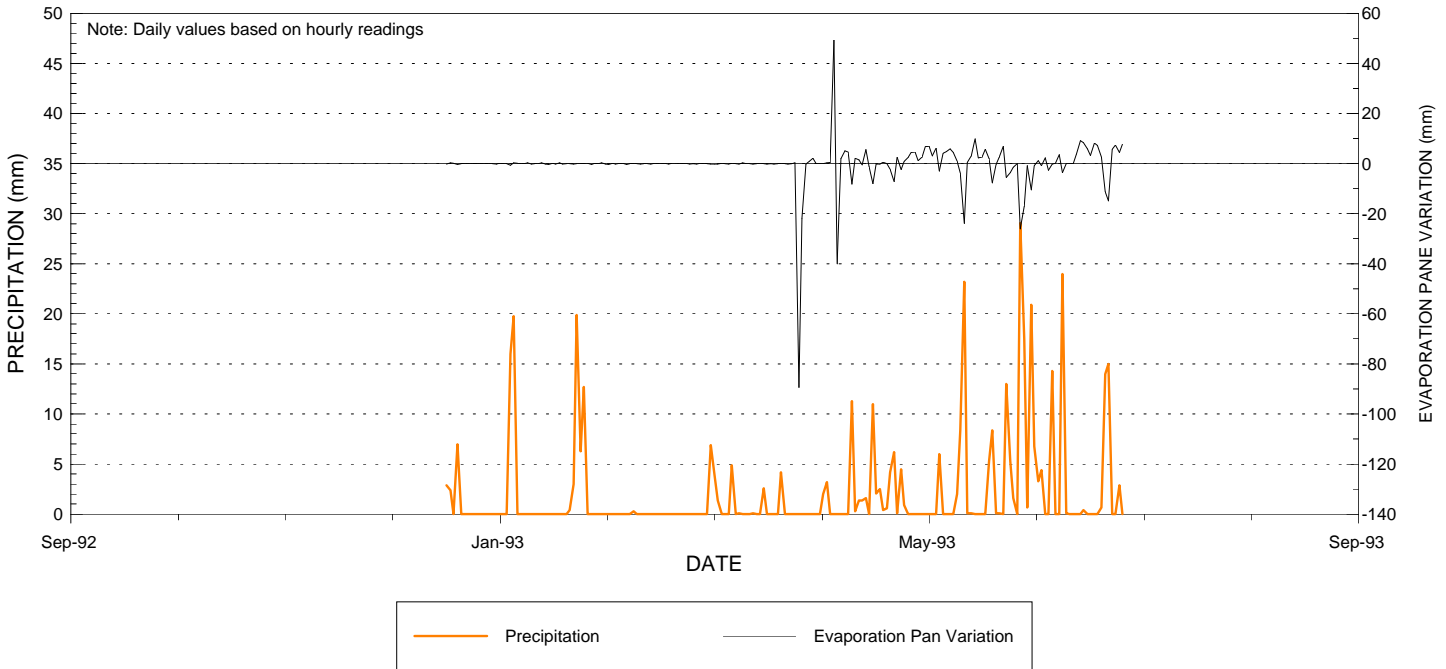


Table I-1
Ambient Temperature-Relative Humidity

TIME_SERIAL_amb	T_AIR_AVG_C	RH_AIR_AVG_%	T_AIR_MAX_C	RH_AIR_MAX_%	T_AIR_MIN_C	RH_AIR_MIN_%
1992/10/18	0.51	54.69	5.55	82.60	-4.00	28.50
1992/10/19	-0.65	80.00	3.06	98.00	-3.84	55.97
1992/10/20	0.94	75.20	5.67	91.90	-1.64	50.59
1992/10/21	2.67	80.80	6.34	94.10	-1.67	65.82
1992/10/22	3.69	95.40	6.93	98.10	-1.76	85.60
1992/10/23	3.65	86.80	7.05	98.10	-1.78	73.40
1992/10/24	8.30	90.70	10.39	96.40	5.59	78.80
1992/10/25	3.94	96.70	5.28	97.00	3.15	96.20
1992/10/26	6.08	96.50	9.43	96.80	4.72	95.90
1992/10/27	2.76	91.90	4.83	96.40	0.61	86.80
1992/10/28	0.68	80.50	2.19	89.60	-0.69	69.14
1992/10/29	-0.22	82.70	3.04	96.60	-2.99	66.96
1992/10/30	-1.78	74.60	2.16	85.20	-4.41	61.08
1992/10/31	-2.68	69.61	3.03	86.60	-6.26	48.77
1992/11/01	-3.61	80.50	-1.68	91.70	-6.98	72.30
1992/11/02	-4.37	77.60	-2.27	87.50	-7.45	68.16
1992/11/03	-4.64	85.20	-0.47	97.90	-10.73	68.95
1992/11/04	0.86	97.10	3.65	97.90	-2.53	96.40
1992/11/05	5.52	80.30	8.31	96.70	2.82	62.15
1992/11/06	0.51	88.10	2.39	97.30	-1.13	77.70
1992/11/07	-4.82	79.60	-1.41	85.60	-10.58	68.21
1992/11/08	-7.20	76.60	-2.12	87.00	-10.96	60.96
1992/11/09	-6.18	79.50	-0.86	92.10	-10.45	61.03
1992/11/10	-5.64	76.30	1.97	92.50	-10.79	50.73
1992/11/11	-0.25	90.20	3.38	96.30	-5.93	74.00
1992/11/12	1.36	80.00	4.78	92.70	-1.10	60.14
1992/11/13	3.75	87.10	11.74	97.70	-0.38	59.26
1992/11/14	0.66	60.24	3.23	67.59	-1.84	51.45
1992/11/15	-2.79	84.60	0.39	97.40	-8.36	69.32
1992/11/16	-5.26	84.00	-2.53	97.40	-11.30	63.52
1992/11/17	-10.42	85.20	-4.29	92.00	-17.60	75.00
1992/11/18	-13.22	78.60	-6.63	90.20	-19.06	59.43
1992/11/19	-12.95	79.00	-7.40	89.40	-16.26	64.63
1992/11/20	-9.67	77.20	-3.00	88.50	-15.72	61.58
1992/11/21	-6.74	92.00	-3.08	97.60	-11.51	80.90
1992/11/22	-1.50	97.00	0.06	97.40	-2.67	96.70
1992/11/23	-2.58	96.60	-2.20	96.90	-3.07	96.40
1992/11/24	-6.07	95.30	-3.55	96.60	-11.62	92.40
1992/11/25	-3.96	96.00	-1.35	96.80	-10.29	95.00
1992/11/26	-0.56	96.10	1.77	96.70	-3.01	95.60
1992/11/27	2.24	91.20	6.35	96.00	-1.03	79.70
1992/11/28	-2.01	81.00	2.52	91.90	-6.49	67.20
1992/11/29	0.51	76.70	5.01	87.10	-2.81	57.85
1992/11/30	-1.29	87.00	0.26	91.40	-3.80	81.90
1992/12/01	-2.01	80.70	-0.37	91.00	-4.16	68.31
1992/12/02	-2.35	91.70	3.05	96.90	-7.67	76.50
1992/12/03	-2.05	96.40	-0.91	97.00	-3.42	95.50
1992/12/04	-3.04	87.30	-1.40	93.10	-6.04	83.80
1992/12/05	-7.77	90.80	-5.53	94.40	-11.25	85.40
1992/12/06	-10.46	79.40	-9.30	90.00	-12.96	69.59
1992/12/07	-8.51	77.10	-5.87	89.50	-10.21	62.69
1992/12/08	-11.00	73.70	-9.07	83.40	-12.20	65.76
1992/12/09	-10.88	73.80	-6.73	80.70	-13.85	60.88
1992/12/10	-11.99	77.40	-4.33	89.60	-15.48	55.80
1992/12/11	-7.72	92.30	-5.61	94.70	-12.14	90.20
1992/12/12	-5.43	80.40	-1.80	96.10	-7.61	50.03
1992/12/13	-4.27	95.80	-3.37	97.10	-5.36	93.70
1992/12/14	-6.48	93.40	-1.93	96.60	-10.02	81.60
1992/12/15	-0.17	62.89	4.05	94.90	-7.96	47.60
1992/12/16	-1.28	95.80	2.55	97.10	-2.92	86.90
1992/12/17	3.10	87.60	5.76	95.80	-0.08	73.90
1992/12/18	-2.03	92.80	0.91	95.80	-9.33	83.00
1992/12/19	-11.01	86.90	-7.57	93.80	-14.64	82.70
1992/12/20	-1.49	94.00	2.19	96.60	-6.71	86.00
1992/12/21	-12.11	80.20	-2.86	94.40	-18.86	70.70
1992/12/22	-10.72	86.10	-5.88	95.40	-15.48	75.40
1992/12/23	-5.25	93.20	-3.71	96.30	-7.83	87.90
1992/12/24	-9.92	85.90	-2.65	96.10	-20.66	69.75
1992/12/25	-21.39	68.57	-19.27	83.40	-24.17	60.32
1992/12/26	-13.59	73.40	-8.33	93.50	-20.14	60.40
1992/12/27	-20.88	62.32	-18.26	66.20	-22.70	57.32
1992/12/28	-13.69	68.97	-6.08	79.90	-22.63	57.99
1992/12/29	-6.19	77.10	-2.18	92.20	-11.45	68.16
1992/12/30	-10.91	93.20	-9.33	94.20	-12.61	92.10
1992/12/31	-8.30	95.00	-6.36	95.80	-10.40	94.10
1993/01/01	-9.68	91.40	-5.96	95.90	-18.10	77.60
1993/01/02	-19.53	70.70	-18.33	75.30	-21.05	67.01
1993/01/03	-14.61	68.41	-8.75	79.60	-19.54	52.92
1993/01/04	-1.16	93.20	4.25	96.50	-9.23	87.60
1993/01/05	-1.17	94.10	2.57	94.70	-7.34	92.40
1993/01/06	-11.71	91.10	-9.08	93.80	-16.21	85.60

Table I-1
Ambient Temperature-Relative Humidity

TIME_SERIAL_amb	T_AIR_AVG_C	RH_AIR_AVG_%	T_AIR_MAX_C	RH_AIR_MAX_%	T_AIR_MIN_C	RH_AIR_MIN_%
1993/01/07	-7.32	90.20	-3.10	94.10	-14.40	80.30
1993/01/08	-9.20	88.20	-4.04	95.30	-19.90	76.10
1993/01/09	-21.87	71.40	-18.62	77.40	-24.53	60.88
1993/01/10	-22.31	66.48	-14.72	76.30	-26.20	54.52
1993/01/11	-13.89	59.64	-10.07	76.50	-16.23	49.28
1993/01/12	-13.90	70.60	-9.31	77.30	-16.93	53.71
1993/01/13	-15.60	71.60	-12.43	81.40	-18.69	53.08
1993/01/14	-17.45	69.62	-12.03	83.80	-20.91	44.17
1993/01/15	-13.95	57.87	-9.60	90.20	-19.03	41.80
1993/01/16	-10.94	80.50	-4.84	91.20	-18.85	65.70
1993/01/17	-9.43	83.60	-3.69	92.30	-17.68	73.30
1993/01/18	-11.27	73.50	-4.22	90.50	-19.03	59.93
1993/01/19	-22.13	59.41	-19.50	63.93	-23.33	53.94
1993/01/20	-15.93	66.62	-10.75	76.40	-21.19	58.73
1993/01/21	-13.18	75.80	-3.93	89.80	-22.51	57.53
1993/01/22	-7.04	79.40	1.97	91.90	-16.14	47.85
1993/01/23	-0.49	94.50	0.26	96.30	-2.40	93.40
1993/01/24	0.15	92.10	3.04	95.00	-2.07	81.70
1993/01/25	-3.87	84.00	2.42	95.00	-15.78	70.00
1993/01/26	-17.60	64.15	-13.83	69.99	-20.03	55.19
1993/01/27	-10.09	73.10	-6.01	84.30	-15.45	56.17
1993/01/28	-9.56	78.40	-6.03	90.20	-15.71	70.30
1993/01/29	-14.68	84.70	-10.60	90.40	-20.17	75.00
1993/01/30	-24.88	63.28	-14.44	80.00	-28.55	54.60
1993/01/31	-26.22	55.13	-21.11	69.67	-30.80	45.06
1993/02/01	-20.58	78.20	-16.41	81.70	-24.45	73.50
1993/02/02	-19.11	68.43	-12.43	81.50	-23.53	49.47
1993/02/03	-13.19	78.80	-6.62	88.90	-21.88	72.60
1993/02/04	-13.01	76.30	-6.62	93.00	-17.48	64.24
1993/02/05	-15.32	71.90	-10.76	78.10	-21.74	65.23
1993/02/06	-25.79	58.00	-21.37	65.12	-30.16	51.63
1993/02/07	-21.88	57.76	-16.24	66.94	-27.50	48.33
1993/02/08	-15.12	75.80	-9.09	88.50	-18.86	54.81
1993/02/09	-20.21	61.39	-15.88	73.20	-23.73	46.64
1993/02/10	-11.85	78.40	-5.59	92.60	-20.68	67.73
1993/02/11	-14.62	66.23	-9.69	84.10	-18.02	50.69
1993/02/12	-14.27	51.83	-7.24	63.62	-20.68	34.15
1993/02/13	-9.55	85.80	-2.65	95.50	-13.93	62.85
1993/02/14	-5.68	89.50	-0.87	95.10	-8.25	81.20
1993/02/15	-11.40	70.80	-6.63	84.30	-19.34	50.34
1993/02/16	-13.80	76.30	-8.32	92.90	-23.16	53.62
1993/02/17	-7.87	91.10	-4.62	95.00	-10.35	77.70
1993/02/18	-17.02	64.24	-11.02	76.60	-27.88	51.69
1993/02/19	-20.92	64.16	-13.47	76.90	-29.82	50.25
1993/02/20	-20.07	61.44	-15.39	74.30	-24.08	49.86
1993/02/21	-23.04	54.28	-15.04	72.30	-29.37	32.82
1993/02/22	-19.50	77.50	-16.64	85.90	-28.73	59.24
1993/02/23	-14.35	86.20	-9.08	90.40	-18.14	80.90
1993/02/24	-11.75	84.80	-5.85	90.30	-17.86	72.90
1993/02/25	-13.34	78.00	-8.93	89.20	-16.85	64.81
1993/02/26	-13.97	66.70	-8.21	81.40	-19.32	48.35
1993/02/27	-14.84	65.06	-7.07	81.60	-24.56	41.84
1993/02/28	-16.99	68.20	-7.49	84.50	-26.59	48.48
1993/03/01	-9.13	60.86	-4.79	84.40	-14.59	34.47
1993/03/02	-3.99	51.39	1.39	81.50	-8.69	40.47
1993/03/03	-3.24	55.48	1.53	60.33	-6.11	49.07
1993/03/04	-6.81	67.25	-1.06	88.70	-15.82	46.60
1993/03/05	-13.58	85.90	-10.17	90.10	-19.81	76.50
1993/03/06	-13.25	89.40	-11.97	90.50	-15.01	88.00
1993/03/07	-9.62	83.90	-6.85	91.40	-12.46	71.00
1993/03/08	-5.79	72.90	0.58	86.90	-11.97	55.55
1993/03/09	-9.96	89.20	-4.40	91.80	-17.67	84.80
1993/03/10	-11.70	79.50	-2.90	89.80	-21.97	64.67
1993/03/11	-10.23	89.20	-5.37	92.80	-16.45	83.50
1993/03/12	-12.21	65.10	-8.37	92.30	-15.94	42.33
1993/03/13	-10.82	48.89	-3.54	91.90	-20.91	27.08
1993/03/14	-8.48	85.40	-0.48	92.30	-13.73	70.10
1993/03/15	-17.01	60.78	-14.39	77.60	-22.84	46.96
1993/03/16	-9.37	63.85	-1.57	86.40	-25.29	38.87
1993/03/17	-0.28	87.40	4.42	92.80	-12.66	72.80
1993/03/18	-15.69	55.65	-11.01	72.00	-19.01	36.77
1993/03/19	-9.43	50.29	0.49	70.20	-17.77	32.14
1993/03/20	-2.52	37.14	4.88	64.39	-14.15	20.58
1993/03/21	-1.75	73.20	0.86	95.10	-3.83	48.93
1993/03/22	-1.07	81.80	0.99	94.40	-3.32	70.20
1993/03/23	-4.70	58.53	0.74	77.70	-12.49	41.58
1993/03/24	-4.34	55.51	7.02	88.70	-17.15	23.91
1993/03/25	4.61	60.79	10.42	82.20	-1.66	38.89
1993/03/26	8.86	55.00	15.86	74.70	1.46	38.62
1993/03/27	9.54	52.32	17.06	82.70	1.04	29.05
1993/03/28	5.31	65.79	11.19	90.10	-1.90	46.92

Table I-1
 Ambient Temperature-Relative Humidity

TIME_SERIAL_amb	T_AIR_AVG_C	RH_AIR_AVG_%	T_AIR_MAX_C	RH_AIR_MAX_%	T_AIR_MIN_C	RH_AIR_MIN_%
1993/03/29	1.77	68.22	7.42	91.90	-2.68	45.30
1993/03/30	1.00	70.30	8.89	94.50	-4.61	45.88
1993/03/31	-3.52	48.14	-0.56	73.00	-9.28	28.22
1993/04/01	-4.37	38.93	1.60	51.58	-10.33	23.23
1993/04/02	-5.25	74.10	-3.36	94.10	-7.02	53.75
1993/04/03	-4.00	73.00	-1.16	93.40	-6.67	55.08
1993/04/04	-0.21	53.49	6.57	80.40	-6.14	29.42
1993/04/05	0.48	51.95	9.19	91.50	-9.97	20.53
1993/04/06	2.53	45.91	11.95	74.50	-6.90	17.89
1993/04/07	6.01	34.80	14.91	64.85	-4.46	16.21
1993/04/08	2.34	57.29	9.91	81.30	-5.42	36.45
1993/04/09	5.89	50.59	12.84	88.20	-4.59	24.94
1993/04/10	7.42	63.82	12.27	87.90	3.23	40.32
1993/04/11	6.29	92.00	8.55	94.50	3.98	83.00
1993/04/12	4.47	85.50	8.35	95.40	0.64	59.99
1993/04/13	3.36	73.00	7.34	92.30	0.48	49.63
1993/04/14	-2.96	85.40	2.18	92.40	-5.32	51.72
1993/04/15	-0.92	77.90	5.84	91.50	-6.59	59.93
1993/04/16	-1.35	84.80	0.46	93.20	-2.98	79.80
1993/04/17	6.61	89.40	11.74	93.60	-0.48	74.60
1993/04/18	6.17	82.60	9.43	90.10	2.58	74.10
1993/04/19	3.17	80.70	6.68	92.30	-1.78	62.48
1993/04/20	0.28	71.70	1.97	90.70	-2.52	54.91
1993/04/21	6.47	86.10	15.92	93.30	-1.29	70.90
1993/04/22	3.83	91.00	9.62	92.80	1.37	86.80
1993/04/23	3.10	90.50	7.42	91.70	0.82	87.40
1993/04/24	2.49	73.50	6.68	91.40	-0.58	48.07
1993/04/25	2.36	79.10	6.93	92.50	-2.85	53.46
1993/04/26	4.23	80.80	8.05	92.40	-0.85	56.48
1993/04/27	-0.44	57.72	4.31	81.30	-3.46	37.46
1993/04/28	2.00	50.34	10.43	92.40	-7.74	22.27
1993/04/29	3.45	55.79	10.97	94.10	-1.60	23.25
1993/04/30	1.44	89.10	6.99	93.70	-2.09	76.60
1993/05/01	7.17	79.60	16.28	92.50	-0.07	58.62
1993/05/02	8.65	63.34	14.12	86.80	-0.37	29.87
1993/05/03	5.43	59.45	13.73	92.90	-5.01	33.25
1993/05/04	13.02	53.21	19.91	77.00	6.71	43.33
1993/05/05	17.19	61.30	22.80	87.80	9.80	38.87
1993/05/06	12.65	85.40	15.46	92.70	4.27	74.20
1993/05/07	9.07	66.37	15.84	92.80	2.73	30.76
1993/05/08	12.86	46.21	20.57	91.50	1.68	21.04
1993/05/09	6.77	50.84	12.84	80.10	-1.35	17.45
1993/05/10	2.99	51.85	11.34	86.50	-3.74	18.82
1993/05/11	0.80	82.20	4.39	94.00	-1.89	67.78
1993/05/12	2.81	92.20	4.81	93.40	0.74	91.60
1993/05/13	2.46	95.00	4.26	95.70	0.19	93.60
1993/05/14	5.55	82.10	11.00	96.10	0.79	57.95
1993/05/15	5.63	78.50	13.41	91.70	-1.49	53.80
1993/05/16	12.18	64.23	20.88	91.00	2.82	41.09
1993/05/17	9.69	53.52	14.51	87.70	3.42	32.62
1993/05/18	8.38	55.54	13.86	84.80	2.78	32.48
1993/05/19	9.97	57.07	16.37	83.40	0.05	36.23
1993/05/20	8.77	85.20	12.27	93.00	4.87	75.60
1993/05/21	6.96	90.10	9.52	92.20	4.81	88.90
1993/05/22	10.83	74.40	17.75	90.10	4.84	40.34
1993/05/23	11.54	73.50	18.04	91.20	6.47	42.94
1993/05/24	14.56	42.53	22.35	69.91	7.43	16.87
1993/05/25	10.75	82.70	14.01	91.20	8.82	64.44
1993/05/26	10.74	86.80	14.51	91.40	7.57	77.00
1993/05/27	9.17	86.40	12.15	90.30	7.09	74.60
1993/05/28	9.93	83.00	14.81	91.50	5.03	58.88
1993/05/29	6.44	89.90	8.38	91.20	4.80	88.60
1993/05/30	4.67	90.70	5.33	91.40	3.63	90.10
1993/05/31	4.11	89.30	6.10	91.70	2.50	82.90
1993/06/01	4.27	90.60	6.62	92.20	2.07	89.10
1993/06/02	7.09	85.30	11.10	90.20	4.67	68.52
1993/06/03	9.31	80.00	12.77	91.50	4.06	64.64
1993/06/04	8.40	85.70	11.38	92.30	2.20	72.60
1993/06/05	11.66	59.84	19.50	92.10	0.75	31.64
1993/06/06	13.84	52.01	18.44	67.47	10.33	36.83
1993/06/07	5.86	89.80	9.65	92.10	4.70	53.54
1993/06/08	10.30	71.50	17.28	91.80	5.19	33.61
1993/06/09	14.99	47.35	22.24	76.80	6.71	21.55
1993/06/10	9.67	85.90	12.37	91.80	7.89	62.44
1993/06/11	11.24	73.40	18.70	90.80	5.12	42.61
1993/06/12	11.22	76.30	17.29	91.00	5.07	58.14
1993/06/13	16.78	55.80	25.01	91.60	5.62	25.16
1993/06/14	20.73	57.37	29.18	88.00	10.84	24.65
1993/06/15	22.55	52.77	30.71	90.50	12.38	17.57
1993/06/16	18.67	61.31	25.54	84.70	11.03	37.87
1993/06/17	15.24	74.00	19.25	90.50	9.55	57.50

Table I-1
 Ambient Temperature-Relative Humidity

TIME_SERIAL_amb	T_AIR_AVG_C	RH_AIR_AVG_%	T_AIR_MAX_C	RH_AIR_MAX_%	T_AIR_MIN_C	RH_AIR_MIN_%
1993/06/18	15.99	69.75	20.67	91.80	9.04	48.84
1993/06/19	17.18	60.81	23.38	90.90	11.92	19.04
1993/06/20	16.65	47.55	24.75	81.20	8.08	15.16
1993/06/21	15.17	74.20	21.89	90.70	8.07	39.71
1993/06/22	14.63	88.20	16.57	89.80	12.57	86.60
1993/06/23	9.22	88.00	12.71	90.00	7.14	83.90
1993/06/24	11.51	66.66	17.72	88.40	6.49	32.86
1993/06/25	18.29	50.48	27.18	85.70	7.24	26.69
1993/06/26	22.37	57.94	29.97	87.30	13.05	40.27
1993/06/27	21.63	60.86	26.65	88.40	14.60	32.01
1993/06/28	16.72	82.30	23.75	91.20	11.40	63.49
1993/06/29	16.91	72.20	20.94	88.60	12.71	51.14
1993/06/30	13.45	81.00	16.66	90.50	7.75	67.65
1993/07/01	16.24	57.08	23.61	90.40	7.35	26.87
1993/07/02	18.68	50.15	26.11	87.10	7.85	23.36
1993/07/03	14.88	70.00	17.73	89.70	11.36	45.88
1993/07/04	16.79	81.50	20.98	89.20	12.68	68.72
1993/07/05	14.94	65.93	22.03	90.40	8.78	34.09
1993/07/06	16.79	54.83	22.96	84.00	11.85	40.22
1993/07/07	15.92	79.10	23.63	87.70	9.93	66.21
1993/07/08	20.82	65.79	27.29	90.10	12.49	40.30
1993/07/09	19.29	57.25	26.07	84.50	12.59	34.06
1993/07/10	17.78	80.40	23.94	89.60	11.56	62.26
1993/07/11	18.79	72.10	23.69	89.10	14.81	51.22
1993/07/12	15.27	83.70	19.63	90.60	10.69	73.20
Average:	-1.324	74.683	3.575	88.431	-6.601	58.746
Minimum:	-26.220	34.800	-21.370	51.580	-30.800	15.160
Maximum:	22.550	97.100	30.710	98.100	14.810	96.700
Median:	-1.226	77.300	2.469	91.000	-5.391	59.345
Standard Deviation:	11.098	14.189	11.543	8.130	11.102	20.572
Population:	268.000	268.000	268.000	268.000	268.000	268.000

TIME_SERIAL	TIME	EVAP0_MM	DELTA_EVAP0_MM	RAIN_MM	AVG_WIND_M/S	MAX_WIND_M/S	MIN_WIND_M/S
1992/12/17	2400	111.4	-0.12	2.9	1.543	6.287	0.447
1992/12/18	2400	111.7	0.27	2.4	3.106	12.53	0.447
1992/12/19	2400	111.9	0.22	0	3.192	11.17	0.447
1992/12/20	2400	111.6	-0.28	7	3.032	10.05	0.447
1992/12/21	2400	111.6	-0.07	0	5.051	14.45	0.447
1992/12/22	2400	111.7	0.12	0	2.114	6.847	0.447
1992/12/23	2400	111.6	-0.06	0	1.885	5.647	0.447
1992/12/24	2400	111.7	0.03	0	4.879	22.61	0.447
1992/12/25	2400	111.6	-0.02	0	5.747	18.05	0.447
1992/12/26	2400	111.8	0.11	0	4.066	13.57	0.447
1992/12/27	2400	111.8	0.00	0	5.237	15.65	0.447
1992/12/28	2400	111.8	0.01	0	1.739	5.087	0.447
1992/12/29	2400	111.7	-0.03	0	2.364	6.607	0.447
1992/12/30	2400	111.7	-0.01	0	2.126	5.567	0.447
1992/12/31	2400	111.6	-0.17	0	1.496	4.207	0.447
1993/01/01	2400	111.7	0.11	0	4.582	12.21	0.847
1993/01/02	2400	111.6	-0.04	0	6.44	14.45	2.047
1993/01/03	2400	111.6	-0.01	0	3.58	12.05	0.447
1993/01/03	2400	111.6	-0.01	0	3.58	12.05	0.447
1993/01/04	2400	111	-0.63	16	2.225	6.847	0.447
1993/01/05	2400	111.3	0.29	19.8	2.539	9.01	0.447
1993/01/06	2400	111.5	0.18	0	1.889	7.25	0.447
1993/01/07	2400	111.4	-0.04	0	1.905	8.93	0.447
1993/01/08	2400	111.4	-0.02	0	2.335	7.57	0.447
1993/01/09	2400	111.7	0.29	0	3.154	8.05	0.447
1993/01/10	2400	111.5	-0.19	0	2.66	7.01	0.447
1993/01/11	2400	111.5	-0.06	0	3.976	10.37	0.447
1993/01/12	2400	111.4	-0.02	0	3.469	12.61	0.447
1993/01/13	2400	111.7	0.29	0	2.805	8.37	0.447
1993/01/14	2400	111.6	-0.16	0	2.22	6.127	0.447
1993/01/15	2400	111.3	-0.26	0	1.99	6.607	0.447
1993/01/16	2400	111.5	0.18	0	1.877	7.89	0.447
1993/01/17	2400	111.4	-0.09	0	1.141	4.127	0.447
1993/01/18	2400	111.7	0.25	0	5.211	14.13	0.847
1993/01/19	2400	111.5	-0.16	0	5.367	12.37	0.847
1993/01/20	2400	111.5	0.03	0	3.775	9.97	0.447
1993/01/21	2400	111.6	0.06	0.4	1.701	5.727	0.447
1993/01/22	2400	111.5	-0.10	3	1.378	5.247	0.447
1993/01/23	2400	111.4	-0.06	19.9	0.907	5.887	0.447
1993/01/24	2400	111.4	-0.04	6.3	2.1	10.05	0.447
1993/01/25	2400	111.5	0.09	12.7	5.583	15.65	0.447
1993/01/26	2400	111.6	0.10	0	5.193	13.97	0.447
1993/01/27	2400	111.3	-0.25	0	2.556	8.05	0.447
1993/01/28	2400	111.5	0.17	0	3.848	8.85	1.087
1993/01/29	2400	111.5	0.02	0	2.182	9.01	0.447
1993/01/30	2400	111.8	0.32	0	6.475	15.97	1.407
1993/01/31	2400	111.7	-0.13	0	3.083	10.53	0.447
1993/02/01	2400	111.4	-0.32	0	2.392	7.17	0.447
1993/02/02	2400	111.5	0.13	0	1.942	6.607	0.447
1993/02/03	2400	111.4	-0.15	0	1.843	5.807	0.447
1993/02/04	2400	111.5	0.13	0	5.528	12.69	1.007
1993/02/05	2400	111.7	0.23	0	4.156	11.41	0.447
1993/02/06	2400	111.5	-0.26	0	4.285	12.29	0.607
1993/02/07	2400	111.4	-0.05	0	2.925	7.09	0.447
1993/02/08	2400	111.6	0.19	0.3	3.357	10.05	0.447
1993/02/09	2400	111.6	0.02	0	4.24	12.53	0.447
1993/02/10	2400	111.5	-0.13	0	2.978	10.05	0.447
1993/02/11	2400	111.6	0.06	0	4.494	10.85	0.687
1993/02/12	2400	111.5	-0.07	0	2.744	8.05	0.447
1993/02/13	2400	111.3	-0.17	0	2.522	8.21	0.447
1993/02/14	2400	111.4	0.11	0	4.002	10.29	0.767
1993/02/15	2400	111.4	-0.01	0	3.331	8.69	0.447
1993/02/16	2400	111.4	-0.04	0	2.356	6.687	0.447
1993/02/17	2400	111.5	0.10	0	5.027	15.33	0.687
1993/02/18	2400	111.4	-0.15	0	3.183	11.25	0.447

TIME_SERIAL	TIME	EVAPO_MM	DELTA_EVAPO_MM	RAIN_MM	AVG_WIND_M/S	MAX_WIND_M/S	MIN_WIND_M/S
1993/02/19	2400	111.5	0.10	0	2.767	7.49	0.447
1993/02/20	2400	111.6	0.17	0	2.889	9.41	0.447
1993/02/21	2400	111.6	-0.01	0	2.944	8.29	0.447
1993/02/22	2400	111.6	-0.02	0	2.824	8.13	0.447
1993/02/23	2400	111.7	0.10	0	2.122	6.127	0.447
1993/02/24	2400	111.6	-0.13	0	1.811	5.327	0.447
1993/02/25	2400	111.6	0.01	0	3.424	8.93	0.767
1993/02/26	2400	111.3	-0.23	0	3.356	7.73	0.607
1993/02/27	2400	111.5	0.15	0	2.419	7.41	0.447
1993/02/28	2400	111.6	0.07	0	2.318	7.01	0.447
1993/03/01	2400	111.6	0.04	0	4.605	9.73	1.967
1993/03/02	2400	111.5	-0.14	6.9	4.831	10.77	1.647
1993/03/03	2400	111.3	-0.15	3.7	4.954	12.93	1.487
1993/03/04	2400	111.1	-0.17	1.4	2.453	7.41	0.447
1993/03/05	2400	111.3	0.16	0	2.91	8.21	0.447
1993/03/06	2400	111.3	0.05	0	4.258	9.01	1.487
1993/03/07	2400	111.2	-0.15	0	4.089	9.25	1.167
1993/03/08	2400	111.3	0.14	4.9	3.868	10.37	0.447
1993/03/09	2400	111.3	-0.07	0	1.861	5.887	0.447
1993/03/10	2400	111	-0.20	0.1	1.382	4.847	0.447
1993/03/11	2400	111.3	0.26	0	1.482	6.127	0.447
1993/03/12	2400	111.3	0.01	0	5.001	11.57	1.167
1993/03/13	2400	111.3	-0.04	0	2.907	9.17	0.447
1993/03/14	2400	111.1	-0.18	0.1	5.219	15.73	0.447
1993/03/15	2400	111.2	0.06	0	5.323	15.33	0.447
1993/03/16	2400	111.3	0.13	0	4.174	13.17	0.447
1993/03/17	2400	111.4	0.07	2.6	5.51	13.89	1.167
1993/03/18	2400	111.2	-0.19	0	4.56	11.73	1.407
1993/03/19	2400	111.2	-0.01	0	2.454	6.287	0.447
1993/03/20	2400	111.1	-0.09	0	1.978	6.687	0.447
1993/03/21	2400	111.1	0.02	0	2.835	9.01	0.447
1993/03/22	2400	111.2	0.13	4.2	3.654	10.85	0.447
1993/03/23	2400	111.3	0.04	0	4.331	11.49	0.447
1993/03/24	2400	111.1	-0.18	0	1.515	6.527	0.447
1993/03/25	2400	111	-0.07	0	2.898	8.21	0.447
1993/03/26	2400	111.4	0.33	0	2.173	7.97	0.447
1993/03/27	2400	21.96	-89.40	0	2.048	5.647	0.447
1993/03/28	2400	0.2	-21.76	0	1.946	5.967	0.447
1993/03/29	2400	0.102	-0.10	0	2.519	9.09	0.447
1993/03/30	2400	1.084	0.98	0	1.87	5.567	0.447
1993/03/31	2400	3.337	2.25	0	3.585	8.77	0.447
1993/04/01	2400	3.314	-0.02	0	2.378	5.487	0.447
1993/04/02	2400	3.315	0.00	0	3.625	9.49	1.167
1993/04/03	2400	3.314	-0.00	2	3.449	8.37	1.167
1993/04/04	2400	3.606	0.29	3.2	2.475	7.01	0.447
1993/04/05	2400	4.003	0.40	0	1.768	6.447	0.447
1993/04/06	2400	53.36	49.36	0	1.335	4.687	0.447
1993/04/07	2400	13.33	-40.03	0	1.813	5.727	0.447
1993/04/08	2400	15.31	1.98	0	1.367	5.647	0.447
1993/04/09	2400	20.41	5.10	0	2.363	8.05	0.447
1993/04/10	2400	25.03	4.63	0	3.777	11.41	0.847
1993/04/11	2400	16.92	-8.11	11.3	3.624	10.05	1.407
1993/04/12	2400	19.16	2.24	0.3	2.943	8.37	0.447
1993/04/13	2400	20.78	1.62	1.4	3.93	9.09	1.167
1993/04/14	2400	20.29	-0.49	1.4	3.604	8.93	0.847
1993/04/15	2400	25.91	5.62	1.6	1.934	5.327	0.447
1993/04/16	2400	24.71	-1.19	0	3.786	7.89	1.247
1993/04/17	2400	16.75	-7.96	11	4.263	11.09	1.167
1993/04/18	2400	16.54	-0.21	2.1	3	9.89	0.447
1993/04/19	2400	16.36	-0.18	2.5	2.779	10.13	0.447
1993/04/20	2400	16.94	0.58	0.4	3.062	9.17	0.447
1993/04/21	2400	16.91	-0.03	0.6	2.826	10.05	0.447
1993/04/22	2400	14.78	-2.13	4.2	2.832	7.89	0.447
1993/04/23	2400	7.59	-7.19	6.2	3.166	9.81	0.447
1993/04/24	2400	10.19	2.60	0.1	5.219	15.57	0.447

TIME_SERIAL	TIME	EVAPO_MM	DELTA_EVAPO_MM	RAIN_MM	AVG_WIND_M/S	MAX_WIND_M/S	MIN_WIND_M/S
1993/04/25	2400	7.87	-2.31	4.5	3.401	10.77	0.447
1993/04/26	2400	8.74	0.87	0.9	3.351	10.53	0.447
1993/04/27	2400	11.26	2.52	0	2.905	7.41	0.447
1993/04/28	2400	15.82	4.57	0	2.51	8.53	0.447
1993/04/29	2400	20.44	4.62	0	2.55	8.61	0.447
1993/04/30	2400	21.73	1.28	0	2.625	5.727	0.687
1993/05/01	2400	24.31	2.58	0	2.131	7.41	0.447
1993/05/02	2400	31.22	6.92	0	3.597	11.01	0.447
1993/05/03	2400	38.24	7.02	0	3.703	10.21	0.447
1993/05/04	2400	41.38	3.14	0	2.772	9.25	0.447
1993/05/05	2400	47.55	6.17	0	2.541	9.49	0.447
1993/05/06	2400	44.65	-2.90	6	3.034	8.93	0.447
1993/05/07	2400	48.89	4.24	0	2.618	7.33	0.447
1993/05/08	2400	53.73	4.84	0	3.048	10.61	0.447
1993/05/09	2400	59.59	5.85	0	3.11	8.93	0.447
1993/05/10	2400	64.14	4.55	0	2.317	7.49	0.447
1993/05/11	2400	65.18	1.05	2	2.032	7.01	0.447
1993/05/12	2400	61.45	-3.74	8.4	3.29	7.09	0.447
1993/05/13	2400	37.59	-23.86	23.2	3.188	10.53	0.447
1993/05/14	2400	38.06	0.48	0.1	1.697	5.967	0.447
1993/05/15	2400	41.17	3.11	0.1	2.211	6.287	0.447
1993/05/16	2400	51.15	9.97	0	3.729	12.29	0.447
1993/05/17	2400	53.44	2.29	0	3.42	11.33	0.527
1993/05/18	2400	56.07	2.63	0	3.504	11.49	0.447
1993/05/19	2400	61.75	5.68	0	2.952	9.97	0.447
1993/05/20	2400	63.81	2.05	5.3	2.241	6.047	0.447
1993/05/21	2400	56.21	-7.60	8.4	1.517	4.607	0.447
1993/05/22	2400	55.94	-0.27	0.1	2.457	7.57	0.447
1993/05/23	2400	58.61	2.67	0.1	2.116	7.17	0.447
1993/05/24	2400	65.7	7.08	0	3.05	8.05	0.447
1993/05/25	2400	60.24	-5.45	13	2.583	7.17	0.447
1993/05/26	2400	56.7	-3.55	5.3	2.303	6.607	0.447
1993/05/27	2400	55.28	-1.42	1.6	3.024	7.89	0.447
1993/05/28	2400	55.22	-0.05	0	2.484	6.367	0.447
1993/05/29	2400	29.18	-26.05	29.1	3.153	9.65	0.447
1993/05/30	2400	12.16	-17.02	17.5	4.678	11.49	1.407
1993/05/31	2400	11.44	-0.72	0.7	3.439	9.33	0.927
1993/06/01	2400	1.007	-10.43	20.9	4.914	11.73	1.567
1993/06/02	2400	0.155	-0.85	6.8	3.444	14.77	0.447
1993/06/03	2400	1.444	1.29	3.3	2.851	9.17	0.447
1993/06/04	2400	0.699	-0.75	4.4	2.259	7.97	0.447
1993/06/05	2400	2.985	2.29	0	2.105	8.93	0.447
1993/06/06	2400	0.279	-2.71	0	2.934	9.73	0.447
1993/06/07	2400	0.11	-0.17	14.3	4.745	12.29	1.167
1993/06/08	2400	0.225	0.12	0	3.66	10.61	0.447
1993/06/09	2400	3.815	3.59	0	2.912	10.77	0.527
1993/06/10	2400	0.181	-3.63	24	2.057	5.807	0.447
1993/06/11	2400	0.19	0.01	0.1	2.73	9.89	0.447
1993/06/12	2400	0.145	-0.05	0	2.885	7.65	0.447
1993/06/13	2400	0.171	0.03	0	2.032	7.97	0.447
1993/06/14	2400	4.089	3.92	0	2.311	8.53	0.447
1993/06/15	2400	13.28	9.19	0	2.157	7.49	0.447
1993/06/16	2400	21.76	8.48	0.4	2.635	11.33	0.447
1993/06/17	2400	27.7	5.95	0	3.294	8.69	0.447
1993/06/18	2400	31	3.30	0	1.963	5.727	0.447
1993/06/19	2400	39.27	8.27	0	2.146	7.01	0.447
1993/06/20	2400	46.66	7.39	0	2.371	7.09	0.447
1993/06/21	2400	49.37	2.71	0.7	2.604	9.09	0.447
1993/06/22	2400	38.21	-11.16	14	1.661	5.727	0.447
1993/06/23	2400	23.48	-14.73	15	5.657	13.41	1.887
1993/06/24	2400	29.3	5.83	0	3.836	11.01	0.447
1993/06/25	2400	36.81	7.51	0	2.494	9.17	0.447
1993/06/26	2400	41.38	4.57	2.9	2.743	9.81	0.447
1993/06/27	2400	49.2	7.82	0	2.757	8.77	0.447

TIME_SERIAL	TIME	EVAPO_MM	DELTA_EVAPO_MM	RAIN_MM	AVG_WIND_M/S	MAX_WIND_M/S	MIN_WIND_M/S
Average:		70.734	-0.32	2.041	3.069	9.151	0.575
Minimum:		0.102	-89.40	0.000	0.907	4.127	0.447
Maximum:		111.900	49.36	29.100	6.475	22.610	2.047
Median:		111.100	0.02	0.000	2.894	8.930	0.447
Standard Deviation:		44.902	9.07	4.976	1.118	2.886	0.315
Population:		194.000	194.00	194.000	194.000	194.000	194.000

APPENDIX II

Monitoring Data - Pile 18A

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Figure II-1
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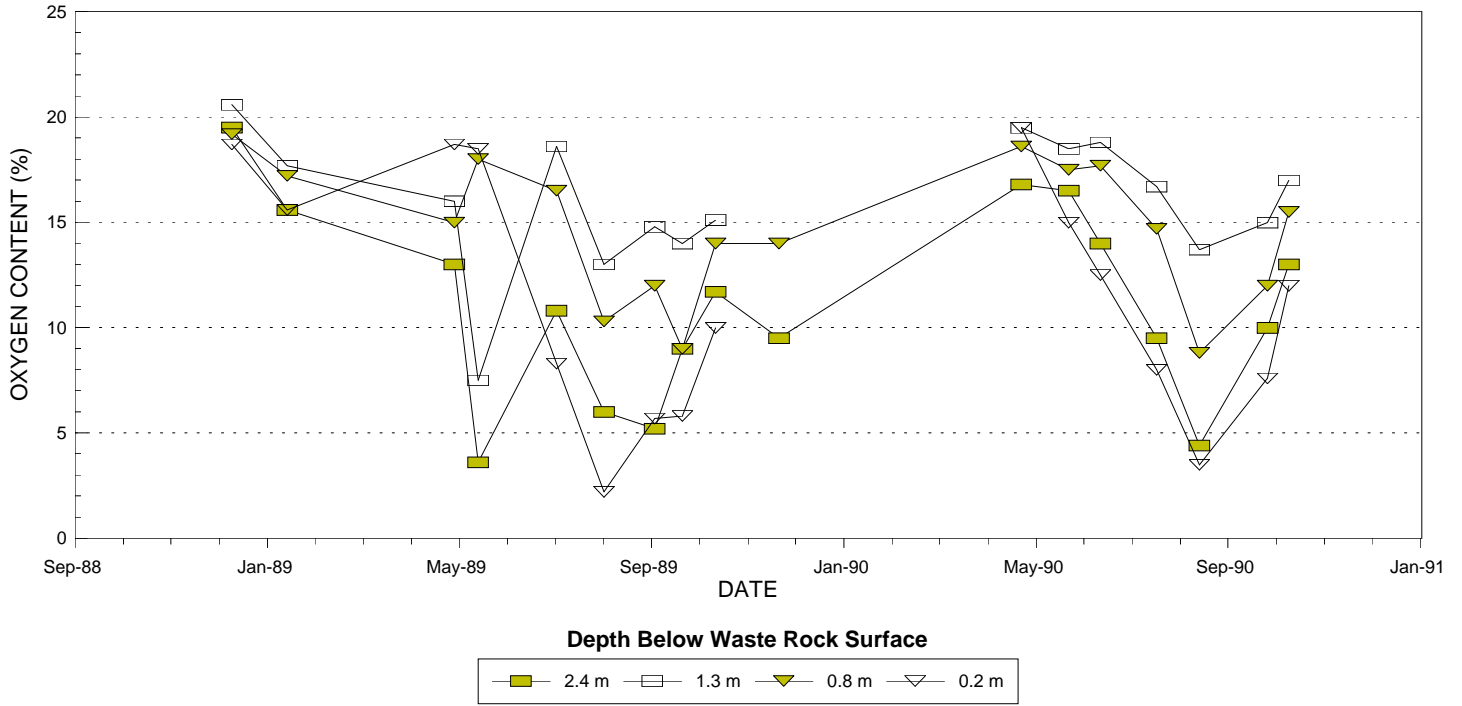


Figure II-2
Oxygen Data, Pile 18A, Station 2

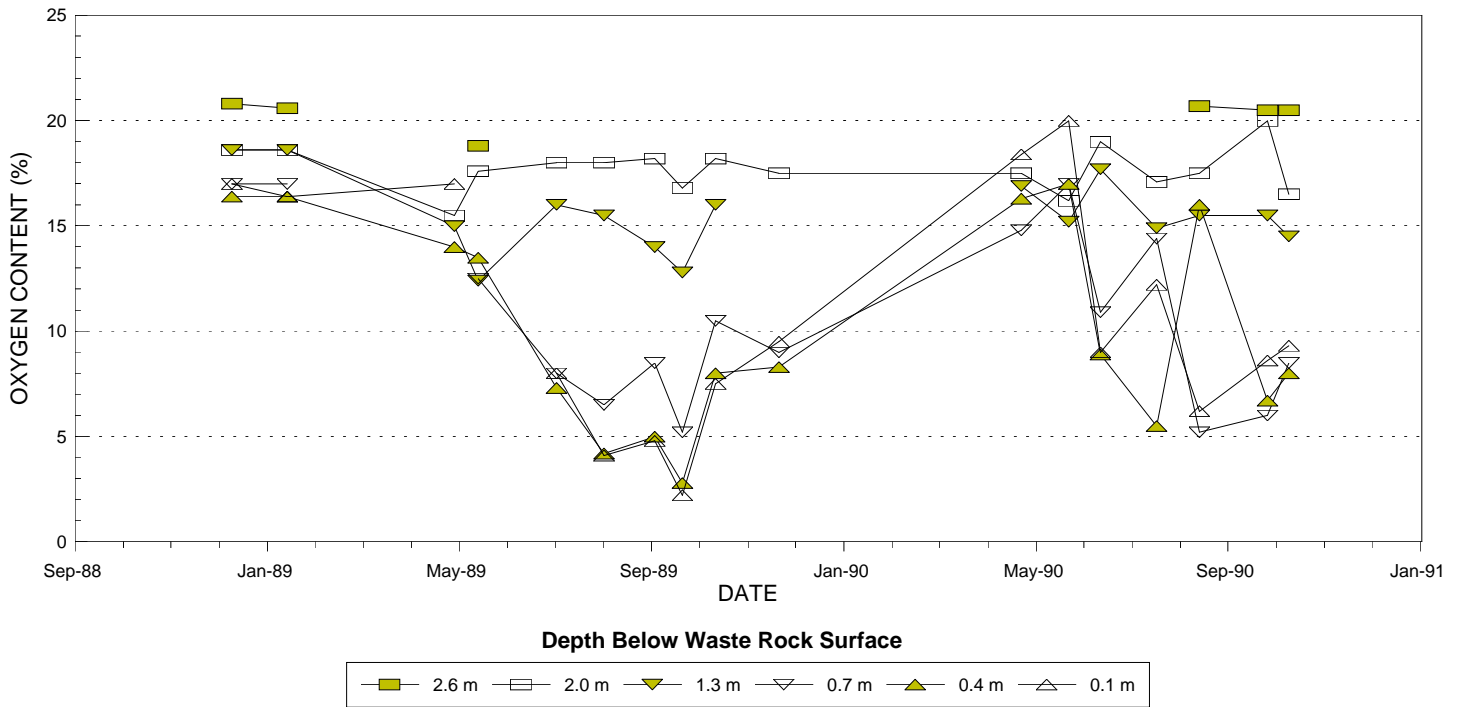


Figure II-3
Oxygen Data, Pile 18A, Station 3

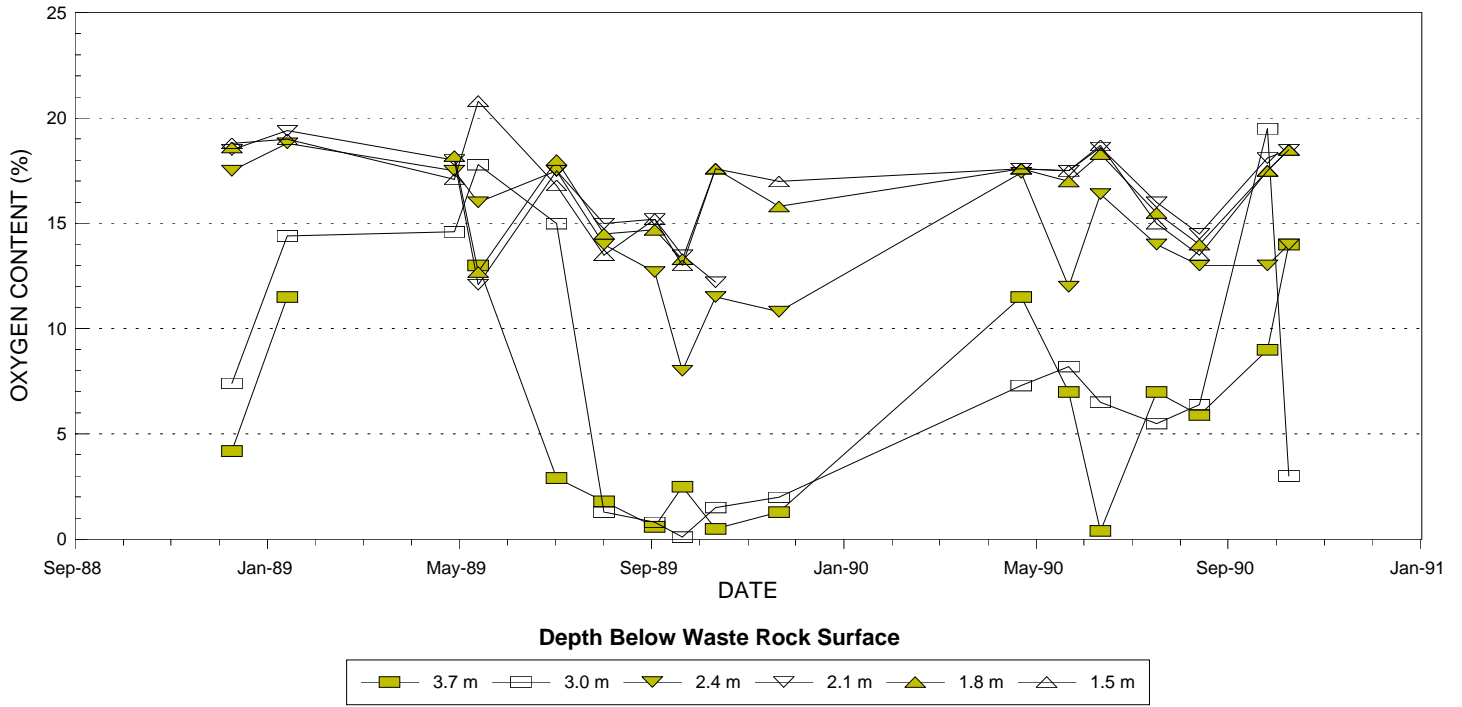


Figure II-4
Oxygen Data, Pile 18A, Station 4

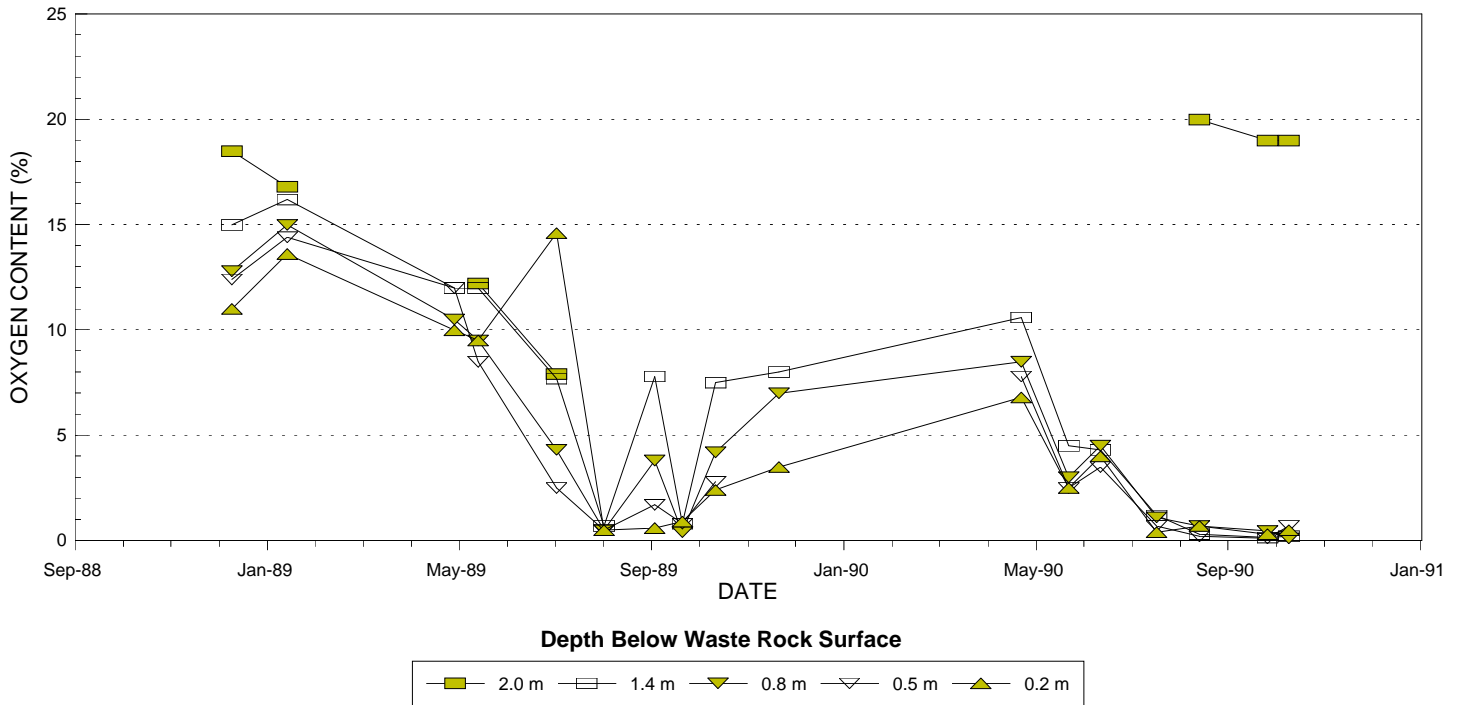


Figure II-5
Oxygen Data, Pile 18A, Station 5

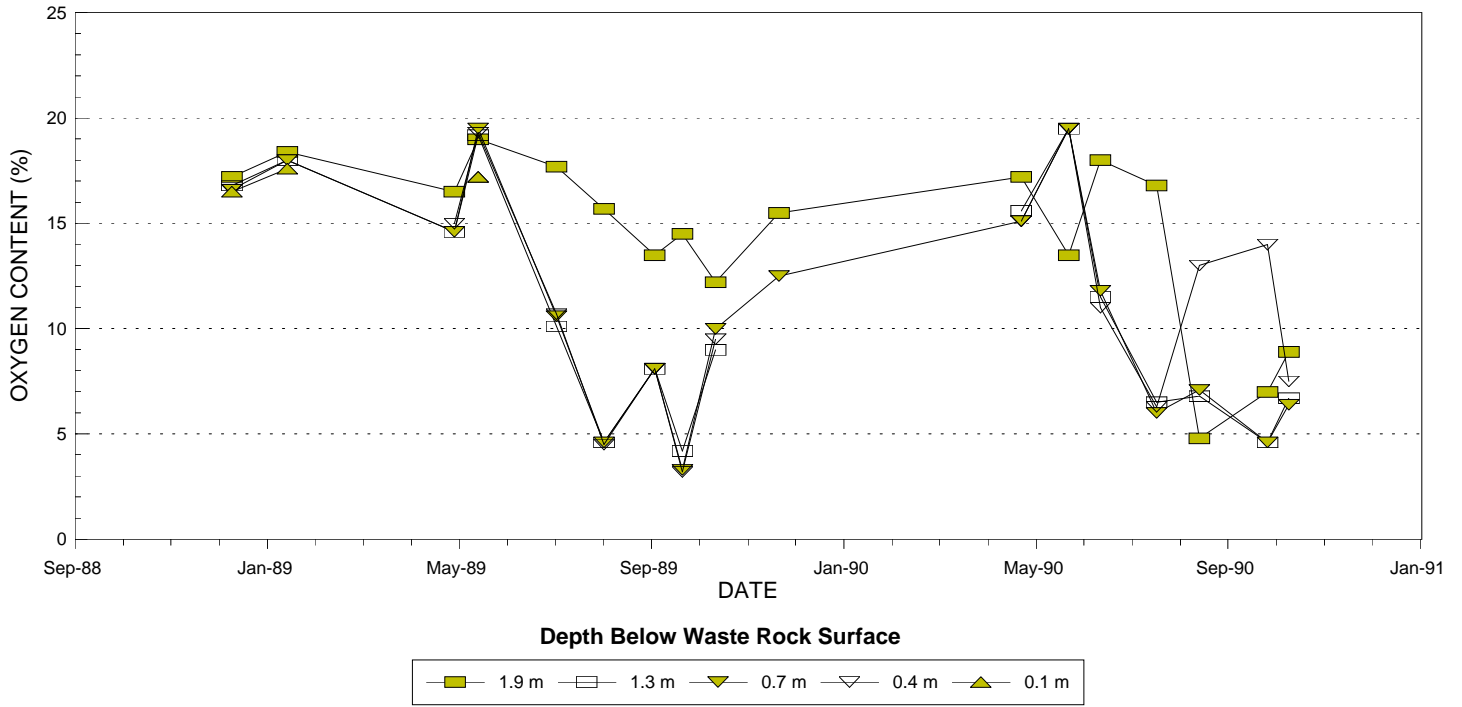


Figure II-6
Oxygen Data, Pile 18A, Station 6

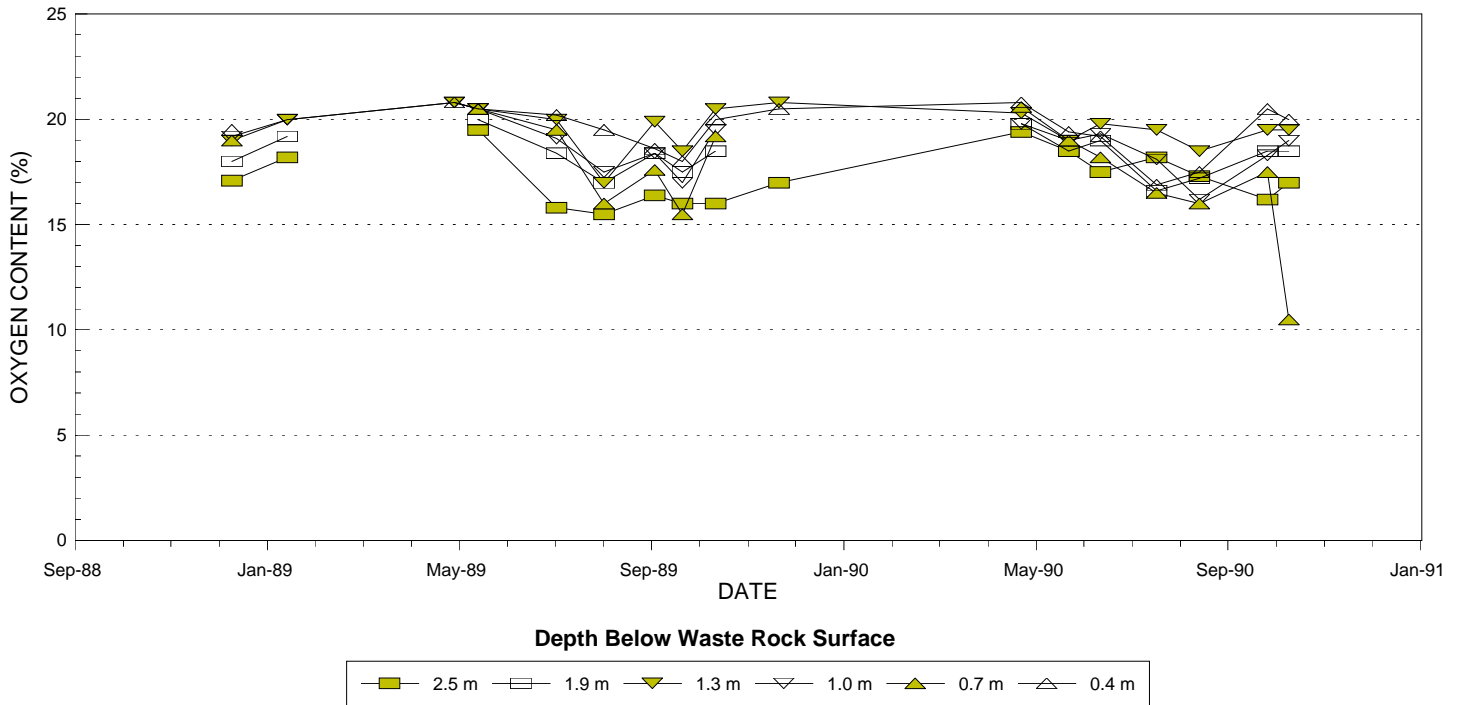


Figure II-7
Temperature Data, Pile 18A, Station 1

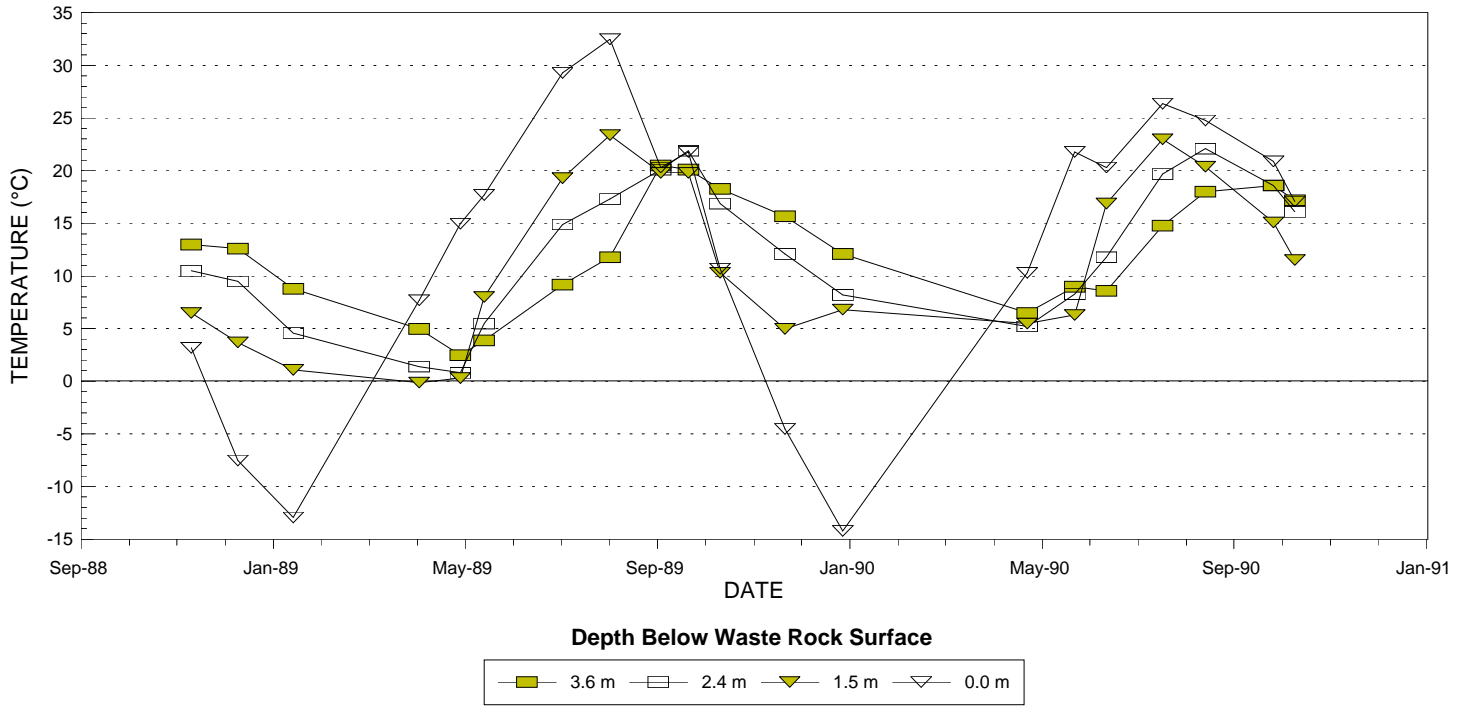


Figure II-8
Temperature Data, Pile 18A, Station 2

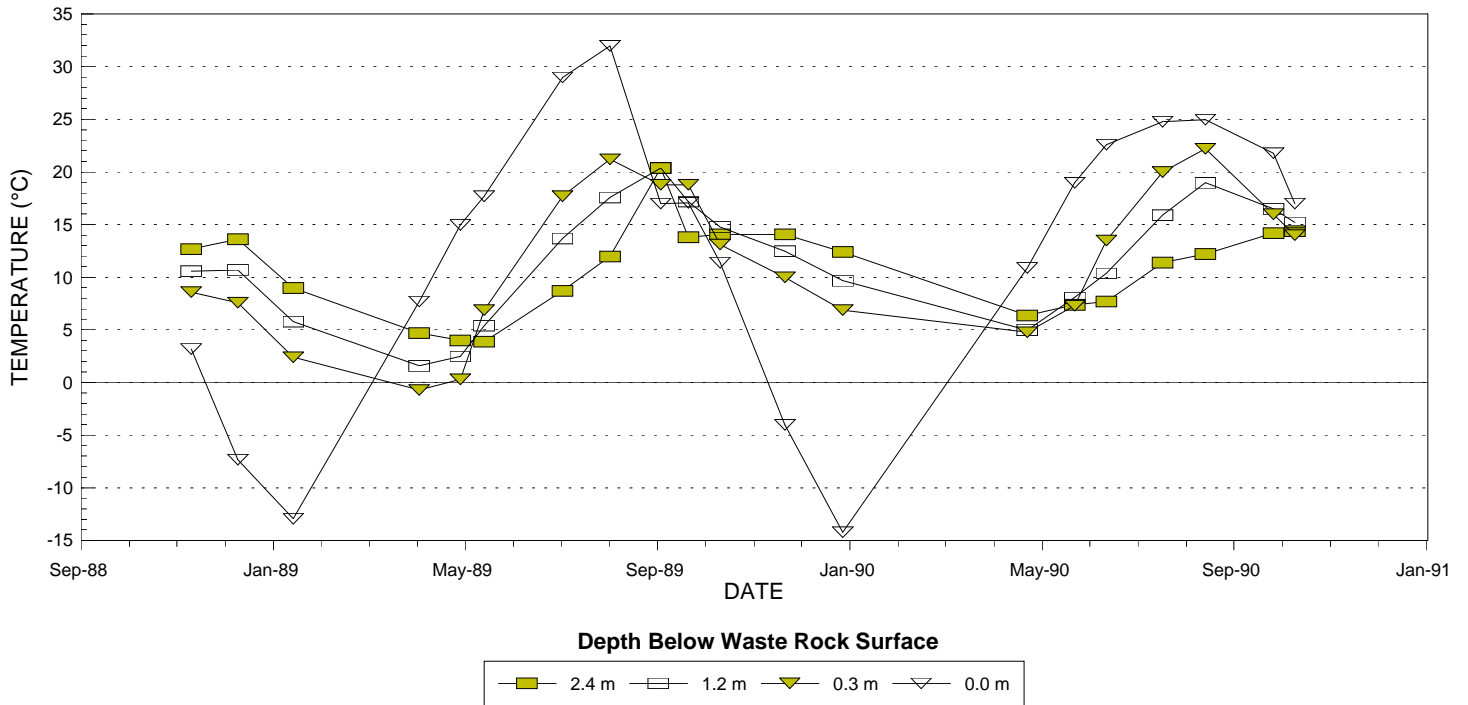


Figure II-9
Temperature Data, Pile 18A, Station 3

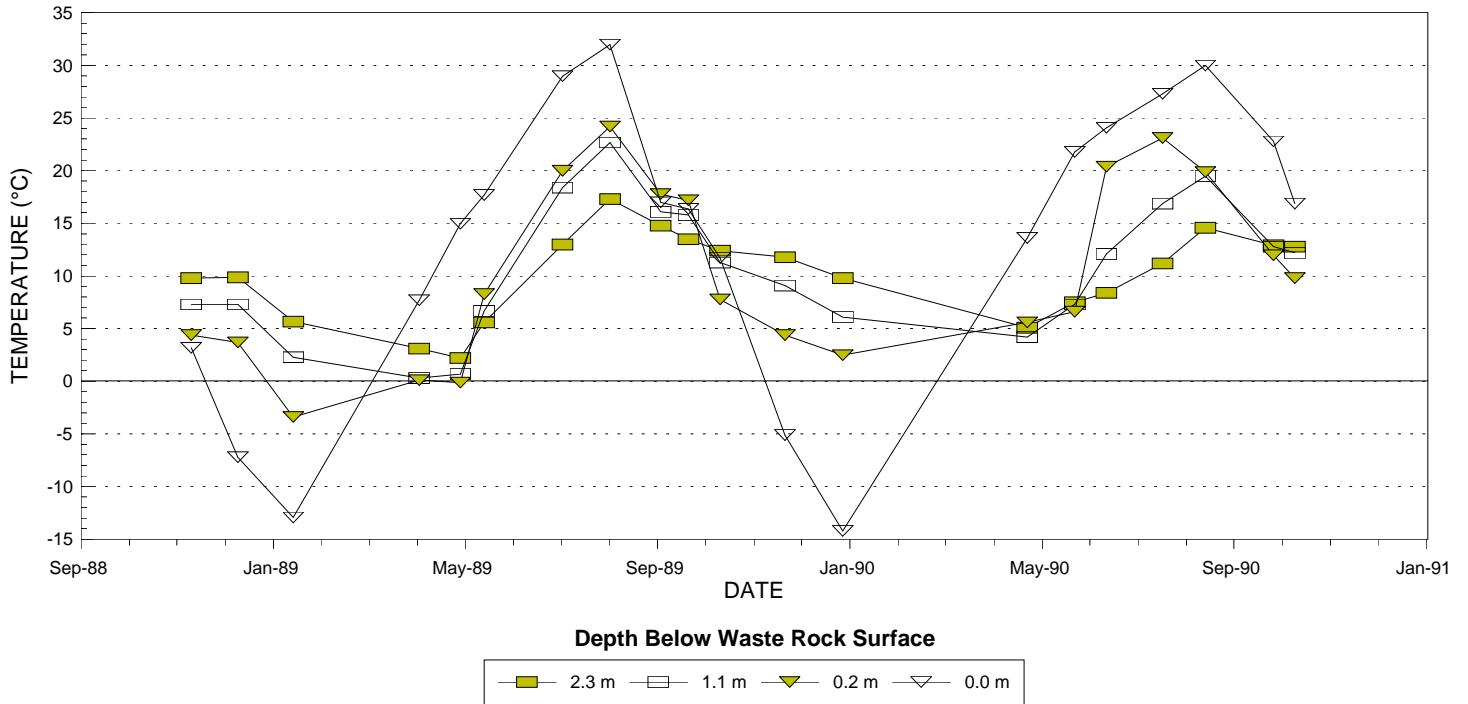


Figure II-10
Temperature Data, Pile 18A, Station 4

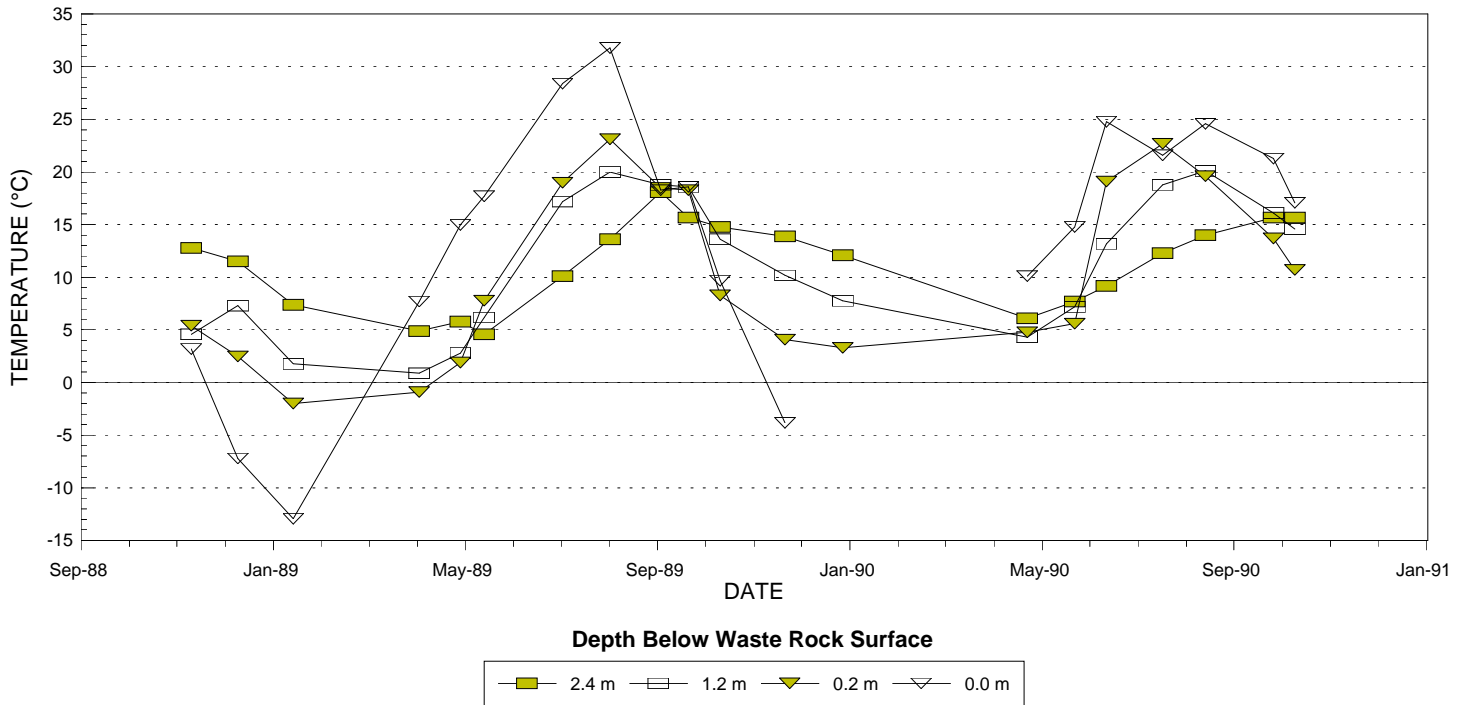


Figure II-11
Temperature Data, Pile 18A, Station 5

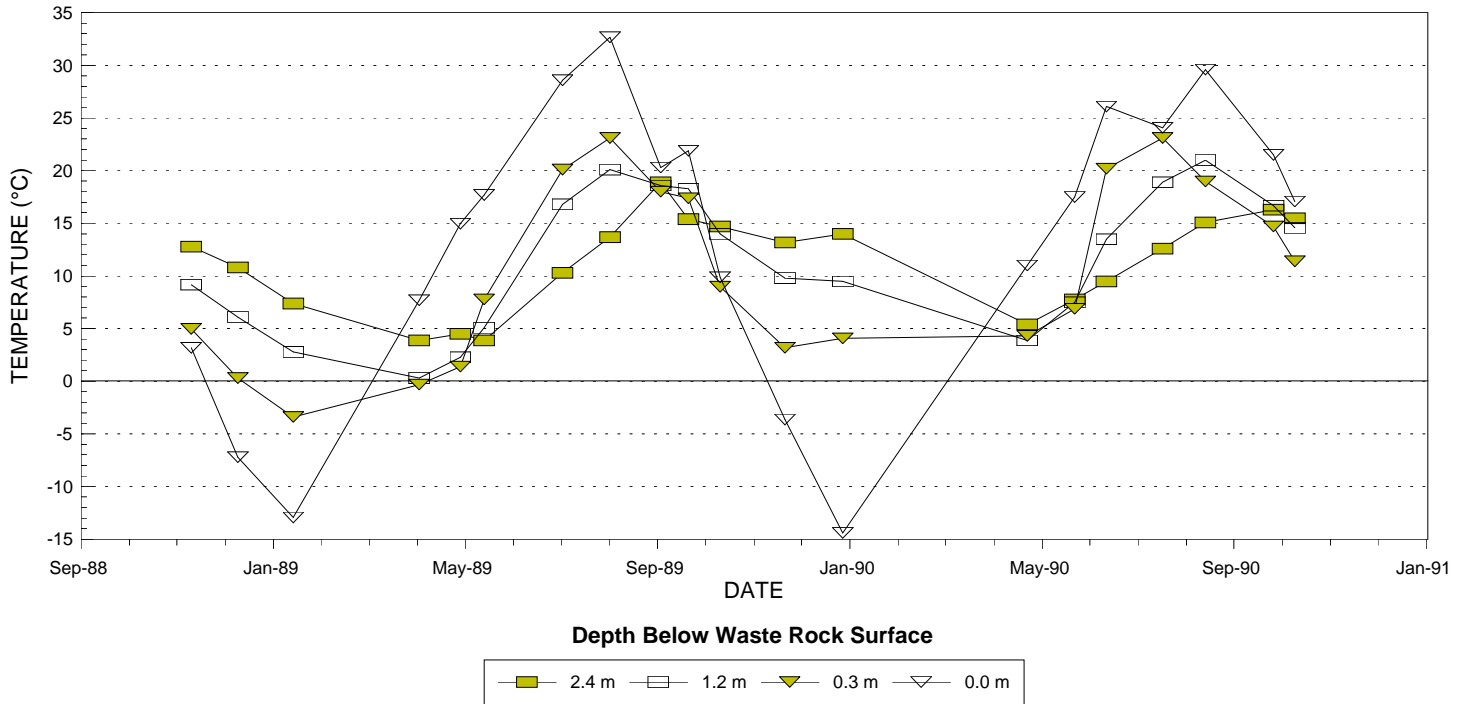


Figure II-12
Temperature Data, Pile 18A, Station 6

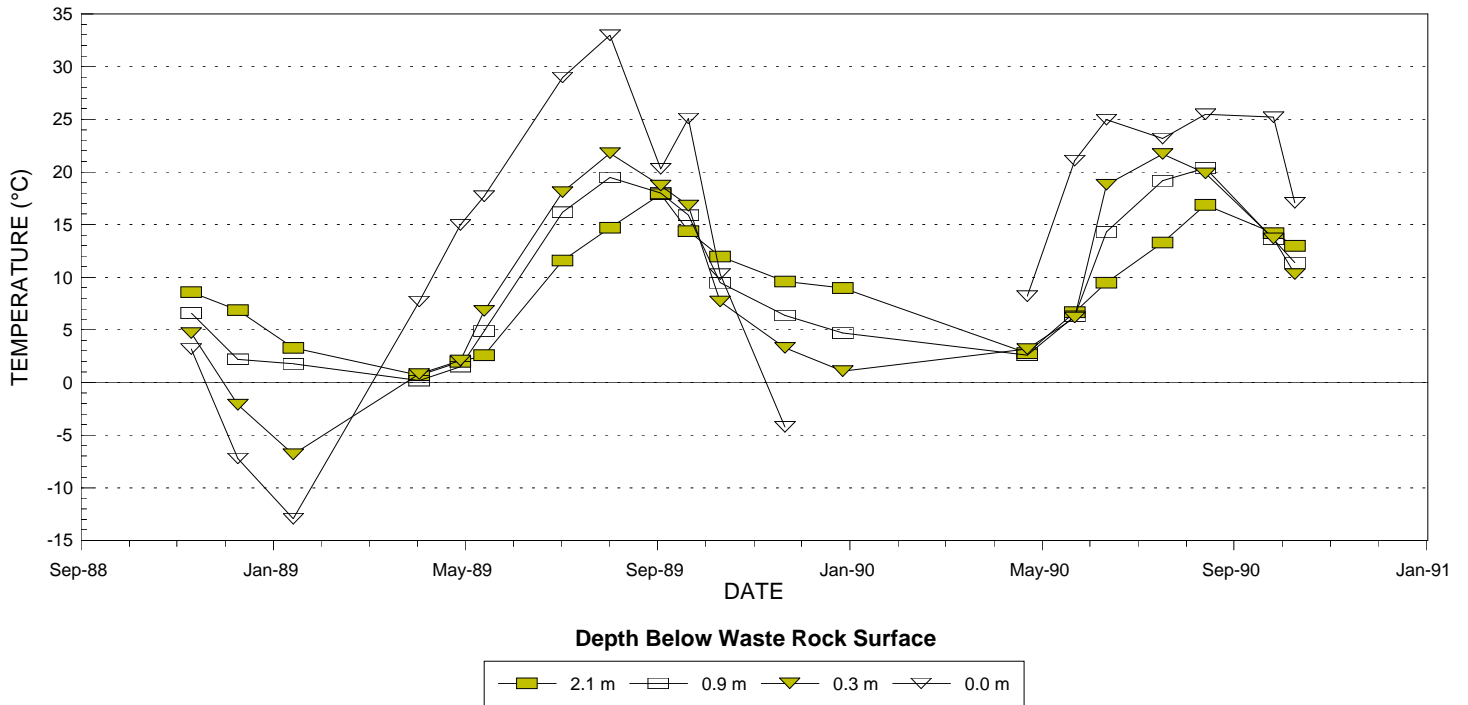


Table II-1
Gas Phase Oxygen (%) - Pile 18A

Station	Port	Depth (m)	88/12/10	89/01/14	89/04/30	89/05.15	89/07/04	89/08/03	89/09/04	89/09/22	89/10/12	89/11/22	90/04/25
1	1	2.4	19.5	15.6	13.0	3.6	10.8	6.0	5.2	9.0	11.7	9.5	16.8
	2	1.3	20.6	17.7	16.0	7.5	18.6	13.0	14.8	14.0	15.1	NA	19.5
	3	0.8	19.2	17.2	15.0	18.0	16.5	10.3	12.0	9.0	14.0	14.0	18.6
	4	0.2	18.7	15.6	18.7	18.5	8.3	2.2	5.7	5.8	10.0	NA	19.5
2	1	2.6	20.8	20.6	NA	18.8	NA	NA	NA	NA	NA	NA	NA
	2	2.0	18.6	18.6	15.5	17.6	18.0	18.0	18.2	16.8	18.2	17.5	17.5
	3	1.3	18.6	18.6	15.0	12.4	16.0	15.5	14.0	12.8	16.0	NA	16.9
	4	0.7	17.0	17.0	NA	12.5	8.0	6.5	8.5	5.2	10.5	9.0	14.8
	5	0.4	16.4	16.4	14.0	13.5	7.3	4.2	5.0	2.8	8.0	8.3	16.3
	6	0.1	17.0	16.4	17.0	NA	8.0	4.1	4.8	2.2	7.5	9.5	18.4
3	1	3.7	4.2	11.5	NA	13.0	2.9	1.8	0.6	2.5	0.5	1.3	11.5
	2	3.0	7.4	14.4	14.6	17.8	15.0	1.3	0.8	0.1	1.5	2.0	7.3
	3	2.4	17.5	18.8	17.5	16.0	17.5	14.0	12.7	8.0	11.5	10.8	17.4
	4	2.1	18.5	19.4	18.0	12.1	17.5	15.0	15.2	13.5	12.2	NA	17.6
	5	1.8	18.6	NA	18.2	12.7	18.0	14.5	14.7	13.3	17.6	15.8	17.6
	6	1.5	18.8	19.0	17.1	20.8	16.8	13.5	15.2	13.0	17.6	17.0	17.6
4	1	2.0	18.5	16.8	NA	12.2	7.9	NA	NA	NA	NA	NA	NA
	2	1.4	15.0	16.2	12.0	12.0	7.7	0.7	7.8	0.8	7.5	8.0	10.6
	3	0.8	12.8	15.0	10.5	9.5	4.3	0.5	3.8	0.4	4.2	7.0	8.5
	4	0.5	12.4	14.4	12.0	8.5	2.5	0.5	1.7	0.8	2.8	NA	7.8
	5	0.2	11.0	13.6	10.0	9.5	14.6	0.5	0.6	0.9	2.4	3.5	6.8
5	1	1.9	17.2	18.4	16.5	19.0	17.7	15.7	13.5	14.5	12.2	15.5	17.2
	2	1.3	16.8	18.0	14.6	19.2	10.1	4.6	8.1	4.2	9.0	NA	15.6
	3	0.7	16.6	18.0	14.6	19.5	10.6	4.6	8.1	3.3	10.0	12.5	15.1
	4	0.4	16.6	NA	15.0	19.3	10.7	4.5	8.1	3.2	9.5	NA	15.1
	5	0.1	16.5	17.6	NA	17.2	NA	NA	NA	NA	NA	NA	NA
6	1	2.5	17.1	18.2	NA	19.5	15.8	15.5	16.4	16.0	16.0	17.0	19.4
	2	1.9	18.0	19.2	NA	20.0	18.4	17.0	18.4	17.5	18.5	NA	19.8
	3	1.3	19.0	20.0	20.8	20.5	20.0	17.0	19.9	18.5	20.5	20.8	20.3
	4	1.0	19.2	20.0	20.8	20.5	19.1	17.5	18.4	17.0	19.5	NA	19.8
	5	0.7	19.0	NA	NA	20.5	19.5	16.0	17.6	15.5	19.2	NA	20.6
	6	0.4	19.5	NA	20.8	20.5	20.2	19.5	18.6	18.0	20.0	20.5	20.8

Table II-1
 Gas Phase Oxygen (%) - Pile 18A

Station	Port	Depth (m)	90/05/25	90/06/14	90/07/01	90/08/01	90/09/01	90/10/01
1	1	2.4	16.5	14.0	9.5	4.4	10.0	13.0
	2	1.3	18.5	18.8	16.7	13.7	15.0	17.0
	3	0.8	17.5	17.7	14.7	8.8	12.0	15.5
	4	0.2	15.0	12.5	8.0	3.5	7.6	12.0
2	1	2.6	NA	NA	NA	20.7	20.5	20.5
	2	2.0	16.2	19.0	17.1	17.5	20.0	16.5
	3	1.3	15.2	17.7	14.9	15.5	15.5	14.5
	4	0.7	17.0	10.9	14.4	5.2	6.0	8.5
	5	0.4	17.0	8.9		16.0	6.7	8.0
	6	0.1	20.0	9.0	12.2	6.2	8.6	9.3
3	1	3.7	7.0	0.4	7.0	5.9	9.0	14.0
	2	3.0	8.2	6.5	5.5	6.4	19.5	3.0
	3	2.4	12.0	16.4	14.0	13.0	13.0	14.0
	4	2.1	17.5	18.6	16.0	14.5	18.1	18.5
	5	1.8	17.0	18.3	15.5	14.0	17.5	18.5
	6	1.5	17.5	18.7	15.0	13.5	17.5	18.5
4	1	2.0	NA	NA	NA	20.0	19.0	19.0
	2	1.4	4.5	4.3	1.2	0.3	0.2	0.2
	3	0.8	3.0	4.5	1.1	0.7	0.5	0.1
	4	0.5	2.5	3.5	0.7	0.2	0.1	0.7
	5	0.2	2.5	4.0	0.4	0.7	0.3	0.5
5	1	1.9	13.5	18.0	16.8	4.8	7.0	8.9
	2	1.3	19.5	11.5	6.5	6.8	4.6	6.7
	3	0.7	19.5	11.8	6.0	7.1	4.6	6.4
	4	0.4	19.5	11.0	6.3	13.0	14.0	7.5
	5	0.1	NA	NA	NA	NA	NA	NA
6	1	2.5	18.5	17.5	18.2	17.3	16.2	17.0
	2	1.9	18.5	19.0	16.6	17.2	18.5	18.5
	3	1.3	19.0	19.8	19.5	18.5	19.5	19.5
	4	1.0	19.0	19.3	18.1	16.2	18.3	19.0
	5	0.7	19.0	18.2	16.5	16.0	17.5	10.5
	6	0.4	19.4	19.2	16.9	17.5	20.5	20.0

Table II-2
 Temperature (°C) - Pile 18A

Station	Port	Depth (m)	88/11/10	88/12/10	89/01/14	89/04/04	89/04/30	89/05/15	89/07/04	89/08/03	89/09/04	89/09/22	89/10/12
1	Red	3.6	13.0	12.6	8.8	5.0	2.5	3.9	9.2	11.8	20.5	20.1	18.3
	Blue	2.4	10.5	9.5	4.6	1.4	0.8	5.5	14.9	17.3	20.1	21.9	16.9
	Black	1.5	6.5	3.7	1.1	-0.1	0.3	8.0	19.3	23.4	19.8	19.8	10.3
	Surface	0.0	3.2	-7.5	-12.9	7.7	15.0	17.7	29.3	32.5	20.3	21.8	10.7
2	Red	2.4	12.7	13.6	9.0	4.7	4.0	3.9	8.7	12.0	20.4	13.8	14.1
	Blue	1.2	10.6	10.7	5.8	1.6	2.5	5.4	13.7	17.6	20.4	17.2	14.8
	Black	0.3	8.6	7.6	2.4	-0.7	0.3	6.9	17.7	21.2	18.8	18.8	13.1
	Surface	0.0	3.2	-7.3	-12.9	7.7	15.0	17.7	29.0	32.0	17.0	17.1	11.4
3	Red	2.3	9.8	9.9	5.7	3.1	2.2	5.6	13.0	17.3	14.8	13.5	12.4
	Blue	1.1	7.3	7.3	2.3	0.3	0.7	6.7	18.4	22.7	16.1	15.8	11.3
	Black	0.2	4.4	3.7	-3.4	0.1	-0.1	8.3	20.0	24.2	17.8	17.2	7.8
	Surface	0.0	3.2	-7.2	-12.9	7.7	15.0	17.7	29.0	32.0	17.0	16.4	11.7
4	Red	2.4	12.8	11.5	7.4	4.9	5.8	4.6	10.1	13.6	18.1	15.7	14.8
	Blue	1.2	4.6	7.3	1.8	0.9	2.8	6.2	17.2	20.0	18.8	18.6	13.6
	Black	0.2	5.4	2.5	-2.0	-0.9	1.9	7.8	19.0	23.1	18.5	18.3	8.3
	Surface	0.0	3.2	-7.2	-12.9	7.7	15.0	17.7	28.4	31.8	18.3	18.6	9.7
5	Red	2.4	12.8	10.8	7.4	3.9	4.5	3.9	10.3	13.7	18.9	15.4	14.7
	Blue	1.2	9.2	6.1	2.8	0.3	2.3	5.1	16.8	20.1	18.6	18.3	14.0
	Black	0.3	5.0	0.3	-3.4	-0.3	1.4	7.8	20.1	23.1	18.0	17.4	9.0
	Surface	0.0	3.2	-7.2	-12.9	7.7	15.0	17.7	28.6	32.7	20.3	21.9	9.9
6	Red	2.1	8.6	6.9	3.3	0.7	2.0	2.6	11.6	14.7	17.9	14.4	12.0
	Blue	0.9	6.6	2.2	1.8	0.2	1.5	4.9	16.2	19.5	18.0	15.9	9.5
	Black	0.3	4.7	-2.1	-6.8	0.8	2.1	6.8	18.1	21.8	18.7	16.8	7.7
	Surface	0.0	3.2	-7.2	-12.9	7.7	15.0	17.7	29.0	33.0	20.3	25.1	10.3

Table II-2
 Temperature (°C) - Pile 18A

Station	Port	Depth (m)	89/11/22	89/12/29	90/04/01	90/05/01	90/06/01	90/07/01	90/08/01	90/09/01	90/10/01
1	Red	3.6	15.7	12.1	6.5	9	8.6	14.8	18	18.6	17.2
	Blue	2.4	12.1	8.2	5.2	8.3	11.8	19.7	22.1	18.6	16.1
	Black	1.5	5.0	6.8	5.5	6.3	16.9	23.0	20.4	15.1	11.5
	Surface	0.0	-4.5	-14.2	10.3	21.8	20.3	26.4	24.8	20.9	17.1
2	Red	2.4	14.1	12.4	6.4	7.4	7.7	11.4	12.2	14.2	14.4
	Blue	1.2	12.5	9.7	5.0	8.1	10.4	15.9	19	16.5	15.2
	Black	0.3	10.0	6.9	4.8	7.3	13.5	20.0	22.2	16	14
	Surface	0.0	-4.0	-14.2	10.9	19	22.6	24.8	25	21.8	17
3	Red	2.3	11.8	9.8	5.1	7.5	8.4	11.2	14.6	12.9	12.8
	Blue	1.1	9.1	6.1	4.2	7.3	12.1	16.9	19.5	12.8	12.2
	Black	0.2	4.4	2.5	5.6	6.6	20.4	23.1	19.9	12	9.8
	Surface	0.0	-5.1	-14.2	13.6	21.8	24.1	27.3	30	22.8	16.9
4	Red	2.4	13.9	12.1	6.1	7.7	9.2	12.3	14	15.7	15.7
	Blue	1.2	10.2	7.8	4.3	7.2	13.2	18.8	20.1	16.1	14.6
	Black	0.2	4.1	3.3	4.8	5.6	19.1	22.7	19.6	13.7	10.7
	Surface	0.0	-3.8	-	10.1	14.8	24.8	21.6	24.6	21.3	17.1
5	Red	2.4	13.2	14.0	5.4	7.8	9.5	12.6	15.1	16.3	15.5
	Blue	1.2	9.8	9.5	3.9	7.5	13.5	18.9	21	16.7	14.6
	Black	0.3	3.2	4.1	4.3	6.9	20.2	23.1	19	14.7	11.4
	Surface	0.0	-3.6	-14.4	11.0	17.5	26.1	24.1	29.6	21.5	17.1
6	Red	2.1	9.6	9.0	2.8	6.7	9.5	13.3	16.9	14.2	13
	Blue	0.9	6.4	4.7	2.6	6.3	14.3	19.2	20.4	13.6	11.4
	Black	0.3	3.3	1.1	3.2	6.2	18.8	21.7	19.9	13.7	10.3
	Surface	0.0	-4.2	-	8.2	21.1	25.0	23.2	25.5	25.2	17.1

APPENDIX III

Monitoring Data - Pile 18B

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Figure II-1
Oxygen Data, Pile 18A, Station 1

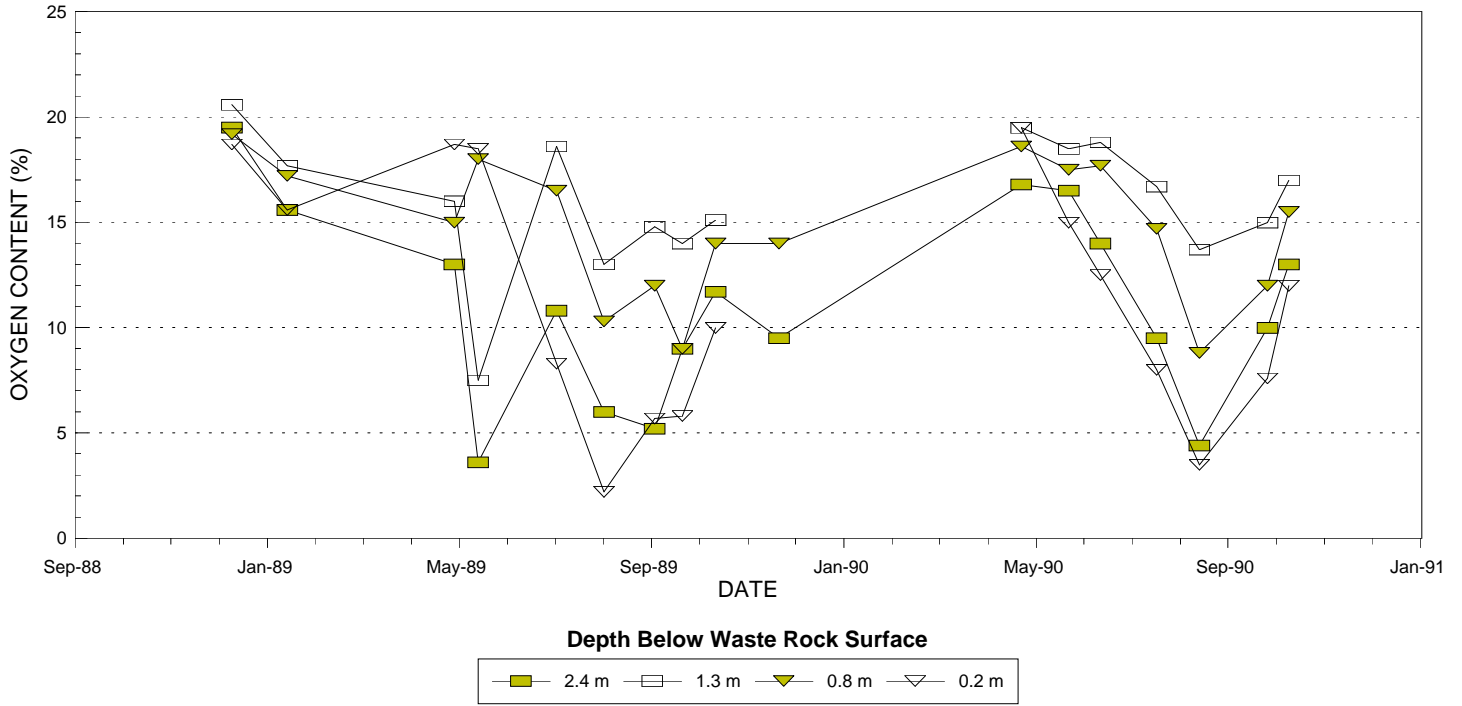


Figure II-2
Oxygen Data, Pile 18A, Station 2

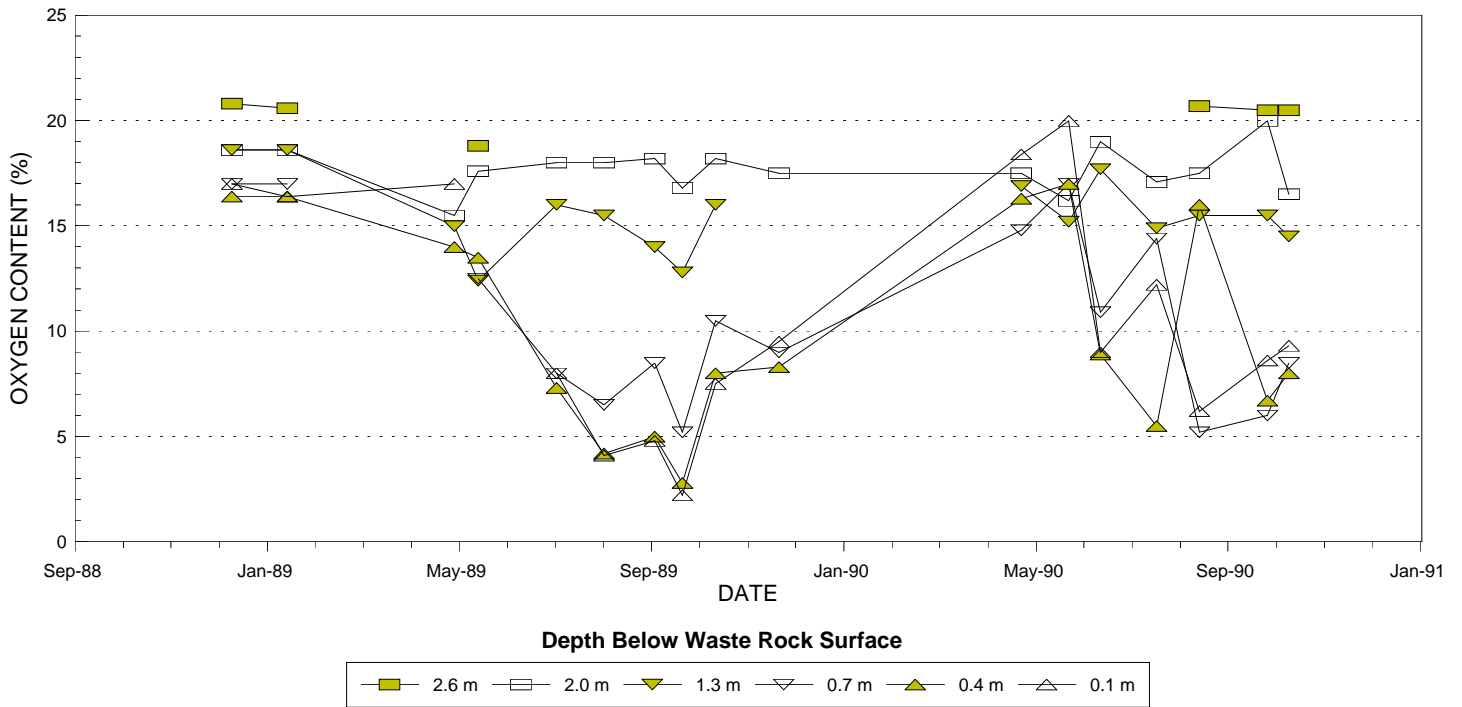


Figure II-3
Oxygen Data, Pile 18A, Station 3

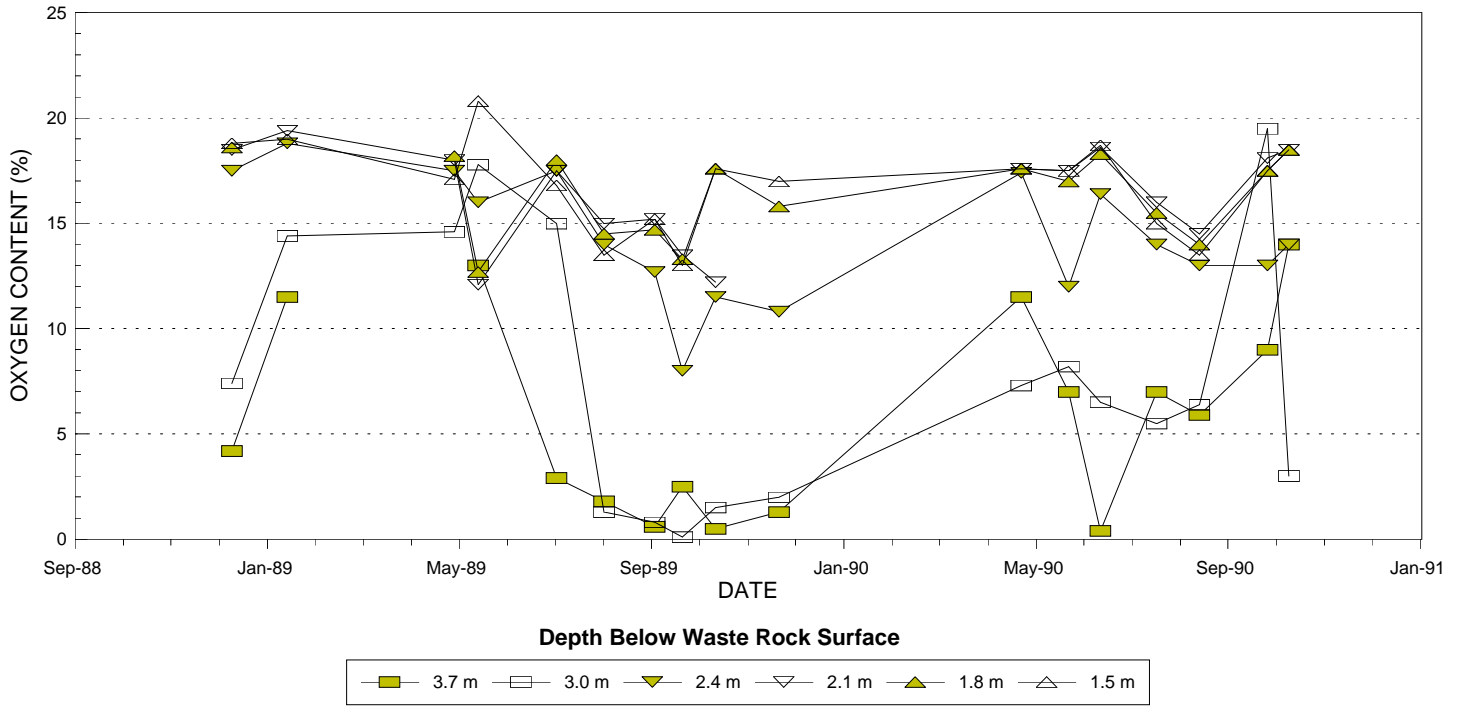


Figure II-4
Oxygen Data, Pile 18A, Station 4

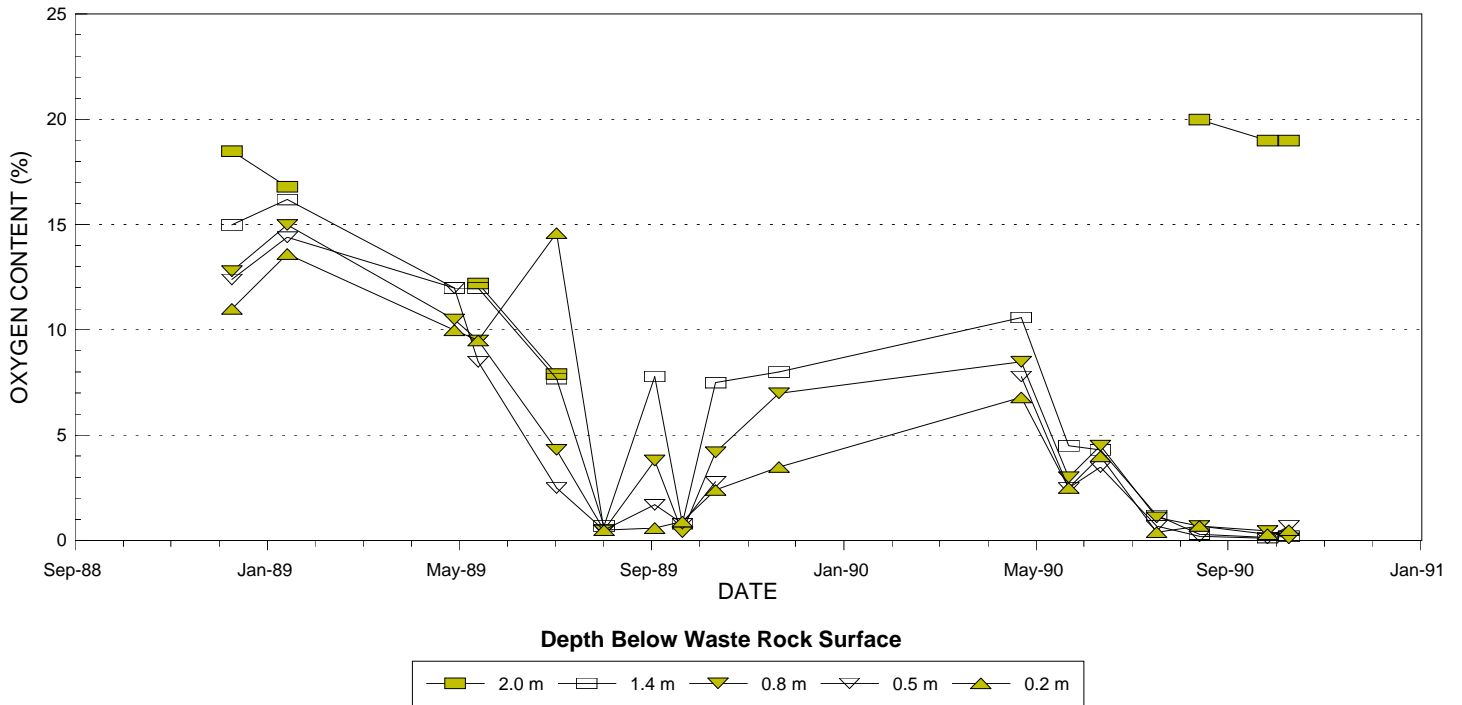


Figure II-5
Oxygen Data, Pile 18A, Station 5

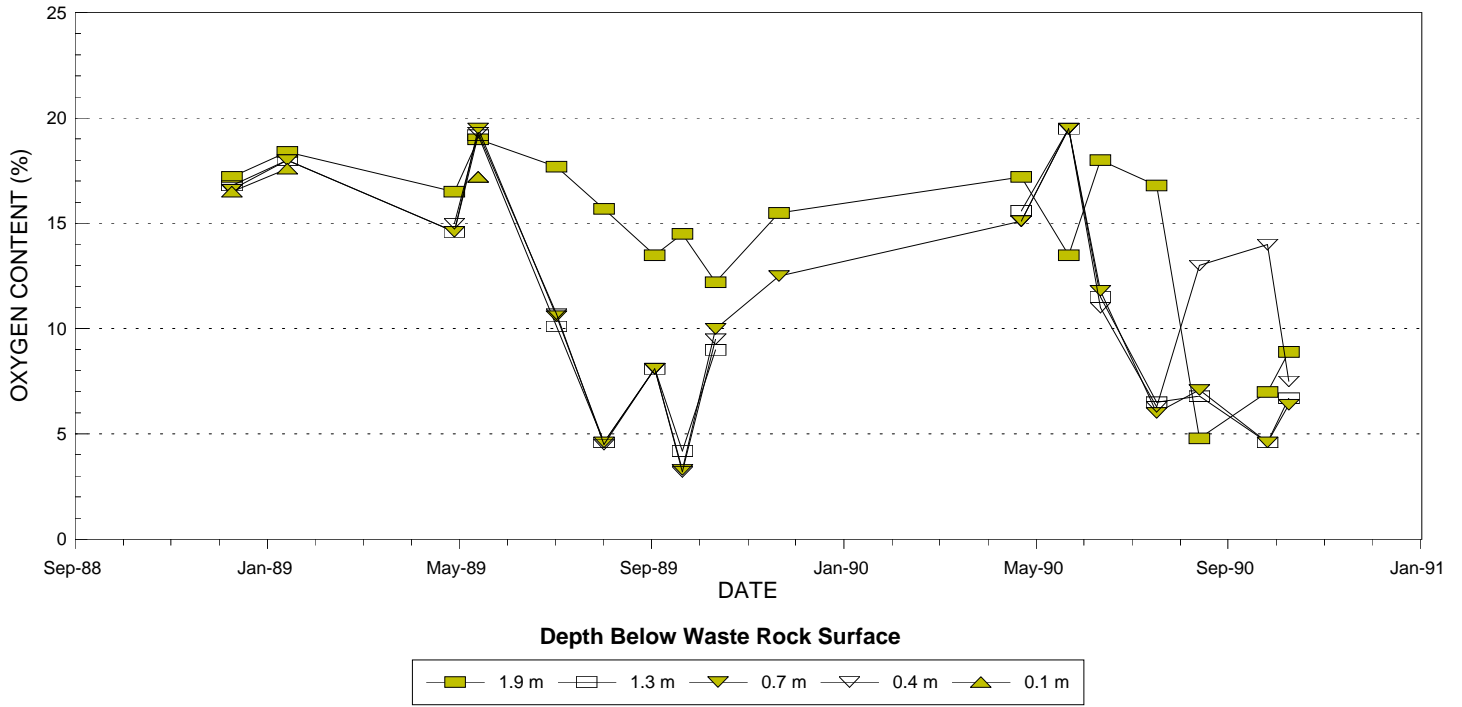


Figure II-6
Oxygen Data, Pile 18A, Station 6

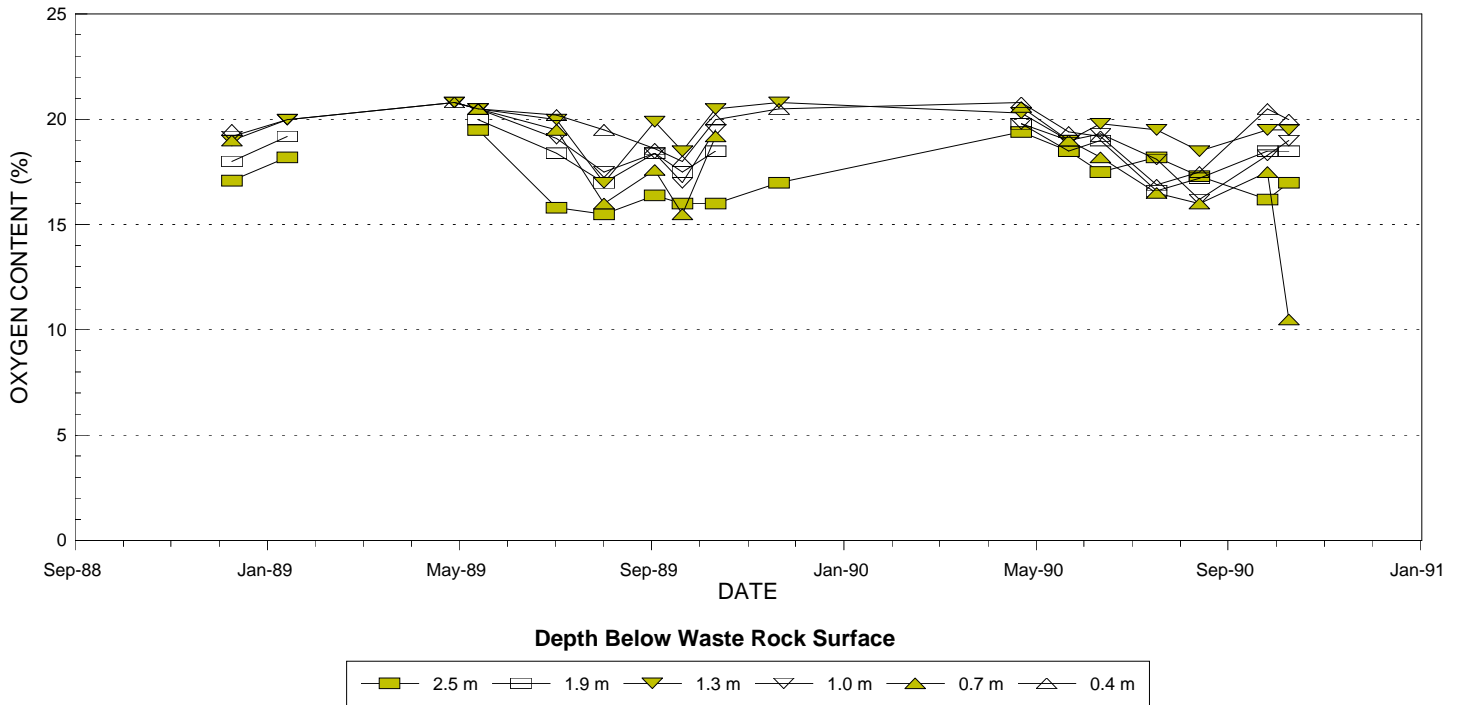


Figure II-7
Temperature Data, Pile 18A, Station 1

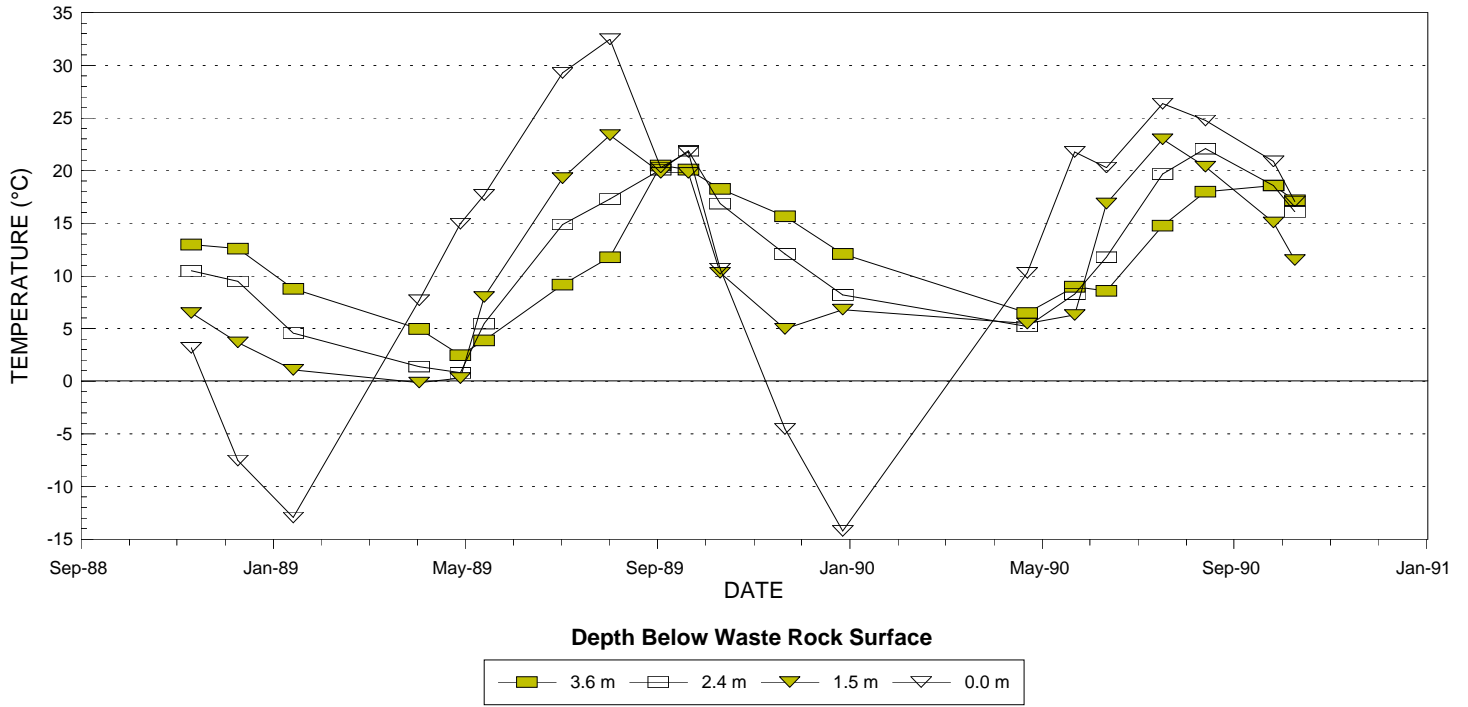


Figure II-8
Temperature Data, Pile 18A, Station 2

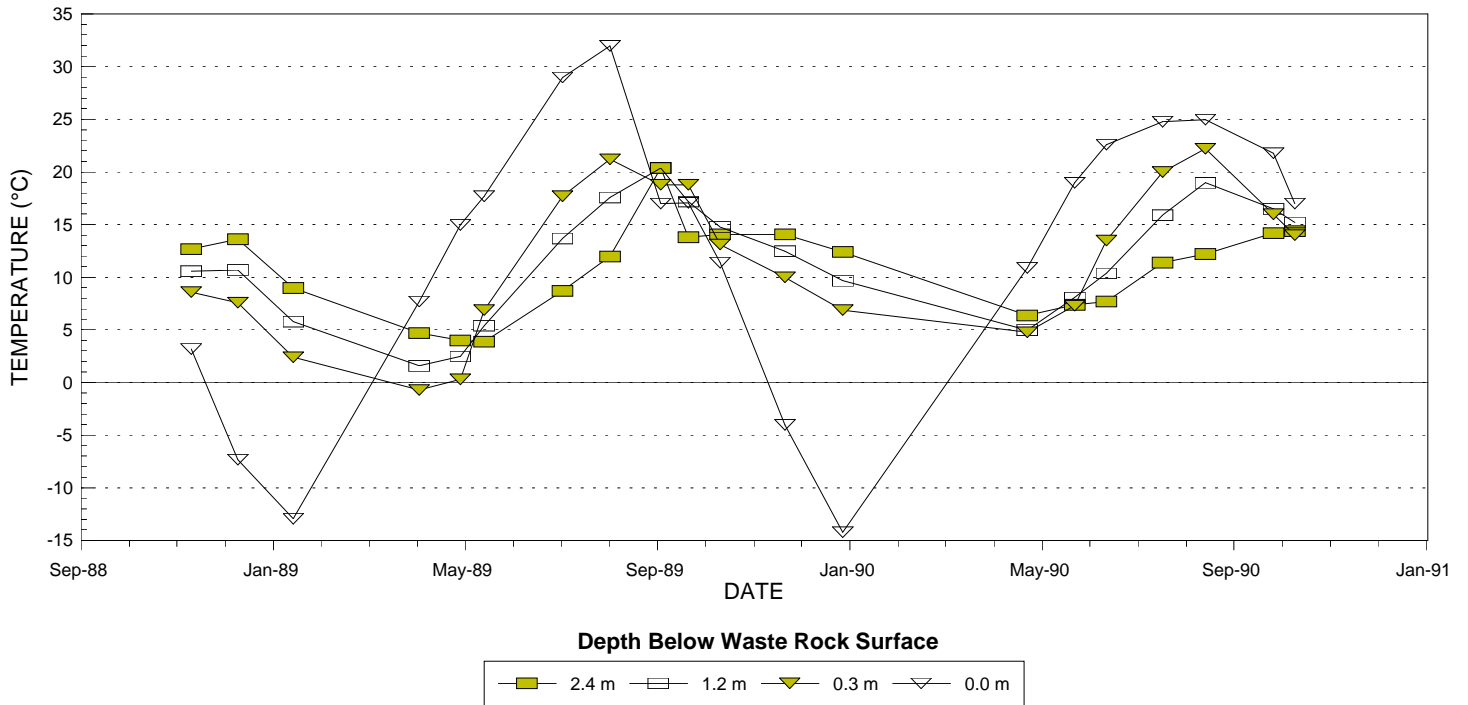


Figure II-9
Temperature Data, Pile 18A, Station 3

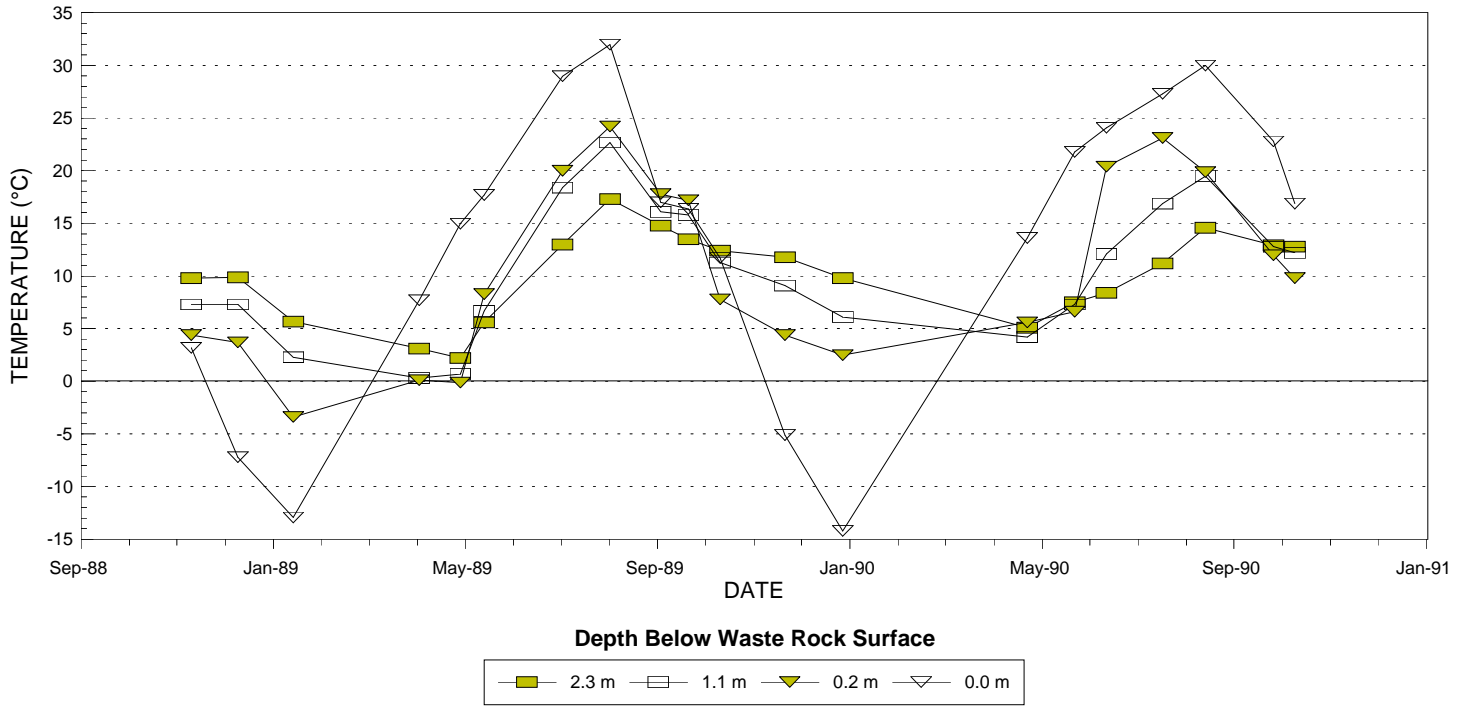


Figure II-10
Temperature Data, Pile 18A, Station 4

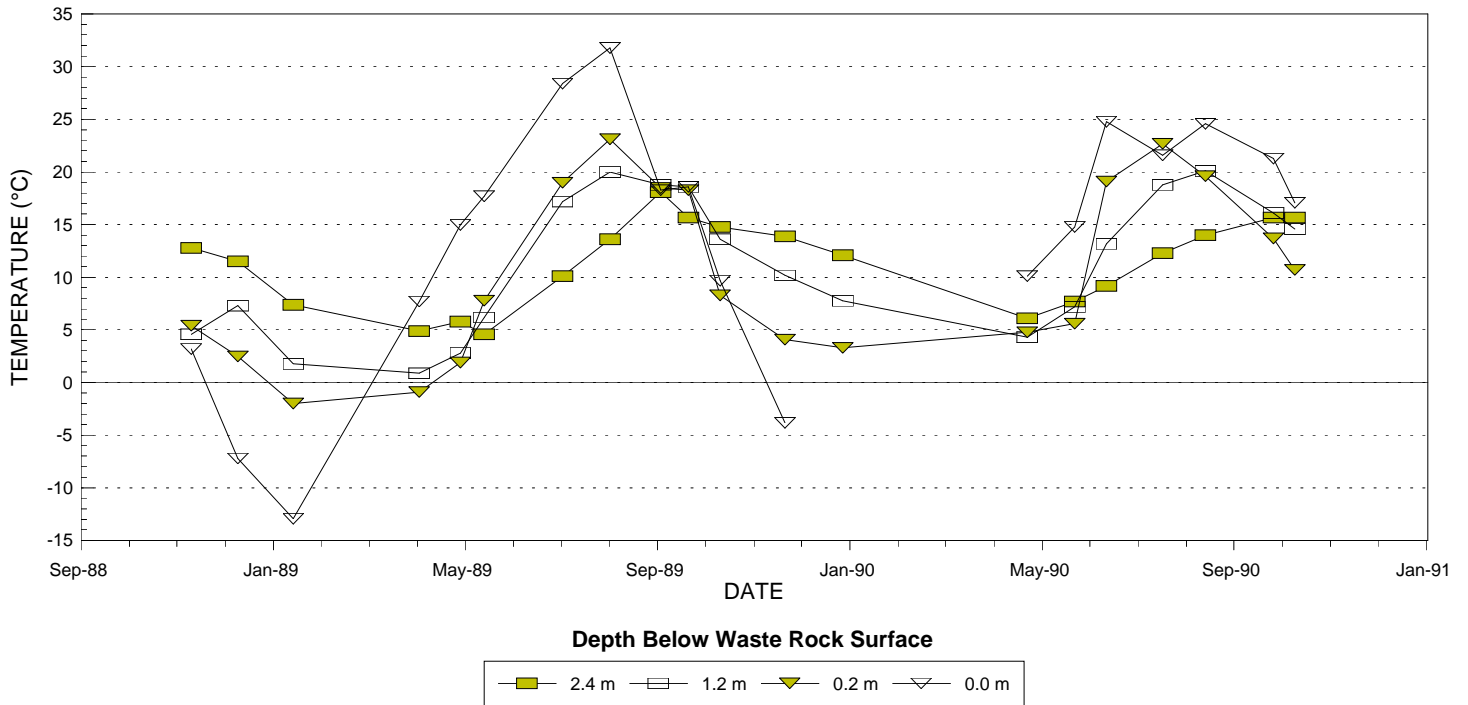


Figure II-11
Temperature Data, Pile 18A, Station 5

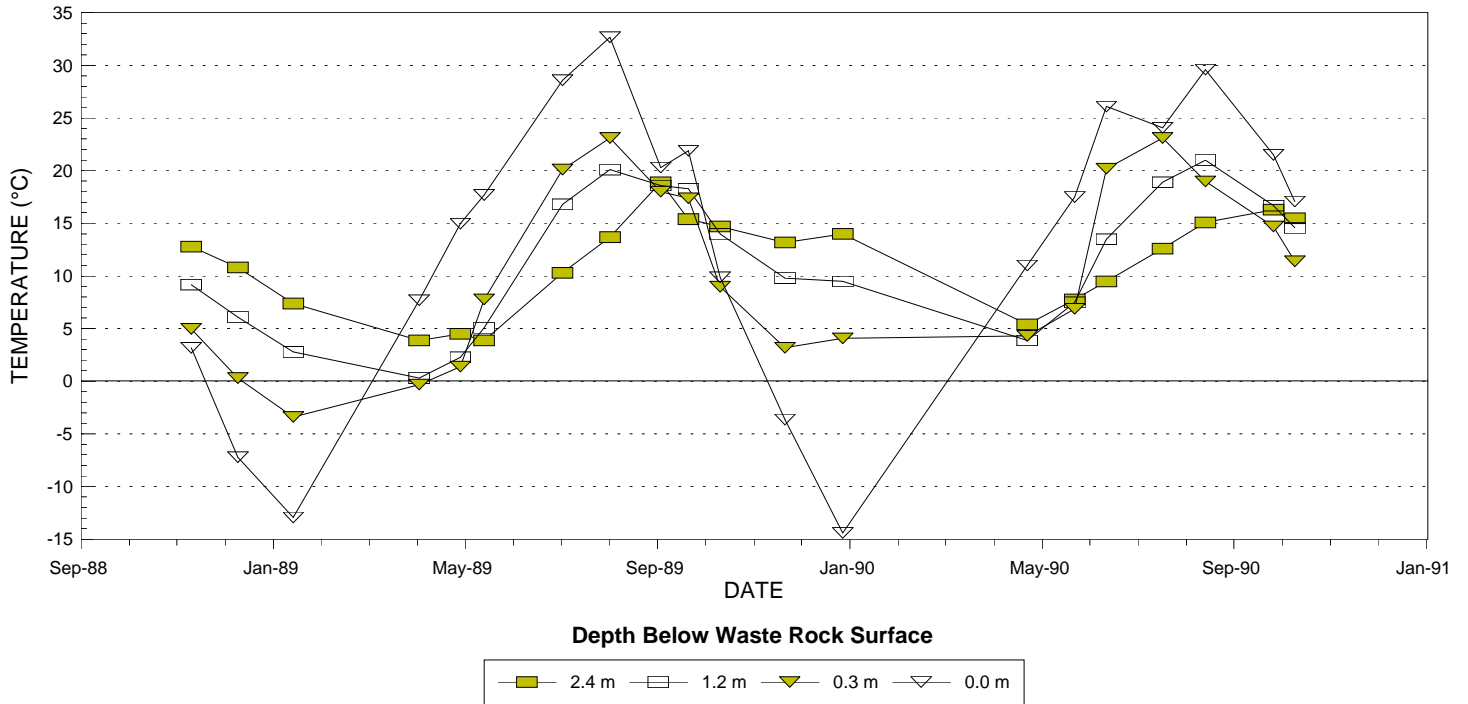


Figure II-12
Temperature Data, Pile 18A, Station 6

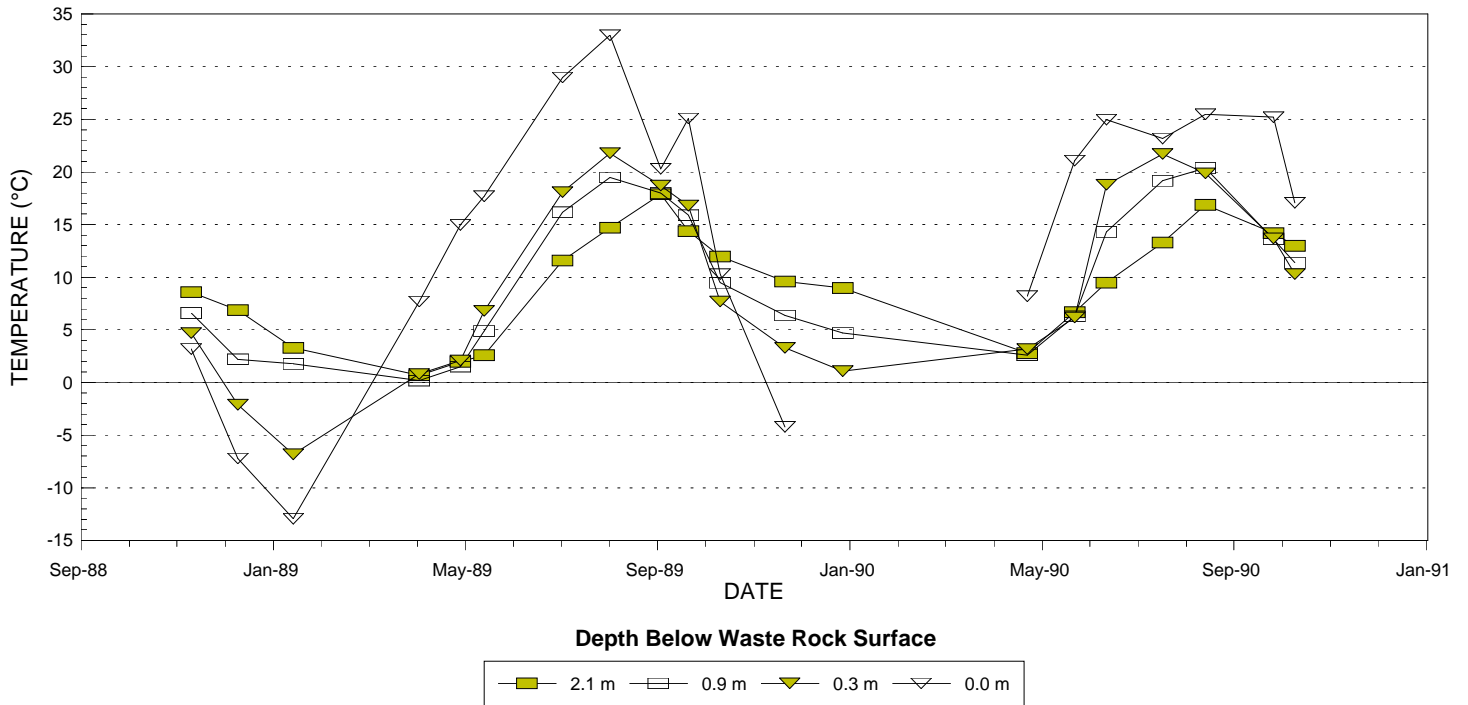


Table III-1
Gas Phase Oxygen (%) - Pile 18B

Station	Port	Depth (m)	88-12-10 (YY-MM-DD)	89-01-14	89-02-17	89-04-30	89-05-15	89-07-04	89-08-03	89-09-04	89-09-22	89-10-13	89-11-22	90-04-25	90-05-25	90-06-14	90-07-20	90-08-16	
1	1	3.2	19.8		20.5		19.2	18.8				19.0	19.5					19.8	
	2	2.6	19.8	19.8	19.9	19.6	19.6	20.0	19.5	20.0	19.2	19.8		20.5	20.5	19.8	19.0	18.6	
	3	2.0	19.4	19.6	19.6	19.5	19.6	20.4	19.0	20.0	19.5	20.0	20.5	20.5	20.5	19.8	19.4	18.5	
	4	1.4	19.4	19.6	19.2	19.7	19.6	20.5	19.5	20.2	19.5	20.2		20.6	20.5	19.8	19.4	18.6	
	5	0.8	19.6	19.6	19.6	20.0	19.8	20.4	19.5	20.1	19.5	20.4		20.7	20.8	19.8	19.2	18.5	
	6	0.2	19.6	20.2	19.4	20.0		20.3	19.5	20.5	20.0	20.6	20.8	20.7	20.8	20.0	19.0	18.5	
2	1	4.6	18.6	18.6	19.6		18.8	17.1	12.0	13.5	11.7	15.5	16.0	20.0	20.5	19.6	17.2	11.5	
	2	4.0	18.4	18.6	18.7	18.0	19.0	16.4	11.5	13.3	11.2	15.5		20.0	20.2	19.2	16.0	12.0	
	3	3.4	18.4	19.2	18.7	18.0	18.8	16.6	9.5	13.5	10.5	18.7	18.0	20.0	20.0	19.0	14.1	10.3	
	4	2.7	18.5	19.4	18.6	19.2	18.8	16.6	9.4	14.5	11.0	18.5		20.3	20.2	19.3	15.0	10.5	
	5	2.1	18.5	17.8	18.5	18.5	18.5	18.5	13.6	7.6	14.5	10.0	18.2	20.0	20.1	17.5	11.7	9.7	
	6	1.5	18.4	16.5	17.5	17.0	17.6	17.6	7.7	4.2	12.5	7.0	17.4	15.8	19.9	19.9	14.0	7.9	8.5
	7	0.9							5.9	2.8	15.9	7.0	17.4		19.6	19.0	9.8	4.0	6.7
3	1	4.6	18.5			19.6	19.0	19.5	14.0	17.1	14.5	14.5	17.0	20.0	20.5	20.0	17.5	11.0	
	2	4.0	18.5		19.6		19.3	18.7	11.5	12.0	12.7	13.5		20.1	20.5	19.8	17.4	10.9	
	3	3.4	18.3	19.0	19.4	19.2	19.0	18.2	9.0	12.0	15.0	12.7	11.8	20.0	20.5	19.8	16.2	10.0	
	4	2.7	17.8	17.6	18.3	18.5	18.5	16.0	8.0	11.0	10.7	12.7		19.9	20.0	19.0	15.5	9.0	
	5	2.1	17.6		16.5	17.6	17.1	10.2	4.9	9.0	6.6	11.2	10.5	19.7	19.5	17.7	16.0	7.0	
	6	1.5	15.4	11.2	11.5	16.7	15.8	5.5	0.9	6.7	3.1	7.5		19.3	19.0	13.5	7.1	4.2	
	7	0.9	15.5	9.8	8.0		13.9	5.2	0.2		2.6	4.5	7.7	18.9	18.5	9.0	2.8	1.9	
4	1	4.6	1.5			16.6	17.6	9.6	5.1	10.1	6.6	15.2	13.0	18.5	19.3	13.2	9.0	8.2	
	2	4.0	14.4			18.0	18.0	12.8	5.1	10.4	6.3	15.2		19.0	19.1	13.3	9.0	7.3	
	3	3.4	16.5			18.6	18.3	8.0	4.8	9.9	6.3	15.0	15.5	19.6	19.0	10.8	6.0	6.2	
	4	2.7	17.5	16.6		18.5	18.2	6.8	3.6	8.8	4.8	13.5		19.7	17.0	9.5	6.5	6.5	
	5	2.1	16.5	16.4		17.5	17.5	5.1		6.0	3.0	13.5	14.5	19.2	15.0	9.3	2.5	1.8	
	6	1.5	16.4			14.6	13.8	1.1	0.1	1.0	0.2	14.5	11.3	17.1	13.0	5.5	1.0	2.1	
	7	0.6																	
5	1	3.7	1.1	0.9			3.9	1.7	0.5	1.3	0.3	1.0	1.0	7.4	5.0	16.5	4.0	10.5	
	2	3.1	1.9			7.8	8.7	4.1	2.0	2.8	2.3	3.0	2.5	9.7	7.0	8.5	4.0	4.3	
	3	2.5	3.2	6.8		7.0	6.6	3.1	1.2	2.5	0.6	2.5		9.9	10.0	10.1	3.7	4.2	
	4	1.9	3.4	11.5		8.6	8.8	1.5	0.1	1.4	2.0	6.0	5.0	12.2	15.2	11.5	5.5	3.6	
	5	1.2	10.2	15.0		12.0	11.5	4.6	3.2	8.0	4.2	10.5		14.1	15.8	11.5	6.3	6.5	
	6	0.6	11.5	15.0		14.0	15.7	2.7	2.4	8.3	3.8	10.2	11.5	14.0	18.0	10.0	6.0	5.4	
	7	0.1	11.5	20.0		20.5	20.8	20.5	17.0	19.4	15.2	19.0	20.0	20.5	20.5	20.8	20.8	20.0	
6	1	4.3	2.7	7.7		4.1	8.0	3.2	1.0	2.7	1.5	4.2	5.0		5.0	9.8	5.2	1.5	
	2	3.7	3.7	8.8		5.0	9.9	5.5	3.0	5.0	1.9	4.5		7.5	6.0	10.5	5.6	3.4	
	3	3.0	6.0	11.8		5.6	11.8	7.6	4.1	9.0	5.4	9.5	8.0	9.6	11.2	9.8	6.6	3.7	
	4	2.4	17.0	18.2		10.0	12.0	8.0	4.8	11.0	4.0	15.0		12.6	15.5	10.0	7.5	4.5	
	5	1.8	16.0	18.6		13.0	15.5	12.0	4.5	11.0	7.6	14.5	15.5	13.5	16.5	10.5	7.4	8.7	
	6	1.2	16.8	18.6		14.0	15.8	15.0	7.1	13.0	9.5	15.5		15.0	17.5	17.5	10.0	5.0	
	7	0.6	16.5	18.8		15.0	15.5	13.9	9.5	14.9	14.2	16.5	16.8	16.0	17.8	14.5	10.0		

Table III-1
Gas Phase Oxygen (%) - Pile 18B

Station	Port	Depth (m)	90-09-28	90-10-12	91-04-11	91-05-22	91-06-19	91-07-19	91-08-21	91-10-22	92-03-17	92-04-22	92-05-26	92-06-29	92-07-15	92-08-17	92-09-29	92-10-19	
1	1	3.2	20.5	20.7		21.0		20.8			21.0								
	2	2.6	19.5	20.0	20.0	19.5	20.0		20.0	21.8			20.0	20.2	19.6	20.5	20.5	20.4	
	3	2.0	19.3	20.0	20.0	19.5	20.2	20.0	20.0	21.8	17.5		18.0	20.2	19.3	20.5	20.6	20.5	
	4	1.4	19.5	20.0	20.0	19.5	11.0	20.0	20.0	21.8			19.2	20.3	19.2	20.2	20.8	20.5	
	5	0.8	19.3	20.0		20.0	11.0	20.0	20.0	21.8			19.0	20.5	19.3	20.2	20.8	20.3	
	6	0.2	19.3	20.2	20.5	20.0		20.5	20.0	21.8		16.5		19.0	20.8	20.5	20.8	20.8	20.7
2	1	4.6	17.5	18.7	19.5	18.5	19.5	16.0	17.5	20.0			20.0	16.2	16.0	15.2	19.2	19.7	
	2	4.0	17.7	18.5	19.5	18.5	19.0	14.5	17.0	10.0			20.0	16.0	15.3	16.1	19.1	19.6	
	3	3.4	17.7	18.5	19.0	19.0	19.5	11.5	16.5	20.0			20.0	14.8	13.9	13.8	18.7	19.3	
	4	2.7	17.5	18.5	19.0	19.0	19.5	10.5	17.0	20.0			20.0	14.0	15.5	14.4	18.7	19.9	
	5	2.1	16.5	18.0	19.0	19.0	17.0	7.0	17.0	20.0			20.0	13.0	13.1	12.8	18.4	20.1	
	6	1.5	15.5	17.0	19.0	18.5	13.5	4.7	17.0	20.0			20.0	12.0	12.5	11.4	17.7	19.9	
	7	0.9	14.0	16.0	15.0	17.5	13.0	11.5	16.5	19.5			20.0	16.5	14.4	18.0	18.9	19.3	
3	1	4.6	13.0	16.2		17.5	20.2	17.5	18.0	20.0				17.5	15.7	15.7	19.9	19.9	
	2	4.0	13.0	18.0	20.0	17.5	20.0	16.0	16.5	20.0			20.5	17.1	14.1	14.7	19.6	19.9	
	3	3.4	17.0	18.0	19.5	17.5	20.0	14.0	15.5	20.0			20.5	16.0	12.2	13.7	19.5	19.8	
	4	2.7	11.0	17.0	19.0	18.0	15.5	10.5	14.0	19.5			20.5	15.5	11.3	12.9	19.3	19.6	
	5	2.1	10.5	16.5	18.0	17.5	8.4	3.8	13.0	19.0			19.5	13.5	9.6	11.5	19.2	19.2	
	6	1.5	10.7	15.5	18.5	16.5	6.8	1.4	10.5	18.5			18.5	8.6	7.0	6.8	18.5	19.0	
	7	0.9	11.0	15.0	17.5	14.0	10.0	3.3	8.6	17.0			17.0	5.1	4.2	4.7	17.0	17.7	
4	1	4.6	10.5	14.0	18.0	14.5	11.5	11.2	12.0	14.0		20.0	18.5	11.6	9.1	9.9	18.0	16.1	
	2	4.0	9.8	13.5	18.0	14.0	11.2	8.8	10.5	14.0		20.0	18.0	10.4	7.3	7.9	17.9	15.4	
	3	3.4	9.4	12.5	19.0	13.5	10.0	6.0	8.8	14.0		19.5	17.5	8.1	5.9	9.6	17.7	14.7	
	4	2.7	8.4	12.0	19.0	11.0	8.6	4.3	7.1	14.5		20.0	15.5	6.0	5.2	4.6	17.6	12.3	
	5	2.1	6.4	10.5	18.0	7.5	6.2	2.0	4.3	13.5		19.5	14.5	3.9	2.8	4.5	16.8	10.2	
	6	1.5	1.2	5.3	13.5	5.0	3.0	0.7	0.2	8.8		19.0	11.5	0.5	0.9	3.0	15.6	6.4	
	7	0.6			11.5		3.0	1.4	0.1	6.5	17.5	18.0	8.1	0.1	0.2	5.2	15.3	3.7	
5	1	3.7	1.7	2.9	15.0	8.5	2.8	3.8		6.5	9.8		6.0	2.9	1.2	1.5	16.6	3.0	
	2	3.1	3.8	4.5	7.2	7.5	4.4	4.0	5.2	4.9	6.0	19.5	8.8	5.0	3.7	3.8	17.4	4.9	
	3	2.5	4.2	4.5	7.8	9.0	5.5	4.5	5.8	6.1	8.2	19.5	10.5	4.6	4.1	7.2	17.5	7.9	
	4	1.9	7.2	7.1	8.0	11.5	9.2	21.5	8.1	9.7	12.5	19.5	12.5	6.0	6.6	6.1	17.9	12.4	
	5	1.2	10.5	9.2	11.5	14.0	14.5	7.0	9.8	12.5	8.5	19.5	14.5	6.9	6.6	7.2	18.3	14.6	
	6	0.6	9.6	8.9	11.5	16.0	17.5	6.8	8.2	12.5	7.4	19.5	13.5	5.8	5.4	6.0	18.0	14.3	
	7	0.1	19.7	19.5	20.0		21.0	21.7	20.5	21.8	20.0		20.8	20.8					
6	1	4.3	13.7	4.4			18.0	20.0	9.6		20.0				3.5	4.7	18.4	5.2	
	2	3.7	7.6	4.3	6.0		12.5	9.3	9.6	5.2	18.5	21.8	12.5	5.1	7.4	6.5	18.5	6.0	
	3	3.0	12.0	8.1	5.3		13.5	7.1	4.7	1.5		21.8	15.5	5.5	4.2	7.0	18.4	6.5	
	4	2.4	13.5	12.0	13.5		13.0	7.2	8.6			19.0	21.8	13.5	5.0	4.8	9.5	19.1	10.8
	5	1.8	14.0	11.5	20.8		14.0	7.0			21.8	20.0	21.8	14.5	8.4	6.7	10.3	19.4	13.6
	6	1.2	14.7	13.5			16.0	10.5	11.5	21.8	19.0	21.8	16.0	13.7	11.6	11.3	19.7	15.8	
	7	0.6		14.0	14.5		14.5	7.3	12.0	17.5	15.0	21.8		11.9	12.2	11.0	20.1	16.7	

Table III-1
Gas Phase Oxygen (%) - Pile 18B

Station	Port	Depth (m)	92-11-03	93-03-19	93-04-24	93-05-21	93-07-13	93-09-10	93-10-01	93-10-26	93-11-29	93-12-22	93-10-01	93-11-29	93-12-22	94-02-18	94-03-30	94-05-03
1	1	3.2																
	2	2.6	20.3	17.5	20.5	19.2	19.5	19.5	20.8	20.5	21.4	20.3	20.8	21.4	20.3	18.7	12.2	20.4
	3	2.0	20.4	17.8	20.5	19.7	19.5	19.7	20.8	20.3	21.4	20.3	20.8	21.4	20.3	18.7	12.1	20.2
	4	1.4	20.5	17.8	20.6	19.6	19.5	19.7	20.8	20.6	21.3	20.4	20.8	21.3	20.4	18.8	12.4	20.0
	5	0.8	20.5		20.6	19.8	19.6	19.6	20.8	20.6	21.4	20.5	20.8	21.4	20.5	18.9	12.0	19.8
	6	0.2	20.6		20.8	20.6	20.8	20.8	21.5	20.7	21.6		21.5	21.6				19.7
2	1	4.6	20.0	17.4	20.0	19.3	17.9	18.2	19.6	19.7	21.6	19.6	19.6	20.6	19.6	18.1		17.3
	2	4.0	19.9	17.5	20.4	19.4	17.0	17.9	19.7	19.6	20.7	19.6	19.7	20.7	19.6	18.5		19.3
	3	3.4	19.8	17.0	20.4	19.4	16.1		20.1	19.9	20.9	19.7	20.1	20.9	19.7	19.0		19.9
	4	2.7	19.9	17.0	20.5	19.3	16.9	19.8	20.3	18.5	20.8	19.9	20.3	20.8	19.9	18.8		20.2
	5	2.1	19.9	15.9	20.7	19.1	15.6	17.7	20.1	18.6	20.6	19.9	20.1	20.6	19.9			20.0
	6	1.5	19.8	13.7	20.8	18.9	13.2	17.0	20.0	19.4	20.4	19.7	20.0	20.4	19.7	17.3		19.7
	7	0.9	19.6	10.0	20.8	18.1	10.5	15.9	19.3	19.6	20.1	19.0	19.3	20.1	19.0			
3	1	4.6	20.3	16.9	20.4	19.9	16.7	18.0	16.8	18.0	18.3	19.1	16.8	18.3	19.1	15.4		16.8
	2	4.0	20.2	17.2	20.4	19.8	17.1	17.2	15.7	17.2	18.7	19.1	15.7	18.7	19.1	15.7		17.0
	3	3.4	20.2	17.2	20.4	19.7	16.8	15.4	16.0	15.4	18.9	19.3	16.0	18.9	19.3			17.3
	4	2.7	20.0	15.6	20.3	19.3	15.7	14.0	15.8	14.0	18.0	19.5	15.8	18.0	19.5			17.2
	5	2.1	19.6	10.6	20.0	18.1	12.3	13.3	15.2	13.3	18.4	19.2	15.2	18.4	19.2			16.9
	6	1.5	19.0	5.2	19.3	16.1	7.0	10.3	15.8	10.3	17.9		15.8	17.9				16.7
	7	0.9	18.4		19.0	14.7	3.6	7.7	16.3	7.7	15.8	18.8	16.3	15.8	18.8		2.3	17.3
4	1	4.6	16.3	11.4	18.7	16.9	10.2	9.8	12.9	9.8	17.4	18.3	12.9	17.4	18.3	15.3	11.3	16.7
	2	4.0	17.1	12.6	19.2	17.4	9.4	8.5	12.7	8.5	17.5	18.5	12.7	17.5	18.5	15.1	11.6	16.5
	3	3.4	17.7	13.6	19.7	16.8	7.6	6.9	12.4	6.9	17.4	18.9	12.4	17.4	18.9	14.8	12.1	16.4
	4	2.7	16.9	14.8	19.8	14.7	5.8	5.3	11.5	5.3	17.1	18.9	11.5	17.1	18.9			16.3
	5	2.1	15.2		19.1	12.4	3.4	3.4	9.7	3.4	16.2		9.7	16.2			11.0	15.9
	6	1.5	12.3	9.7	16.6	8.6	0.5	0.7	4.8	0.7	14.8	19.1	4.8	14.8	19.1	14.0	6.8	13.9
	7	0.6	11.2	5.4	15.4	5.2	0.0	0.5	1.2	0.5	13.4		1.2	13.4		13.7	4.0	13.0
5	1	3.7	1.5	1.8	7.8	6.6	1.6	2.4	3.0	2.4	2.5	2.7	3.0	2.5	2.7	2.0	0.6	3.7
	2	3.1	4.2		9.9	7.9	4.0	4.6	6.3	4.6	5.3	5.0	6.3	5.3	5.0	5.6	1.4	6.1
	3	2.5	6.6	6.7	10.3	8.8	4.8	5.3	7.9	5.3	9.0	7.8	7.9	9.0	7.8	9.4	2.0	7.8
	4	1.9	10.8	8.2	11.5	10.4	6.6	7.3	11.3	7.3	12.4	10.7	11.3	12.4	10.7	11.9	2.6	10.9
	5	1.2	13.6	7.6	12.7	11.3	7.2	8.1	14.2	8.1	13.8	11.5	14.2	13.8	11.5	11.2	2.7	12.7
	6	0.6	13.8		12.8	11.0	4.6	7.1	14.1	7.1	13.1	10.8	14.1	13.1	10.8			14.1
	7	0.1																
6	1	4.3	3.9		9.6	9.7	4.9	1.7	4.5	1.7	4.4	2.8	4.5	4.4	2.8	16.2	12.7	
	2	3.7	4.3		9.8	9.9	5.4	1.8	5.0	1.8	8.0	3.1	5.0	8.0	3.1	17.4	12.2	9.0
	3	3.0	8.1	18.1	10.9	10.8	5.3	3.0	8.9	3.0	14.9	5.9	8.9	14.9	5.9	18.8	13.3	9.6
	4	2.4	16.0	16.9	11.5	11.8	5.1	6.3	12.8	6.3	17.5	15.1	12.8	17.5	15.1	18.9	15.2	10.1
	5	1.8	15.9		15.8	NA	5.8	6.2	12.7	6.2	17.5	14.9	12.7	17.5	14.9	18.9	15.2	13.1
	6	1.2	16.7		17.3	14.2	7.8	8.0	15.1	8.0	17.9	14.7	15.1	17.9	14.7	18.4	9.4	17.1
	7	0.6	18.2			14.2	7.1	9.1	17.8	9.1	18.2	14.6	17.8	18.2	14.6	17.4	5.3	19.2

Station	Port	Depth (m)	94-06-08	94-07-12	94-08-15	94-09-20	94-11-16	95-04-13	95-06-07
1	1	3.2							
	2	2.6	20.1	19.0	19.5	19.9	19.8	19.9	20.7
	3	2.0	20.1	19.0	19.7	19.9	20.1	19.9	20.8
	4	1.4	20.2	19.0	19.7	19.9	20.0	19.8	20.7
	5	0.8	20.3	19.0	19.6	20.0	20.3	19.6	20.9
	6	0.2	20.5	20.2	20.6	21.0	20.8		
2	1	4.6	18.9	15.5	13.5	16.8	18.2	18.6	20.0
	2	4.0	18.8	14.3	12.2	16.5	18.3	19.1	19.9
	3	3.4	17.9	12.1	10.7	17.2	18.3	19.4	20.0
	4	2.7	17.9	11.3	11.1	16.4	18.7	19.5	20.2
	5	2.1	17.5	10.1	9.9	17.0	18.2	20.1	19.5
	6	1.5	17.0	8.5	9.2	17.2	18.3	19.9	19.2
	7	0.9	16.3	13.1	9.3	15.8	18.4	20.4	17.5
3	1	4.6	18.5	15.9	11.2	13.3	17.7	19.0	19.6
	2	4.0	18.7	14.5	10.6	13.7	17.5	18.8	19.2
	3	3.4	18.8	13.1	10.7	13.5	17.7	19.1	18.9
	4	2.7	18.5	12.1	10.6	12.9	17.8	19.0	18.7
	5	2.1	18.3	9.8	8.8	12.9	17.5	18.8	18.2
	6	1.5	16.8	6.0	7.0	12.3	17.1	8.6	17.0
	7	0.9	14.9	4.0	6.3	13.7	17.1	18.4	15.3
4	1	4.6	14.3	8.9	7.1	11.3	16.5	17.6	13.7
	2	4.0	14.0	8.2	7.0	11.6	16.8	17.7	12.9
	3	3.4	12.7	6.7	5.9	11.3	16.7		11.8
	4	2.7	10.8	5.3	4.5	10.4	16.6	17.8	10.8
	5	2.1	8.5	3.5	3.3	8.3	15.9	17.2	9.5
	6	1.5	4.7	0.6	0.4	3.1	13.5	14.9	6.2
	7	0.6	2.0	0.2	0.6	0.4	12.6	13.7	2.6
5	1	3.7		2.0	6.0	3.5	3.4	6.4	
	2	3.1	8.4	4.3	5.4	6.2	7.3	6.7	8.6
	3	2.5	9.2	4.8	7.0	8.6	12.6	8.9	10.2
	4	1.9	10.9	5.9	9.2	12.5	16.4	12.5	12.3
	5	1.2	11.7	6.3	9.8	14.6	17.2	14.3	13.1
	6	0.6	10.8	5.2	7.9	14.0	16.8	14.8	13.8
	7	0.1							
6	1	4.3	8.9				15.5	19.5	
	2	3.7	8.9	8.3	5.8	12.1	15.7	19.2	13.4
	3	3.0	9.0	8.3	7.3	13.7	16.1	18.6	13.3
	4	2.4	11.0	8.4	7.1	14.6	16.5	17.2	13.4
	5	1.8	11.0	9.4	8.0	14.6	16.7	17.3	13.5
	6	1.2	11.7	10.9	12.6	16.8	17.9	17.6	15.4
	7	0.6	11.8	10.6	15.9	19.8	20.3	18.4	17.8

Table III-2
Temperature (°C) - Pile 18B

Station	Port	Depth (m)	88-11-10 (YY-MM-DD)	88-12-10	89-01-14	89-02-17	89-04-30	89-05-15	89-07-04	89-08-03	89-09-04	89-09-22	89-10-12	89-11-22	89-12-29	90-04-25	90-05-25
1	Red	1.8	8.8	6.8	7.0	8.0	5.4	4.7	9.7	12.4	15.2	13.5	12.1	10.0	10.3	5.7	6.7
	Blue	0.6	6.0	2.5	2.5	4.9	1.8	6.9	16.6	19.2	17.2	15.7	8.9	4.9	5.1	3.2	5.1
	Surface	0.0	3.2	-7.2	-12.9	-20.1	7.7	17.7	26.7	28.3	19.9	18.1	9.5	-4.0	-14.5	10.5	19.6
2	Red	4.0	16.2	13.4	12.4	13.0	8.4	6.9	9.7	12.4	18.5	16.2	16.4	16.4	16.9	10.2	9.5
	Blue	0.9	9.1	3.9	0.7	2.7	-0.2	6.2	19.2	22.0	19.9	19.3	12.8	8.1	7.0	5.9	7.0
	Black	0.3	7.7	2.1	-0.7	1.4	-0.6	6.9	19.8	23.3	19.8	19.1	10.7	5.8	5.1	6.1	6.5
	Surface	0.0	3.2	-7.2	-12.9	-20.0	7.7	17.7	26.7	28.7	25.1	24.9	10.7	-3.4	-14.5	13.3	19.9
3	Red	4.6	16.9	15.1	13.8	14.4	9.5	8.0	10.0	12.7	17.7	15.7	15.7	16.6	17.0	10.4	9.0
	Blue	2.8	16.1	12.8	10.0	11.5	6.6	6.9	13.0	16.8	20.1	19.5	18.6	16.6	8.2	8.4	8.7
	Black	1.6	11.5	6.4	5.0	6.5	2.7	7.4	17.3	20.1	20.3	19.8	16.2	12.2		6.1	7.4
	Surface	0.0	3.2	-7.3	-12.9	-20.0	7.7	17.7	27.3	28.5	25.1	22.7	10.4	-4.1	-14.5	11.5	19.6
4	Red	4.3	15.1	13.5	11.8		7.7	7.4	10.2	12.9	18.8	15.0	15.5	15.0	16.8	9.2	9.3
	Blue	1.3	9.5	4.7	1.2		0.2	8.0	18.3	21.0	19.9	17.9	12.8	8.3	8.1	5.7	7.6
	Black	0.1	5.3	-5.2	-3.1		0.0	9.9	23.8	24.7	20.8	18.1	9.9	1.5	3.8	5.8	7.8
	Surface	0.0	3.2	-7.2	-12.9		7.7	17.7	27.3	28.2	20.9	27.9	10.7	-5.1	-14.8	15.2	20.9
5	Red	4.4	14.6	12.5	10.9		8.0	7.2	9.6	11.8	17.9	14.1	14.2	14.1	13.1	8.4	8.8
	Blue	1.3	9.9	4.5	1.9		0.5	7.8	17.7	20.4	18.7	18.0	12.9	8.4	8.4	5.1	7.3
	Black	0.7	8.3	1.1	-1.5		-0.2	8.6	19.1	22.2	18.3	17.8	9.8	5.2	5.7	5.6	6.3
	Surface	0.0	3.2	-7.2	-12.9		7.7	17.7	28.6	27.3	20.9	29.3	9.9	-5.0	-	11.6	28.8
6	Red	4.2	12.4	8.7	7.0		4.1	6.5	8.1	10.2	15.5	12.5	12.4	12.1	13.0	7.2	7.4
	Blue	1.1	10.1	5.2	0.8		-0.5	5.7	14.4	17.8	19.0	17.3	13.9	9.4	8.0	3.1	7.1
	Black	0.2	9.4	1.5	-3.3		-0.8	7.7	17.8	20.6	19.2	17.3	10.6	5.8	4.1	3.6	5.8
	Surface	0.0	3.2	-7.2	-12.9		7.7	17.7	28.6	27.3	20.9	25.1	10.0	-5.0	-	12.4	25.1

Table III-2
Temperature (°C) - Pile 18B

Station	Port	Depth (m)	90-06-14	90-07-20	90-08-16	90-09-28	90-10-12	91-01-16	91-04-11	91-05-22	91-06-19	91-07-17	91-08-21	91-10-22	92-03-17	92-04-22	92-05-26	92-06-24
1	Red	1.8	7.3	10.4	14.5	12.8	12.7	7.5	7.9	7.6	6.2	19.1	14.2	11.9	5.4	6.1	4.9	9.1
	Blue	0.6	12.8	18.7	20.7	11.8	10.4	3.1	4.1	8.3	12.2	16.6	19.4	9.0	1.0	2.5	11.6	15.8
	Surface	0.0	22.3	23.0	26.4	23.6	16.6	-3.1		28.7	32.5	33.4	16.5	3.0	-3.0	3.1	15.5	20.6
2	Red	4.0	9.8	11.6	14.7	16.6	17.0	13.1	12.6	8.5	8.2	11.4	15.5	18.2	11.0	10.7	9.3	9.4
	Blue	0.9	15.3	21.1	22.5	16.2	13.8	3.1	5.3	9.7	14.4	19.7	22.2	13.4	0.1	2.1	13.7	17.2
	Black	0.3	17.5	22.8	22.5	15.3	12.0	1.1	4.1	12.2	16.1	20.6	21.1	11.1	-1.7	2.2	15.1	17.5
	Surface	0.0	27.3	26.3	31.0	22.9	16.5	-3.1		28.4	30.5	32.3	17.8	3.8	-3.0	4.6	16.4	24.1
3	Red	4.6	9.6	11.4	14.2	15.5	16.2	14.2		9.5	8.0	11.0	14.0	17.9	11.7	11.0	9.5	9.5
	Blue	2.8	10.2	14.3	17.8	18.9	18.6	12.3		11.0	9.8	14.3	18.2	19.0	8.3	8.0	8.8	11.7
	Black	1.6	12.3	18.0	21.0	17.8	16.3	7.6		15.1	12.6	17.3	21.1	16.1	3.5	4.4	11.1	15.3
	Surface	0.0	25.3	21.9	26.5	24.4	16.6	-3.1		27.2	34.9	31.6	18.0	4.8	-3.0	5.3	17.7	23.6
4	Red	4.3	10.0	11.7	14.9	15.9	15.5	13.9	11.7	9.5	8.4	11.2	14.9	17.0	10.2	9.5	9.5	9.7
	Blue	1.3	14.4	19.6	21.9	15.7	13.4	5.2	5.7	9.2	14.1	17.8	21.5	13.8	0.6	3.5	13.7	16.5
	Black	0.1	20.2	23.8	21.5	14.2	11.3	0.4	3.6	9.7	20.5	21.9	17.0	7.2	-4.3	6.6	15.0	16.9
	Surface	0.0	29.8	26.2	26.6	26.1	16.9	-3.1		21.9	30.6	40.1	15.8	3.6	-3.0	5.4	21.0	19.0
5	Red	4.4	10.0	10.7	13.3	14.7	14.3	13.3	11.2	9.5	7.7	10.0	13.7	15.7	10.2	9.4	8.1	9.4
	Blue	1.3	14.0	18.8	21.3	15.8	12.9	6.6	5.4	10.9	13.2	17.8	21.2	12.9	0.8	2.6	11.8	16.3
	Black	0.7	16.9	21.6	21.5	14.7	10.7	4.4	4.6	12.0	16.0	20.4	19.9	10.6	-1.6	1.1	14.0	17.1
	Surface	0.0	31.2	26.7	31.5	23.8	16.7	-3.1		25.5	36.0	39.7	17.0	3.8	-3.0	4.4	21.7	21.8
6	Red	4.2	8.0	9.1	11.4	12.8	11.5	11.1	10.8	5.4	6.5	8.6	12.1	13.9	7.8	6.0	7.5	7.6
	Blue	1.1	10.7	15.1	18.5	16.1	13.4	7.5	7.4	8.6	10.8	15.3	19.2	13.7	2.5	1.3	8.6	13.0
	Black	0.2	13.7	19.7	20.7	14.5	10.7	4.7	5.2		13.7	18.9	20.7	11.3	0.8	-0.6	12.5	16.2
	Surface	0.0	27.6	24.9	30.0	24.5	16.5	-3.1	NA	23.5	32.3	37.9	18.0	4.7	-3.0	2.2	19.0	23.6

Table III-2
 Temperature (°C) - Pile 18B

Station	Port	Depth (m)	92-07-14	92-08-17	92-09-29	92-11-03	93-03-19	93-04-24	93-05-21	93-07-13	93-09-10	93-10-01	93-10-21	93-10-25	93-10-26	93-11-29	93-12-22	94-02-18
1	Red	1.8	9.8	10.9	11.8	10.9	5.6	5.7	4.8	10.7	13.5	12.2	0.5	6.5	12.1	6.7	8.1	5.3
	Blue	0.6	14.2	15.1	13.0	5.8	1.3	3.0	8.0	18.3	16.9	12.1	8.7	10.9	8.3	0.4	3.5	-0.3
	Surface	0.0	24.0	22.4	13.7			14.5			15.0		1.5	-2.9	-6.7	1.0		
2	Red	4.0	11.0	12.8	14.9	16.0	10.2	10.3	9.2	11.1	14.8	16.1	16.9	15.4	17.6	13.7	13.5	10.7
	Blue	0.9	15.2	18.8	17.6	8.9	0.4	5.3	10.2	19.8	19.6	16.8	11.8	9.4	12.2	4.4	5.3	0.5
	Black	0.3	15.2	19.3	17.3	6.1	-0.1	5.2	11.0	21.0	19.7	15.5	10.2	7.3	10.6	1.8	4.3	-1.0
	Surface	0.0	27.5	27.5	15.2			14.8			14.7		1.5	-2.9	-6.7	1.0		
3	Red	4.6	8.4	12.5	14.5	16.0		10.4	9.6	11.2	14.2	15.6	11.9	15.9		13.8	14.9	
	Blue	2.8	11.7	15.9	17.8	16.8		8.5	9.3	13.7	17.9	18.5	18.3	17.0	19.6	12.4	13.2	
	Black	1.6	13.7	17.9	18.2	12.3		7.0	9.9	17.5	19.4	17.9	14.9	13.6		6.1	8.0	3.0
	Surface	0.0	26.4	27.0	13.9			14.4			14.8		1.5	-1.5	-6.7	1.0		
4	Red	4.3	11.4	13.4	14.5	14.9	8.2	9.3	8.0	11.2	14.1	13.1	5.6	13.7		12.3	12.9	
	Blue	1.3	15.5	19.0	17.0	9.5	-0.5	5.8	9.7	18.9	18.7	16.4	11.7	10.2		3.2	3.3	
	Black	0.1	16.2	22.8	14.7	1.1	-2.4	5.0	10.7	23.9	17.4	15.6	15.4	2.8		0.0	2.2	
	Surface	0.0	30.5	28.8	14.3			14.4			13.7		1.4	-1.7		1.0		
5	Red	4.4	11.0	12.5	13.4	14.2	8.1	9.9	7.0	10.7	12.0	15.1	14.6	14.4		11.8	13.5	
	Blue	1.3	15.4	18.3	16.4	8.9	1.1	6.5	8.8	18.1	18.0	16.4	10.7	10.2		3.0	6.0	
	Black	0.7	16.0	19.5	15.9	5.1	-0.2	5.9	10.5	20.1	17.8	14.6	8.3	7.3		0.1	3.0	
	Surface	0.0	23.9	28.0	16.1			14.5			15.0		1.6	-1.5		1.0		
6	Red	4.2	9.2	10.5	11.7	12.4	6.4	9.2	6.0	9.1	11.8	13.7	13.0	13.3		10.2	10.0	
	Blue	1.1	13.5	16.2	16.0	10.9	2.0	5.6	6.5	14.9	17.1	16.7	12.3	12.6		5.3	5.9	
	Black	0.2	15.3	18.0	15.6	7.3	-0.2	5.4	8.4	18.3	17.7	15.6	10.0	8.3		0.6	3.5	
	Surface	0.0	20.0	28.2	14.6			14.4			14.6		1.5	-1.0		1.0		

Table III-2
 Temperature (°C) - Pile 18B

Station	Port	Depth (m)	94-03-30	94-05-03	94-06-08	94-07-12	94-08-15	94-09-20	94-11-16	95-04-10	95-04-13	95-06-07
1	Red	1.8	3.6	4.4	6.8	7.0	11.4	11.1	10.8	3.3	4.8	6.4
	Blue	0.6	0.4	1.7	12.8	15.2	18.1	12.1	6.5	-0.3	3.3	12.8
	Surface	0.0		18.5	19.6	27.8	19.3	16.0	4.8	NA	NA	
2	Red	4.0	8.1	7.8	8.4	8.7	11.9	13.8	15.9	9.6	12.1	8.7
	Blue	0.9	0.9	3.4	12.5	17.1	20.8	16.1	9.7	3.1	5.6	12.9
	Black	0.3	-0.7	3.9	14.1	18.7	21.6	15.1	8.4	2.1	4.2	14.0
	Surface	0.0		12.1	17.4	27.5	20.1	16.9				
3	Red	4.6		7.7	8.1	8.6	11.6	13.5	16.2	13.1	13.1	9.1
	Blue	2.8		4.0	8.7	11.9	16.1	17.0	17.2	10.6	11.1	9.7
	Black	1.6		4.1	10.6	15.5	19.5	17.4	13.6	7.3	7.6	11.7
	Surface	0.0		16.1	19.4	31.2	22.1	17.7	7.6			
4	Red	4.3	8.2	7.8	8.2	9.4	12.6	13.0	14.9	11.2	11.9	8.6
	Blue	1.3	0.6	6.1	11.6	17.2	20.6	16.5	10.0	5.8	6.2	12.6
	Black	0.1	0.2	4.6	14.4	20.6	19.7	13.7	4.8	3.3	4.2	18.9
	Surface	0.0		15.8	18.7	28.0	24.2	17.8				
5	Red	4.4	8.5	7.3	7.6	8.7	11.2	13.4	14.0	10.9	11.5	8.2
	Blue	1.3	0.9	4.1	11.2	16.3	19.9	15.6	9.3	5.9	6.4	11.8
	Black	0.7	0.3	7.5	13.4	19.1	21.2	14.2	7.1	4.5	4.8	13.7
	Surface	0.0		12.3	18.7	30.2	23.4	18.0				
6	Red	4.2	6.6	6.2	6.1	7.6	20.4	11.0	12.1	8.5	9.3	6.9
	Blue	1.1	1.2	1.6	8.0	14.0	17.7	15.8	10.1	5.6	6.3	9.3
	Black	0.2	-0.6	1.9	11.5	17.1	10.0	14.8	7.5	4.0	4.6	12.4
	Surface	0.0		12.5	17.6	30.1	22.2	16.7	5.4			

Table III-3
Gas Phase Carbon Dioxide (%) Pile 18B

Station	Port	depth (m)	93/10/01	93/11/29	93/12/22	94/03/30	94/05/03	94/06/08
1	1	3.2 m	NA	NA	NA	NA	NA	NA
	2	2.6 m	0.35	0.33	0.30	0.94	0.17	0.04
	3	2.0 m	0.45	0.27	0.19	0.86	0.14	0.08
	4	1.4 m	NA	0.27	0.14	0.85	0.13	0.17
	5	0.8 m	NA	0.29	0.13	0.86	0.13	0.26
	6	0.2 m	NA	0.18	NA	NA	0.00	0.00
2	1	4.6 m	NA	0.27	0.39	NA	0.68	0.24
	2	4.0 m	NA	0.25	0.35	NA	0.64	0.16
	3	3.4 m	NA	0.12	0.17	NA	0.16	0.15
	4	2.7 m	NA	0.11	0.13	NA	0.12	0.15
	5	2.1 m	NA	0.11	0.12	NA	0.14	0.16
	6	1.5 m	NA	0.11	0.13	NA	0.16	0.18
	7	0.9 m	NA	0.12	0.13	NA	NA	0.17
3	1	4.6 m	NA	0.52	0.31	NA	0.39	0.16
	2	4.0 m	NA	0.44	0.29	NA	0.37	0.12
	3	3.4 m	NA	0.43	0.25	NA	0.31	0.12
	4	2.7 m	NA	0.48	0.23	NA	0.30	0.13
	5	2.1 m	NA	0.44	0.23	NA	0.32	0.13
	6	1.5 m	NA	0.43	NA	NA	0.26	0.16
	7	0.9 m	NA	0.43	0.22	0.71	0.19	0.25
4	1	4.6 m	NA	0.64	0.43	0.62	0.37	0.37
	2	4.0 m	NA	0.58	0.37	0.59	0.39	0.33
	3	3.4 m	NA	0.57	0.33	0.56	0.42	0.37
	4	2.7 m	NA	0.57	0.32	NA	0.43	0.42
	5	2.1 m	NA	0.57	NA	0.84	0.44	0.46
	6	1.5 m	NA	0.47	0.28	0.71	0.45	0.50
	7	0.6 m	NA	0.44	NA	1.02	0.48	0.47
5	1	3.7 m	NA	2.58	2.65	5.43	1.83	NA
	2	3.1 m	NA	2.37	2.30	3.73	1.54	0.47
	3	2.5 m	NA	1.70	1.62	1.83	1.33	0.43
	4	1.9 m	NA	1.20	1.04	1.22	1.11	0.43
	5	1.2 m	NA	0.91	0.75	0.90	0.88	0.45
	6	0.6 m	NA	0.80	0.70	NA	0.76	0.48
	7	0.1 m	NA	NA	NA	NA	NA	NA
6	1	4.3 m	NA	4.90	4.80	3.41	NA	2.50
	2	3.7 m	NA	4.22	4.67	3.14	2.85	2.72
	3	3.0 m	NA	1.80	3.04	2.68	2.60	2.48
	4	2.4 m	NA	1.32	1.23	1.39	2.39	1.61
	5	1.8 m	NA	1.31	1.32	1.35	1.95	1.67
	6	1.2 m	NA	1.01	1.30	1.17	0.89	1.16
	7	0.6 m	NA	0.59	0.71	0.82	0.32	0.52

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Monitoring Data - Pile 17

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Figure IV-1
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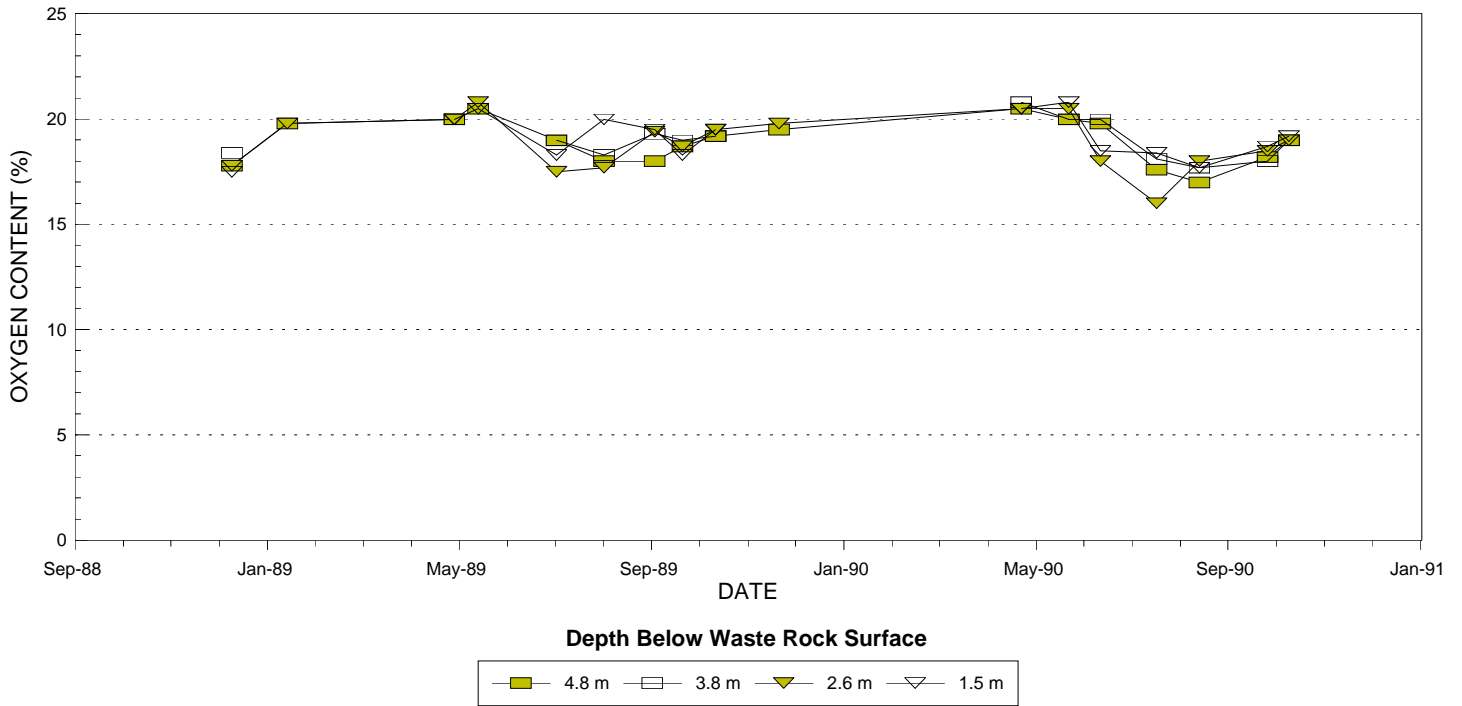


Figure IV-2
Oxygen Data, Pile 17, Station 2

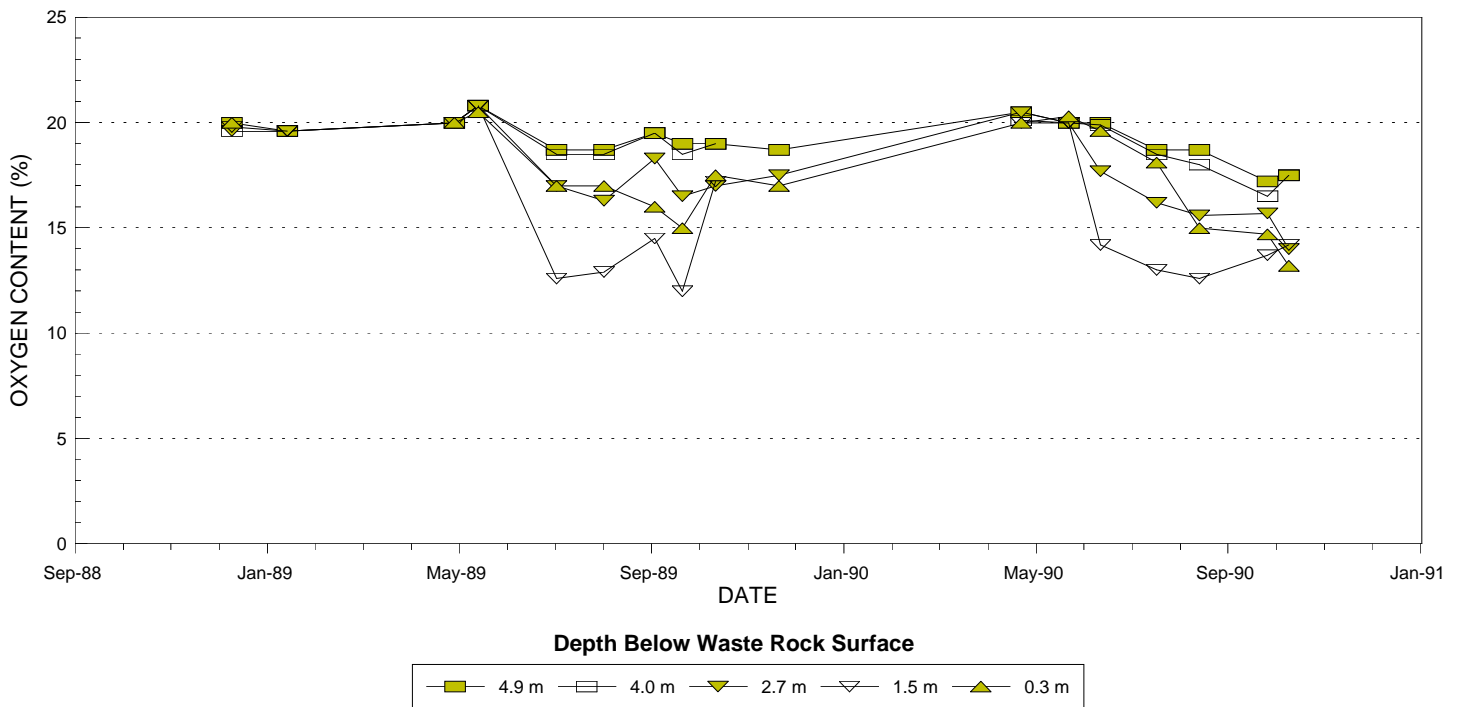


Figure IV-3
Oxygen Data, Pile 17, Station 3

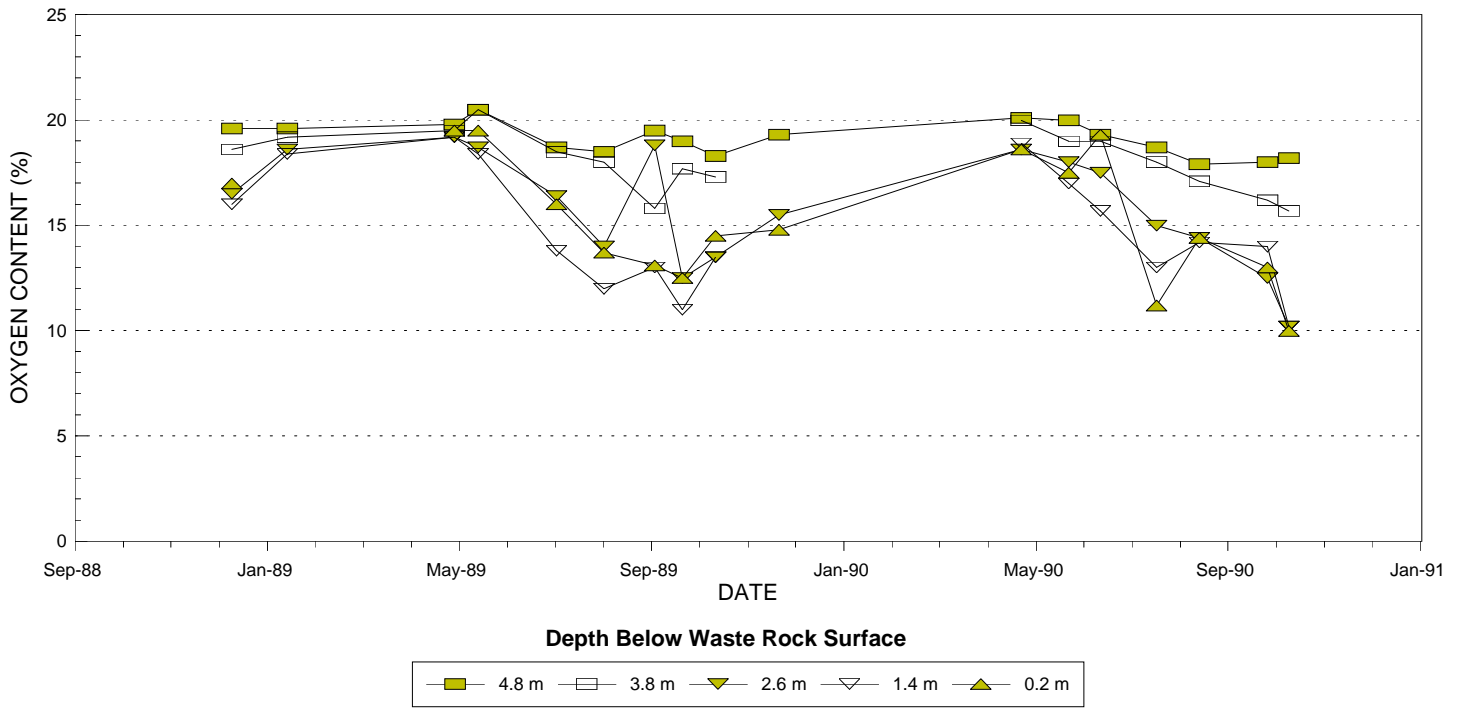


Figure IV-4
Oxygen Data, Pile 17, Station 4

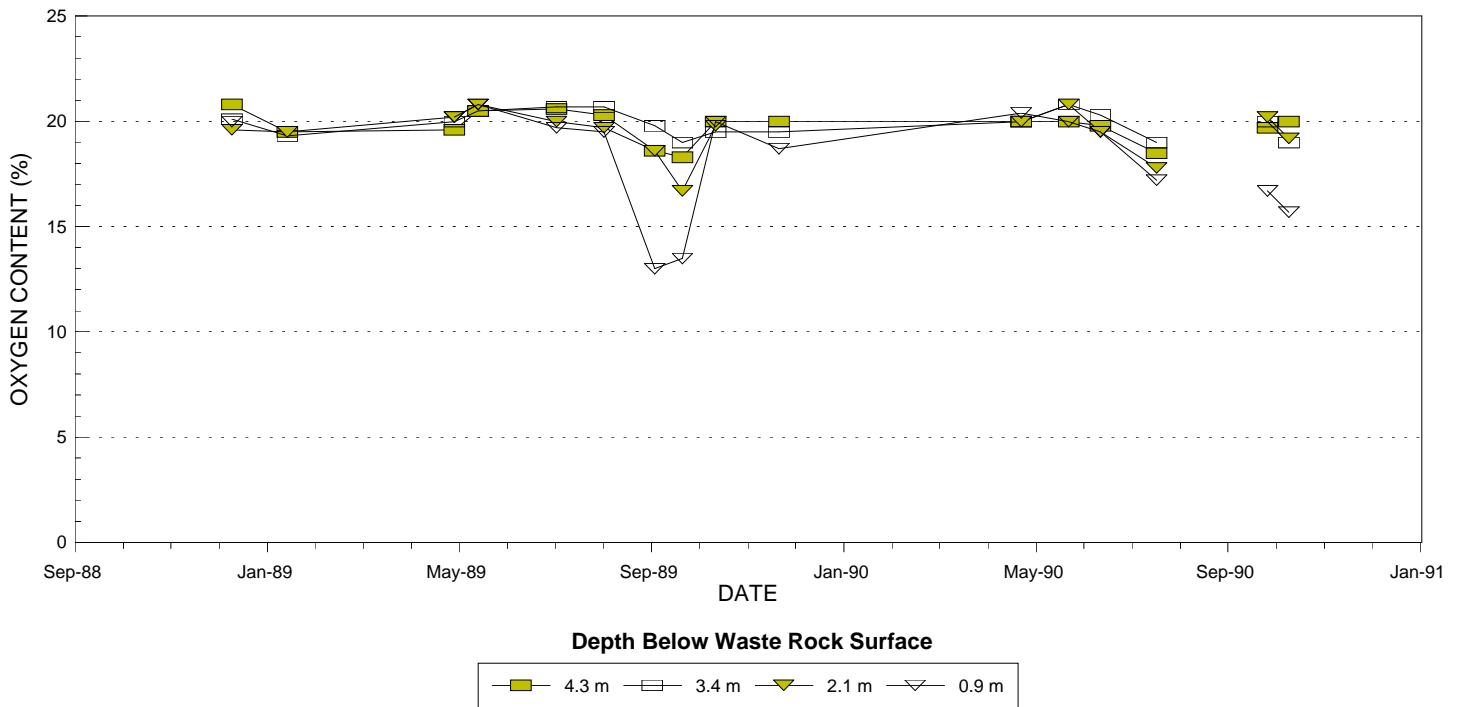


Figure IV-5
Oxygen Data, Pile 17, Station 5

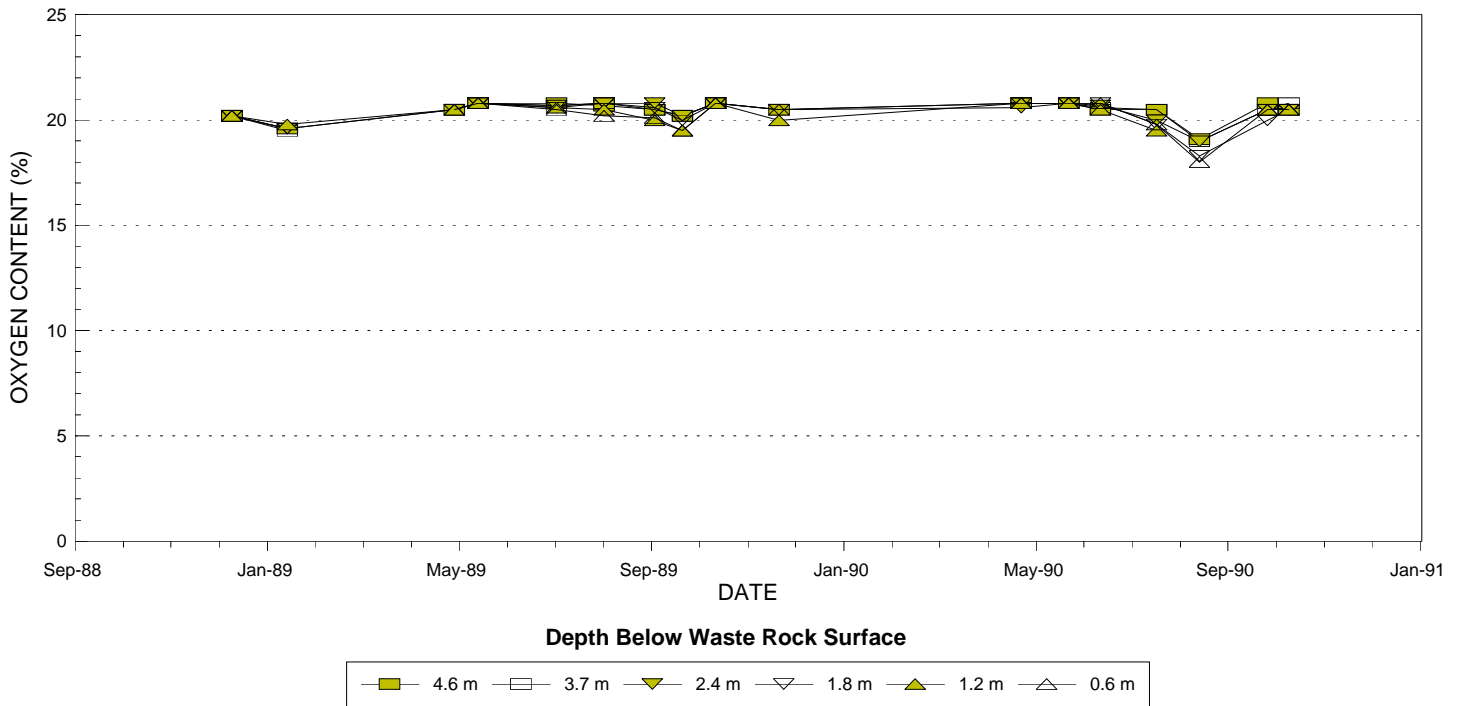


Figure IV-6
Oxygen Data, Pile 17, Station 6

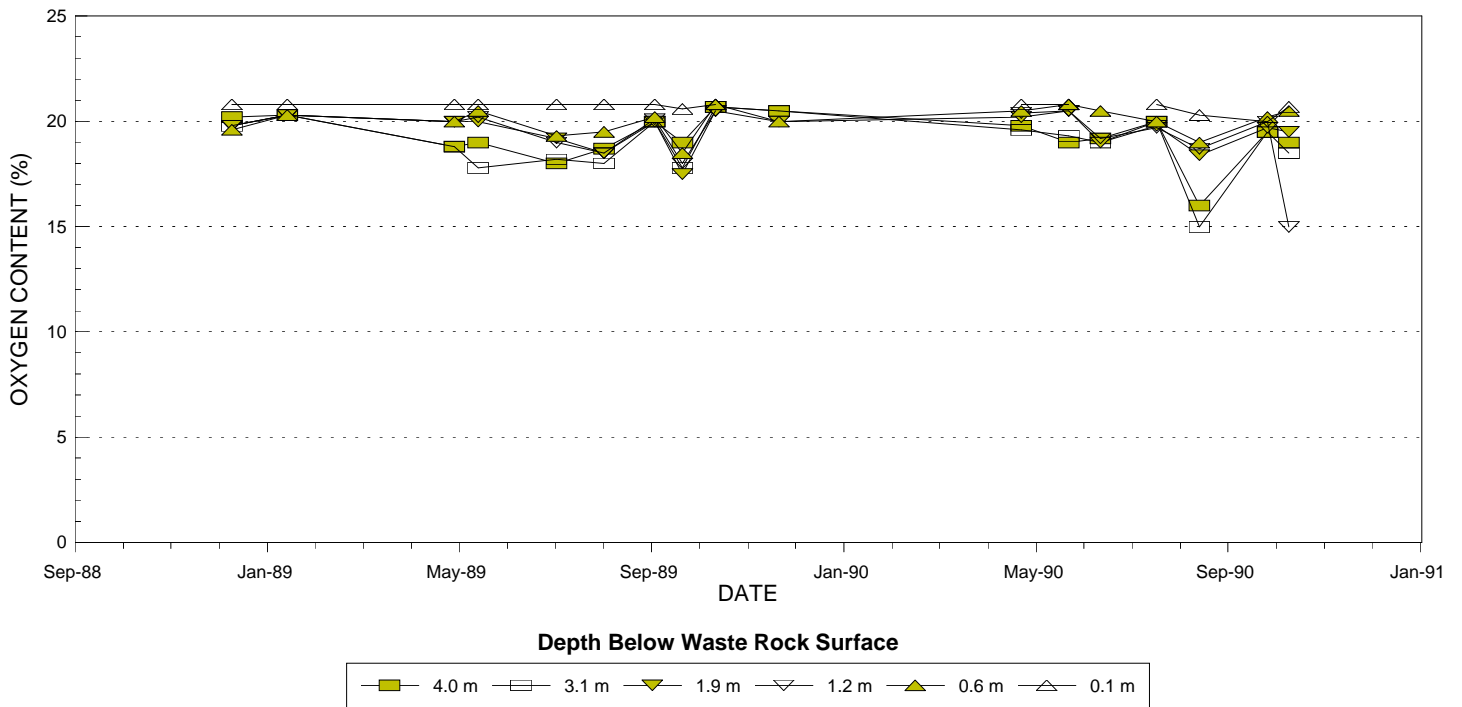


Figure IV-7
Temperature Data, Pile 17, Station 1

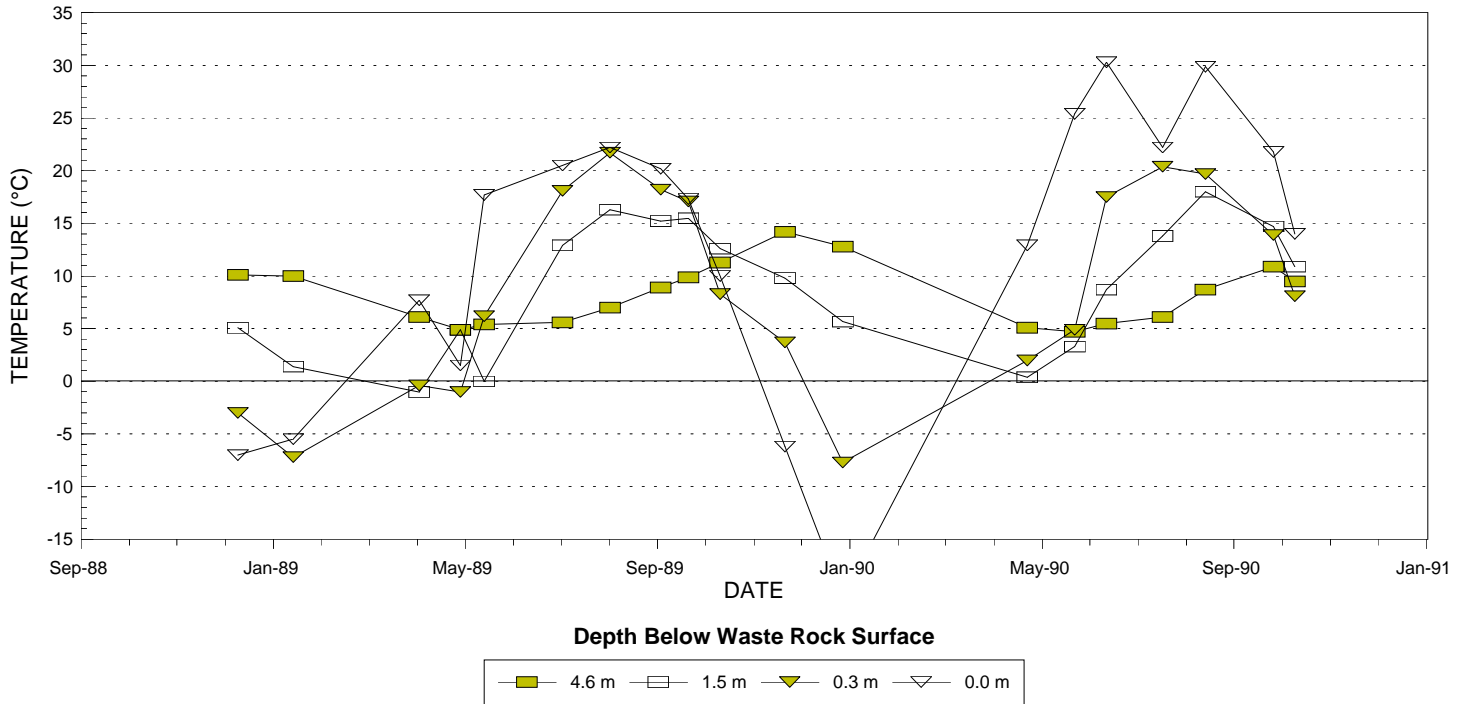


Figure IV-8
Temperature Data, Pile 17, Station 2

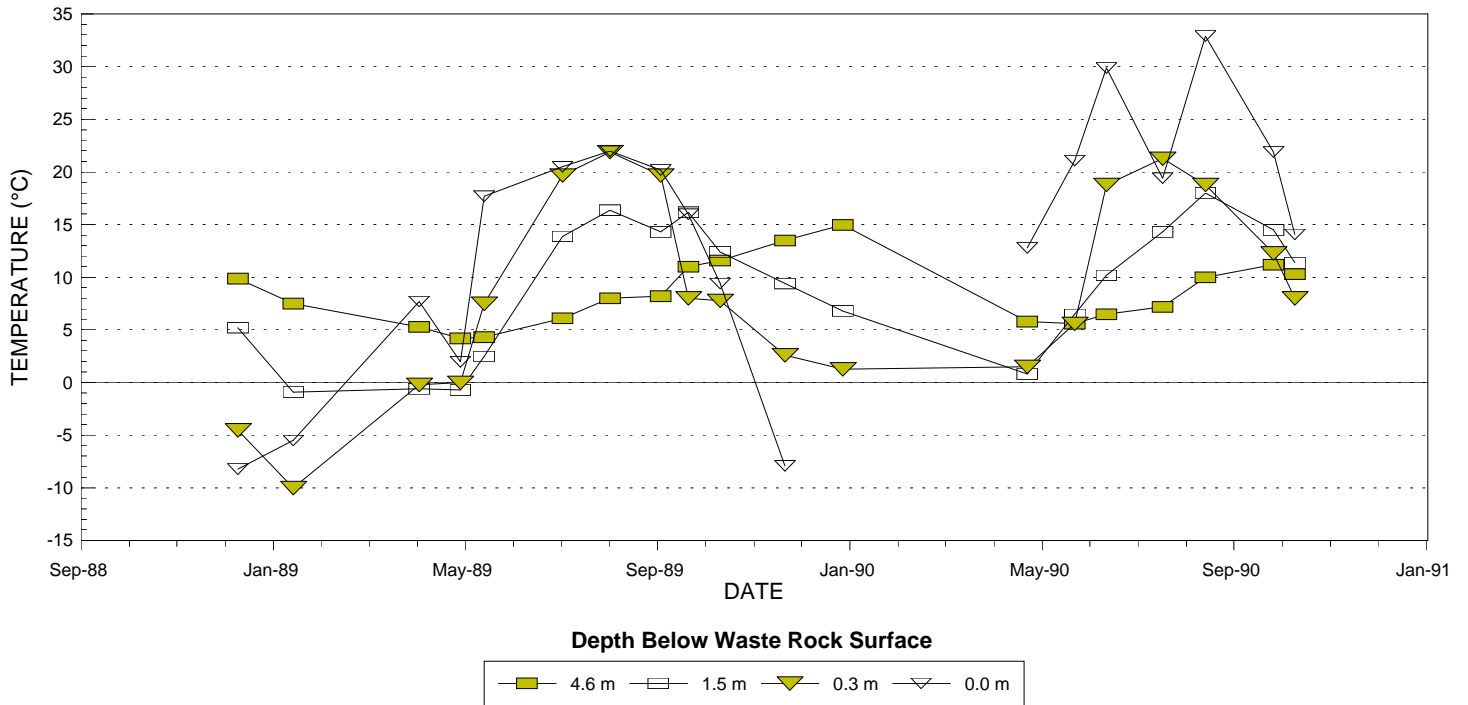


Figure IV-9
Temperature Data, Pile 17, Station 3

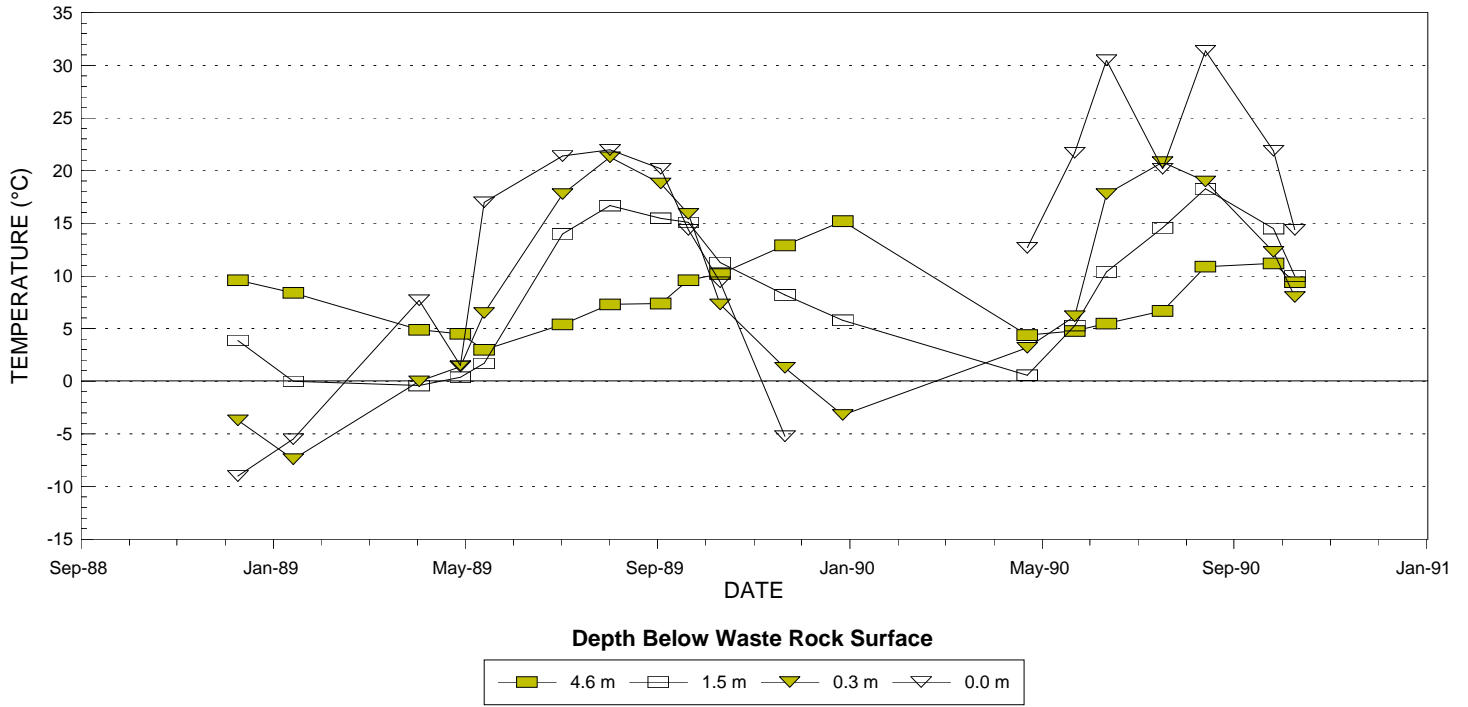


Figure IV-10
Temperature Data, Pile 17, Station 4

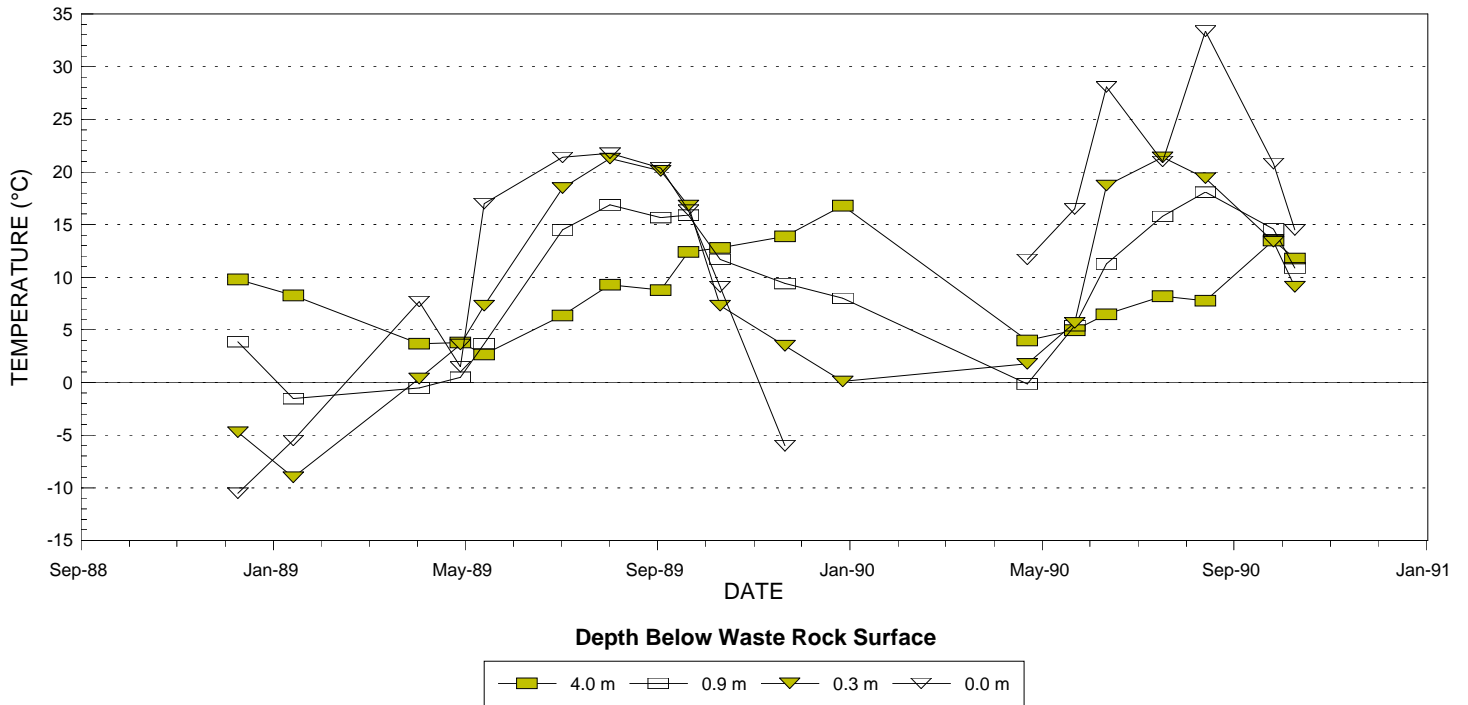


Figure IV-11
Temperature Data, Pile 17, Station 5

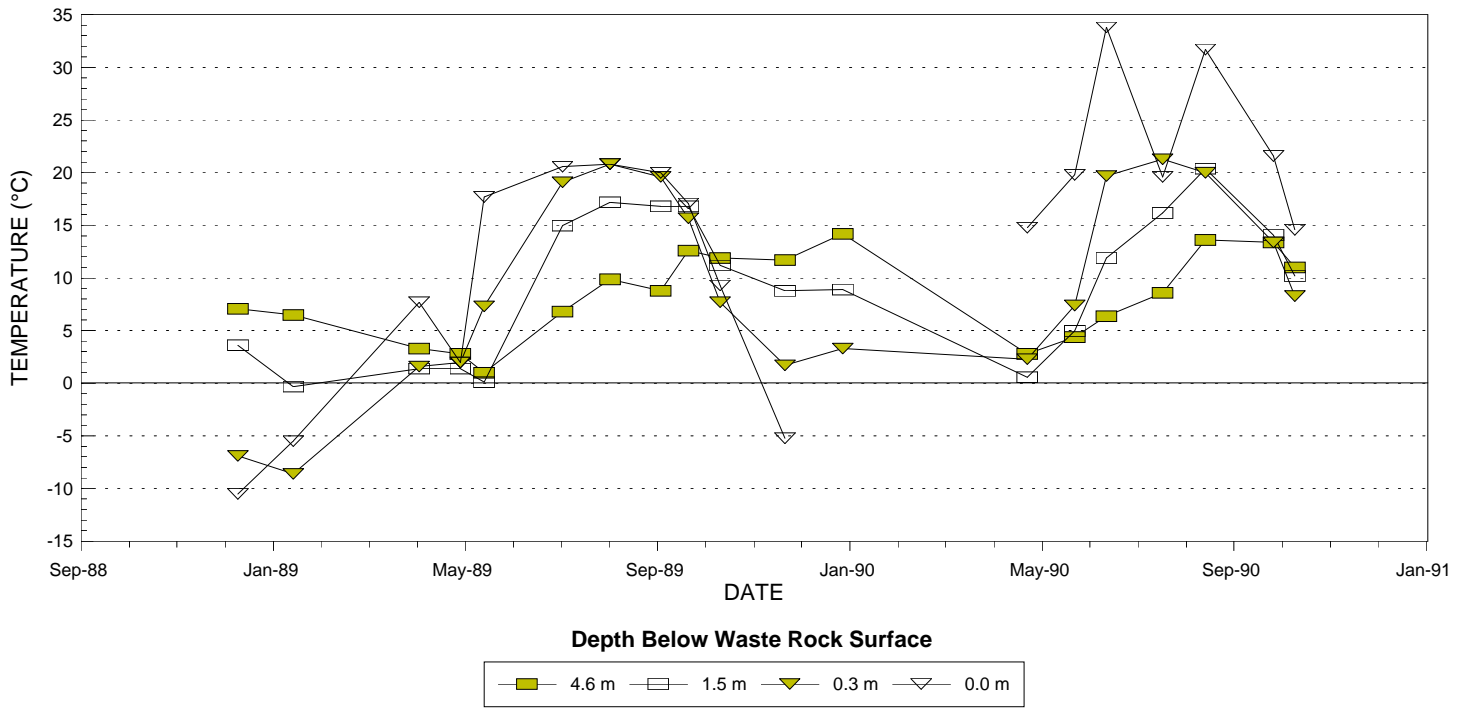


Figure IV-12
Temperature Data, Pile 17, Station 6

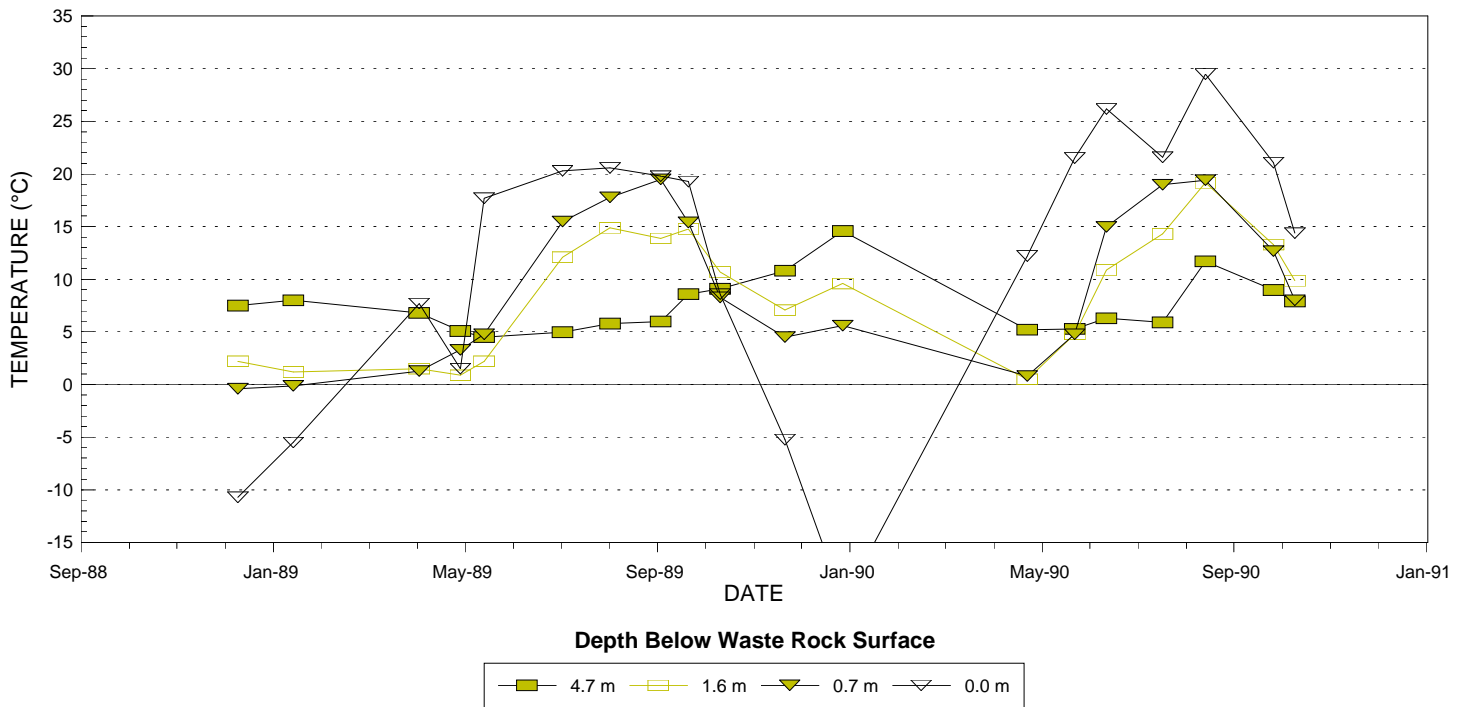


Table IV-1
Gas Phase Oxygen (%) - Pile 17

Station	Port	Depth (m)	88/11/11	88/12/10	89/01/14	89/02/17	89/07/04	89/08/03	89/09/04	89/09/22	89/10/12	89/11/22	90/04/25
1	1	4.8	17.8	19.8	20.0	20.5	19.0	18.0	18.0	18.7	19.2	19.5	20.5
	2	3.8	18.4	NA	20.0	NA	19.0	18.3	19.3	19.0	19.2	NA	20.8
	3	2.6	17.8	19.8	20.0	20.8	17.5	17.7	19.4	18.7	19.5	19.8	20.5
	4	1.5	17.5	NA	20.0	20.5	18.3	20.0	19.5	18.3	19.5	NA	20.5
2	1	4.9	20.0	19.6	20.0	20.8	18.7	18.7	19.5	19.0	19.0	18.7	20.5
	2	4.0	19.6	19.6	20.0	20.8	18.5	18.5	19.5	18.5	19.0	NA	20.1
	3	2.7	19.6	19.6	20.0	20.8	17.0	16.3	18.3	16.5	17.0	17.5	20.5
	4	1.5	19.8	19.6	NA	20.8	12.6	12.9	14.5	12.0	17.2	NA	20.0
	5	0.3	20.0	NA	20.0	20.5	17.0	17.0	16.0	15.0	17.5	17.0	20.0
3	1	4.8	19.6	19.6	19.8	20.5	18.7	18.5	19.5	19.0	18.3	19.3	20.1
	2	3.8	18.6	19.2	19.5	20.5	18.5	18.0	15.8	17.7	17.3	NA	20.0
	3	2.6	16.5	18.6	19.2	18.7	16.4	14.0	18.8	12.5	13.5	15.5	18.6
	4	1.4	16.0	18.4	19.2	18.4	13.8	12.0	13.0	11.0	13.5	NA	18.9
	5	0.2	17.0	NA	19.5	19.5	16.0	13.7	13.1	12.5	14.5	14.8	18.6
4	1	4.3	20.8	19.5	19.6	20.5	20.6	20.3	18.6	18.3	20.0	20.0	20.0
	2	3.4	20.1	19.3	20.0	20.5	20.7	20.7	19.8	19.0	19.5	19.5	20.0
	3	2.1	19.6	19.5	20.2	20.8	20.0	19.7	18.6	16.7	19.8	NA	20.0
	4	0.9	20.0	NA	20.2	20.8	19.7	19.5	13.0	13.5	20.0	18.7	20.4
5	1	4.6	20.2	19.6	20.5	20.8	20.8	20.7	20.5	20.2	20.8	20.5	20.8
	2	3.7	20.2	19.5	NA	20.8	20.7	20.8	20.5	20.2	20.8	NA	20.8
	3	2.4	20.2	19.6	20.5	20.8	20.7	20.8	20.8	20.2	20.8	20.5	20.6
	4	1.8	20.2	19.6	NA	20.8	20.6	20.8	20.6	20.0	20.8	NA	20.8
	5	1.2	20.2	19.8	20.5	20.8	20.6	20.5	20.0	19.5	20.8	20.0	20.8
	6	0.6	20.2	NA	20.5	20.8	20.5	20.2	20.1	19.5	20.8	20.5	20.8
6	1	4.0	20.2	20.3	18.8	19.0	18.0	18.7	20.0	19.0	20.7	20.5	19.8
	2	3.1	19.8	20.3	18.8	17.8	18.2	18.0	20.0	17.8	20.7	20.5	19.6
	3	1.9	19.8	20.3	20.0	20.0	19.2	18.5	20.0	17.5	20.5	20.0	20.2
	4	1.2	19.8	20.3	20.0	20.2	19.0	18.5	20.1	18.0	20.5	NA	20.4
	5	0.6	19.6	20.3	20.0	20.5	19.3	19.5	20.2	18.5	20.8	20.0	20.5
	6	0.1	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.6	20.8	NA

Table IV-1
Gas Phase Oxygen (%) - Pile 17

Station	Port	Depth (m)	90/05/25	90/06/14	90/07/01	90/08/01	90/09/01	90/10/01
1	1	4.8	20.0	19.8	17.6	17.0	18.2	19.0
	2	3.8	20.0	20.0	18.1	17.7	18.0	19.0
	3	2.6	20.5	18.0	16.0	18.0	18.5	19.0
	4	1.5	20.8	18.5	18.4	17.7	18.7	19.2
2	1	4.9	20.0	20.0	18.7	18.7	17.2	17.5
	2	4.0	20.0	19.9	18.5	18.0	16.5	17.5
	3	2.7	20.0	17.7	16.2	15.6	15.7	14.0
	4	1.5	20.0	14.2	13.0	12.6	13.7	14.2
	5	0.3	20.3	19.6	15.0	15.0	14.7	13.2
3	1	4.8	20.0	19.3	18.7	17.9	18.0	18.2
	2	3.8	19.0	19.0	18.0	17.1	16.2	15.7
	3	2.6	18.0	17.5	15.0	14.4	12.5	10.2
	4	1.4	17.0	15.7	13.0	14.2	14.0	10.2
	5	0.2	17.5	19.3	11.2	14.4	13.0	10.0
4	1	4.3	20.0	19.8	18.5	NA	19.7	20.0
	2	3.4	20.8	20.3	19.0	NA	20.0	19.0
	3	2.1	20.8	19.5	17.8	NA	20.2	19.2
	4	0.9	20.0	19.5	17.2	NA	16.7	15.7
5	1	4.6	20.8	20.5	20.5	19.1	20.8	20.5
	2	3.7	20.8	20.6	20.5	19.0	20.5	20.8
	3	2.4	20.8	20.7	20.0	19.0	20.5	20.5
	4	1.8	20.8	20.8	19.8	18.3	20.0	20.5
	5	1.2	20.8	20.5	19.5	NA	20.5	20.5
	6	0.6	20.8	20.8	19.8	18.0	20.5	20.5
6	1	4.0	19.0	19.2	20.0	16.0	19.5	19.0
	2	3.1	19.3	19.0	20.0	15.0	19.5	18.5
	3	1.9	20.5	19.0	19.8	18.4	19.7	19.5
	4	1.2	20.5	19.2	19.7	18.7	20.0	15.0
	5	0.6	20.8	20.5	20.0	19.0	20.2	20.5
	6	0.1	20.8	NA	20.8	20.3	20.0	20.7

Table IV-2
Temperature (°C) - Pile 17

Station	Port	Depth (m)	88/12/10	89/01/14	89/04/04	89/04/30	89/05/15	89/07/04	89/08/03	89/09/04	89/09/22	89/10/12	89/11/22
1	Red	4.6	10.1	10.0	6.1	4.9	5.4	5.6	7.0	8.9	9.9	11.3	14.2
	Blue	1.5	5.1	1.4	-1.0	4.9	0.0	12.9	16.3	15.2	15.5	12.6	9.8
	Black	0.3	-3.0	-7.2	-0.4	-1.0	6.2	18.1	21.7	18.2	17.1	8.3	3.7
	Surface	0.0	-7.0	-5.5	7.7	1.5	17.7	20.5	22.2	20.2	17.3	10	-6.2
2	Red	4.6	9.9	7.5	5.3	4.2	4.3	6.1	8.0	8.2	11.0	11.6	13.5
	Blue	1.5	5.2	-0.9	-0.6	-0.7	2.5	13.9	16.4	14.3	16.2	12.4	9.4
	Black	0.3	-4.5	-10.0	-0.2	0.0	7.5	19.7	21.9	19.7	8.0	7.8	2.6
	Surface	0.0	-8.2	-5.5	7.7	2.0	17.7	20.5	22.0	20.2	16.0	9.4	-7.9
3	Red	4.6	9.6	8.4	4.9	4.5	3.0	5.4	7.3	7.4	9.6	10.2	12.9
	Blue	1.5	3.9	0.0	-0.4	0.4	1.7	14.0	16.7	15.5	15.1	11.3	8.2
	Black	0.3	-3.7	-7.4	0.0	1.4	6.5	17.8	21.3	18.8	15.9	7.3	1.3
	Surface	0.0	-9.0	-5.5	7.7	1.5	17.0	21.4	22.0	20.2	14.4	9.4	-5.2
4	Red	4.0	9.8	8.3	3.7	3.8	2.7	6.4	9.3	8.8	12.4	12.8	13.9
	Blue	0.9	3.9	-1.5	-0.5	0.5	3.7	14.5	16.9	15.7	15.9	11.7	9.4
	Black	0.3	-4.7	-9.0	0.4	3.6	7.3	18.5	21.3	20.1	16.8	7.3	3.5
	Surface	0.0	-10.5	-5.5	7.7	1.5	17.0	21.4	21.8	20.4	16.4	9.1	-6
5	Red	4.6	7.1	6.5	3.3	2.8	1.0	6.8	9.9	8.8	12.6	11.9	11.7
	Blue	1.5	3.6	-0.3	1.4	1.4	0.1	15.0	17.2	16.8	16.8	11.2	8.8
	Black	0.3	-6.9	-8.6	1.6	2.0	7.3	19.1	20.8	19.6	15.7	7.7	1.7
	Surface	0.0	-10.5	-5.5	7.7	2.0	17.7	20.6	20.8	20.0	17.1	9.3	-5.2
6	Red	4.7	7.5	8.0	6.8	5.1	4.5	5.0	5.8	6.0	8.6	9.1	10.8
	Blue	1.6	2.2	1.2	1.5	0.9	2.2	12.1	14.9	13.9	14.8	10.7	7.1
	Black	0.7	-0.4	-0.1	1.3	3.3	4.8	15.5	17.8	19.5	15.4	8.3	4.5
	Surface	0.0	-10.7	-5.5	7.7	1.5	17.7	20.3	20.6	19.8	19.3	8.6	-5.2

Table IV-2
Temperature (°C) - Pile 17

Station	Port	Depth (m)	89/12/29	90/04/25	90/05/25	90/06/14	90/07/01	90/08/01	90/09/01	90/10/01
1	Red	4.6	12.8	5.1	4.7	5.5	6.1	8.7	10.9	9.5
	Blue	1.5	5.7	0.4	3.3	8.7	13.8	18	14.7	10.9
	Black	0.3	-7.7	2	4.9	17.5	20.4	19.7	13.9	8.1
	Surface	0.0	-20.5	12.9	25.4	30.3	22.2	29.9	21.8	14
2	Red	4.6	15.0	5.8	5.6	6.5	7.2	10	11.2	10.3
	Blue	1.5	6.8	0.8	6.5	10.2	14.3	18	14.5	11.4
	Black	0.3	1.3	1.5	5.6	18.8	21.3	18.8	12.3	8
	Surface	0.0	NA	12.8	21.1	29.9	19.4	32.9	21.9	14.1
3	Red	4.6	15.2	4.4	4.8	5.5	6.7	10.9	11.2	9.4
	Blue	1.5	5.8	0.6	5.3	10.4	14.6	18.3	14.5	10
	Black	0.3	-3.2	3.2	6.2	17.8	20.8	19	12.3	8
	Surface	0.0	NA	12.7	21.7	30.5	20.2	31.4	21.9	14.4
4	Red	4.0	16.8	4	5	6.5	8.2	7.8	13.5	11.8
	Blue	0.9	8.0	-0.1	5.4	11.3	15.8	18.1	14.6	10.9
	Black	0.3	0.1	1.8	5.7	18.7	21.4	19.4	13.4	9.1
	Surface	0.0	NA	11.7	16.5	28.1	21	33.4	20.8	14.5
5	Red	4.6	14.2	2.8	4.4	6.4	8.6	13.6	13.4	11
	Blue	1.5	8.9	0.6	5	11.9	16.2	20.4	14.1	10.2
	Black	0.3	3.3	2.3	7.4	19.7	21.3	20	13.4	8.3
	Surface	0.0	NA	14.8	19.8	33.8	19.6	31.7	21.6	14.6
6	Red	4.7	14.6	5.2	5.3	6.3	5.9	11.7	9	7.9
	Blue	1.6	9.6	0.5	4.8	10.9	14.3	19.2	13.3	9.9
	Black	0.7	5.6	0.8	4.8	15	19	19.4	12.7	8
	Surface	0.0	-20.5	12.2	21.5	26.2	21.6	29.5	21.1	14.4

APPENDIX V

Monitoring Data - Pile 7/12

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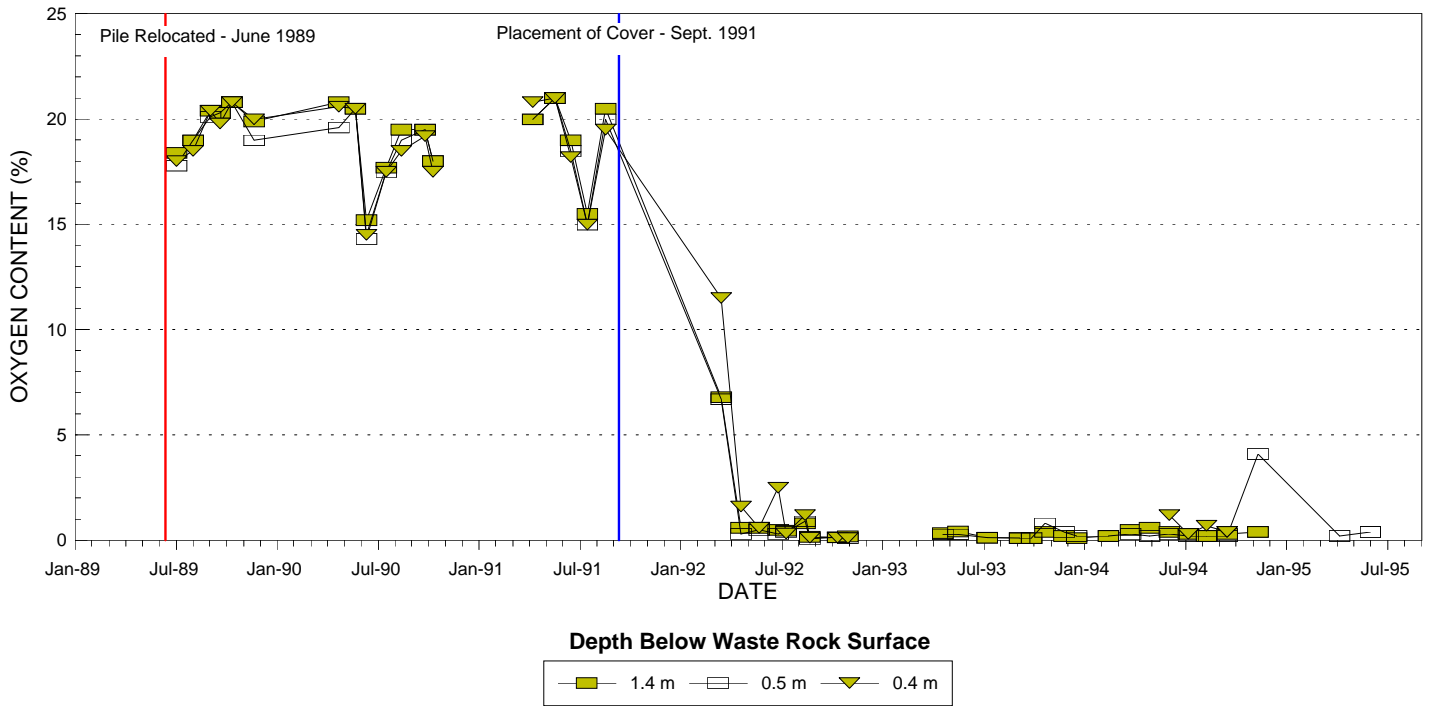


Figure V-2
Oxygen Data, Pile 7/12, Station 2

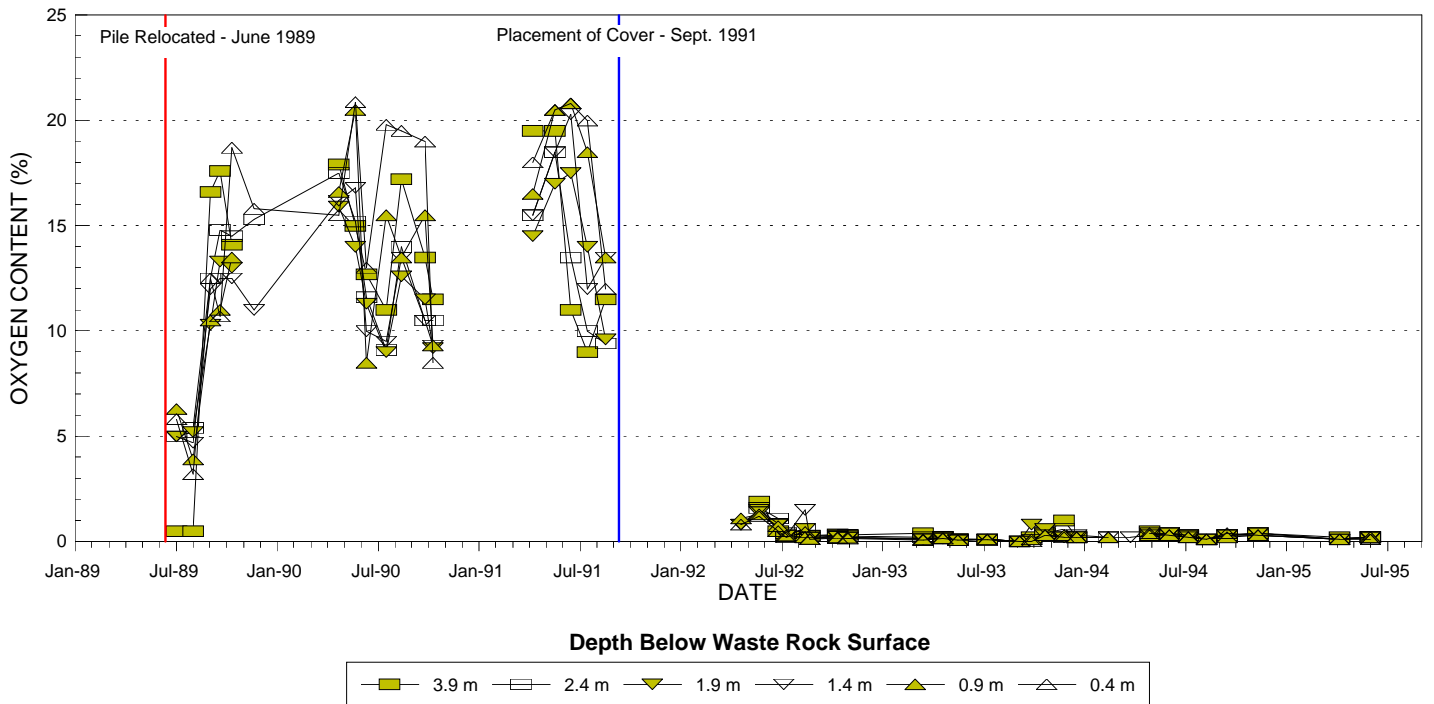


Figure V-3
Oxygen Data, Pile 7/12, Station 3

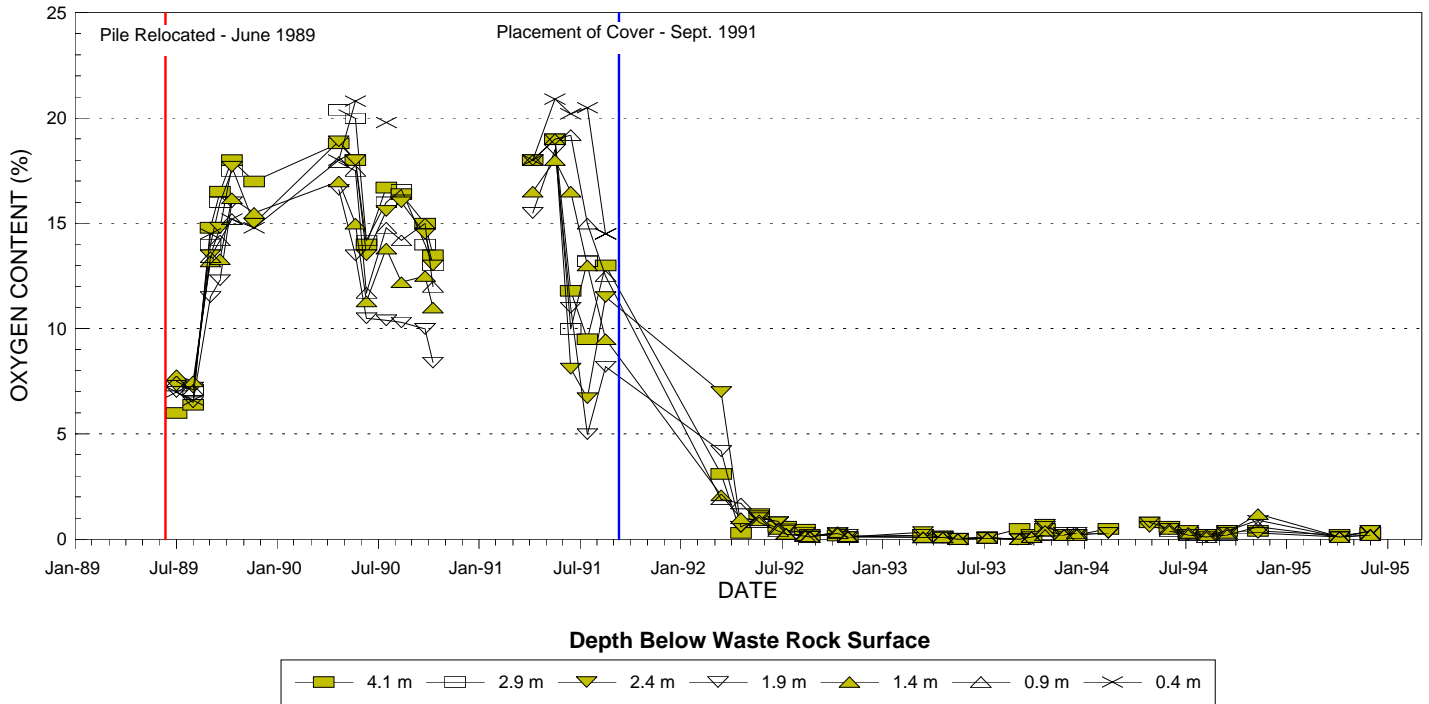
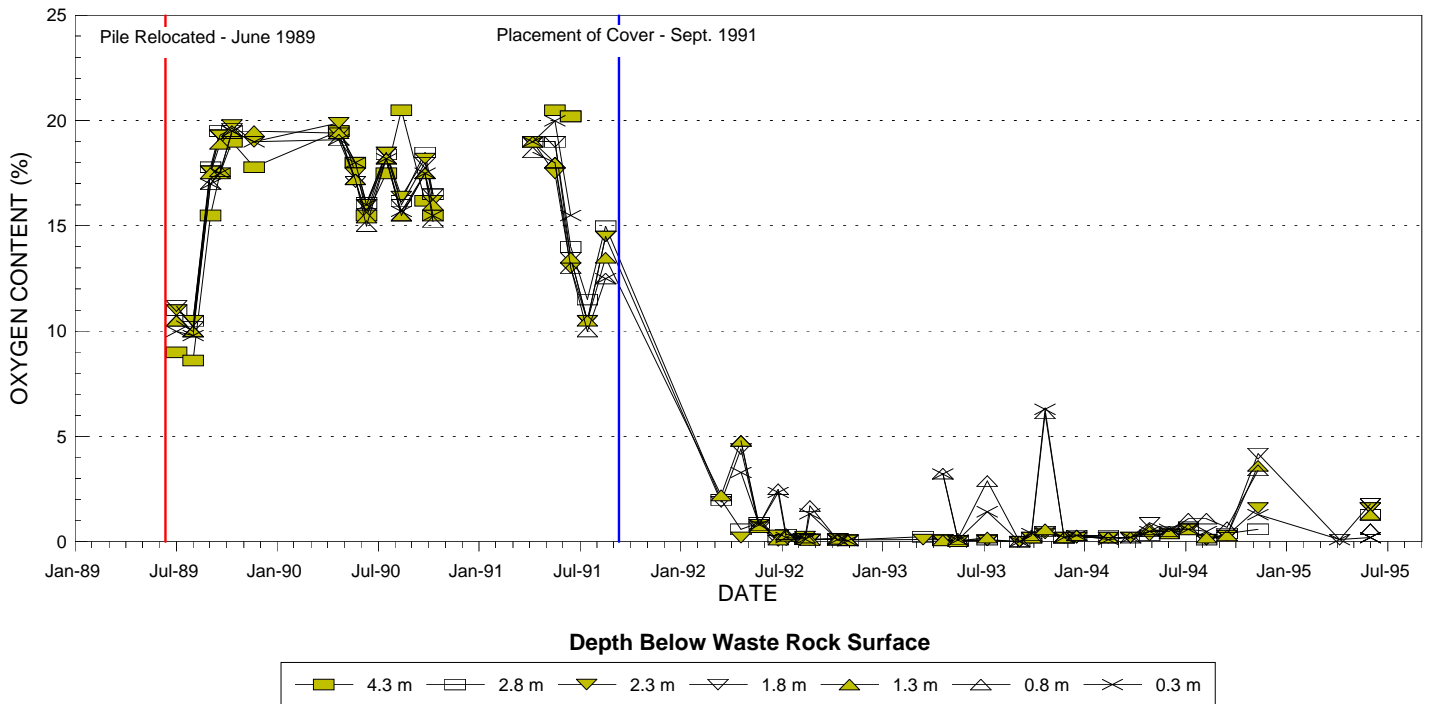
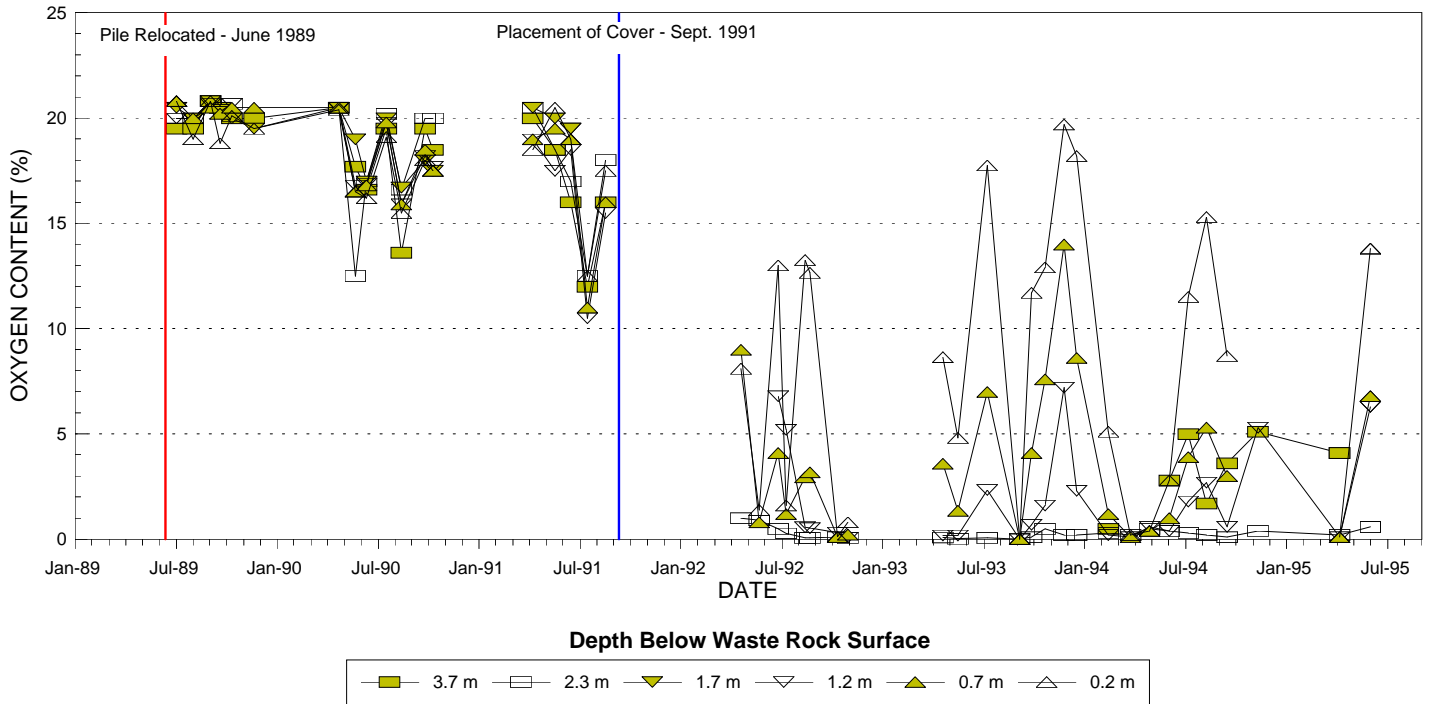


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**Figure V-5
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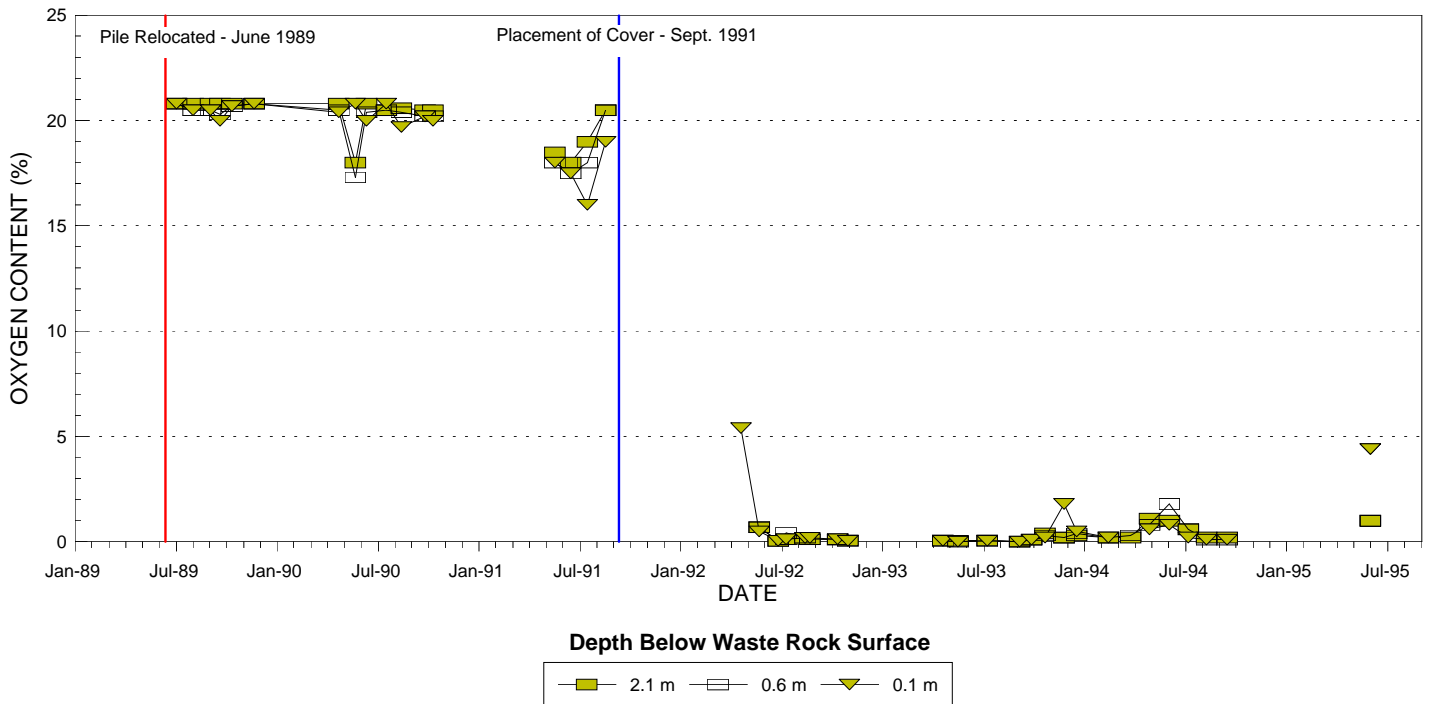


Figure V-7
Temperature Data, Pile 7/12, Station 1

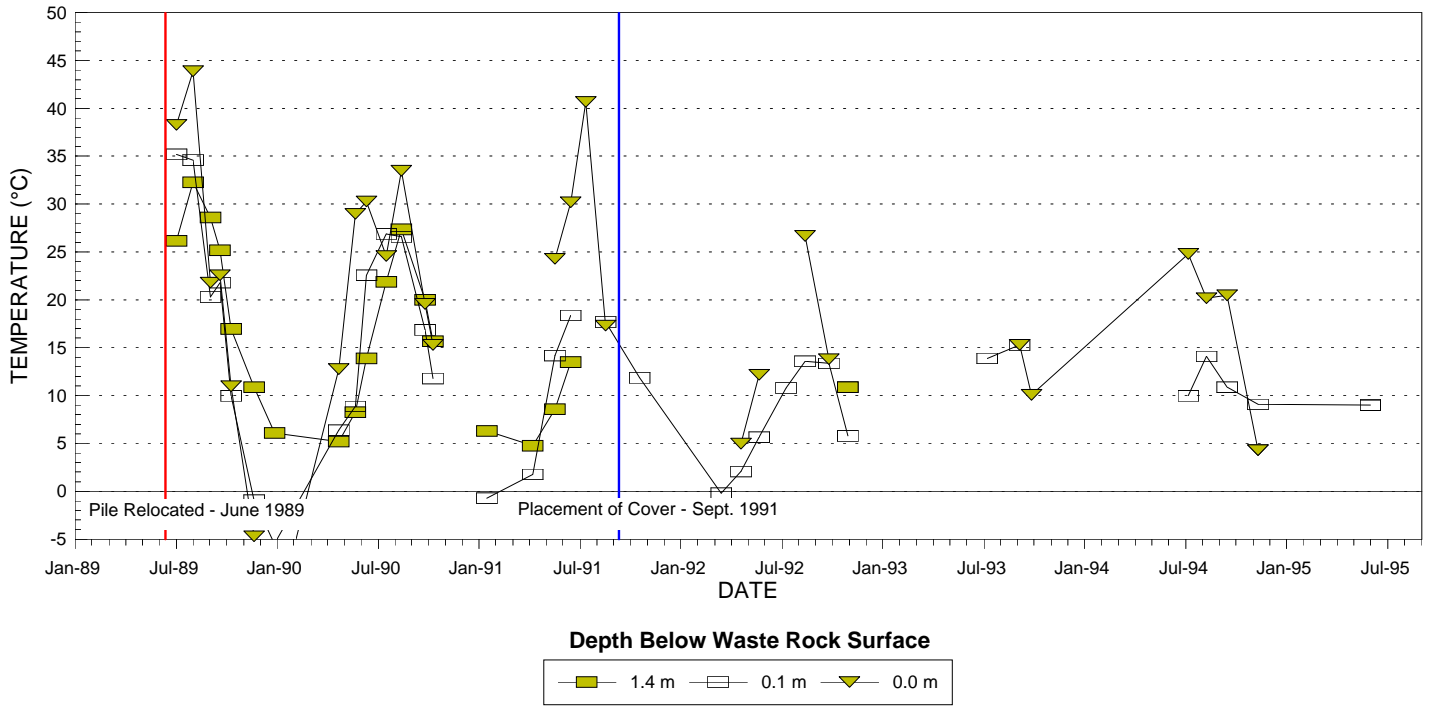


Figure V-8
Temperature Data - Datalogger, Pile 7/12, Station 1

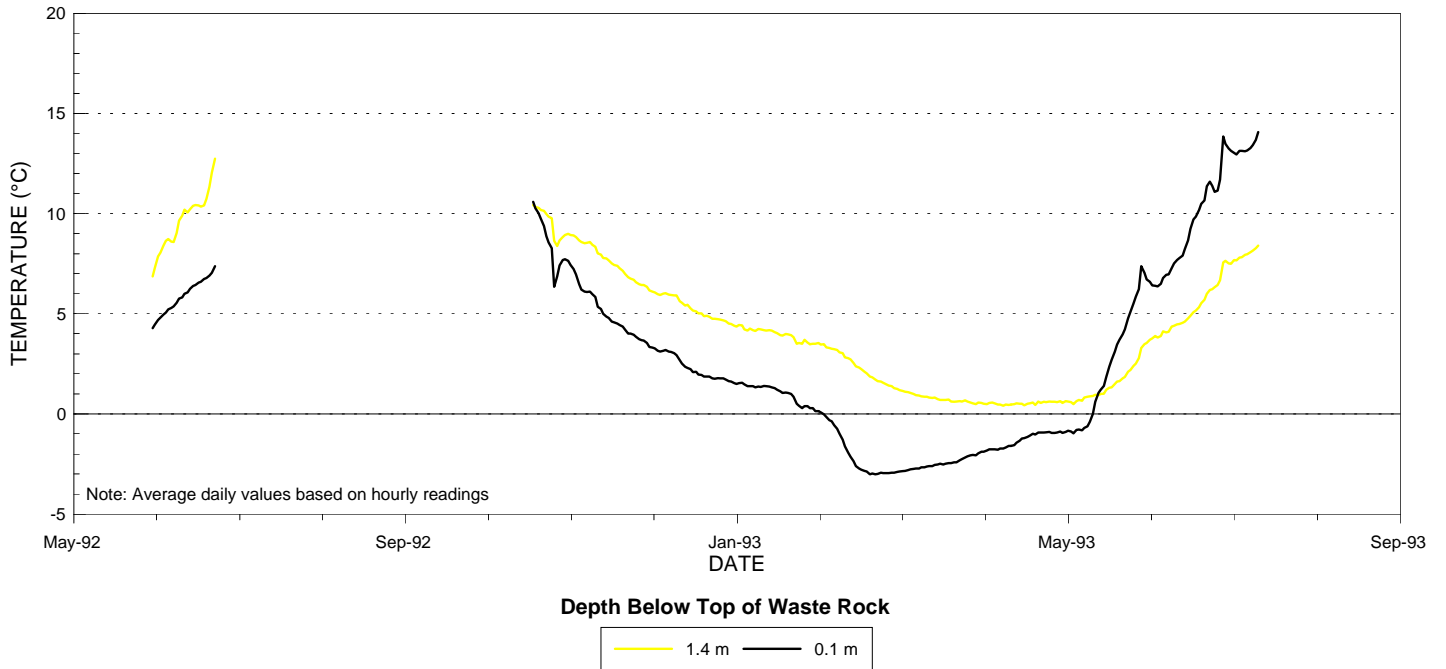


Figure V-9
Temperature Data, Pile 7/12, Station 2

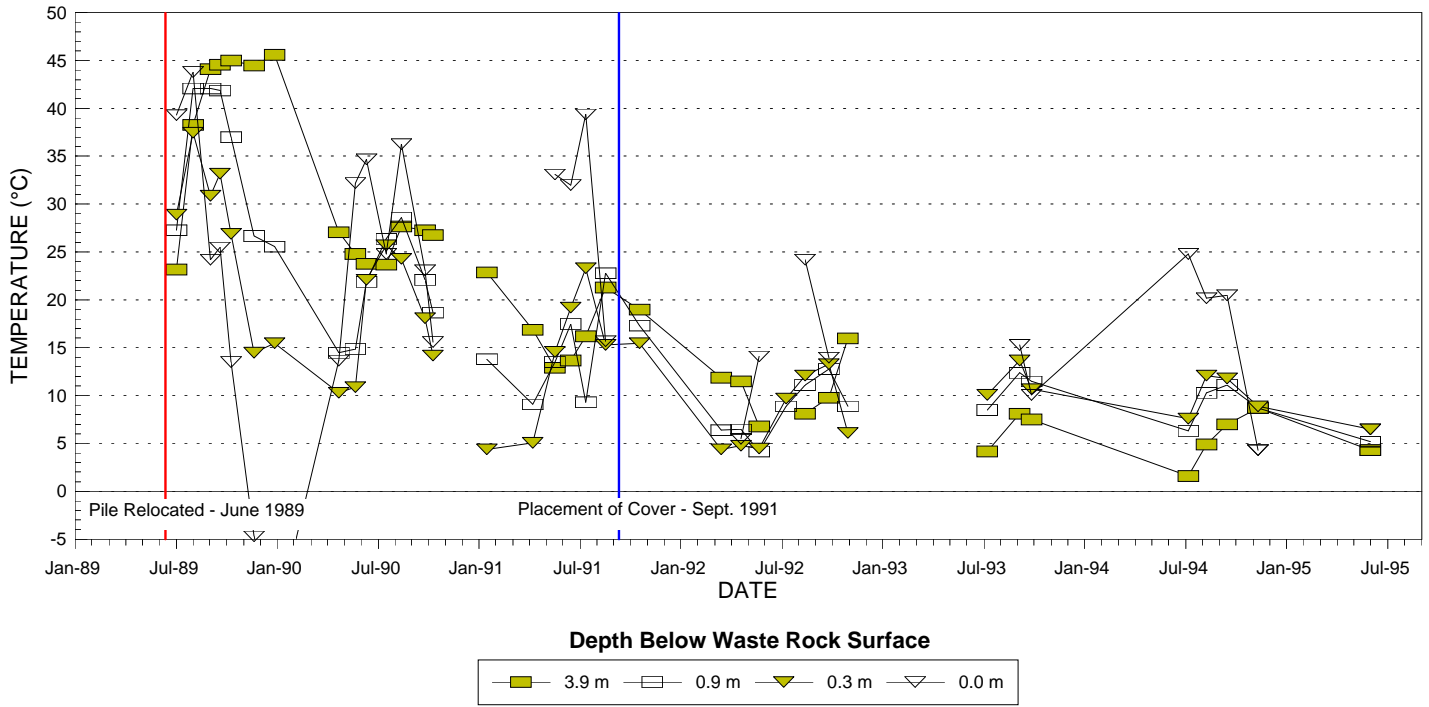


Figure V-10
Temperature Data - Datalogger, Pile 7/12, Station 2

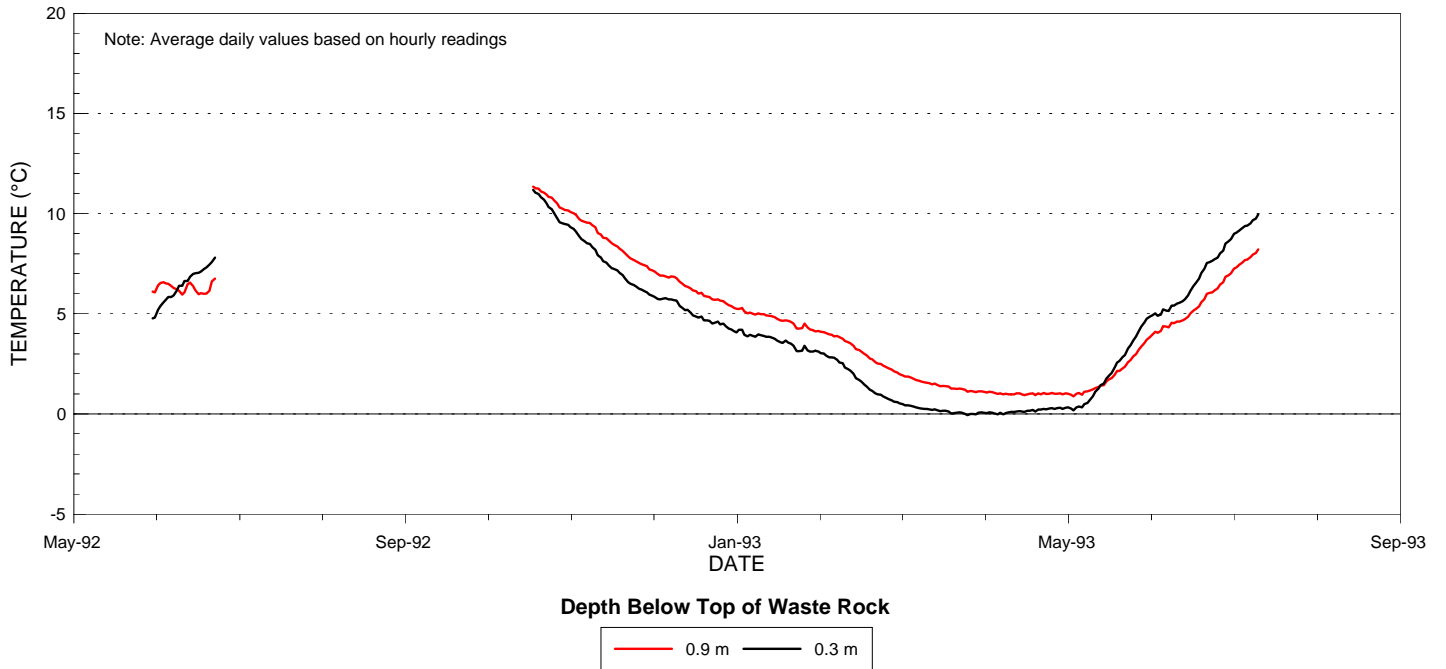


Figure V-11
Temperature Data, Pile 7/12, Station 3

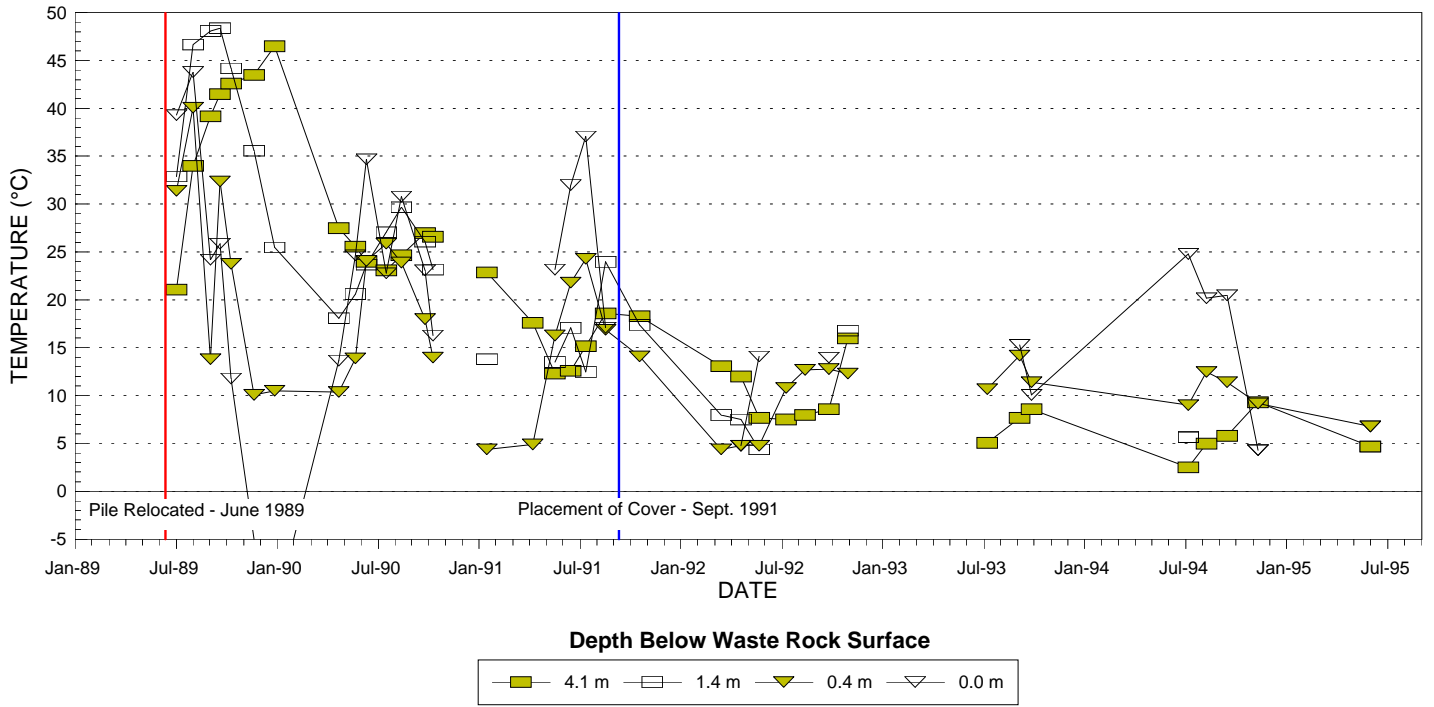


Figure V-12
Temperature Data - Datalogger, Pile 7/12, Station 3

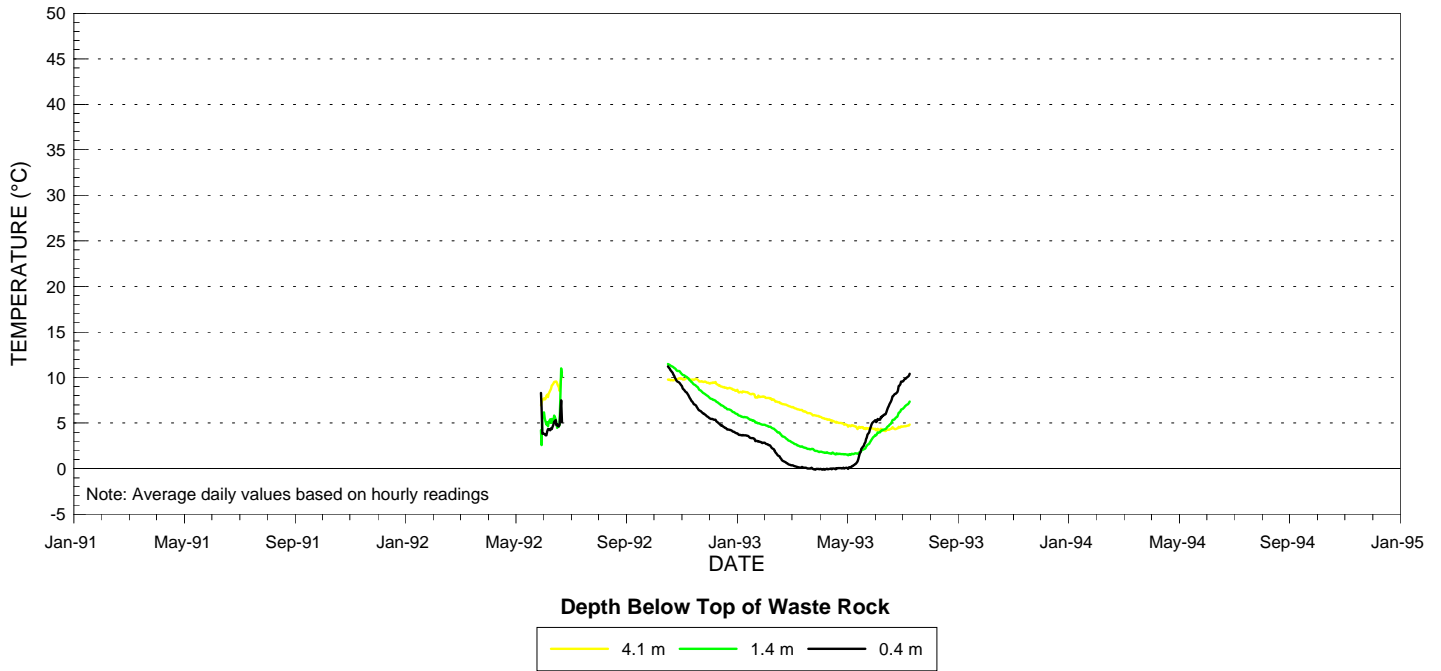


Figure V-13
Temperature Data, Pile 7/12, Station 4

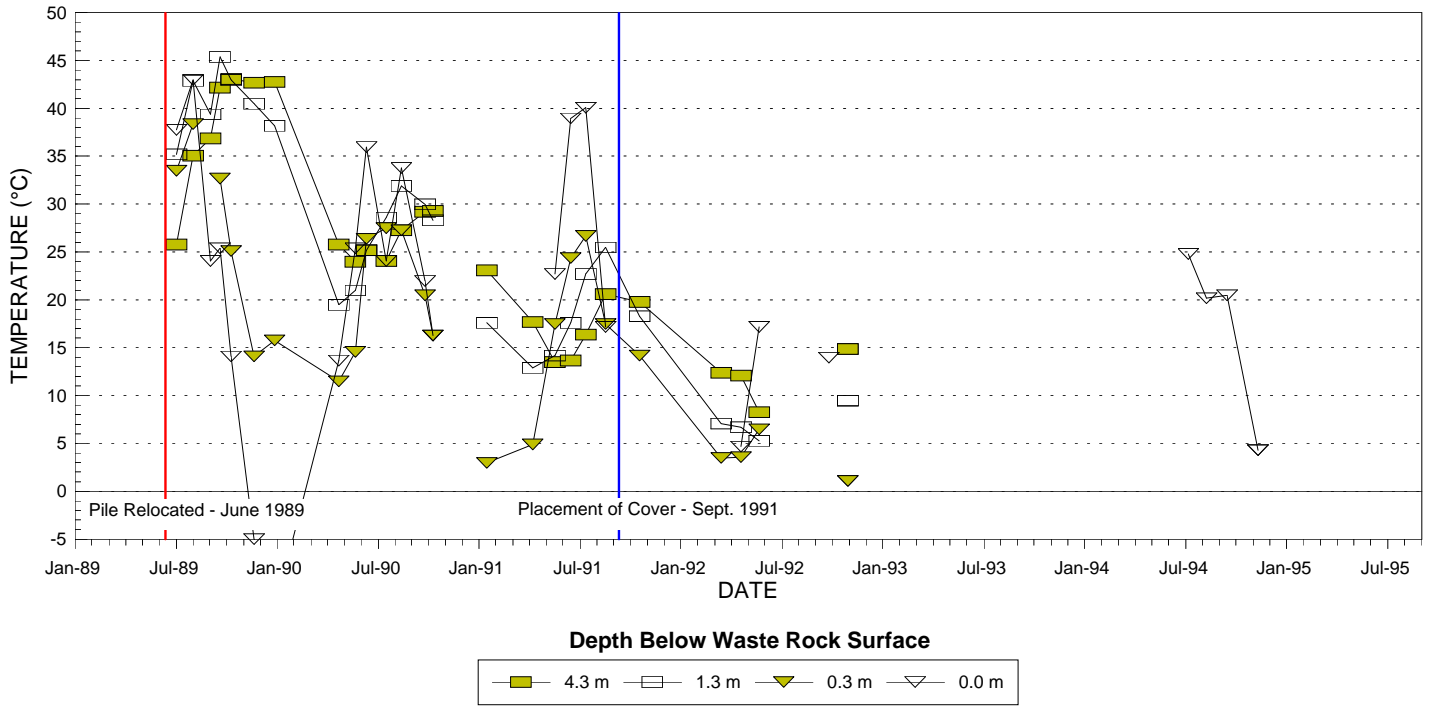


Figure V-14
Temperature Data - Datalogger, Pile 7/12, Station 4

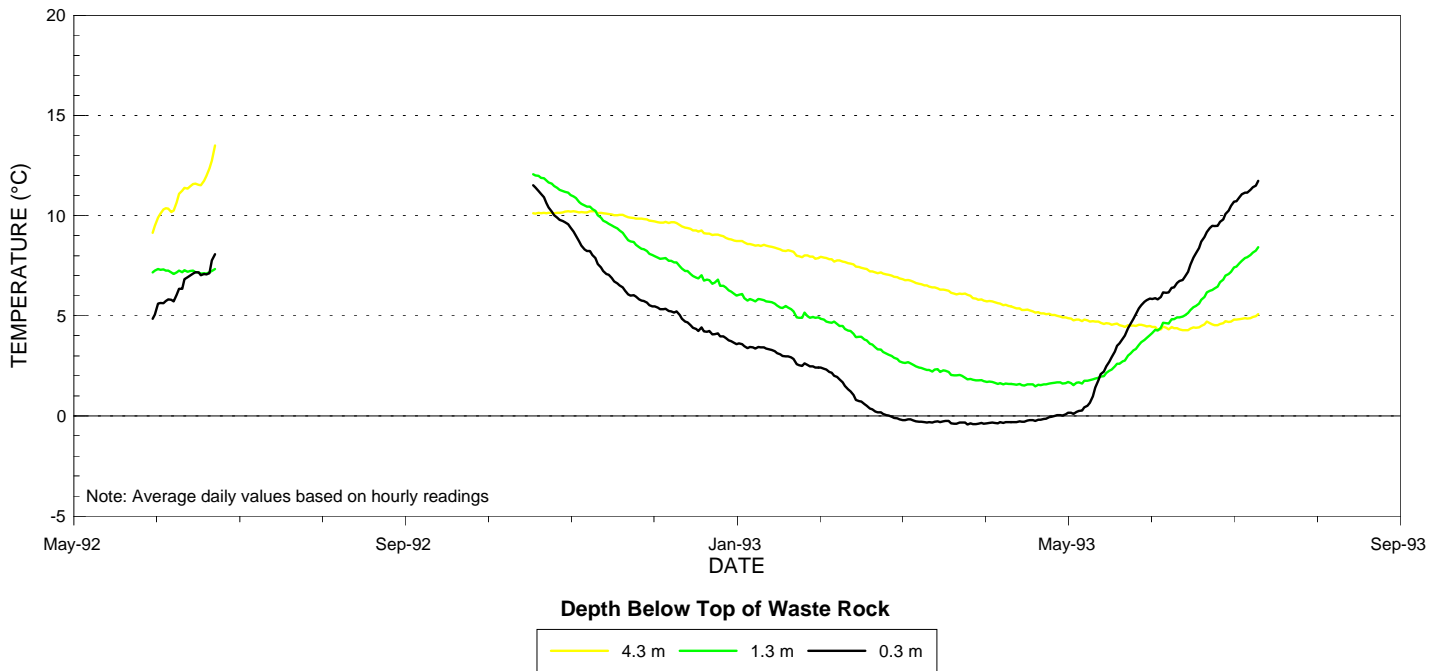


Figure V-15
Temperature Data, Pile 7/12, Station 5

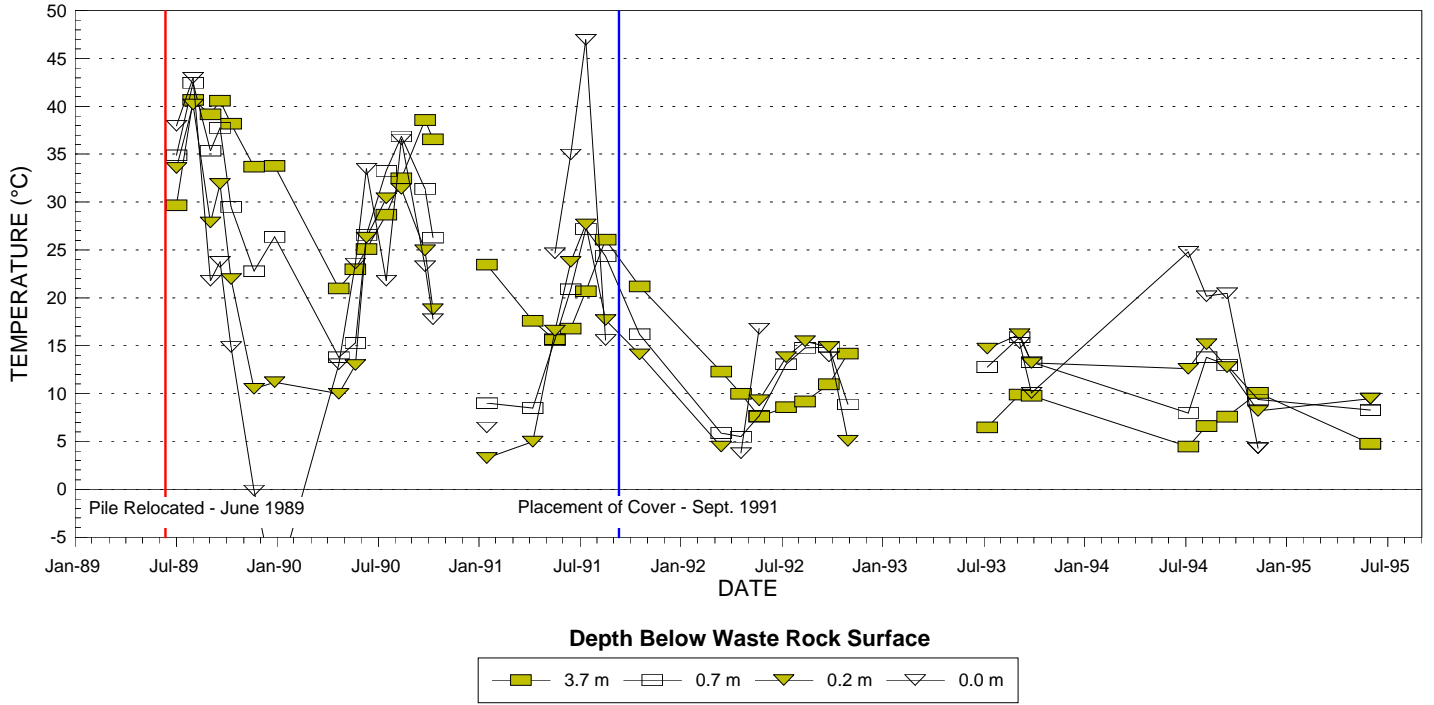


Figure V-16
Temperature Data - Datalogger, Pile 7/12, Station 5

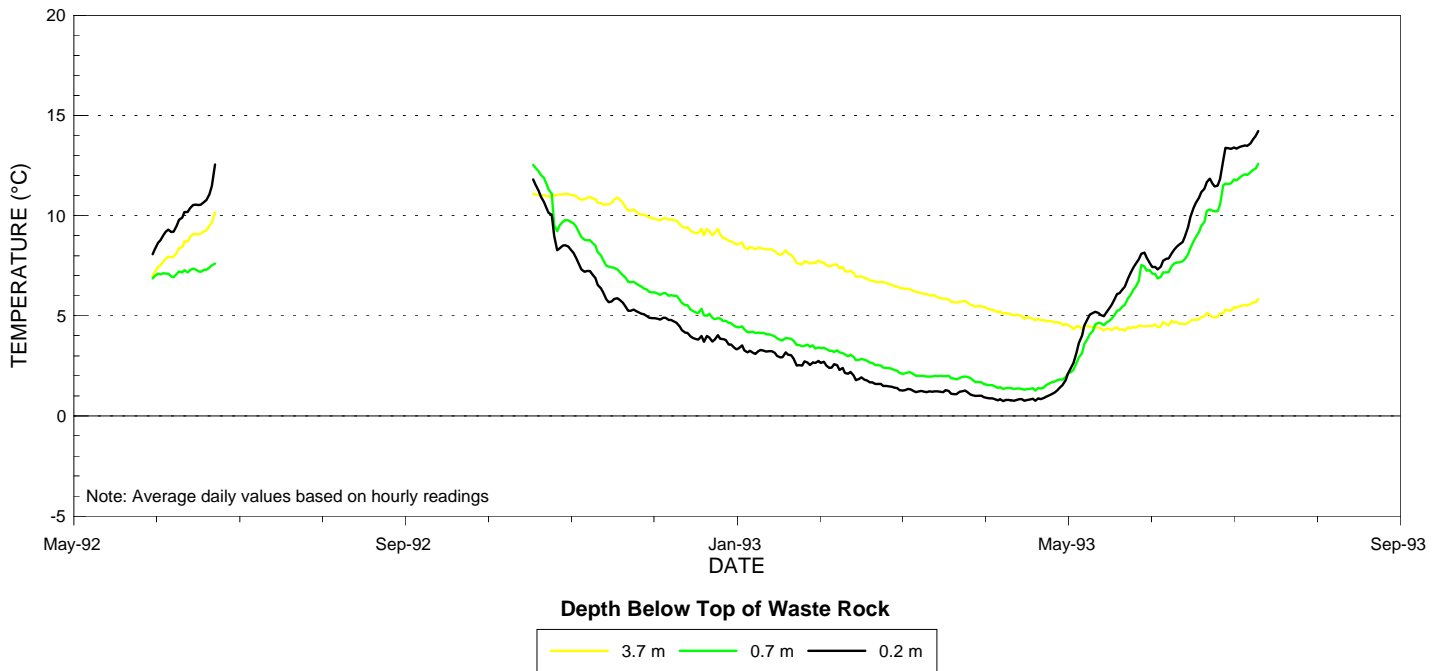


Figure V-17
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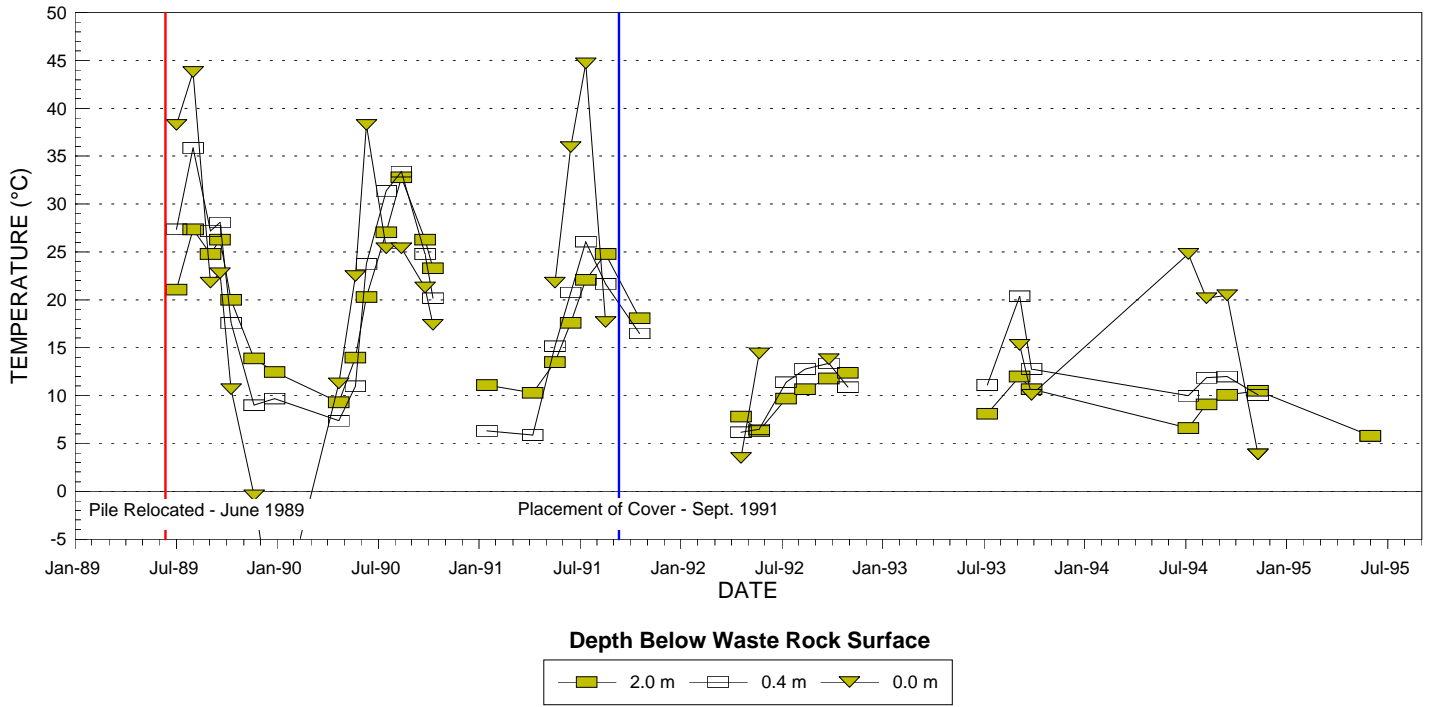


Figure V-18
Temperature Data - Datalogger, Pile 7/12, Station 6

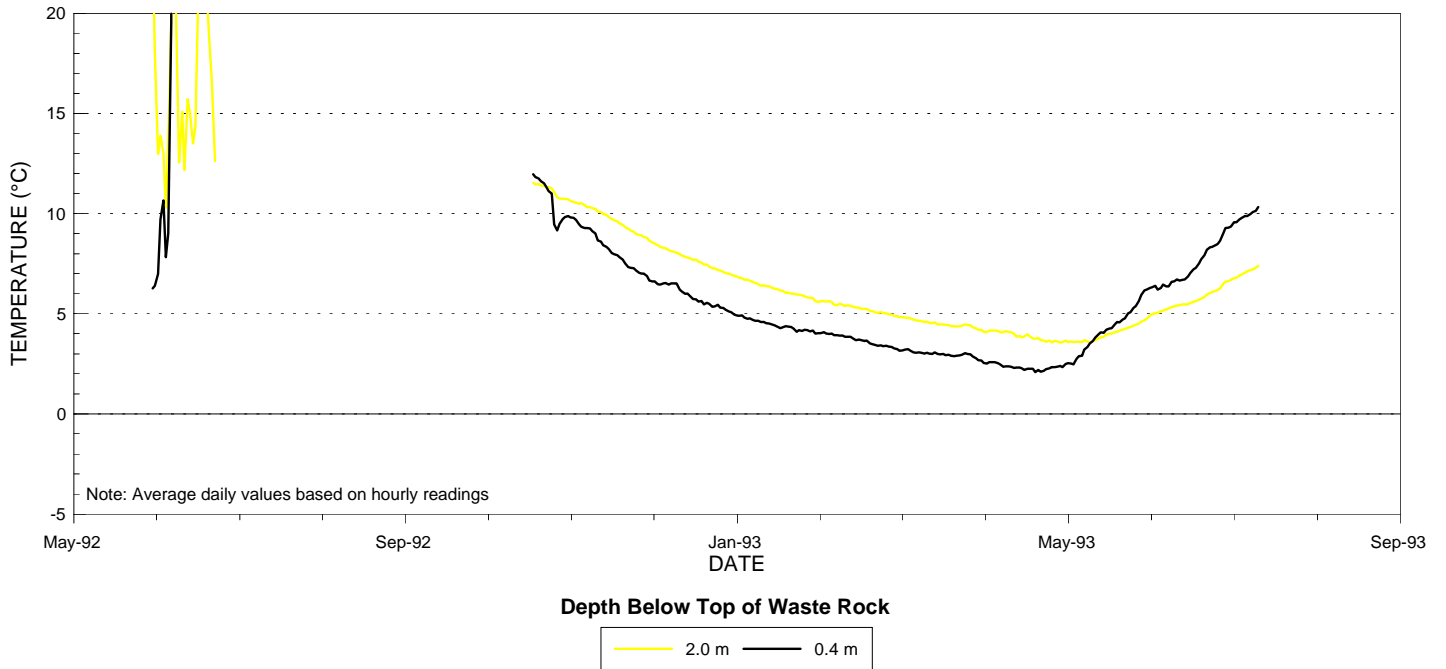


Figure V-19
Temperature Data, Pile 7/12, Station 7

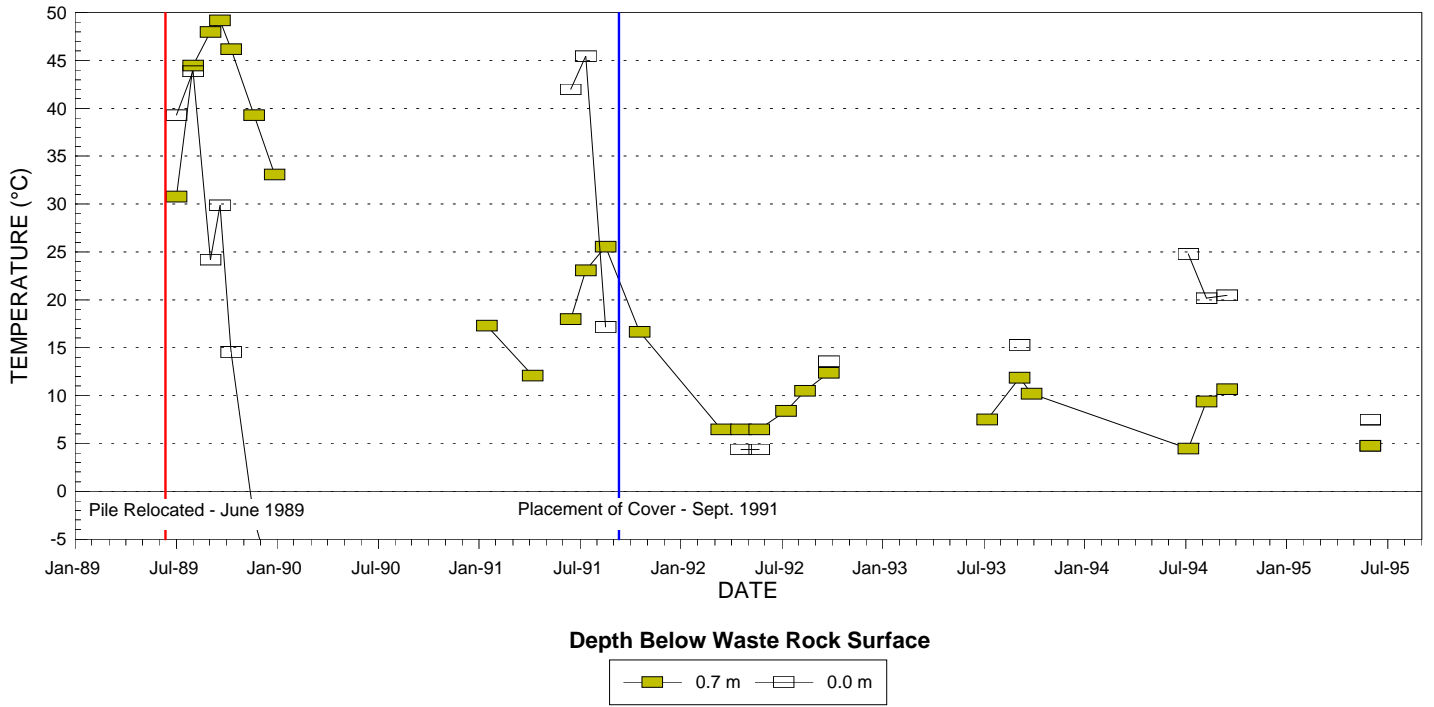


Figure V-20
Temperature Data - Datalogger, Pile 7/12, Station 7

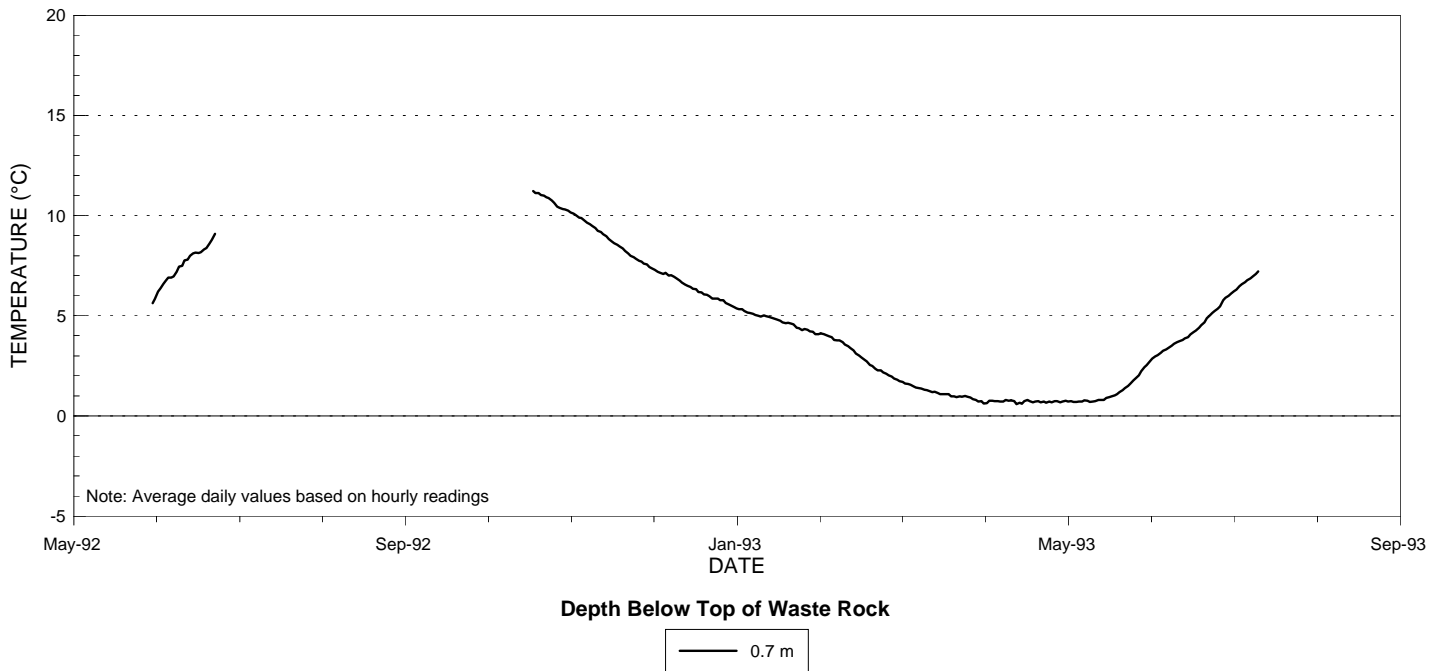


Figure V-21
Carbon Dioxide Data, Pile 7/12, Station 1

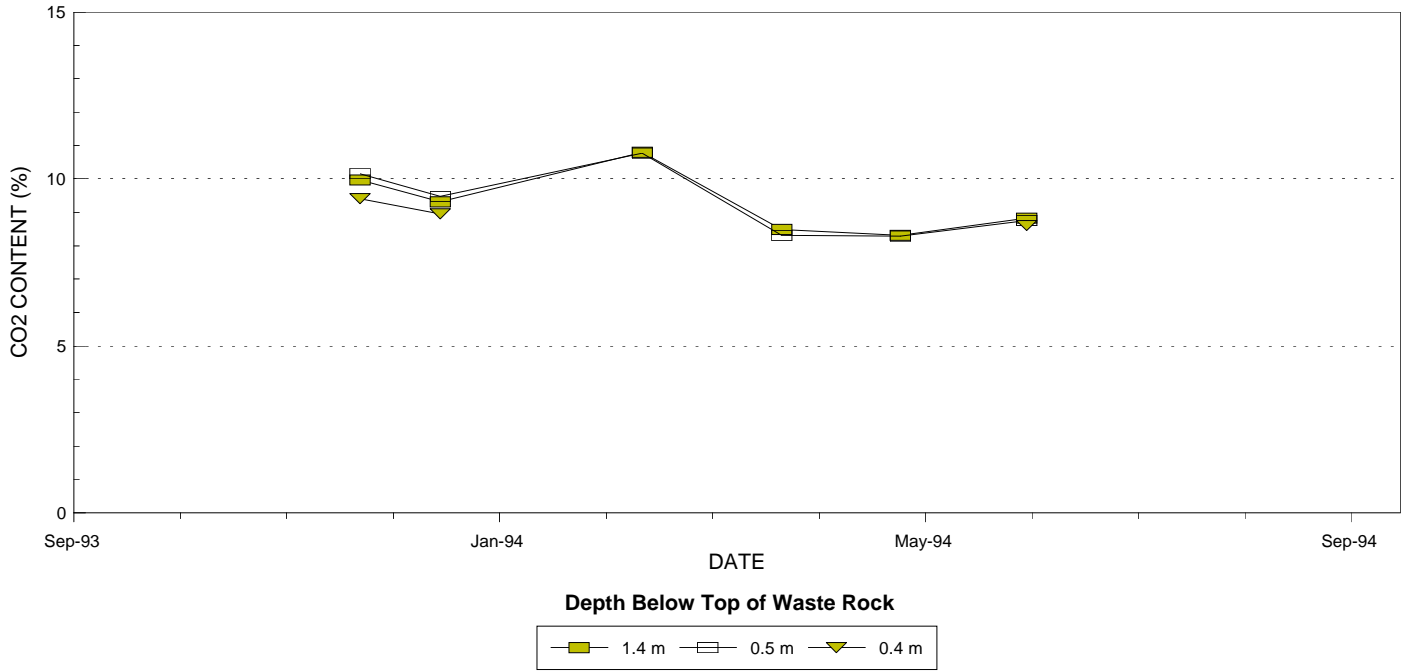


Figure V-22
Carbon Dioxide Data, Pile 7/12, Station 2

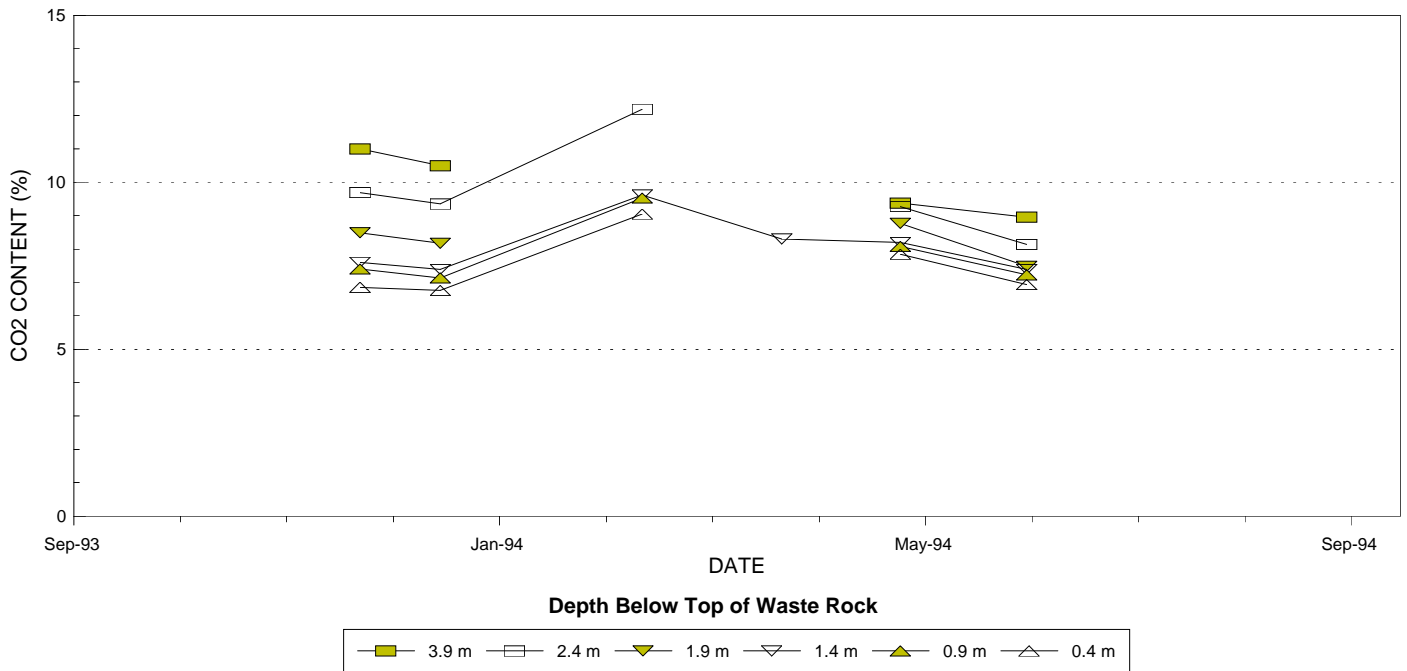


Figure V-23
Carbon Dioxide Data, Pile 7/12, Station 3

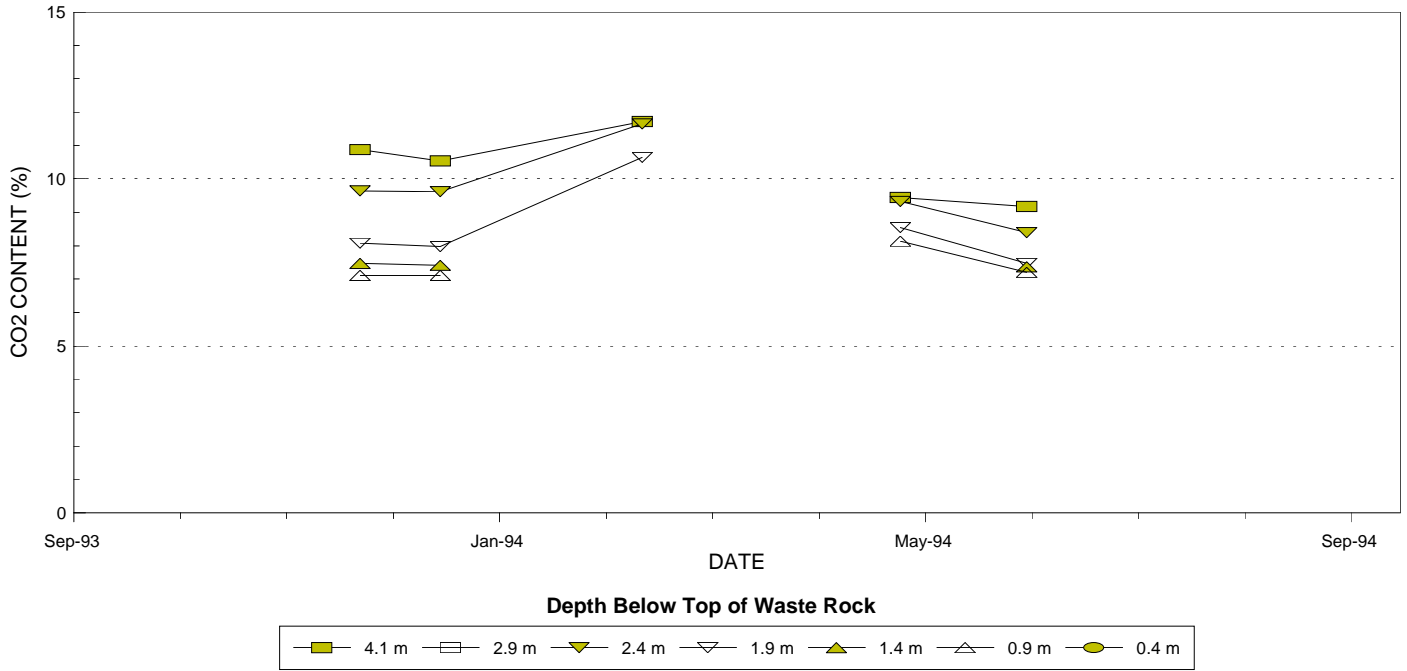


Figure V-24
Carbon Dioxide Data, Pile 7/12, Station 4

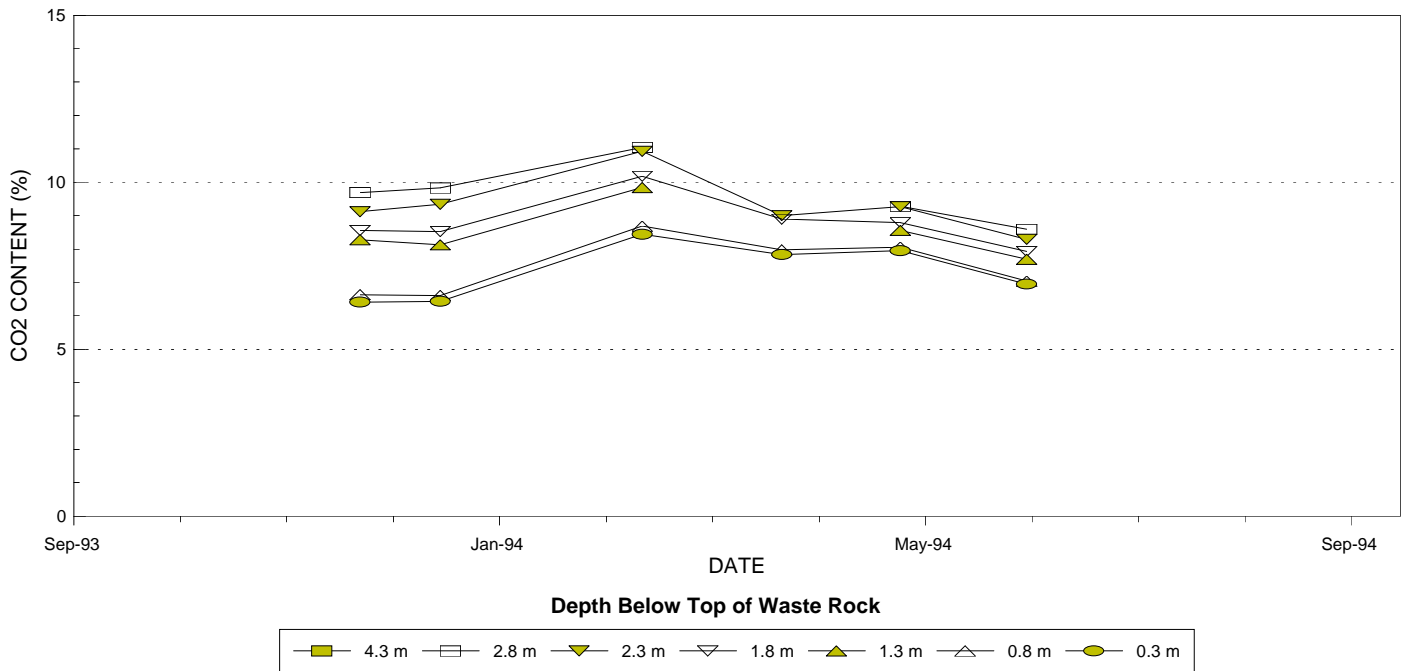


Figure V-25
Carbon Dioxide Data, Pile 7/12, Station 5

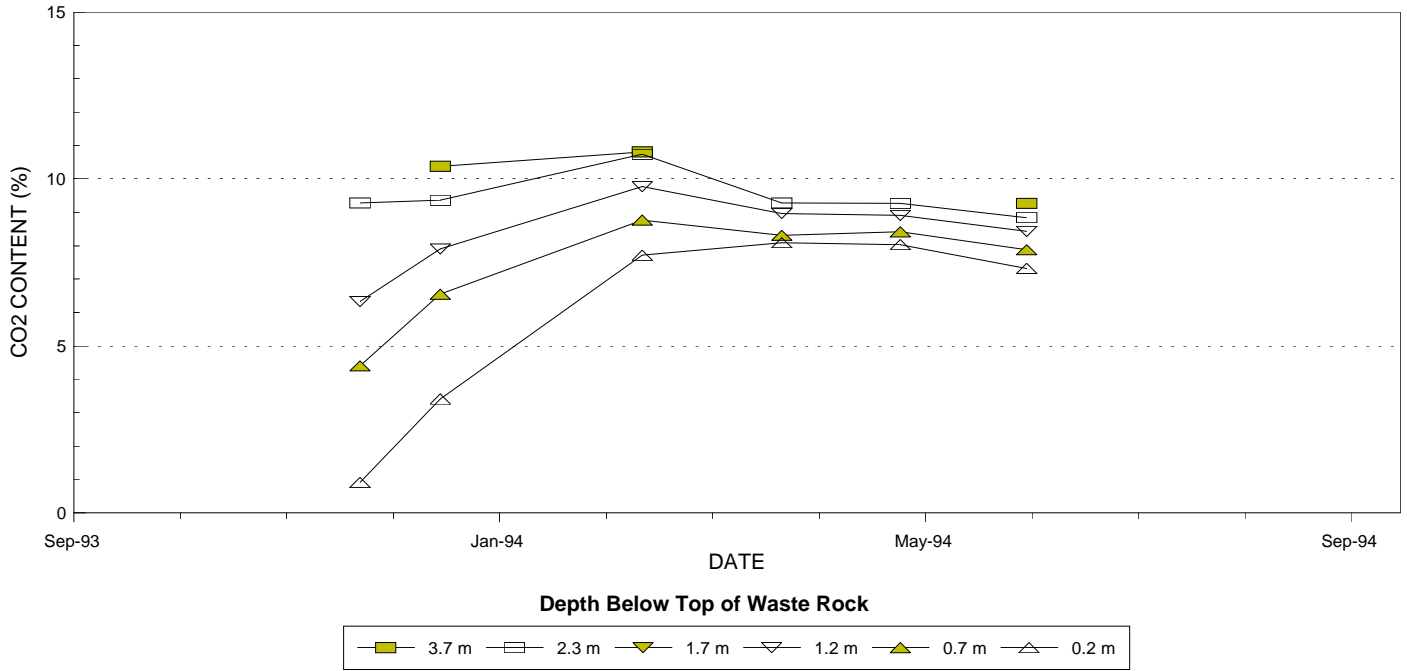


Figure V-26
Carbon Dioxide Data, Pile 7/12, Station 6

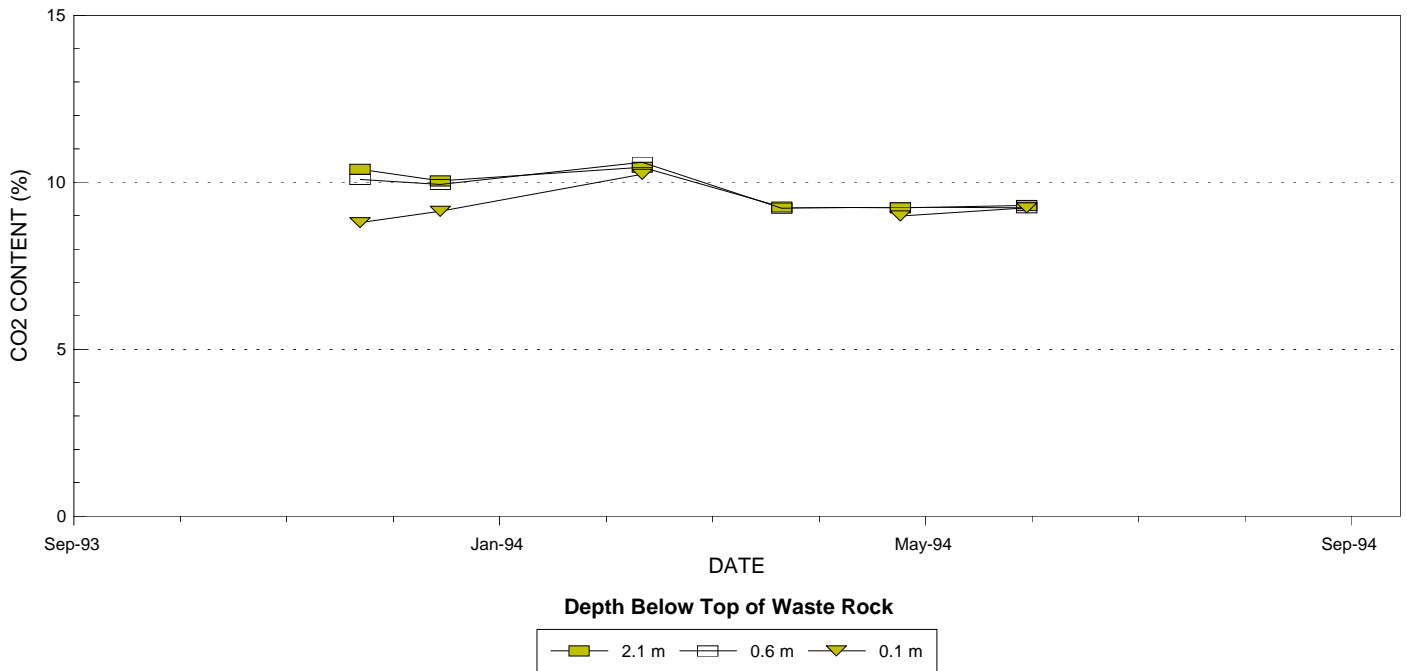


Figure V-27
Soil Suction Data, Heat Dissipation (Agwa Blocks)
Pile 7/12, Granular Cover, 0.3 m Below Cover Surface

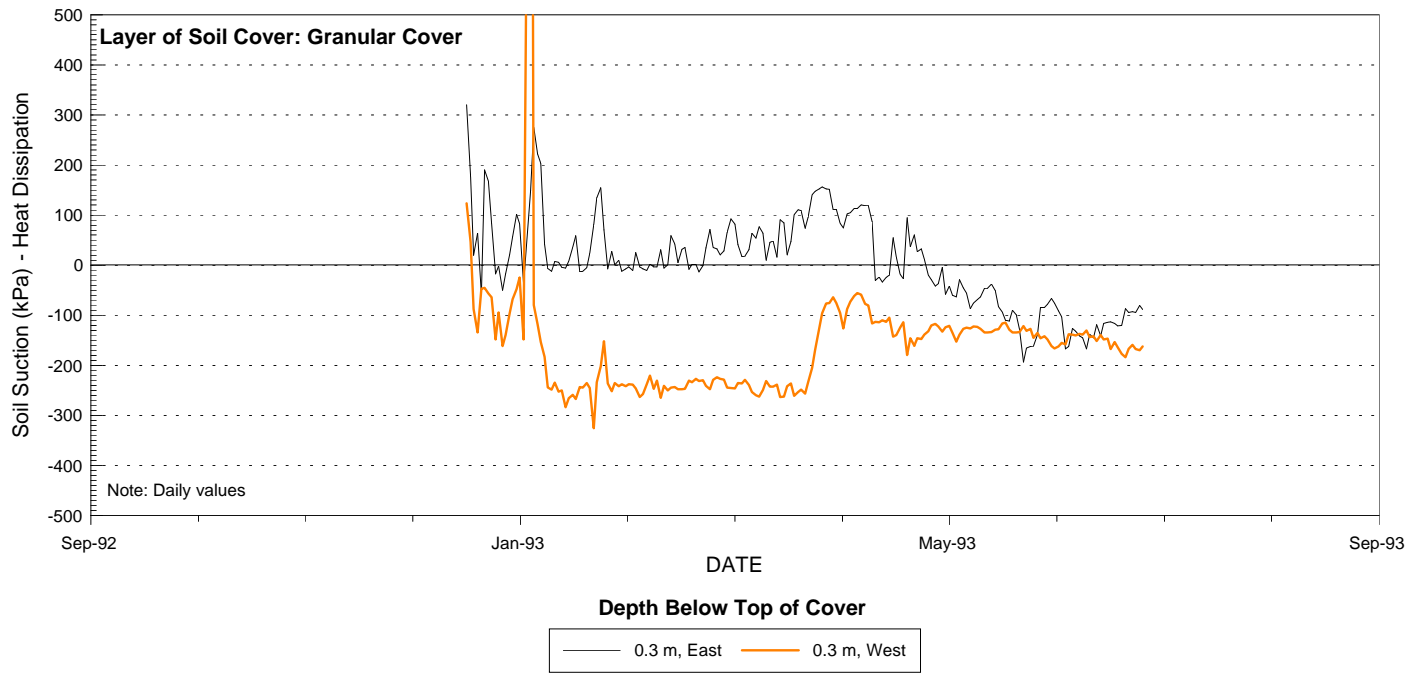


Figure V-28
Soil Suction Data, Heat Dissipation (Agwa Blocks)
Pile 7/12, Glacial Till, 0.9 m Below Cover Surface

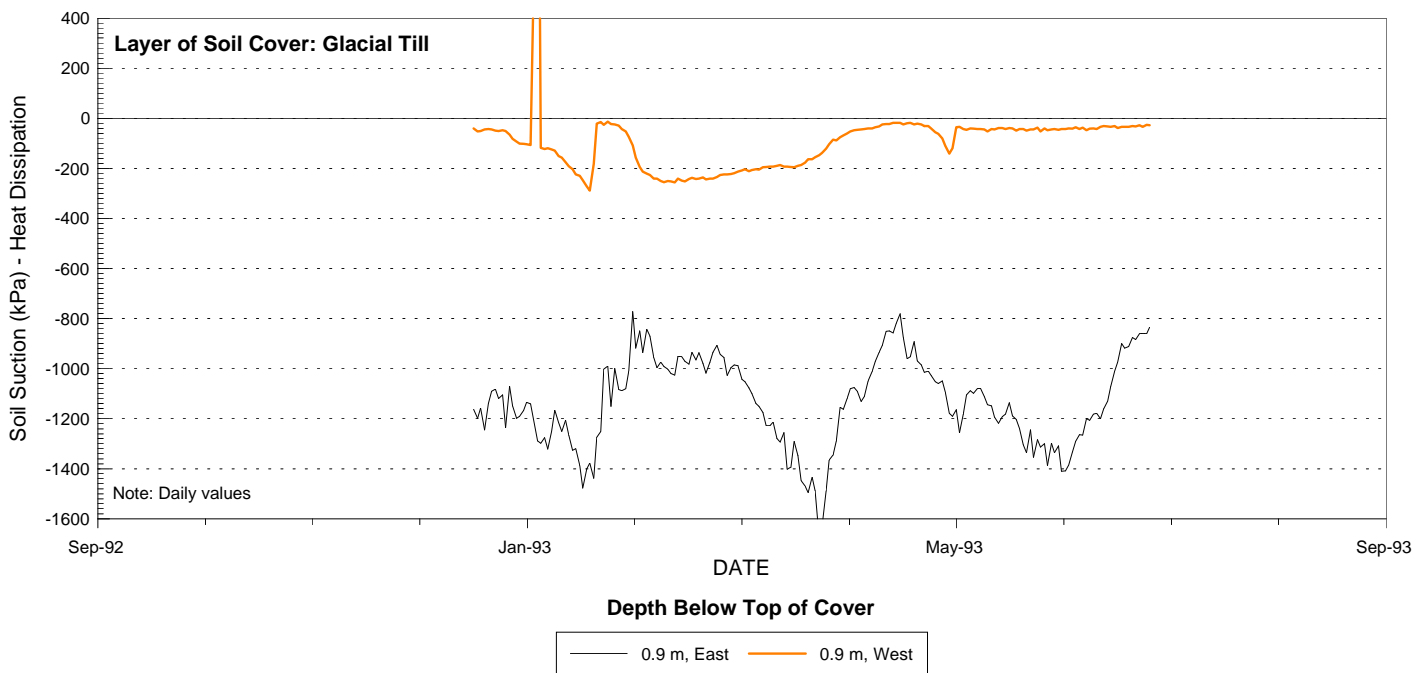


Figure V-29
Soil Suction Data, Heat Dissipation (Agwa Blocks)
Pile 7/12, Base Sand, 1.2 m Below Cover Surface

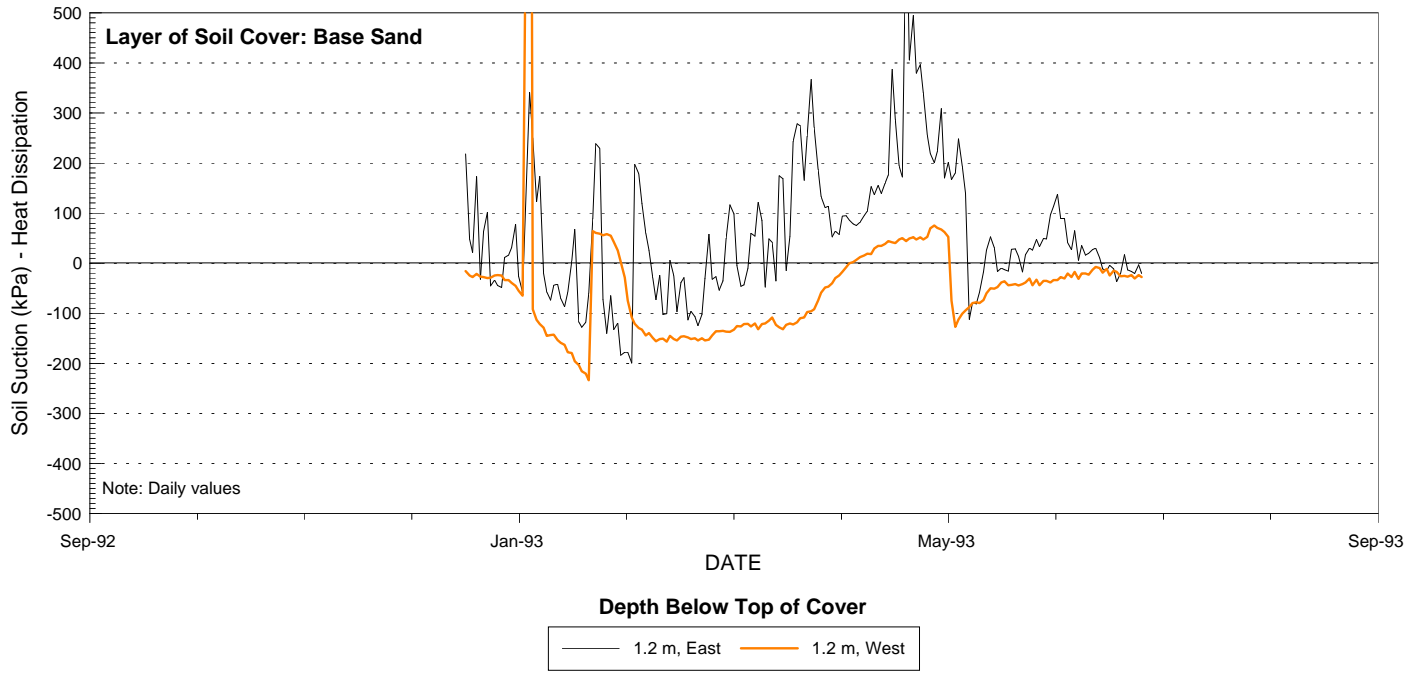


Figure V-30
Soil Suction Data, Gypsum Blocks
Pile 7/12, Granular Cover, 0.3 m Below Cover Surface

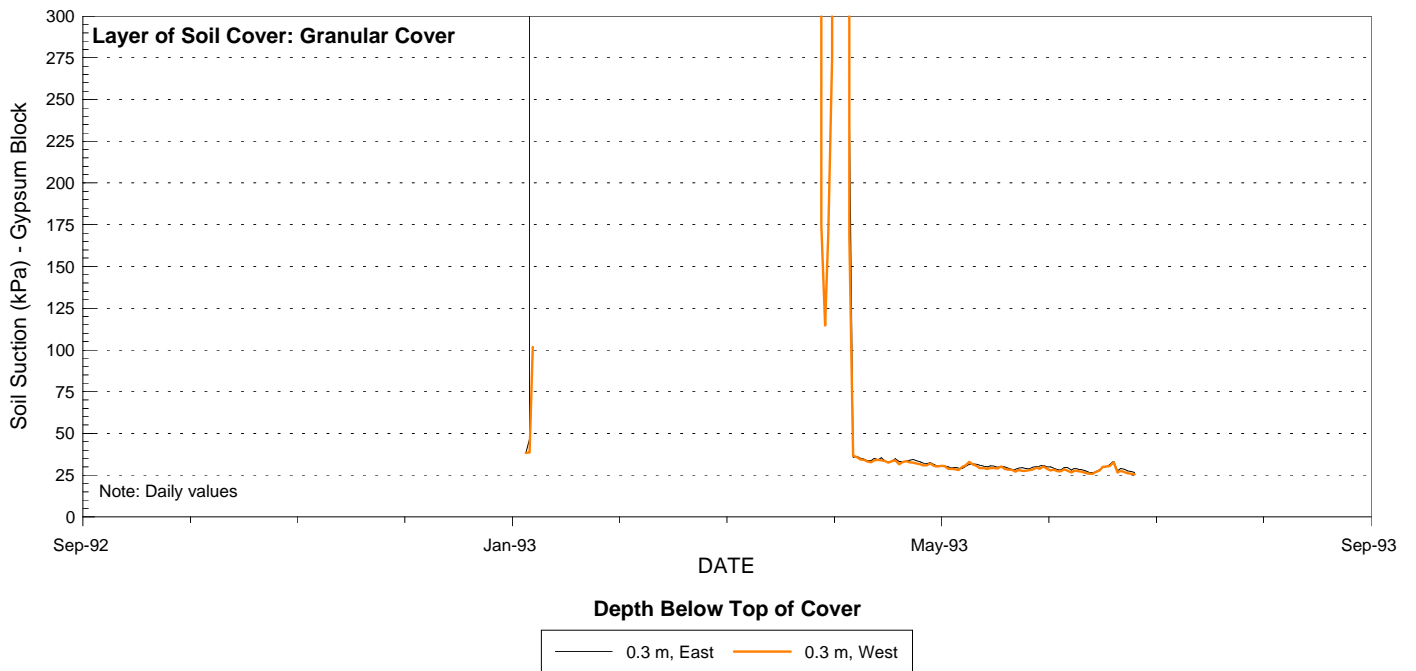


Figure V-31
Soil Suction Data, Gypsum Blocks
Pile 7/12, Glacial Till, 0.4 m Below Cover Surface

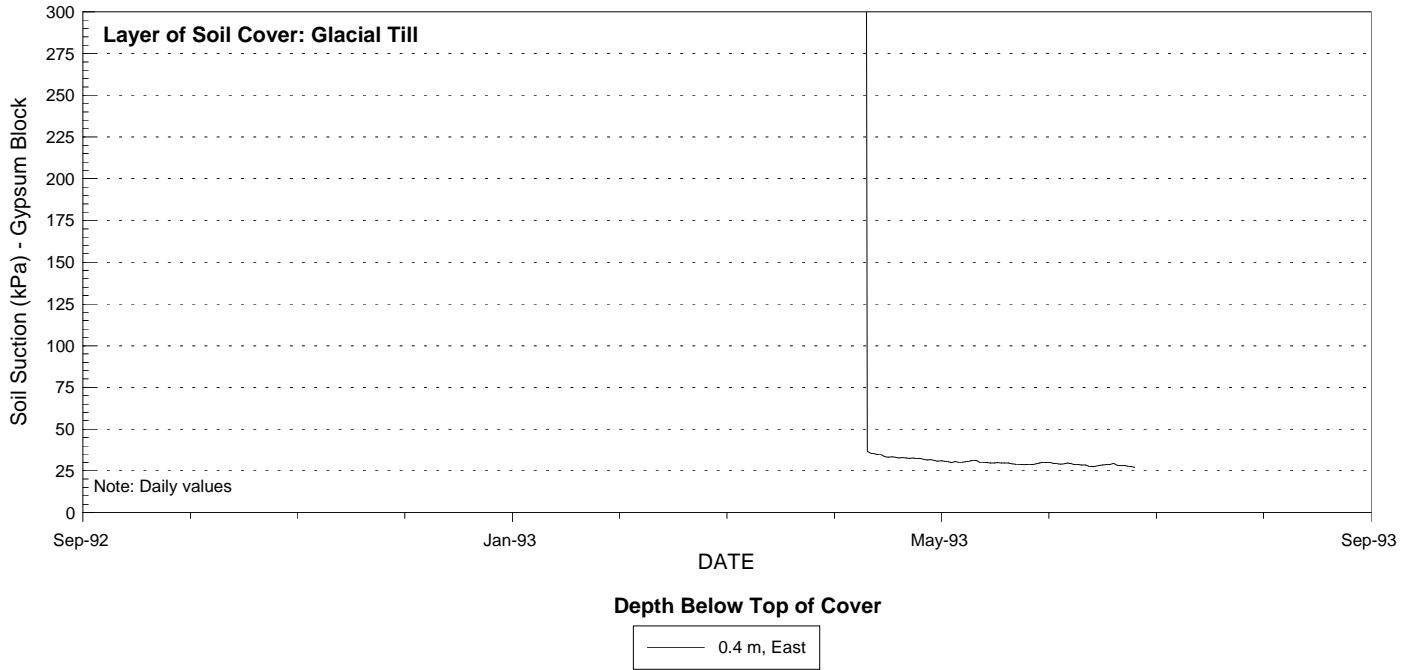


Figure V-32
Soil Suction Data, Gypsum Blocks
Pile 7/12, Glacial Till, 0.6 m Below Cover Surface

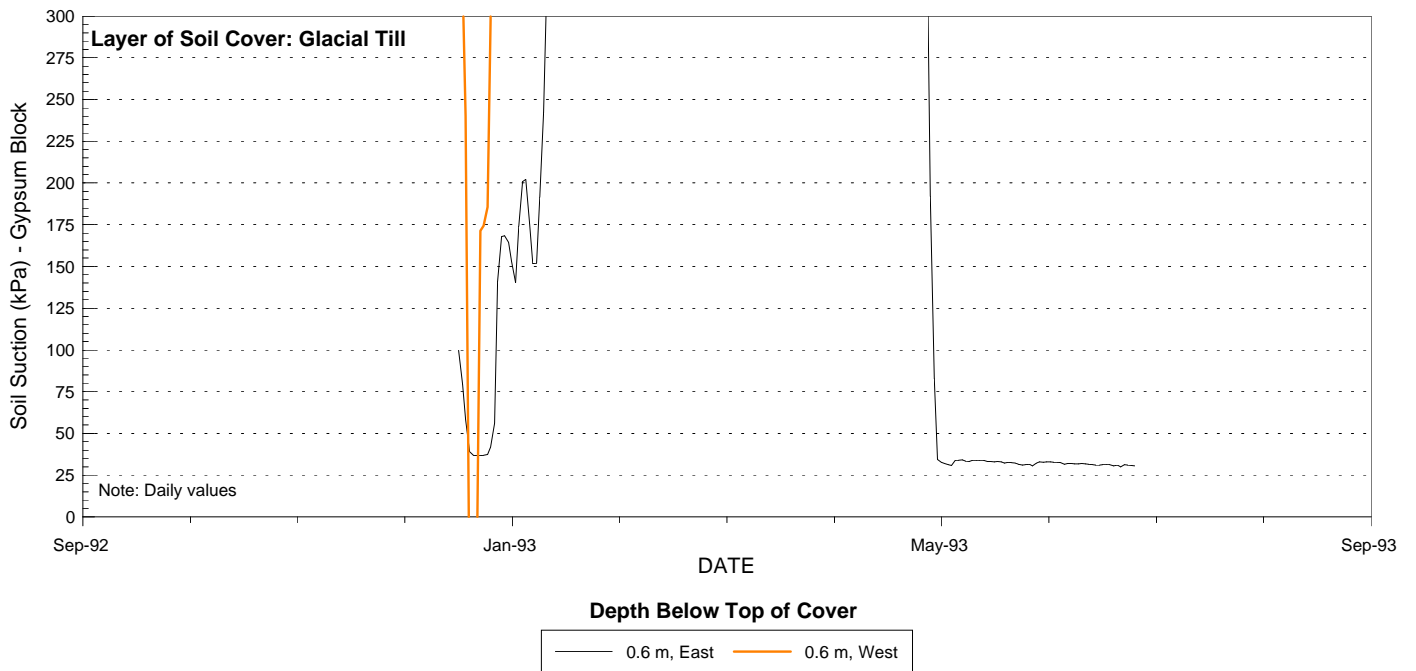


Figure V-33
Soil Suction Data, Gypsum Blocks
Pile 7/12, Glacial Till, 0.9 m Below Cover Surface

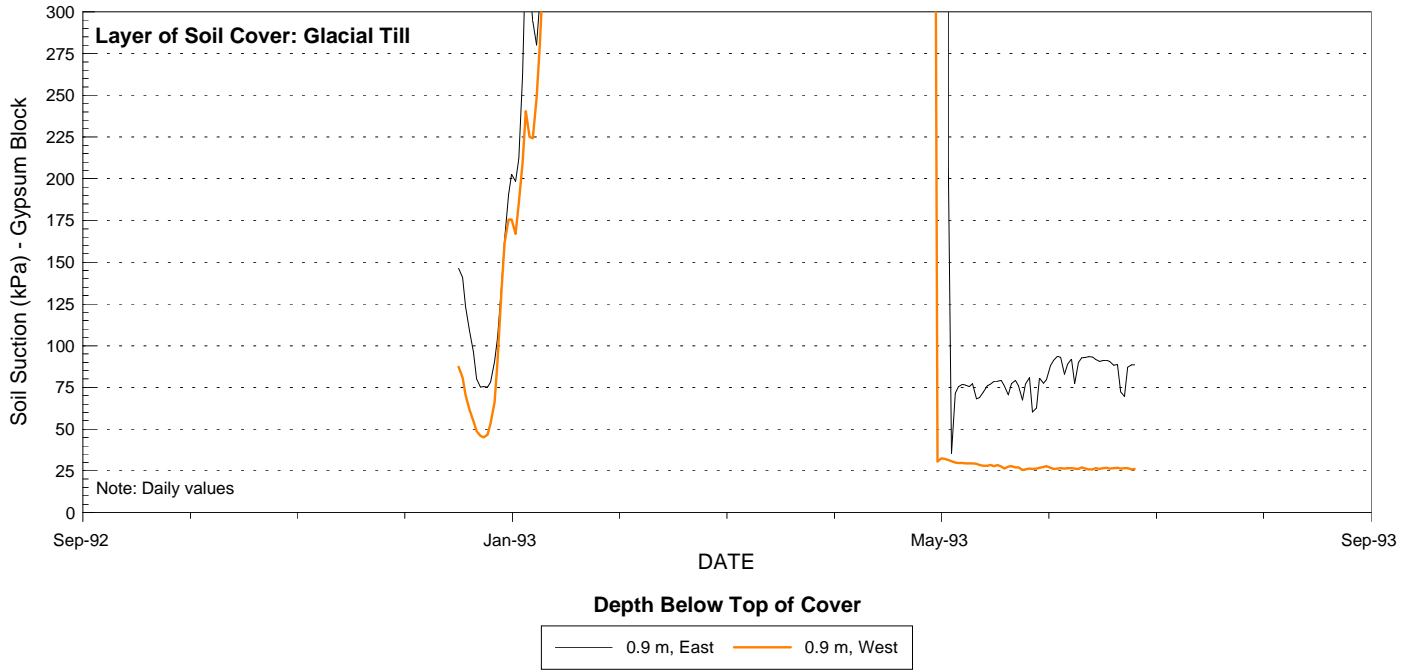


Figure V-34
Soil Suction Data, Gypsum Blocks
Pile 7/12, Base Sand, 1.0 m Below Cover Surface

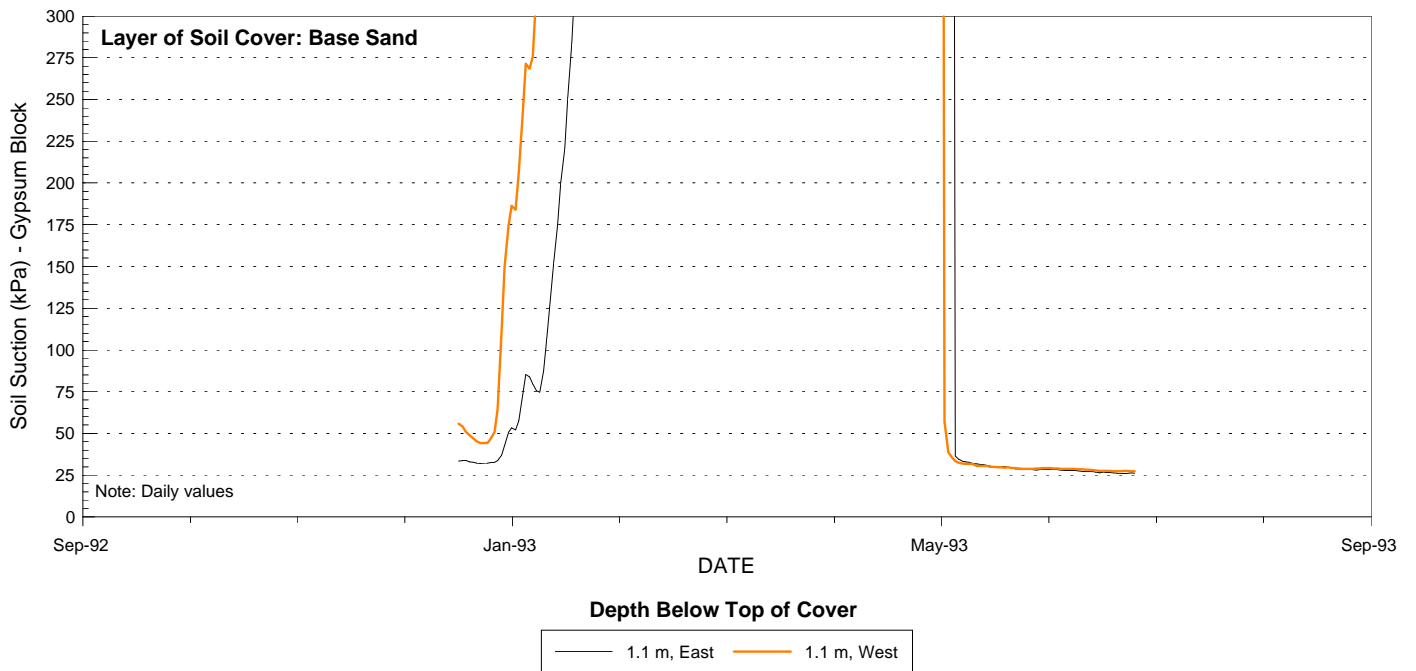


Figure V-35
Soil Suction Data, Gypsum Blocks
Pile 7/12, Base Sand - Waste Rock Interface, 1.3 m Below Cover Surface

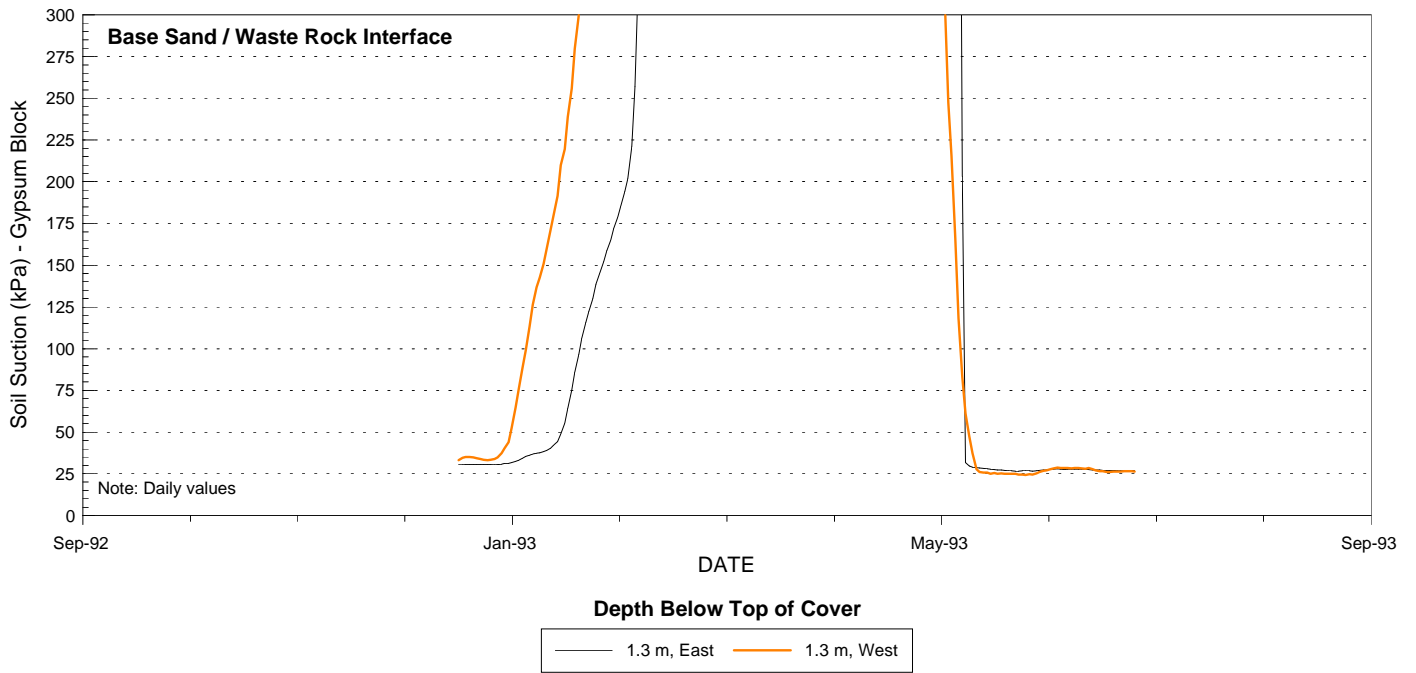


Table V-1
Gas Phase Oxygen (%) - Pile 7/12

Station	Port	Depth (m)	89-07-04 (YY-MM-DD)	89-08-03	89-09-04	89-09-22	89-10-13	89-11-22	90-04-25	90-05-25	90-06-14	90-07-20	90-08-16	90-09-28	90-10-12
1	1	1.4	18.4	19.0	20.4	20.3	20.8	19.9	20.8	20.5	15.2	17.7	19.5	19.5	18.0
	2	0.5	17.8	19.0	20.1	20.3	20.8	19.0	19.6	20.5	14.3	17.5	19.0	19.5	18.0
	3	0.4	18.0	18.5	20.4	19.8	20.8	20.0	20.6	20.5	14.5	17.5	18.5	19.2	17.5
2	1	3.9	0.5	0.5	16.6	17.6	14.1		17.9	15.0	12.7	11.0	17.2	13.5	11.5
	2	2.4	5.0	5.4	12.5	14.8	14.5	15.3	17.5	15.2	11.6	9.1	14.0	10.5	10.5
	3	1.9	5.0	5.2	10.3	13.3	13.0		15.9	14.0	11.3	9.0	12.6	11.5	9.2
	4	1.4	5.0	4.7	12.0	12.5	12.5	11.0	16.2	16.8	10.0	9.5	13.5	10.5	9.3
	5	0.9	6.3	3.9	10.5	11.0	13.5		16.6	20.5	8.5	15.5	13.5	15.5	9.3
	6	0.4	5.8	3.2	12.5	10.7	18.7	15.8	15.5	20.9	13.0	19.8	19.5	19.0	8.5
3	1	4.1	6.0	6.4	14.8	16.5	18.0	17.0	18.8	18.0	14.0	16.7	16.4	15.0	13.5
	2	2.9	7.3	7.1	14.0	16.0	17.5		20.4	20.0	14.2	16.0	16.6	14.0	13.0
	3	2.4	7.3	7.2	13.5	14.8	17.7	15.0	18.9	18.0	13.5	15.6	16.0	14.5	13.0
	4	1.9	7.0	6.5	11.5	12.3	16.0		16.6	13.5	10.5	10.4	10.3	10.0	8.4
	5	1.4	7.8	7.5	13.2	13.3	16.2	15.5	17.0	15.0	11.3	13.8	12.2	12.5	11.0
	6	0.9	7.5	7.1	13.4	14.2	15.2		17.9	17.5	11.7	14.8	14.2	15.0	12.0
	7	0.4	7.0	6.6	14.5		15.2	14.8	18.0	20.8		19.8			
4	1	4.3	9.0	8.6	15.5	17.5	19.0	17.8	19.5	18.0	15.5	17.5	20.5	16.2	15.5
	2	2.8	11.0	10.5	17.8	19.5	19.5		19.5	18.0	16.1	18.4	16.2	18.5	16.5
	3	2.3	11.0	10.5	17.6	19.3	19.8	19.0	19.9	17.5	16.0	18.5	16.4	18.2	16.2
	4	1.8	11.2	10.2	17.6	19.3	19.6		19.4	17.1	15.6	18.5	16.0	18.0	16.5
	5	1.3	10.5	10.0	17.5	18.9	19.5	19.5	19.4	17.2	15.4	18.2	15.5	17.5	16.0
	6	0.8	10.5	10.0	17.0	17.6	19.4		19.1	17.2	15.0	18.2	15.5	17.5	15.2
	7	0.3	10.0	9.8	17.0	17.5	19.5	19.0	19.1	18.0	16.0	18.2	15.7	17.5	15.5
5	1	3.7	19.5	19.5	20.8	20.5	20.0	20.0	20.5	17.7	16.6	19.5	13.6	19.5	18.5
	2	2.3	20.0	20.0	20.8	20.5	20.7		20.5	12.5	17.0	20.2	16.6	20.0	20.0
	3	1.7	20.5	20.0	20.8	20.4	20.0	19.5	20.5	19.0	17.0	20.0	16.7	18.0	17.5
	4	1.2	20.0	20.0	20.7	20.3	20.7		20.5	16.8	16.9	19.8	15.9	18.2	17.7
	5	0.7	20.8	20.0	20.5	20.2	20.5	20.5	20.5	16.5	16.8	19.8	15.9	18.5	17.5
	6	0.2	20.8	19.0	20.8	18.8	20.1	19.5	20.4	16.5	16.2	19.1	15.5	18.0	17.5
6	1	2.1	20.8	20.8	20.8	20.8	20.8	20.8	20.8	18.0	20.8	20.5	20.6	20.5	20.5
	2	0.6	20.8	20.5	20.5	20.3	20.7	20.8	20.5	17.3	20.4	20.5	20.4	20.2	20.2
	3	0.1	20.8	20.5	20.5	20.0	20.7	20.8	20.4	20.8	20.0	20.8	19.7	20.2	20.0

Table V-1
 Gas Phase Oxygen (%) - Pile 7/12

Station	Port	Depth (m)	91-04-11	91-05-22	91-06-19	91-07-19	91-08-21	92-03-17	92-04-22	92-05-26	92-06-29	92-07-14	92-08-17	92-08-26	92-10-14
1	1	1.4	20.0	21.0	19.0	15.5	20.5	6.8	0.6	0.6	0.5	0.5	0.8	0.2	0.2
	2	0.5	20.0	21.0	18.5	15.0	20.0	6.7	0.3	0.5	0.3	0.4	0.9	0.1	0.2
	3	0.4	20.8	21.0	18.2	15.0	19.5	11.5	1.6	0.6	2.5	0.3	1.2	0.1	0.1
2	1	3.9	19.5	19.5	11.0	9.0	11.5			1.9	0.5	0.3	0.2	0.3	0.4
	2	2.4	15.5	18.5	13.5	10.0	9.4			1.6	1.1	0.4	0.6	0.3	0.3
	3	1.9	14.5	17.0	17.5	14.0	9.6		0.8	1.4	0.8	0.3	0.6	0.2	0.3
	4	1.4	15.5	18.5	20.3	12.0	13.5		0.8	1.5	0.9	0.3	1.5	0.2	0.2
	5	0.9	16.5	20.5	20.8	18.5	13.5		1.1	1.3	0.7	0.3	0.2	0.1	0.2
3	6	0.4	18.0	20.5	20.8	20.0	12.0		0.8	1.2	0.5	0.2	0.5	0.1	0.2
	1	4.1	18.0	19.0	11.8	9.5	13.0	3.1	0.3	1.2	0.6	0.6	0.5	0.2	0.2
	2	2.9		19.0	10.0	13.2									
	3	2.4	18.0	19.0	8.1	6.7	11.5	7.0	0.6	1.1	0.8	0.5		0.1	0.3
	4	1.9	15.5	18.5	11.0	5.0	8.2	4.2	0.6	1.0	0.9	0.4	0.3	0.1	0.3
	5	1.4	16.5	18.0	16.5	13.0	9.5	2.1	1.0	0.9	0.5	0.3	0.2	0.1	0.4
	6	0.9	18.0	19.0	19.2	15.0	12.5	1.9	1.7	0.8	0.4	0.3	0.1	0.1	0.3
4	7	0.4	18.0	20.9	20.2	20.5	14.5								
	1	4.3		20.5	20.2										
	2	2.8	19.0	19.0	14.0	11.5	15.0	2.0	0.6	0.9	0.2	0.4	0.2	0.1	0.2
	3	2.3	19.0	17.5	13.0	10.5	14.5		0.2	0.8	0.3	0.1	0.2	0.1	0.1
	4	1.8	19.0	19.0	13.5	10.5	14.5	1.9	4.4	0.7	0.1	0.1	0.2	0.1	0.2
	5	1.3	19.0	18.0	13.5	10.5	13.5	2.2	4.8	0.7	0.1	0.3	0.1	0.1	0.1
	6	0.8	18.5	18.0	13.0	10.0	12.5		4.8	0.8	2.5	0.4	0.2	1.7	0.1
5	7	0.3	19.0	20.0	15.5		12.5		3.3	0.8	2.4	0.2	0.1	1.3	0.1
	1	3.7	20.0	18.5	16.0	12.0	16.0								
	2	2.3	20.5	18.5	17.0	12.5	18.0		1.0	0.9	0.5	0.3	0.1	0.1	0.1
	3	1.7	20.5	20.0	19.5										
	4	1.2	19.0	17.5	18.5	10.5	15.5				6.8	5.2	0.6	0.5	0.3
	5	0.7	19.0	19.5	19.0	11.0	16.0		9.0	0.8	4.1	1.2	2.9	3.2	0.1
6	6	0.2	18.5	20.5	19.0	12.5	17.5		8.1	1.4	13.0	1.6	13.3	12.7	0.1
	1	2.1		18.5	18.0	19.0	20.5			0.7	0.1	0.1	0.2	0.1	0.1
	2	0.6		18.0	17.5	18.0	20.5			0.7	0.1	0.4	0.2	0.1	0.1
3	0.1		18.0	17.5	16.0	19.0		5.4	0.5	0.1	0.1	0.2	0.2	0.1	

Table V-1
Gas Phase Oxygen (%) - Pile 7/12

Station	Port	Depth (m)	92-11-03	93-03-19	93-04-24	93-05-21	93-07-13	93-09-10	93-10-01	93-10-26	93-11-29	93-12-22	94-02-18	94-03-30	94-05-03
1	1	1.4	0.2		0.4	0.4	0.1	0.1	0.1	0.4	0.2	0.1	0.2	0.5	0.6
	2	0.5	0.1		0.3	0.3	0.1	0.1	0.1	0.8	0.4	0.2	0.2	0.3	0.2
	3	0.4	0.1												
2	1	3.9	0.3	0.4	0.2	0.1	0.1	0.0	0.2	0.4	1.0	0.2			0.5
	2	2.4	0.3	0.2	0.3	0.1	0.1	0.0	0.1	0.4	0.6	0.2	0.2		0.3
	3	1.9	0.2	0.1	0.1	0.1	0.1	0.0	0.8	0.6	0.2	0.2			0.4
	4	1.4	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.3	0.2	0.3	0.2	0.2	0.3
	5	0.9	0.2	0.1	0.2	0.1	0.1	0.0	0.1	0.3	0.3	0.2	0.2		0.3
	6	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.3	0.2	0.2	0.2		0.4
3	1	4.1	0.1	0.2	0.1	0.0	0.1	0.5	0.2	0.5	0.2	0.2	0.5		0.8
	2	2.9													
	3	2.4	0.1	0.4	0.1	0.0	0.1	0.0	0.1	0.7	0.2	0.2	0.3		0.6
	4	1.9	0.2	0.2	0.1	0.0	0.1	0.0	0.0	0.6	0.3	0.3	0.3		0.8
	5	1.4	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.4	0.2	0.2			
	6	0.9	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.2	0.2	0.3			
	7	0.4													
4	1	4.3													
	2	2.8	0.1	0.3	0.1	0.1	0.1	0.0	0.2	0.5	0.2	0.3	0.3		0.3
	3	2.3	0.1	0.1	0.1	0.0	0.1	0.0	0.2	0.4	0.2	0.2	0.2	0.2	0.3
	4	1.8	0.1		0.1	0.0	0.1	0.0	0.2	0.5	0.2	0.2	0.2	0.2	0.9
	5	1.3	0.1		0.1	0.0	0.2		0.2	0.6	0.2	0.3	0.2		0.6
	6	0.8	0.1		3.2	0.2	2.9	0.0	0.3	6.1	0.2	0.3	0.2	0.2	0.5
	7	0.3	0.0		3.2	0.1	1.4	0.0	0.4	6.3	0.2	0.3	0.1	0.2	0.5
5	1	3.7											0.5		
	2	2.3	0.1		0.1	0.0	0.1	0.0	0.1	0.5	0.2	0.2	0.3	0.2	0.5
	3	1.7													
	4	1.2	0.1		0.2	0.2	2.3	0.0	0.7	1.6	7.2	2.3	0.2	0.1	0.6
	5	0.7	0.2		3.6	1.4	7.0	0.0	4.1	7.6	14.0	8.6	1.2	0.1	0.4
	6	0.2	0.8		8.7	4.8	17.8	0.0	11.7	12.9	19.7	18.2	5.1	0.2	0.4
6	1	2.1	0.1		0.1	0.0	0.1	0.0	0.1	0.4	0.2	0.3	0.2	0.2	1.1
	2	0.6	0.0		0.1	0.0	0.0	0.0	0.1	0.3	0.2	0.4	0.2	0.3	0.8
	3	0.1	0.0		0.1	0.0	0.0	0.0	0.1	0.2	1.8	0.5	0.2		0.6

Table V-1
 Gas Phase Oxygen (%) - Pile 7/12

Station	Port	Depth (m)	94-06-08	94-07-12	94-08-15	94-09-20	94-11-16	95-04-13	95-06-07
1	1	1.4	0.4	0.3	0.2	0.3	0.4		
	2	0.5	0.3	0.2	0.2	0.2	4.1	0.2	0.4
	3	0.4	1.2	0.3	0.7	0.4			
2	1	3.9	0.3	0.3	0.1	0.3	0.4	0.2	0.2
	2	2.4	0.4	0.3	0.1	0.3	0.3	0.1	0.2
	3	1.9	0.4	0.2	0.1	0.3	0.4	0.1	0.2
	4	1.4	0.4	0.3	0.1	0.3	0.4	0.1	0.2
	5	0.9	0.3	0.2	0.1	0.2	0.3	0.1	0.2
	6	0.4	0.3	0.2	0.1	0.4	0.3	0.1	0.1
3	1	4.1	0.6	0.3	0.2	0.4	0.4	0.2	0.3
	2	2.9							
	3	2.4	0.5	0.4	0.1	0.3	0.3	0.1	0.4
	4	1.9	0.5	0.2	0.2	0.4	0.9	0.1	0.4
	5	1.4	0.5	0.3	0.2	0.3	1.2	0.1	0.2
	6	0.9	0.4	0.2	0.1	0.2	0.6	0.1	0.2
	7	0.4							
4	1	4.3							
	2	2.8	0.4	0.6	0.1	0.4	0.6		1.3
	3	2.3	0.4	0.6	0.1	0.3	1.6		1.6
	4	1.8	0.5	0.7	0.1	0.3	4.2	0.1	1.8
	5	1.3	0.4	0.6	0.2	0.3	3.6		1.3
	6	0.8	0.5	1.1	1.1	0.7	3.4		0.6
	7	0.3	0.6	0.6	0.5		1.3	0.1	0.2
5	1	3.7	2.8	5.0	1.7	3.6	5.1	4.1	
	2	2.3	0.4	0.3	0.2	0.1	0.4	0.2	0.6
	3	1.7							
	4	1.2	0.4	1.8	2.7	0.6	5.3	0.1	6.3
	5	0.7	1.0	3.9	5.3	3.0		0.1	6.8
	6	0.2	2.8	11.5	15.3	8.7		0.1	13.8
6	1	2.1	1.0	0.6	0.2	0.2			1.0
	2	0.6	1.8	0.6	0.1	0.1			1.0
	3	0.1	0.8	0.2	0.1	0.1			4.4

Table V-2
Temperature (°C) - Pile 7/12

Station	Port	Depth (m)	89-07-04 (YY-MM-DD)	89-08-03	89-09-04	89-09-22	89-10-12	89-11-22	89-12-29	90-04-25	90-05-25	90-06-14	90-07-20	90-08-16	90-09-28
1	Red	1.4	26.2	32.3	28.6	25.2	17.0	10.9	6.1	5.2	8.3	13.9	21.9	27.4	20.0
	Blue	0.1	35.2	34.6	20.3	21.8	10.0	-0.9	-5.4	6.4	8.9	22.6	26.9	26.6	16.9
	Surface	0.0	38.3	43.9	21.8	22.6	11.0	-4.7	-14.0	12.8	29.0	30.3	24.6	33.5	19.6
2	Red	3.9	23.2	38.3	44.1	44.6	45.0	44.5	45.6	27.1	24.8	23.8	23.7	27.7	27.3
	Blue	0.9	27.3	42.1	42.1	41.9	37.0	26.7	25.6	14.5	14.9	21.9	26.4	28.6	22.1
	Black	0.3	28.9	37.5	30.9	33.2	26.9	14.5	15.5	10.3	10.9	22.1	25.7	24.3	18.1
	Surface	0.0	39.3	43.8	24.2	25.5	13.5	-4.7	-14.2	13.7	32.2	34.7	24.8	36.3	23.1
3	Red	4.1	21.1	34.0	39.2	41.5	42.6	43.5	46.5	27.5	25.6	24.0	23.1	24.7	27.0
	Blue	1.4	32.9	46.7	48.1	48.4	44.2	35.6	25.5	18.1	20.6	23.7	27.1	29.7	26.1
	Black	0.4	31.4	40.1	13.8	32.4	23.8	10.1	10.5	10.4	13.9	24.1	25.9	23.9	18.0
	Surface	0.0	39.3	43.8	24.2	25.9	11.8	-5.1	-13.1	13.7	24.7	34.7	22.8	30.8	23.1
4	Red	4.3	25.8	35.1	36.9	42.2	43.1	42.7	42.8	25.8	24.0	25.2	24.1	27.3	29.2
	Blue	1.3	35.2	42.9	39.4	45.4	43.0	40.5	38.2	19.5	21.0	25.2	28.6	31.9	30.0
	Black	0.3	33.5	38.4	NA	32.7	25.1	14.1	15.8	11.5	14.6	26.4	27.5	27.3	20.5
	Surface	0.0	37.8	43.0	24.1	25.4	14.1	-5.0	-12.3	13.7	25.4	36.0	24.1	33.8	22.0
5	Red	3.7	29.7	40.7	39.2	40.6	38.2	33.7	33.8	21.0	23.0	25.1	28.7	32.5	38.6
	Blue	0.7	34.9	42.5	35.4	37.8	29.5	22.8	26.4	13.8	15.3	26.6	33.3	36.9	31.4
	Black	0.2	33.6	40.2	27.9	31.9	22.0	10.5	11.2	10.0	13.0	26.3	30.4	31.4	25.0
	Surface	0.0	38.0	43.0	21.8	23.8	14.9	-0.1	-11.0	13.1	23.6	33.5	21.8	36.6	23.3
6	Red	2.0	21.1	27.4	24.8	26.3	20.0	13.9	12.5	9.3	14.0	20.3	27.1	32.8	26.3
	Blue	0.4	27.4	35.9	27.2	28.1	17.6	9.0	9.7	7.4	11.0	23.8	31.4	33.4	24.8
	Surface	0.0	38.3	43.8	21.8	22.8	10.7	-0.4	-15.5	11.3	22.5	38.3	25.4	25.4	21.3
7	Black	0.7	30.8	44.5	48.0	49.2	46.2	39.3	33.1	NA	NA	NA	NA	NA	NA
	Surface	0.0	39.3	43.9	24.2	29.9	14.6	-2.9	-10.5	NA	NA	NA	NA	NA	NA

Table V-2
Temperature (°C) - Pile 7/12

Station	Port	Depth (m)	90-10-12	91-01-18	91-04-11	91-05-22	91-06-19	91-07-17	91-08-21	91-10-22	92-03-17	92-04-22	92-05-26	92-07-14	92-08-17
1	Red	1.4	15.7	6.3	4.8	8.6	13.5	NA	NA	NA	NA	NA	NA	NA	NA
	Blue	0.1	11.8	-0.7	1.8	14.2	18.4	NA	17.7	11.9	-0.2	2.1	5.7	10.8	13.6
	Surface	0.0	15.3	NA	NA	24.3	30.2	40.7	17.3	NA	NA	5.0	12.2	NA	26.7
2	Red	3.9	26.8	22.9	16.9	12.9	13.7	16.2	21.3	19.0	11.9	11.5	6.8	NA	8.1
	Blue	0.9	18.7	13.8	9.1	13.5	17.5	9.3	22.8	17.3	6.4	6.5	4.2	8.9	11.1
	Black	0.3	14.2	4.4	5.1	14.6	19.2	23.3	15.3	15.5	4.4	4.8	4.5	9.7	12.1
	Surface	0.0	15.6	NA	NA	33.1	32.0	39.4	15.7	NA	NA	5.5	14.1	NA	24.2
3	Red	4.1	26.6	22.9	17.6	12.3	12.6	15.2	18.6	18.3	13.1	12.0	7.7	7.5	8.0
	Blue	1.4	23.2	13.8	NA	13.5	17.1	12.5	24.0	17.4	8.0	7.5	4.4	NA	NA
	Black	0.4	14.0	4.4	4.9	16.3	21.8	24.3	16.9	14.1	4.4	4.8	4.8	10.8	12.7
	Surface	0.0	16.3	NA	NA	23.2	32.0	37.1	17.1	NA	NA	4.8	14.1	NA	NA
4	Red	4.3	29.3	23.1	17.7	13.5	13.7	16.4	20.6	19.8	12.4	12.1	8.3	NA	NA
	Blue	1.3	28.3	17.6	12.9	14.2	17.6	22.7	25.5	18.3	7.1	6.7	5.3	NA	NA
	Black	0.3	16.3	3.0	4.9	17.5	24.4	26.7	17.5	14.2	3.5	3.6	6.5	NA	NA
	Surface	0.0	16.3	NA	NA	22.7	39.0	40.1	17.2	NA	NA	4.7	17.2	NA	NA
5	Red	3.7	36.6	23.5	17.6	15.6	16.8	20.7	26.1	21.2	12.3	10.0	7.6	8.6	9.2
	Blue	0.7	26.3	9.0	8.5	15.7	20.9	27.2	24.4	16.2	5.9	5.5	7.7	13.1	14.8
	Black	0.2	18.8	3.3	5.0	16.6	23.8	27.7	17.7	14.1	4.5	NA	9.3	13.8	15.5
	Surface	0.0	17.8	6.5	NA	24.7	35.0	47.0	15.6	NA	NA	3.8	16.8	NA	NA
6	Red	2.0	23.3	11.1	10.3	13.5	17.6	22.1	24.8	18.1	NA	7.8	6.3	9.7	10.7
	Blue	0.4	20.2	6.3	5.9	15.2	20.8	26.1	21.7	16.5	NA	6.2	6.5	11.4	12.8
	Surface	0.0	17.4	NA	NA	21.8	36.0	44.7	17.7	NA	NA	3.5	14.4	NA	NA
7	Black	0.7	NA	17.3	12.1	NA	18.0	23.1	25.6	16.7	6.5	6.5	6.5	8.4	10.5
	Surface	0.0	NA	NA	NA	NA	42.0	45.5	17.2	NA	NA	4.4	4.4	NA	NA

Table V-2
 Temperature (°C) - Pile 7/12

Station	Port	Depth (m)	92-09-29	92-11-03	93-03-19	93-04-24	93-05-21	93-07-13	93-09-10	93-10-01	94-07-12	94-08-15	94-09-20	94-11-16	95-06-07
1	Red	1.4	NA	10.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Blue	0.1	13.4	5.8	NA	NA	NA	13.9	15.3	NA	10.0	14.1	10.9	9.1	9.0
	Surface	0.0	13.8	NA	NA	NA	NA	NA	15.3	10.1	24.8	20.2	20.5	4.3	NA
2	Red	3.9	9.8	16.0	NA	NA	NA	4.2	8.1	7.5	1.6	4.9	7.0	8.7	4.3
	Blue	0.9	12.8	8.9	NA	NA	NA	8.5	12.4	11.5	6.3	10.3	11.1	8.7	5.2
	Black	0.3	13.3	6.1	NA	NA	NA	10.1	13.7	10.7	7.6	12.1	11.8	8.9	6.5
	Surface	0.0	14.0	NA	NA	NA	NA	NA	15.3	10.1	24.8	20.2	20.5	4.3	NA
3	Red	4.1	8.6	16.0	NA	NA	NA	5.1	7.7	8.6	2.5	5.0	5.8	9.3	4.7
	Blue	1.4	NA	16.8	NA	NA	NA	NA	NA	NA	5.7	NA	NA	NA	NA
	Black	0.4	12.8	12.3	NA	NA	NA	10.7	14.2	11.4	9.0	12.5	11.4	9.2	6.8
	Surface	0.0	14.0	NA	NA	NA	NA	NA	15.3	10.1	24.8	20.2	20.5	4.3	NA
4	Red	4.3	NA	14.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Blue	1.3	NA	9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Black	0.3	NA	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Surface	0.0	14.0	NA	NA	NA	NA	NA	NA	NA	24.8	20.2	20.5	4.3	NA
5	Red	3.7	11.0	14.2	NA	NA	NA	6.5	9.9	9.8	4.5	6.6	7.6	10.1	4.8
	Blue	0.7	14.9	8.9	NA	NA	NA	12.8	15.9	13.3	8.0	13.8	13.0	9.4	8.3
	Black	0.2	14.9	5.1	NA	NA	NA	14.7	16.2	13.2	12.6	15.2	12.8	8.2	9.5
	Surface	0.0	13.9	NA	NA	NA	NA	NA	15.3	10.1	24.8	20.2	20.5	4.3	NA
6	Red	2.0	11.8	12.4	NA	NA	NA	8.1	12.0	10.7	6.6	9.1	10.1	10.5	5.8
	Blue	0.4	13.4	10.9	NA	NA	NA	11.1	20.4	12.8	10.0	11.9	12.0	10.1	NA
	Surface	0.0	13.8	NA	NA	NA	NA	NA	15.3	10.1	24.8	20.2	20.5	3.9	NA
7	Black	0.7	12.4	NA	NA	NA	NA	7.5	11.9	10.2	4.5	9.4	10.7	NA	4.8
	Surface	0.0	13.6	NA	NA	NA	NA	NA	15.3	NA	24.8	20.2	20.5	NA	7.5

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	6_RED_AVG	6_BLUE_AVG	5_RED_AVG	5_BLUE_AVG	5_BLACK_AVG	4_RED_AVG	4_BLUE_AVG	4_BLACK_AVG	3_RED_AVG	3_BLUE_AVG	3_BLACK_AVG	2_RED_AVG	2_BLUE_AVG	2_BLACK_AVG	7_BLACK_AVG	1_BLUE_AVG	1_BLACK_AVG	6_RED_MAX	6_RED_MAX_TIME	6_BLUE_MAX
92/05/31	23.37	24.20	6.27	6.98	6.87	8.08	9.16	7.17	4.85	6.96	4.20	8.34	5.37	6.12	4.77	5.63	4.29	6.87	25.88	1800	6.39
92/06/01	21.93	18.05	6.40	7.20	7.00	8.34	9.50	7.27	5.06	7.20	2.58	6.70	5.43	6.09	4.81	5.84	4.47	7.31	25.49	1800	6.71
92/06/02	19.88	12.99	7.00	7.45	7.12	8.65	9.92	7.34	5.61	7.55	5.92	6.83	6.18	6.44	5.20	6.22	4.69	8.07	14.83	1400	7.68
92/06/03	23.23	13.91	9.71	7.51	7.07	8.79	10.10	7.31	5.66	7.73	6.17	3.83	3.83	6.49	5.55	5.40	4.81	7.86	19.72	1900	10.76
92/06/04	24.04	13.02	10.67	7.74	7.13	9.53	9.04	7.52	5.49	7.59	5.72	6.80	6.49	6.57	6.60	5.57	6.60	4.87	18.01	1700	11.82
92/06/05	24.69	10.36	7.83	7.65	7.11	8.21	10.38	7.26	5.75	7.71	5.16	3.67	6.80	6.52	5.72	6.80	5.07	8.65	17.96	1700	9.96
92/06/06	20.79	13.53	8.01	7.96	7.11	9.30	10.96	7.27	5.83	7.99	4.85	3.68	6.97	6.52	5.85	6.91	5.22	8.75	19.19	1500	13.98
92/06/07	22.92	19.48	19.61	7.92	6.98	9.20	10.18	7.17	5.81	8.11	5.13	4.09	7.06	6.39	5.86	6.93	5.29	8.61	25.51	1700	28.39
92/06/08	22.48	23.73	31.87	7.94	6.93	9.22	10.26	7.10	5.74	7.88	4.66	4.34	6.76	6.30	5.93	6.97	5.38	8.58	30.06	1800	38.02
92/06/09	22.85	18.56		8.17	7.09	9.50	10.67	7.17	6.06	8.22	5.07	4.37	6.99	6.24	6.15	7.20	5.55	9.03	22.69	1700	76.00
92/06/10	22.25	12.55		8.40	7.23	9.80	11.10	7.26	6.35	8.40	5.41	4.23	7.34	6.16	6.40	7.46	5.77	9.65	15.91	1400	75.10
92/06/11	22.01	15.08		8.44	7.16	9.92	11.25	7.19	6.35	8.75	5.05	4.42	7.25	5.97	6.41	7.50	5.83	9.92	23.12	1700	78.80
92/06/12	10.82	12.18		8.83	7.28	10.19	11.39	7.28	6.83	8.73	5.46	4.35	7.68	6.08	6.65	7.78	6.00	10.20	15.28	100	68.01
92/06/13	10.88	15.73		8.70	7.16	10.19	11.35	7.21	6.93	9.24	5.10	4.59	7.97	6.48	6.64	7.81	6.07	10.06	23.09	2000	77.90
92/06/14	10.72	15.01		8.93	7.29	10.37	11.47	7.25	7.01	9.38	5.25	4.83	8.07	6.57	6.86	8.00	6.25	10.22	18.70	1900	
92/06/15	12.01	13.51		9.07	7.36	10.53	11.59	7.26	7.11	9.53	5.63	5.15	8.98	6.39	6.92	8.13	6.39	10.39	18.46	1900	
92/06/16	14.04	14.39		9.09	7.33	10.56	11.60	7.19	7.18	9.58	5.41	5.34	8.11	6.18	6.74	8.16	6.45	10.44	23.33	1500	74.00
92/06/17	13.52	20.97		9.06	7.23	10.53	11.54	7.16	7.17	9.57	5.04	4.80	7.98	5.99	7.06	8.15	6.57	10.42	32.01	1900	
92/06/18	14.20	23.38		9.12	7.21	10.56	11.52	7.11	7.04	9.37	4.49	4.90	8.00	6.04	7.12	8.19	6.60	10.36	29.62	1800	
92/06/19	16.93	21.78		9.23	7.30	10.70	11.75	7.14	7.09	9.13	4.68	4.65	8.76	5.99	7.25	8.32	6.74	10.42	30.04	1800	
92/06/20	17.01	22.00		9.27	7.30	10.79	11.99	7.12	7.07	8.97	4.61	4.66	8.21	6.01	7.32	8.39	6.79	10.75	28.99	1900	
92/06/21	9.77	18.56		9.50	7.43	11.08	12.36	7.19	7.13	8.53	4.83	4.86	8.52	6.16	7.47	8.61	6.92	11.36	22.21	100	
92/06/22	9.76	16.63		9.66	7.51	11.48	12.75	7.25	7.78	9.94	11.05	7.53	9.08	6.63	7.59	8.80	7.06	12.06	18.21	1500	
92/06/23	10.22	12.64		10.16	7.62	12.55	13.52	7.34	8.08	10.58	10.15	7.51	9.34	6.76	7.81	9.09	7.39	12.75	14.01	1800	
92/10/18	2400.00	11.54	11.97	11.10	12.53	11.81	10.12	12.08	11.52	9.77	11.50	11.24	-8.05	11.36	11.20	11.23	10.59	10.44	11.68	1700	12.18
92/10/19	2400.00	11.46	11.84	11.07	12.41	11.56	10.11	12.02	11.41	9.73	11.42	11.12	-11.21	11.28	11.06	11.13	10.29	10.34	11.52	1700	12.03
92/10/20	2400.00	11.49	11.77	11.07	12.22	11.26	10.15	11.99	11.24	9.78	11.43	11.05	-7.73	11.25	11.03	11.13	10.33	10.31	11.61	1500	11.95
92/10/21	2400.00	11.42	11.63	11.01	12.03	11.03	11.05	11.12	11.09	9.70	11.20	10.84	-4.02	11.22	10.82	10.94	9.73	10.18	11.48	1400	11.81
92/10/22	2400.00	11.39	11.59	10.99	10.70	10.15	10.55	11.87	10.92	9.75	11.29	10.73	-2.34	11.06	10.71	11.00	9.39	10.15	11.43	1800	11.61
92/10/23	2400.00	11.32	11.33	10.99	11.60	10.40	10.13	11.77	10.64	9.71	11.21	10.53	-2.83	10.96	10.53	10.92	8.88	10.00	11.40	2000	11.56
92/10/24	2400.00	11.33	11.13	10.96	11.32	10.14	10.15	11.67	10.41	9.71	11.16	10.34	6.62	10.85	10.35	10.88	8.57	9.86	11.36	2000	11.22
92/10/25	2400.00	11.25	11.00	11.09	11.09	10.05	10.15	11.60	10.21	9.74	11.09	10.21	-1.80	10.80	10.23	10.77	8.28	9.78	11.30	100	11.13
92/10/26	2400.00	11.10	9.46	11.00	9.54	9.00	10.13	11.48	10.03	9.73	11.02	10.01	2.51	10.67	10.03	10.66	6.35	8.65	11.30	800	10.65
92/10/27	2400.00	10.82	9.17	11.07	9.24	8.27	10.15	11.39	9.91	9.77	10.94	9.82	-4.18	10.51	10.67	10.03	10.66	6.35	8.65	11.30	9.35
92/10/28	2400.00	10.76	9.51	11.07	9.52	8.38	10.14	11.29	9.79	9.79	10.83	9.66	-8.49	10.33	9.59	10.39	7.42	8.67	10.79	1900	9.71
92/10/29	2400.00	10.75	9.73	11.08	9.70	8.51	10.17	11.23	9.74	9.85	10.75	9.56	-9.99	10.25	9.52	10.34	7.69	8.85	10.84	1800	9.93
92/10/30	2400.00	10.75	9.84	11.08	9.77	8.53	10.20	11.19	9.68	9.90	10.72	9.49	-12.07	10.19	9.49	10.32	7.73	8.94	10.88	1600	10.02
92/10/31	2400.00	10.73	9.89	11.09	9.78	8.48	9.99	11.23	9.59	10.23	10.67	9.49	-14.16	10.65	9.65	10.56	7.95	8.99	10.88	1600	10.12
92/11/01	2400.00	10.63	9.52	11.04	9.52	8.40	9.40	11.05	9.40	9.89	10.50	9.28	-17.23	10.08	9.33	10.16	7.44	8.93	10.66	1000	9.97
92/11/02	2400.00	10.63	9.79	11.03	9.62	8.14	10.22	10.97	9.22	9.92	10.49	9.19	-18.91	10.03	9.25	10.10	7.24	8.92	10.63	1400	9.91
92/11/03	2400.00	10.56	9.69	10.99	9.46	7.91	10.21	10.88	9.00	9.90	10.39	9.04	-18.75	9.95	9.12	10.02	6.97	8.85	10.62	700	9.85
92/11/04	2400.00	10.50	9.47	10.85	9.15	7.56	10.17	10.70	8.73	9.79	10.29	8.79	-8.03	9.74	8.88	9.92	6.48	8.67	10.55	100	9.60
92/11/05	2400.00	10.53	9.35	10.80	8.93	7.32	10.19	10.60	8.52	9.79	10.24	8.64	1.28	9.66	8.74	9.89	6.21	8.58	10.59	1800	9.46
92/11/06	2400.00	10.43	9.29	10.82	8.81	7.21	10.17	10.51	8.32	9.82	10.16	8.51	-8.56	9.61	8.62	9.76	6.11	8.54	10.48	1700	9.38
92/11/07	2400.00	10.35	9.29	10.89	8.79	7.25	10.17	10.46	8.24	9.90	10.11	8.43	-19.77	9.57	8.54	9.65	6.09	8.56	10.40	2300	9.51
92/11/08	2400.00	10.34	9.28	10.94	8.78	7.25	10.23	10.45	8.24	9.99	10.09	8.36	-23.98	9.55	8.49	9.59	6.12	8.59	10.40	1600	9.48
92/11/09	2400.00	10.28	9.13	10.87	8.65	7.08	10.22	10.35	8.04	9.95	10.01	8.22	-21.99	9.42	8.33	9.49	5.99	8.46	10.36	1800	9.30
92/11/10	2400.00	10.24	9.02	10.84	8.52	6.90	10.22	10.25	7.88	9.96	9.91	8.08	-20.69	9.32	8.21	9.39	5.85	8.36	10.34	1800	9.23
92/11/11	2400.00	10.10	8.67	10.65	8.18	6.50	10.13	10.02	7.60	9.70	7.78	7.78	-10.65	9.04	7.92	8.06	5.62	8.02	10.17	100	8.99
92/11/12	2400.00	10.09	8.51	10.64	8.03	6.27	10.15	9.87	7.43	9.78	8.31	7.89	-8.67	8.96	7.92	8.19	5.25	7.96	10.22	1800	8.82
92/11/13	2400.00	10.09	8.43	10.58	7.99	6.17	10.12	9.76	7.24	9.71	9.53	7.49	-3.14	8.80	7.64	9.07	5.02	7.79	10.10	1600	8.56
92/11/14	2400.00	9.95	8.36	10.58	7.50	5.82	10.11	9.68	7.10	9.78	9.48	7.40	-9.08	8.68	7.75	8.97	4.87	7.77	10.04	1500	8.51
92/11/15	2400.00	9.83	8.24	10.58	7.47	5.70	10.09	9.60	7.05	9.78	9.36	7.28	-15.68	8.67	7.43	8.84	4.80	7.68	9.86	300	8.47
92/11/16	2400.00	9.74	8.04	10.64	7.42	5.73	10.06	9.52	6.89	9.76	9.27	7.10	-15.87	8.53	7.28	8.72	4.61	7.52	9.78	300	8.12
92/11/17	2400.00	9.67	7.99	10.83	7.41	5.85	10.03	9.44	6.72	9.83	9.17	6.59	-25.35	8.46	7.25	8.63	4.59	7.45	9.71	100	8.08
92/11/18	2400.00	9.62	7.93	10.90	7.33	5.88	10.03	9.37	6.62	9.87	9.11	6.91	-28.00	8.38	7.17	8.55	4.53	7.40	9.71	200	8.06</

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	6_RED_AVG	6_BLUE_AVG	5_RED_AVG	5_BLUE_AVG	5_BLACK_AVG	4_RED_AVG	4_BLUE_AVG	4_BLACK_AVG	3_RED_AVG	3_BLUE_AVG	3_BLACK_AVG	2_RED_AVG	2_BLUE_AVG	2_BLACK_AVG	1_BLUE_AVG	1_BLACK_AVG	6_RED_MAX	6_RED_TIME	6_BLUE_MAX	6_BLUE_TIME
93/01/231	2400.00	6.91	4.98	6.62	4.51	3.42	8.77	6.10	3.65	8.58	6.11	3.96	-13.88	5.31	4.13	5.44	1.55	4.40	6.95	500	5.05
93/01/01	2400.00	6.88	4.93	8.57	4.44	3.35	8.74	6.03	3.59	8.55	6.07	3.92	-11.94	5.26	4.07	5.38	1.50	4.37	6.95	0	5.03
93/01/02	2400.00	6.83	4.92	8.59	4.43	3.40	8.74	6.06	3.63	8.61	6.03	3.88	-30.29	5.24	4.21	5.35	1.55	4.45	6.92	100	5.00
93/01/03	2400.00	6.78	4.92	8.66	4.49	3.54	8.74	6.10	3.60	8.69	6.04	3.89	-33.83	5.30	4.21	5.35	1.57	4.42	6.81	1500	4.96
93/01/04	2400.00	6.71	4.81	8.44	4.34	3.28	8.66	5.88	3.48	8.46	5.91	3.78	-13.20	5.13	3.96	5.25	1.48	4.23	6.76	100	4.82
93/01/05	2400.00	6.69	4.76	8.32	4.20	3.17	8.59	5.78	3.40	8.38	5.85	3.72	-9.42	5.03	3.87	5.16	1.40	4.17	6.74	400	4.80
93/01/06	2400.00	6.67	4.78	8.46	4.19	3.26	8.58	5.85	3.46	8.46	5.81	3.73	-24.04	5.07	3.95	5.14	1.39	4.27	6.71	700	4.82
93/01/07	2400.00	6.59	4.71	8.39	4.21	3.16	8.55	5.80	3.43	8.40	5.74	3.68	-19.54	5.01	3.90	5.10	1.38	4.20	6.66	300	4.76
93/01/08	2400.00	6.55	4.66	8.32	4.15	3.10	8.52	5.74	3.38	8.38	5.71	3.65	-20.34	4.96	3.85	5.05	1.34	4.15	6.62	2300	4.74
93/01/09	2400.00	6.50	4.60	8.41	4.17	3.25	8.53	5.84	3.45	8.50	5.69	3.70	-38.56	5.03	3.87	5.02	1.38	4.25	6.61	100	4.80
93/01/10	2400.00	6.41	4.68	8.40	4.09	3.25	8.49	5.82	3.43	8.49	5.69	3.68	-42.20	4.98	3.88	4.92	1.36	4.22	6.60	1900	4.76
93/01/11	2400.00	6.40	4.60	8.35	4.16	3.25	8.55	5.79	3.44	8.44	5.67	3.68	-31.99	4.99	3.90	5.03	1.41	4.20	6.50	2100	4.67
93/01/12	2400.00	6.40	4.55	8.31	4.09	3.22	8.51	5.73	3.44	8.42	5.63	3.65	-32.40	4.94	3.87	4.99	1.39	4.18	6.45	300	4.59
93/01/13	2400.00	6.38	4.53	8.33	4.07	3.23	8.48	5.71	3.34	8.43	5.62	3.64	-34.84	4.92	3.86	4.95	1.36	4.19	6.44	100	4.58
93/01/14	2400.00	6.32	4.48	8.32	4.05	3.24	8.45	5.68	3.30	8.43	5.57	3.62	-38.09	4.89	3.83	4.91	1.34	4.18	6.38	2000	4.55
93/01/15	2400.00	6.26	4.43	8.24	3.98	3.15	8.42	5.61	3.25	8.35	5.52	3.57	-33.83	4.84	3.76	4.86	1.29	4.10	6.30	100	4.48
93/01/16	2400.00	6.23	4.37	8.13	3.88	3.01	8.37	5.51	3.15	8.28	5.48	3.50	-27.51	4.76	3.66	4.81	1.21	4.03	6.31	600	4.45
93/01/17	2400.00	6.17	4.30	8.05	3.81	2.93	8.31	5.42	3.07	8.19	5.40	3.42	-24.90	4.68	3.58	4.75	1.14	3.94	6.26	700	4.42
93/01/18	2400.00	6.16	4.33	8.10	3.78	2.95	8.25	5.39	3.00	8.17	5.38	3.38	-27.51	4.65	3.56	4.69	1.07	3.91	6.24	1900	4.48
93/01/19	2400.00	6.05	4.39	8.28	3.90	3.18	8.23	5.49	3.00	8.24	5.31	3.38	-47.48	4.64	3.66	4.64	1.09	4.00	6.14	200	4.47
93/01/20	2400.00	6.05	4.37	8.12	3.89	3.06	8.27	5.41	2.96	8.22	5.33	3.39	-37.74	4.65	3.57	4.67	1.06	3.97	6.12	2200	4.46
93/01/21	2400.00	6.03	4.35	8.04	3.85	3.05	8.25	5.35	2.93	8.19	5.27	3.35	-36.51	4.63	3.52	4.67	1.05	3.96	6.14	100	4.43
93/01/22	2400.00	6.01	4.28	8.01	3.82	2.97	8.20	5.22	2.84	8.10	5.24	3.28	-28.28	4.62	3.51	4.58	1.07	3.97	6.08	600	4.38
93/01/23	2400.00	5.96	4.12	7.83	3.55	2.53	8.01	4.93	2.60	7.83	5.07	3.05	-7.80	4.28	3.15	4.40	0.52	3.52	5.97	600	4.18
93/01/24	2400.00	5.97	4.19	7.61	3.55	2.55	7.98	4.91	2.55	7.83	5.06	3.05	-6.91	4.27	3.14	4.38	0.42	3.55	6.07	1700	4.38
93/01/25	2400.00	5.93	4.18	7.58	3.50	2.53	7.93	4.91	2.49	7.82	5.00	2.96	-15.16	4.29	3.16	4.29	0.31	3.51	5.96	1600	4.22
93/01/26	2400.00	5.89	4.21	7.74	3.52	2.43	8.03	5.17	2.65	8.03	5.00	3.03	-40.88	4.53	3.41	4.34	0.40	3.71	5.97	200	4.32
93/01/27	2400.00	5.83	4.20	7.70	3.57	2.68	8.02	4.99	2.55	7.92	4.98	3.00	-27.43	4.32	3.18	4.30	0.40	3.58	5.87	700	4.28
93/01/28	2400.00	5.81	4.14	7.61	3.47	2.55	7.96	4.91	2.48	7.86	4.95	2.93	-25.27	4.24	3.11	4.23	0.31	3.50	5.88	0	4.25
93/01/29	2400.00	5.79	4.17	7.67	3.52	2.68	7.96	4.95	2.49	7.90	4.93	2.94	-31.39	4.20	3.12	4.21	0.30	3.52	5.85	400	4.23
93/01/30	2400.00	5.68	4.02	7.64	3.37	2.65	7.85	4.92	2.41	7.89	4.82	2.83	-54.85	4.14	3.16	4.10	0.15	3.51	5.84	500	4.18
93/01/31	2400.00	5.59	4.03	7.78	3.44	2.76	7.89	4.94	2.43	7.94	4.83	2.87	-55.14	4.16	3.12	4.10	0.14	3.55	5.76	1700	4.23
93/02/01	2400.00	5.64	4.04	7.67	3.40	2.65	7.94	4.85	2.42	7.89	4.84	2.87	-44.27	4.12	3.05	4.09	0.09	3.46	5.74	1800	4.16
93/02/02	2400.00	5.61	4.10	7.61	3.42	2.71	7.81	4.82	2.37	7.81	4.82	2.87	-30.87	4.10	3.02	4.09	0.10	3.52	5.76	2200	4.24
93/02/03	2400.00	5.64	4.02	7.52	3.36	2.51	7.89	4.72	2.32	7.78	4.77	2.78	-33.03	4.03	2.92	4.04	-0.14	3.34	5.67	100	4.09
93/02/04	2400.00	5.63	4.00	7.48	3.26	2.40	7.83	4.67	2.21	7.77	4.75	2.74	-30.26	3.98	2.84	3.98	0.30	3.29	5.70	2000	4.09
93/02/05	2400.00	5.59	4.02	7.50	3.25	2.43	7.83	4.67	2.17	7.77	4.71	2.70	-35.85	3.97	2.84	3.95	-0.36	3.25	5.65	2300	4.08
93/02/06	2400.00	5.45	3.93	7.57	3.21	2.40	7.72	4.62	2.02	7.79	4.59	2.60	-54.92	3.89	2.81	3.81	-0.55	3.25	5.63	100	4.11
93/02/07	2400.00	5.44	3.94	7.56	3.28	2.54	7.77	4.61	1.93	7.77	4.61	2.58	-48.90	3.90	2.72	3.79	-0.72	3.20	5.59	2000	4.08
93/02/08	2400.00	5.51	3.93	7.39	3.19	2.31	7.78	4.61	1.85	7.70	4.63	2.54	-32.95	3.84	2.58	3.78	-0.98	3.20	5.60	2100	4.00
93/02/09	2400.00	5.46	3.92	7.45	3.14	2.40	7.72	4.50	1.68	7.73	4.56	2.45	-44.21	3.76	2.55	3.69	-1.28	3.05	5.57	1900	4.05
93/02/10	2400.00	5.41	3.85	7.25	3.08	2.15	7.69	4.34	1.52	7.56	4.48	2.29	-29.85	3.65	2.33	3.58	-1.61	2.83	5.46	0	3.92
93/02/11	2400.00	5.44	3.86	7.20	2.99	2.12	7.63	4.28	1.34	7.59	4.46	2.21	-30.88	3.58	2.25	3.49	-1.92	2.80	5.55	2100	3.91
93/02/12	2400.00	5.39	3.86	7.27	3.06	2.21	7.61	4.25	1.23	7.59	4.40	2.17	-35.38	3.58	2.25	3.49	-2.13	2.74	5.44	200	3.91
93/02/13	2400.00	5.36	3.76	7.13	2.97	2.08	7.57	4.12	1.05	7.48	4.32	2.14	-27.63	3.42	2.14	3.42	-1.90	2.61	5.43	300	3.85
93/02/14	2400.00	5.31	3.81	6.98	2.80	1.80	7.47	3.95	0.80	7.36	4.20	1.77	-20.51	3.25	1.79	3.12	-2.60	2.37	5.35	800	3.73
93/02/15	2400.00	5.32	3.72	6.98	2.82	1.86	7.44	3.95	0.74	7.38	4.16	1.69	-23.71	3.20	1.73	3.03	-2.33	2.31	5.40	2300	3.81
93/02/16	2400.00	5.26	3.70	6.98	2.85	1.93	7.41	3.95	0.73	7.36	4.06	1.59	-27.83	3.11	1.62	2.93	-2.76	2.24	5.39	100	3.81
93/02/17	2400.00	5.24	3.65	6.90	2.81	1.82	7.37	3.81	0.59	7.29	4.00	1.46	-22.12	3.00	1.47	2.81	-2.84	2.11	5.28	300	3.71
93/02/18	2400.00	5.26	3.67	6.87	2.77	1.78	7.35	3.78	0.51	7.29	3.95	1.37	-20.76	2.93	1.38	2.73	-2.88	2.04	5.32	2300	3.75
93/02/19	2400.00	5.14	3.54	6.75	2.68	1.68	7.23	3.62	0.39	7.18	3.78	1.18	-21.91	2.77	1.21	2.56	-3.00	1.88	5.27	2000	3.67
93/02/20	2400.00	5.15	3.50	6.77	2.66	1.69	7.23	3.57	0.34	7.19	3.74	1.11	-22.02	2.73	1.16	2.50	-2.96	1.83	5.23	2100	3.61
93/02/21	2400.00	5.08	3.46	6.71	2.56	1.61	7.16	3.43	0.22	7.13	3.63	0.99	-22.21	2.61	1.04	2.37	-3.01	1.72	5.23	2200	3.63
93/02/22	2400.00	5.04	3.41	6.68	2.53	1.61	7.14	3.34	0.18	7.09	3.54	0.88	-22.44	2.53	0.87	2.29	-2.99	1.64	5.14	0	3.48
93/02/23	2400.00	5.08	3.44	6.71	2.52	1.60	7.17	3.31	0.10	7.10	3.52	0.86	-21.30	2.51	0.86	2.29	-2.99	1.64	5.14	200	3.48
93/02/24	2400.00	5.05	3.40	6.67	2.42	1.52	7.12	3.21	0.12	7.06	3.45	0.78	-20.04	2.42	0.86	2.19	-2.95	1.56	5.11	100	3.49
93/02/25	2400.00	5.03	3.42	6.64	2.40	1.51	7.08	3.12	0.05	7.04	3.39	0.72	-18.83	2.35	0.80	2.11	-2.95	1.50	5.09	700	

Table V-3
Temperature Datalogger - Pile 7/12

TIME SERIAL	TIME	6_RED_AVG	6_BLUE_AVG	5_RED_AVG	5_BLUE_AVG	5_BLACK_AVG	4_RED_AVG	4_BLUE_AVG	4_BLACK_AVG	3_RED_AVG	3_BLUE_AVG	3_BLACK_AVG	2_RED_AVG	2_BLUE_AVG	2_BLACK_AVG	7_BLACK_AVG	1_BLUE_AVG	1_BLACK_AVG	6_RED_MAX	6_RED_MAX_TIME	6_BLUE_MAX	
93/04/10	2400.00	4.15	2.38	5.14	1.39	0.80	5.55	1.62	0.31	5.48	1.79	-0.05	11.86	1.02	0.05	0.80	-1.67	0.47	4.23		2200	2.52
93/04/11	2400.00	4.10	2.39	5.11	1.41	0.81	5.50	1.60	-0.31	5.45	1.76	-0.02	7.98	0.98	0.09	0.77	-1.58	0.46	4.17		200	2.48
93/04/12	2400.00	4.09	2.36	5.07	1.40	0.79	5.42	1.60	-0.30	5.42	1.79	-0.03	6.06	0.99	0.10	0.75	-1.59	0.48	4.17		1900	2.50
93/04/13	2400.00	4.01	2.30	5.03	1.36	0.76	5.41	1.59	-0.30	5.37	1.74	-0.04	6.13	0.99	0.10	0.75	-1.54	0.49	4.14		1800	2.46
93/04/14	2400.00	3.87	2.33	5.07	1.38	0.81	5.38	1.57	-0.30	5.41	1.69	0.00	-8.23	1.04	0.12	0.59	-1.42	0.54	3.95		200	2.44
93/04/15	2400.00	3.90	2.32	5.04	1.38	0.84	5.39	1.60	-0.27	5.36	1.70	-0.01	-2.93	1.03	0.14	0.67	-1.34	0.51	4.07		1900	2.54
93/04/16	2400.00	3.82	2.29	4.99	1.36	0.84	5.31	1.55	-0.28	5.32	1.65	0.01	-6.73	0.99	0.14	0.61	-1.23	0.51	3.99		100	2.50
93/04/17	2400.00	3.89	2.21	4.85	1.32	0.77	5.29	1.53	-0.28	5.20	1.65	-0.05	8.62	0.93	0.10	0.75	-1.20	0.43	4.01		2300	2.29
93/04/18	2400.00	3.97	2.28	4.95	1.35	0.80	5.33	1.58	-0.23	5.28	1.78	0.01	8.97	0.99	0.16	0.80	-1.15	0.51	4.02		500	2.41
93/04/19	2400.00	3.88	2.27	4.90	1.36	0.83	5.27	1.58	-0.21	5.21	1.72	0.02	2.94	1.02	0.18	0.75	-1.08	0.54	3.96		1600	2.42
93/04/20	2400.00	3.79	2.26	4.88	1.39	0.86	5.22	1.58	-0.21	5.20	1.67	0.05	-2.49	1.03	0.21	0.68	-0.99	0.58	3.88		1600	2.37
93/04/21	2400.00	3.77	2.08	4.77	1.28	0.77	5.17	1.50	-0.24	5.08	1.59	-0.06	9.59	0.94	0.13	0.73	-1.03	0.47	3.94		0	2.22
93/04/22	2400.00	3.81	2.21	4.86	1.41	0.81	5.17	1.59	-0.19	5.17	1.69	0.08	4.55	1.04	0.23	0.75	-0.93	0.63	3.93		100	2.26
93/04/23	2400.00	3.88	2.11	4.78	1.36	0.85	5.13	1.54	-0.19	5.08	1.63	0.03	2.59	0.99	0.22	0.69	-0.92	0.55	3.77		1800	2.22
93/04/24	2400.00	3.67	2.18	4.80	1.44	0.91	5.14	1.58	-0.15	5.09	1.65	0.07	1.90	1.05	0.26	0.73	-0.92	0.61	3.77		2200	2.46
93/04/25	2400.00	3.61	2.24	4.73	1.55	0.96	5.08	1.59	-0.12	5.04	1.60	0.05	0.00	1.00	0.24	0.67	-0.90	0.59	3.69		1600	2.41
93/04/26	2400.00	3.66	2.28	4.74	1.62	1.04	5.11	1.63	-0.05	5.04	1.66	0.08	4.60	1.03	0.28	0.73	-0.89	0.62	3.70		1900	2.44
93/04/27	2400.00	3.60	2.34	4.74	1.67	1.09	5.06	1.64	-0.03	5.03	1.62	0.08	-1.93	1.05	0.29	0.69	-0.95	0.62	3.77		2000	2.67
93/04/28	2400.00	3.65	2.34	4.68	1.73	1.17	5.05	1.66	0.00	4.99	1.60	0.05	3.71	1.03	0.27	0.75	-0.94	0.61	3.85		2200	2.68
93/04/29	2400.00	3.63	2.37	4.67	1.78	1.28	5.02	1.68	0.05	4.98	1.78	0.08	6.24	1.03	0.29	0.75	-0.93	0.60	3.81		2100	2.71
93/04/30	2400.00	3.57	2.41	4.66	1.84	1.45	4.97	1.67	0.06	4.95	1.61	0.10	1.08	1.03	0.32	0.69	-0.86	0.65	3.71		2100	2.60
93/05/01	2400.00	3.60	2.34	4.54	1.81	1.55	4.93	1.62	0.04	4.84	1.56	0.01	13.95	0.97	0.26	0.73	-0.95	0.58	3.78		2300	2.64
93/05/02	2400.00	3.67	2.50	4.60	1.86	1.81	4.94	1.65	0.08	4.90	1.61	0.09	16.05	1.04	0.31	0.77	-0.89	0.65	3.77		2300	2.91
93/05/03	2400.00	3.58	2.55	4.55	2.13	2.03	4.83	1.70	0.17	4.83	1.57	0.10	9.82	1.03	0.34	0.74	-0.83	0.64	3.73		2200	2.91
93/05/04	2400.00	3.62	2.52	4.46	2.21	2.41	4.88	1.64	0.16	4.77	1.57	0.08	22.68	0.97	0.29	0.76	-0.87	0.59	3.72		100	2.76
93/05/05	2400.00	3.60	2.49	4.48	2.19	2.39	4.78	1.60	0.15	4.78	1.50	-0.03	32.26	0.93	0.19	0.72	-0.96	0.49	3.69		100	2.73
93/05/06	2400.00	3.68	2.74	4.62	2.66	3.16	4.82	1.67	0.21	4.73	1.59	0.16	21.67	1.03	0.34	0.69	-0.79	0.52	3.67		0	3.05
93/05/07	2400.00	3.62	2.89	4.48	2.94	3.65	4.81	1.69	0.27	4.73	1.60	0.16	17.65	1.05	0.38	0.74	-0.78	0.71	3.77		0	3.32
93/05/08	2400.00	3.59	2.90	4.35	3.14	4.02	4.73	1.63	0.28	4.63	1.52	0.13	23.59	0.97	0.33	0.72	-0.81	0.67	3.73		100	3.05
93/05/09	2400.00	3.68	3.23	4.52	3.60	4.52	4.81	1.76	0.44	4.79	1.64	0.29	14.52	1.13	0.50	0.79	-0.69	0.83	3.82		2200	3.65
93/05/10	2400.00	3.63	3.36	4.49	3.86	4.84	4.77	1.76	0.51	4.74	1.61	0.28	6.96	1.13	0.56	0.77	-0.62	0.86	3.81		2300	3.79
93/05/11	2400.00	3.58	3.53	4.48	4.09	5.06	4.72	1.80	0.68	4.72	1.63	0.39	-0.55	1.18	0.72	0.71	-0.38	0.89	3.74		100	3.81
93/05/12	2400.00	3.63	3.65	4.43	4.25	5.15	4.73	1.83	0.97	4.67	1.65	0.41	2.49	1.23	0.89	0.72	0.01	0.90	3.74		0	3.82
93/05/13	2400.00	3.69	3.82	4.44	4.58	5.20	4.72	1.88	1.42	4.67	1.69	0.52	2.24	1.30	1.11	0.76	0.62	0.96	3.79		1800	4.04
93/05/14	2400.00	3.78	3.97	4.41	4.67	5.15	4.71	1.92	1.80	4.63	1.69	0.56	10.84	1.34	1.28	0.81	1.06	0.95	3.96		2300	4.32
93/05/15	2400.00	3.82	4.07	4.34	4.63	5.05	4.67	1.95	2.09	4.54	1.67	0.79	11.97	1.43	1.45	0.81	1.21	1.00	3.97		0	4.38
93/05/16	2400.00	3.87	4.05	4.28	4.64	4.99	4.65	2.05	2.39	4.49	1.62	1.04	12.26	1.47	1.55	0.80	1.42	1.02	4.00		0	4.39
93/05/17	2400.00	3.98	4.22	4.36	4.66	5.17	4.64	2.14	2.48	4.59	1.67	1.39	18.09	1.63	1.77	0.90	1.65	1.41	4.07		2100	4.53
93/05/18	2400.00	3.99	4.28	4.35	4.75	5.38	4.61	2.26	2.72	4.56	1.82	1.64	15.24	1.74	1.84	0.95	2.36	1.31	4.10		0	4.55
93/05/19	2400.00	4.02	4.30	4.30	4.85	5.55	4.58	2.32	2.94	4.48	1.84	1.82	19.79	1.81	2.06	0.98	2.72	1.33	4.13		0	4.68
93/05/20	2400.00	4.10	4.48	4.41	5.08	5.86	4.61	2.48	3.23	4.57	1.99	2.17	15.61	1.98	2.34	1.05	3.12	1.51	4.17		2200	4.68
93/05/21	2400.00	4.12	4.61	4.42	5.26	6.09	4.62	2.61	3.50	4.55	2.10	2.44	11.43	2.14	2.59	1.10	3.48	1.63	4.17		0	4.78
93/05/22	2400.00	4.17	4.58	4.31	5.31	6.15	4.54	2.62	3.64	4.41	2.11	2.51	21.52	2.15	2.65	1.19	3.70	1.65	4.30		2300	4.88
93/05/23	2400.00	4.21	4.71	4.33	5.49	6.34	4.50	2.73	3.87	4.42	2.17	2.75	23.51	2.29	2.85	1.29	3.99	1.77	4.31		0	5.05
93/05/24	2400.00	4.25	4.77	4.26	5.56	6.48	4.44	2.77	4.02	4.35	2.22	2.90	28.13	2.37	2.95	1.39	4.23	1.86	4.35		2300	5.08
93/05/25	2400.00	4.31	5.03	4.42	5.88	6.89	4.53	3.03	4.39	4.47	2.42	3.28	3.28	2.61	3.28	1.50	4.77	2.12	4.34		2200	5.13
93/05/26	2400.00	4.35	5.09	4.38	6.04	7.13	4.53	3.12	4.59	4.41	2.51	3.43	20.54	2.70	3.44	1.63	5.11	2.21	4.43		2300	5.29
93/05/27	2400.00	4.41	5.25	4.35	6.33	7.64	4.53	3.25	4.84	4.44	2.64	3.75	25.69	2.89	3.69	1.77	5.51	2.40	4.48		2000	5.48
93/05/28	2400.00	4.47	5.41	4.41	6.47	7.62	4.41	3.36	5.08	4.41	2.72	3.97	18.98	2.99	3.89	1.89	5.89	2.59	4.58		500	5.70
93/05/29	2400.00	4.53	5.65	4.52	6.77	7.83	4.55	3.56	5.37	4.49	2.90	4.31	9.91	3.23	4.15	2.03	6.23	2.80	4.58		200	6.17
93/05/30	2400.00	4.61	5.95	4.51	7.53	8.10	4.56	3.68	5.54	4.45	3.03	4.57	6.93	3.38	4.36	2.24	7.38	3.30	4.69		2000	6.17
93/05/31	2400.00	4.69	6.17	4.48	7.46	8.16	4.52	3.81	5.70	4.43	3.20	4.88	5.96	3.56	4.58	2.45	7.05	3.49	4.82		2200	6.33
93/06/01	2400.00	4.76	6.21	4.50	7.27	7.90	4.49	3.91	5.79	4.42	3.32	5.05	5.29	3.71	4.76	2.54	7.52	3.54	4.87		2000	6.27
93/06/02	2400.00	4.81	6.29	4.50	7.28	7.64	4.50	4.05	5.86	4.38	3.45	5.14	12.47	3.84	4.88	2.73	6.61	3.70	5.00		1800	6.52
93/06/03	2400.00	4.88	6.33	4.50	7.12	7.45	4.45	4.15	5.85	4.34	3.57	5.25	16.57	3.97	4.93	2.87	6.42	3.79	5.07		0	6.50
93/06/04	2400.00	5.06	6.41	4.58	7.09	7.45	4.44	4.30	5.89	4.38	3.70	5.33	14.71	4.12	5.04	2.99	6.42	3.90	5.13		0	6.62
93/0																						

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	6_BLUE_MAX_TIME	6_RED_MAX	5_RED_MAX_TIME	5_BLUE_MAX	5_BLUE_MAX_TIME	5_BLACK_MAX	5_BLACK_MAX_TIME	4_RED_MAX	4_RED_MAX_TIME	4_BLUE_MAX	4_BLUE_MAX_TIME	4_BLACK_MAX	4_BLACK_MAX_TIME	3_RED_MAX	3_RED_MAX_TIME	3_BLUE_MAX	3_BLUE_MAX_TIME
92/05/31	23.37	0	7.32	0	7.12	0	8.58	0	9.12	0	7.58	0	5.5	1500	7.15	0	6.94	1500
92/06/01	21.39	0	7.43	0	7.16	0	8.58	0	9.79	0	7.36	0	5.5	0	7.43	0	4.05	0
92/06/02	19.88	0	7.59	2200	7.22	2200	8.81	0	10.10	0	7.38	2200	5.75	0	7.72	0	7.12	1600
92/06/03	23.23	1900	7.87	0	7.36	0	9.12	0	10.42	0	7.41	100	5.82	200	7.93	0	6.91	300
92/06/04	24.04	700	8.11	0	7.43	0	9.38	0	10.58	0	7.41	2300	5.88	0	7.96	100	6.09	100
92/06/05	24.69	700	8.14	100	7.44	100	9.41	0	10.61	100	7.38	100	5.94	200	8.06	2200	6.01	100
92/06/06	20.79	1900	8.15	100	7.29	100	9.43	100	10.54	100	7.37	100	6.03	700	8.35	0	5.84	400
92/06/07	22.92	0	8.08	500	7.14	400	9.34	500	10.29	100	7.29	500	6.22	800	8.42	800	6.45	800
92/06/08	22.48	2300	8.20	0	7.14	0	9.44	0	10.51	0	7.21	500	5.94	800	8.21	0	5.37	600
92/06/09	22.85	0	8.48	0	7.34	0	9.78	0	11.02	0	7.27	0	6.37	0	8.62	0	5.65	2300
92/06/10	22.25	1800	8.60	2300	7.34	2300	9.99	2300	11.34	2300	7.31	2300	6.50	600	8.86	0	5.75	2300
92/06/11	22.01	1900	8.74	0	7.46	0	10.13	300	11.45	500	7.33	300	6.65	0	9.05	0	5.95	200
92/06/12	10.83	1400	8.87	600	7.46	600	10.30	600	11.52	300	7.34	600	6.95	0	9.29	1700	6.01	600
92/06/13	10.88	1600	8.93	600	7.42	600	10.30	600	11.53	600	7.33	600	7.04	600	9.36	300	5.99	600
92/06/14	10.72	100	9.11	0	7.42	0	10.52	0	11.58	0	7.30	0	7.18	500	9.51	0	5.73	0
92/06/15	12.01	100	9.44	0	7.68	0	10.84	0	11.87	0	7.34	0	7.36	0	9.74	0	6.49	0
92/06/16	14.04	1600	9.45	100	7.67	200	10.84	100	11.87	200	7.34	100	7.44	200	9.75	2300	6.64	600
92/06/17	13.52	100	9.43	200	7.58	200	10.83	200	11.82	100	7.33	200	7.49	200	9.78	200	6.37	600
92/06/18	14.20	100	9.45	0	7.50	0	10.79	0	11.74	0	7.23	600	7.42	600	9.76	600	5.37	100
92/06/19	16.93	100	9.66	500	7.68	500	11.02	500	11.99	500	7.31	500	7.52	600	9.56	300	5.96	600
92/06/20	17.01	100	9.57	600	7.62	400	11.03	600	12.17	600	7.28	600	7.52	600	9.47	0	5.98	600
92/06/21	9.77	100	9.59	1900	7.48	2200	11.18	0	12.53	2300	7.22	2300	7.37	0	9.35	200	5.49	2000
92/06/22	9.76	100	9.87	0	7.61	0	12.04	0	13.06	0	7.32	2300	8.03	0	10.45	2300	16.92	1700
92/06/23	10.22	100																
92/10/18	2400.00	2000	11.30	2100	12.69	2100	11.92	200	10.18	1800	12.16	2100	11.60	2000	9.93	2100	11.58	1700
92/10/19	2400.00	100	11.19	100	12.57	100	11.81	100	10.17	1900	12.07	100	11.51	100	9.83	100	11.50	1700
92/10/20	2400.00	2100	11.26	2100	12.32	2100	11.42	100	10.22	1800	12.06	100	11.33	200	9.95	2100	11.52	1500
92/10/21	2400.00	100	11.14	200	12.20	200	11.16	200	10.17	1900	11.97	100	11.19	100	9.81	200	11.36	100
92/10/22	2400.00	2000	11.19	2000	11.98	200	10.83	300	10.20	2000	11.93	2000	11.02	300	9.89	2000	11.35	300
92/10/23	2400.00	100	11.14	100	11.85	100	10.66	100	10.17	2000	11.90	100	10.83	100	9.84	100	11.27	1800
92/10/24	2400.00	100	11.04	0	11.43	100	10.20	300	10.19	1900	11.70	100	10.51	100	9.80	1700	11.18	1600
92/10/25	2400.00	300	11.05	100	11.33	300	10.17	400	10.19	300	11.69	300	10.33	300	9.79	700	11.18	300
92/10/26	2400.00	100	11.08	800	10.32	100	9.75	100	10.15	100	11.53	800	10.10	800	9.80	900	11.05	700
92/10/27	2400.00	2300	11.15	1900	9.40	2200	9.34	100	10.18	900	11.43	300	9.97	100	9.80	2100	10.99	900
92/10/28	2400.00	2300	11.15	300	9.68	300	8.51	2200	10.16	300	11.35	400	9.84	400	9.87	0	10.90	100
92/10/29	2400.00	2100	11.25	1900	9.88	1900	8.65	1900	10.26	1900	11.31	1900	9.83	1900	9.99	1900	10.84	1700
92/10/30	2400.00	1800	11.24	1800	9.93	1800	8.64	1800	10.29	1600	11.24	400	9.75	1800	10.03	1800	10.83	1900
92/10/31	2400.00	1900	11.29	1900	9.92	1900	8.60	1900	10.31	1700	11.22	1900	9.70	700	10.10	1900	10.77	1800
92/11/01	2400.00	600	11.18	800	9.86	800	8.48	300	10.24	700	11.15	800	9.53	800	10.01	300	10.60	400
92/11/02	2400.00	2200	11.17	2300	9.73	800	8.27	100	10.25	700	11.07	700	9.34	300	10.06	2200	10.55	700
92/11/03	2400.00	600	11.21	600	9.72	600	8.15	400	10.30	700	11.04	700	9.18	600	10.11	600	10.51	600
92/11/04	2400.00	100	10.93	100	9.33	100	7.74	100	10.20	2000	10.78	600	8.84	100	8.87	100	10.38	100
92/11/05	2400.00	1900	10.95	2000	9.03	1900	7.44	1900	10.25	1900	10.67	1900	8.60	100	9.90	1900	10.30	1900
92/11/06	2400.00	1800	10.92	1800	8.89	500	7.27	200	10.22	1800	10.58	200	8.42	200	9.91	1800	10.23	1800
92/11/07	2400.00	2300	11.13	2300	8.96	2300	7.42	2300	10.27	2300	10.56	2300	8.35	2300	10.11	2300	10.17	2300
92/11/08	2400.00	100	11.17	500	8.97	600	7.43	600	10.31	700	10.57	700	8.39	700	10.12	600	10.17	200
92/11/09	2400.00	300	11.04	800	8.83	500	7.26	400	10.28	500	10.46	400	8.17	400	10.09	800	10.08	600
92/11/10	2400.00	800	11.03	800	8.74	800	7.11	800	10.30	900	10.37	800	8.03	800	10.10	800	9.99	700
92/11/11	2400.00	100	10.88	100	8.47	100	6.81	100	10.20	100	10.20	100	7.79	100	9.95	100	9.86	100
92/11/12	2400.00	1900	10.84	1900	8.16	1900	6.51	1800	10.24	1900	9.99	1900	7.53	100	9.99	1900	9.77	1800
92/11/13	2400.00	200	10.68	1900	7.98	200	6.29	200	10.20	2000	9.84	200	7.33	100	9.83	1800	9.63	1800
92/11/14	2400.00	1900	10.73	1900	7.63	1900	6.01	100	10.18	1900	9.73	100	7.16	100	9.93	1900	9.57	1800
92/11/15	2400.00	800	10.78	700	7.65	700	5.86	700	10.16	800	9.72	800	7.16	800	9.97	800	9.44	900
92/11/16	2400.00	100	10.96	2300	7.52	1600	5.88	700	10.16	800	9.72	800	7.16	800	9.97	800	9.44	900
92/11/17	2400.00	100	11.12	100	7.53	300	6.08	0	10.07	800	9.53	100	6.83	400	9.91	0	9.24	103
92/11/18	2400.00	200	11.14	100	7.48	100	6.15	300	10.08	1200	9.43	1200	6.72	200	9.96	300	9.21	200
92/11/19	2400.00	100	11.02	2100	7.35	300	5.98	600	10.08	1000	9.41	700	6.61	100	9.93	2200	9.09	100
92/11/20	2400.00	200	10.98	200	7.29	300	5.98	200	10.12	700	9.33	800	6.58	600	9.92	300	9.06	900
92/11/21	2400.00	100	10.77	100	7.13	100	5.77	100	10.05	400	9.11	300	6.37	200	9.85	100	9.00	100
92/11/22	2400.00	200	10.32	900	6.75	700	5.31	100	9.97	1300	8.86	100	6.13	200	9.62	1800	8.72	600
92/11/23	2400.00	400	10.29	400	6.71	2300	5.29	400	9.93	1700	8.76	200	6.05	200	9.61	200	8.66	200
92/11/24	2400.00	0	10.59	0	6.82	0	5.50	0	9.91	700	8.74	2300	6.10	0	9.68	0	8.56	500
92/11/25	2400.00	100	10.44	100	6.82	100	5.46	100	9.90	700	8.71	100	6.11	100	9.72	100	8.47	100
92/11/26	2400.00	200	10.17	400	6.57	500	5.23	300	9.89	1800	8.51	300	5.87	300	9.55	2200	8.35	200
92/11/27	2400.00	1700	10.13	2000	6.50	1600	5.23	1700	9.90	1900	8.40	100	5.83	1600	9.60	1600	8.35	1800
92/11/28	2400.00	1900	10.24	1900	6.49	1900	5.23	600	9.91	1800	8.39	900	5.83	1900	9.68	1900	8.35	2000
92/11/29	2400.00	1800	10.22	1800	6.34	1900	5.22	1900	9.93	1900	8.34	1800	5.79	1800	9.67	1800	8.35	1700
92/11/30	2400.00	300	10.36	300	6.34	300	5.01	300	9.79	300	8.20	300	5.61	300	9.54	300	8.11	200
92/12/01	2400.00	900	10.03	800	6.27	800	4.98	800	9.78	800	8.0							

Table V-3
Temperature Datalogger - Pile 7/12

TIME	SEAL	TIME	6_BLUE_MAX	5_RED_MAX	5_RED_MAX	5_BLUE_MAX	5_BLUE_MAX	5_BLACK_MAX	5_BLACK_MAX	4_RED_MAX	4_RED_MAX	4_BLUE_MAX	4_BLUE_MAX	4_BLACK_MAX	4_BLACK_MAX	3_RED_MAX	3_RED_MAX	3_BLUE_MAX	3_BLUE_MAX
92/12/31	2400.00	100	8.67	100	4.57	100	3.50	100	8.82	100	6.18	100	3.71	100	8.62	100	6.17	100	
93/01/01	2400.00	2300	8.64	2300	4.49	2300	3.40	2300	8.77	2300	6.07	2300	3.63	2300	8.64	2300	6.13	0	
93/01/02	2400.00	100	8.68	0	4.49	100	3.57	0	8.79	1700	6.17	2300	3.70	2100	8.75	2200	6.11	200	
93/01/03	2400.00	2100	8.72	1900	4.54	1900	3.61	700	8.79	1500	6.15	700	3.66	100	8.75	400	6.07	1500	
93/01/04	2400.00	100	8.80	100	4.46	100	3.45	100	8.73	100	6.04	100	3.60	100	8.58	100	6.01	100	
93/01/05	2400.00	600	8.80	200	4.38	200	3.22	700	8.63	300	5.81	400	3.44	200	8.41	200	5.89	100	
93/01/06	2400.00	600	8.53	900	4.25	2100	3.39	1000	8.61	700	5.95	1100	3.52	1200	8.41	1100	5.85	700	
93/01/07	2400.00	100	8.48	400	4.26	1000	3.26	400	8.60	300	5.90	400	3.52	300	8.47	1000	5.79	300	
93/01/08	2400.00	2300	8.42	0	4.20	0	3.22	2300	8.58	2200	5.85	0	3.50	0	8.54	0	5.76	2200	
93/01/09	2400.00	1800	8.55	1800	4.27	1800	3.37	2100	8.63	1800	5.89	1500	3.52	1500	8.61	2000	5.82	1800	
93/01/10	2400.00	2000	8.55	2000	4.28	2000	3.40	2100	8.59	1500	5.90	2100	3.49	2000	8.65	2200	5.81	2000	
93/01/11	2400.00	2100	8.41	1000	4.22	900	3.35	200	8.62	1000	5.86	700	3.52	700	8.50	900	5.73	2100	
93/01/12	2400.00	300	8.38	1000	4.15	200	3.30	700	8.56	700	5.79	700	3.44	700	8.52	300	5.67	1000	
93/01/13	2400.00	100	8.37	800	4.11	500	3.29	2100	8.51	500	5.76	1000	3.39	800	8.49	2100	5.65	500	
93/01/14	2400.00	2000	8.36	2300	4.09	200	3.31	2300	8.51	200	5.72	200	3.27	200	8.50	2200	5.62	2000	
93/01/15	2400.00	300	8.31	100	4.03	400	3.29	100	8.46	1300	5.62	900	3.30	900	8.46	100	5.56	1800	
93/01/16	2400.00	700	8.24	800	3.95	800	3.12	800	8.42	600	5.62	600	3.24	600	8.40	700	5.55	600	
93/01/17	2400.00	700	8.18	800	3.89	600	3.09	800	8.37	1300	5.57	900	3.15	1200	8.34	700	5.48	800	
93/01/18	2400.00	2000	8.37	2000	3.90	0	3.19	0	8.30	2200	5.51	2000	3.06	2200	8.31	2200	5.45	1800	
93/01/19	2400.00	1900	8.34	1900	3.96	1900	3.25	1700	8.28	1700	5.54	1700	3.05	1700	8.30	1900	5.38	1800	
93/01/20	2400.00	2200	8.22	100	3.93	400	3.18	200	8.33	1200	5.49	1100	3.04	1200	8.28	2200	5.42	2200	
93/01/21	2400.00	300	8.19	300	3.93	100	3.25	500	8.31	1300	5.46	100	3.02	1300	8.30	300	5.35	100	
93/01/22	2400.00	600	8.07	700	3.88	600	3.10	700	8.26	1200	5.37	600	2.93	1200	8.26	600	5.32	600	
93/01/23	2400.00	100	7.71	100	3.65	100	2.63	100	8.12	200	5.03	100	2.74	200	7.91	100	5.16	300	
93/01/24	2400.00	1700	7.70	1700	3.70	1700	2.65	1700	8.03	1700	5.04	1700	2.66	1700	7.92	1700	5.20	1700	
93/01/25	2400.00	1600	7.73	0	3.53	1500	2.70	2300	7.97	1400	5.13	0	2.59	0	7.97	0	5.03	1500	
93/01/26	2400.00	2100	7.92	0	3.65	2300	2.99	2300	8.06	1400	5.22	600	2.69	1400	8.11	2100	5.08	2100	
93/01/27	2400.00	800	7.87	800	3.69	800	2.91	800	8.07	500	5.13	400	2.55	400	8.07	800	5.06	800	
93/01/28	2400.00	0	7.73	0	3.54	0	2.61	0	8.04	0	5.04	0	2.54	0	7.99	0	5.00	800	
93/01/29	2400.00	200	7.81	200	3.58	900	2.93	900	8.02	1300	5.08	300	2.54	1100	8.05	200	4.99	100	
93/01/30	2400.00	0	7.75	2000	3.48	300	2.81	800	7.95	100	4.98	1400	2.47	1400	7.98	800	4.95	300	
93/01/31	2400.00	1700	7.89	1700	3.57	1700	2.92	2000	8.04	1700	5.02	1700	2.53	1700	8.06	1700	5.03	1700	
93/02/01	2400.00	1900	7.72	400	3.44	1700	2.76	2100	8.01	1700	4.90	2100	2.48	1500	7.97	2100	4.94	1800	
93/02/02	2400.00	2000	7.80	2200	3.51	2200	2.81	2200	7.96	2200	4.89	2300	2.42	100	8.05	2200	4.95	2100	
93/02/03	2400.00	100	7.73	100	3.44	100	2.81	100	7.96	1300	4.85	2300	2.39	1200	7.94	100	4.81	1000	
93/02/04	2400.00	2000	7.65	2000	3.33	2300	2.57	2000	7.87	2300	4.76	2300	2.25	2000	7.89	2000	4.79	2000	
93/02/05	2400.00	2300	7.62	100	3.31	800	2.59	0	7.86	1300	4.77	0	2.25	100	7.87	0	4.75	200	
93/02/06	2400.00	1800	7.71	1800	3.35	1900	2.75	2000	7.88	1800	4.78	1500	2.14	1800	7.82	2000	4.75	1900	
93/02/07	2400.00	1700	7.67	2100	3.43	1700	2.67	2000	7.89	1700	4.87	1600	2.03	1700	7.87	2100	4.77	1700	
93/02/08	2400.00	2100	7.51	100	3.30	2000	2.53	2000	7.83	800	4.60	100	1.93	800	7.79	100	4.67	2100	
93/02/09	2400.00	1800	7.60	2200	3.21	2200	2.58	2200	7.78	1600	4.55	500	1.75	100	7.85	2200	4.65	1800	
93/02/10	2400.00	100	7.47	100	3.16	800	2.42	100	7.78	1200	4.44	100	1.62	1200	7.70	100	4.52	900	
93/02/11	2400.00	2100	7.35	2100	3.07	2200	2.33	0	7.66	800	4.37	2300	1.40	100	7.74	2100	4.53	2100	
93/02/12	2400.00	1800	7.37	800	3.09	600	2.38	600	7.69	1200	4.37	100	1.33	1200	7.70	100	4.45	200	
93/02/13	2400.00	200	7.28	100	3.08	200	2.21	100	7.64	500	4.21	400	1.15	400	7.62	100	4.41	100	
93/02/14	2400.00	2300	6.99	800	2.83	700	1.83	100	7.51	100	3.99	200	0.91	100	7.39	800	4.26	800	
93/02/15	2400.00	2300	7.07	0	2.89	0	1.95	0	7.49	800	4.02	1100	0.80	700	7.46	0	4.22	800	
93/02/16	2400.00	100	7.08	100	2.90	1300	2.04	1200	7.47	1200	4.09	1200	0.84	1200	7.45	100	4.18	100	
93/02/17	2400.00	100	6.96	200	2.86	200	1.88	200	7.42	200	3.90	200	0.68	300	7.36	200	4.07	100	
93/02/18	2400.00	2300	6.94	2300	2.80	2300	1.80	800	7.38	1400	3.82	900	0.55	100	7.32	900	3.99	500	
93/02/19	2400.00	2100	6.90	2000	2.81	2000	1.79	2300	7.37	1400	3.70	100	0.47	100	7.29	2000	3.92	100	
93/02/20	2400.00	2100	6.86	2100	2.72	2200	1.74	2100	7.30	2000	3.62	1500	0.40	100	7.27	2100	3.82	2100	
93/02/21	2400.00	2100	6.84	2100	2.66	2000	1.72	1700	7.26	2100	3.51	1500	0.30	1500	7.26	2100	3.75	2100	
93/02/22	2400.00	100	6.77	0	2.62	1700	1.68	1700	7.24	1600	3.40	1600	0.25	1700	7.18	0	3.61	0	
93/02/23	2400.00	2200	6.77	100	2.59	100	1.65	300	7.21	100	3.37	700	0.23	700	7.16	300	3.60	300	
93/02/24	2400.00	400	6.75	200	2.52	200	1.58	200	7.17	500	3.28	400	0.16	200	7.14	100	3.54	100	
93/02/25	2400.00	0	6.69	700	2.44	400	1.55	900	7.12	600	3.18	900	0.09	1200	7.09	700	3.43	300	
93/02/26	2400.00	200	6.67	100	2.44	300	1.54	1200	7.09	200	3.12	100	0.08	200	7.06	100	3.39	100	
93/02/27	2400.00	0	6.64	0	2.41	600	1.52	1100	7.06	1100	3.07	1100	0.04	1100	7.04	0	3.30	100	
93/02/28	2400.00	100	6.60	200	2.39	200	1.49	200	7.00	200	2.98	200	-0.01	1300	7.01	100	3.27	200	
93/03/01	2400.00	100	6.57	100	2.33	500	1.45	100	6.99	500	2.92	500	-0.05	100	6.98	100	3.15	100	
93/03/02	2400.00	2000	6.45	1800	2.22	100	1.34	100	6.97	100	2.89	800	-0.10	800	6.86	1800	3.05	300	
93/03/03	2400.00	1800	6.43	1800	2.23	1800	1.38	1800	6.88	1700	2.74	1700	-0.10	1700	6.86	1800	2.96	1800	
93/03/04	2400.00	1900	6.40	1700	2.18	1900	1.35	1800	6.82	1700	2.70	1000	-0.13	1700	6.80	1700	2.96	1900	
93/03/05	2400.00	200	6.41	100	2.22	0	1.36	2000	6.83	400	2.74	600	-0.11	900	6.83	200	2.93	300	
93/03/06	2400.00	300	6.36	300	2.22	300	1.38	400	6.79	400	2.69	400	-0.13	300	6.78	400	2.87	300	
93/03/07	2400.00	200	6.30	200	2.16	400	1.32	200	6.75	200	2.61	400	-0.18	500	6.72	600	2.80	700	
93/03/08	2400.00	2000	6.25	600	2.08	600	1.24	900	6.69	500	2.52	300	-0.18	1900	6.67	400	2.73		

TIME	SEAL	TIME	6_BLUE_MAX	5_RED_MAX	5_RED_MAX	5_BLUE_MAX	5_BLUE_MAX	5_BLACK_MAX	5_BLACK_MAX	4_RED_MAX	4_RED_MAX	4_BLUE_MAX	4_BLUE_MAX	4_BLACK_MAX	4_BLACK_MAX	3_RED_MAX	3_RED_MAX	3_BLUE_MAX	3_BLUE_MAX
93/04/10	2400.00	100	5.27	500	1.49	2200	0.91	100	5.63	100	1.69	100	100	-0.23	200	5.60	400	1.87	100
93/04/11	2400.00	400	5.25	100	1.47	100	0.92	300	5.56	100	1.67	300	200	-0.26	600	5.56	100	1.85	100
93/04/12	2400.00	2100	5.23	2100	1.50	2300	0.92	2100	5.53	400	1.68	2100	2100	-0.24	2100	5.56	2100	1.87	1900
93/04/13	2400.00	2100	5.19	2000	1.46	1900	0.87	2200	5.49	2000	1.66	2000	2000	-0.22	2000	5.53	2100	1.83	1900
93/04/14	2400.00	0	5.14	0	1.44	0	0.89	0	5.41	400	1.67	400	200	-0.24	400	5.48	0	1.77	300
93/04/15	2400.00	2200	5.23	2200	1.54	2100	1.03	2200	5.51	2200	1.74	2200	2200	-0.14	2200	5.55	2200	1.84	2200
93/04/16	2400.00	100	5.15	100	1.52	100	1.02	100	5.39	100	1.70	100	100	-0.20	100	5.48	100	1.81	100
93/04/17	2400.00	100	4.97	100	1.37	2000	0.81	1900	5.35	1800	1.56	700	700	-0.24	100	5.30	100	1.73	0
93/04/18	2400.00	0	5.04	0	1.45	0	0.90	0	5.37	700	1.64	0	0	-0.19	0	5.32	2100	1.82	500
93/04/19	2400.00	300	5.03	2300	1.47	0	0.95	600	5.34	1300	1.64	300	300	-0.15	0	5.33	2300	1.80	1300
93/04/20	2400.00	300	4.97	400	1.47	0	0.96	0	5.26	300	1.64	400	400	-0.16	400	5.28	600	1.73	2300
93/04/21	2400.00	400	4.90	0	1.39	100	0.93	100	5.24	0	1.57	0	0	-0.18	400	5.21	400	1.72	0
93/04/22	2400.00	900	4.94	500	1.44	2200	0.93	500	5.28	200	1.61	900	900	-0.16	700	5.26	500	1.73	200
93/04/23	2400.00	1800	4.89	2000	1.43	1800	0.92	0	5.22	2000	1.61	2000	2000	-0.13	1800	5.17	2000	1.74	2000
93/04/24	2400.00	2300	4.95	2200	1.46	2300	1.10	2300	5.23	2100	1.70	2300	2300	-0.05	0	5.27	2100	1.74	0
93/04/25	2400.00	100	4.93	100	1.65	1500	1.09	100	5.20	1400	1.68	100	100	-0.04	2200	5.24	300	1.71	1500
93/04/26	2400.00	2100	4.83	1800	1.72	2200	1.17	2200	5.15	1500	1.72	2100	2100	0.01	2200	5.12	2000	1.72	2000
93/04/27	2400.00	2300	4.97	2100	1.92	2300	1.37	2200	5.19	2000	1.79	2200	2200	0.09	2000	5.26	2100	1.78	2100
93/04/28	2400.00	2200	4.97	0	1.98	2200	1.46	0	5.18	2200	1.83	2200	2200	0.16	2200	5.31	2200	1.84	2100
93/04/29	2400.00	2200	4.97	2200	2.03	2200	1.60	2200	5.14	2200	1.85	2300	2300	0.17	2300	5.27	2200	1.83	2200
93/04/30	2400.00	2200	4.82	100	2.00	2300	1.66	2200	5.08	2100	1.78	2100	2100	0.15	2300	5.13	100	1.73	100
93/05/01	2400.00	2200	4.83	2300	2.05	2300	1.85	2300	5.03	2300	1.79	2300	2300	0.17	2300	5.13	2300	1.74	2300
93/05/02	2400.00	0	4.93	0	2.35	0	2.28	0	5.07	0	1.87	0	0	0.28	0	5.22	0	1.77	2300
93/05/03	2400.00	100	4.91	100	2.33	200	2.41	2300	5.05	100	1.89	100	100	0.28	100	5.24	100	1.75	2300
93/05/04	2400.00	100	4.69	100	2.37	2300	2.64	2300	4.98	100	1.78	100	100	0.26	500	5.03	100	1.74	100
93/05/05	2400.00	700	4.58	700	2.50	0	2.91	0	4.93	700	1.75	700	700	0.25	700	4.89	500	1.68	700
93/05/06	2400.00	0	4.71	0	3.00	0	3.62	0	4.84	0	1.84	0	0	0.38	0	4.86	0	1.70	0
93/05/07	2400.00	0	4.81	0	3.31	0	4.19	0	4.95	0	1.91	0	0	0.47	0	5.05	0	1.77	0
93/05/08	2400.00	100	4.82	100	3.43	100	4.34	0	4.93	100	1.91	100	100	0.48	100	5.04	100	1.76	100
93/05/09	2400.00	0	4.83	2300	3.97	2200	4.96	0	4.91	2100	1.95	2200	2200	0.62	2200	5.12	2300	1.84	2200
93/05/10	2400.00	0	4.83	0	4.23	0	5.23	0	4.92	2300	1.93	0	0	0.69	0	5.05	0	1.86	2300
93/05/11	2400.00	100	4.83	100	4.27	100	5.27	100	4.88	100	1.96	100	100	0.82	2300	5.08	100	1.76	100
93/05/12	2400.00	0	4.51	2100	4.39	2100	5.22	2100	4.81	2000	1.90	0	0	1.23	0	4.73	2300	1.72	2300
93/05/13	2400.00	0	4.51	2100	4.79	2200	5.29	1800	4.79	2000	1.95	0	0	1.66	0	4.74	2100	1.74	900
93/05/14	2400.00	0	4.68	0	4.88	0	5.33	0	4.88	2200	2.09	0	0	2.06	0	4.91	0	1.85	2300
93/05/15	2400.00	100	4.70	100	4.90	100	5.37	100	4.79	200	2.11	200	200	2.26	2200	4.91	200	1.81	2300
93/05/16	2400.00	200	4.64	200	4.84	200	5.26	200	4.76	200	2.40	200	200	2.40	2300	4.83	200	1.80	200
93/05/17	2400.00	0	4.62	0	4.90	0	5.47	0	4.89	0	2.34	0	0	2.74	0	4.81	0	1.94	0
93/05/18	2400.00	0	4.65	0	5.08	0	5.77	0	4.74	0	2.47	0	0	2.96	0	4.85	0	1.99	0
93/05/19	2400.00	100	4.70	100	5.11	100	5.84	0	4.73	100	2.51	100	100	3.13	0	4.87	100	2.01	0
93/05/20	2400.00	2200	4.57	300	5.27	2200	6.05	2200	4.68	2200	2.61	2200	2200	3.43	2300	4.76	300	2.16	2200
93/05/21	2400.00	0	4.54	0	5.45	0	6.27	0	4.67	0	2.72	0	0	3.66	0	4.67	0	2.19	0
93/05/22	2400.00	0	4.57	100	5.54	2300	6.43	0	4.67	100	2.82	0	0	3.85	0	4.70	100	2.25	2300
93/05/23	2400.00	0	4.59	0	5.77	0	6.66	0	4.61	400	2.91	0	0	4.07	0	4.69	0	2.33	0
93/05/24	2400.00	2300	4.53	200	5.81	0	6.81	0	4.59	200	2.95	400	400	4.21	0	4.67	100	2.37	0
93/05/25	2400.00	0	4.51	100	6.01	0	7.07	0	4.58	1700	3.10	0	0	4.52	0	4.59	300	2.53	0
93/05/26	2400.00	2300	4.52	200	6.28	2300	7.38	0	4.61	200	3.27	0	0	4.75	0	4.54	2100	2.62	2200
93/05/27	2400.00	2200	4.58	2300	6.50	2300	7.64	0	4.58	200	3.39	0	0	5.00	2200	4.56	0	2.76	2300
93/05/28	2400.00	0	4.90	0	7.16	0	8.50	2300	4.59	2300	3.50	0	0	5.30	0	4.58	0	2.87	0
93/05/29	2400.00	1800	4.59	200	7.19	0	7.87	200	4.59	1800	3.63	2200	2200	5.46	2300	4.55	200	2.97	2000
93/05/30	2400.00	1900	4.57	2300	7.68	1800	8.31	2100	4.59	2100	3.79	2300	2300	5.65	1800	4.50	1800	3.12	2300
93/05/31	2400.00	2100	4.62	2200	7.58	100	8.25	100	4.57	2200	3.93	0	0	5.82	2000	4.54	2300	3.33	2200
93/06/01	2400.00	2000	4.59	2000	7.43	100	8.10	100	4.54	1900	4.00	2300	2300	5.87	2000	4.51	100	3.41	2300
93/06/02	2400.00	2300	4.67	2300	7.38	600	7.77	100	4.55	2300	4.21	2300	2300	5.96	2300	4.53	2300	3.59	2300
93/06/03	2400.00	200	4.67	300	7.32	100	7.64	300	4.52	300	4.28	0	0	5.95	200	4.52	300	3.70	2300
93/06/04	2400.00	0	4.82	0	7.24	0	7.66	0	4.49	2300	4.48	0	0	6.01	2200	4.59	0	3.83	0
93/06/05	2400.00	100	4.82	100	7.23	100	7.65	100	4.50	100	4.48	300	300	5.99	100	4.60	100	3.87	0
93/06/06	2400.00	400	4.69	0	7.14	0	7.68	0	4.44	500	4.57	0	0	6.10	0	4.54	400	3.92	0
93/06/07	2400.00	300	4.79	200	7.28	300	8.09	300	4.51	300	4.69	2000	2000	6.21	1500	4.45	400	4.05	300
93/06/08	2400.00	2300	4.96	2300	7.45	2300	8.15	2300	4.48	400	4.78	2300	2300	6.31	2300	4.55	2300	4.41	0
93/06/09	2400.00	600	4.81	500	7.45	600	8.15	600	4.49	600	4.84	600	600	6.34	600	4.51	600	4.14	600
93/06/10	2400.00	0	4.81	2300	7.73	0	8.26	0	4.50	2100	4.88	2100	2100	6.46	0	4.48	500	4.25	2300
93/06/11	2400.00	2300	4.99	2300	7.88	0	8.69	0	4.51	600	5.06	0	0	6.65	0	4.59	0	4.35	2300
93/06/12	2400.00	0	4.99	0	7.95	0	8.80	0	4.49	100	5.11	0	0	6.85	0	4.59	0	4.47	0
93/06/13	2400.00	100	5.00	100	8.01	200	8.87	200	4.50	200	5.16	200	200	6.91	200	4.60	200	4.48	200
93/06/14	2400.00	400	4.87	400	7.94	400	8.95	0	4.42	400	5.15	400	400	6.94	700	4.47	400	4.42	400
93/06/15	2400.00	400	4.89	600	8.08	600	9.23	2200	4.41	500	5.22	500	500	7.09	2200	4.46	300		

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	3_BLACK_MAX	3_BLACK_MAX_TIME	2_RED_MAX	2_RED_MAX_TIME	2_BLUE_MAX	2_BLUE_MAX_TIME	2_BLACK_MAX	2_BLACK_MAX_TIME	7_BLACK_MAX	7_BLACK_MAX_TIME	1_BLUE_MAX	1_BLUE_MAX_TIME	1_BLACK_MAX	1_BLACK_MAX_TIME	6_RED_MIN	6_RED_MIN_TIME	6_BLUE_MIN
92/05/31	23.37	14.50	2000	5.71	1500	6.32	1500	4.97	2300	5.84	0	4.38	0	7.21	0	19.08	0	6.16
92/06/01	21.93	21.07	1700	5.98	0	6.57	2300	5.03	400	6.07	0	4.75	0	7.76	0	13.01	800	6.25
92/06/02	19.88	5.14	1600	6.52	2200	6.78	2200	5.38	2200	6.38	0	4.82	2000	8.08	1900	11.18	800	6.69
92/06/03	23.23	4.33	1900	6.83	0	6.78	200	5.68	0	6.64	0	4.91	0	8.44	0	7.76	600	7.83
92/06/04	24.04	4.49	2000	7.09	0	6.83	0	5.89	0	6.90	0	5.06	2300	8.82	0	9.06	900	9.60
92/06/05	24.69	4.76	2100	7.13	0	6.80	100	5.95	0	7.00	0	5.21	0	8.94	0	-0.22	700	6.86
92/06/06	20.79	4.55	1600	7.14	400	6.69	100	5.95	400	7.00	400	5.27	2000	8.94	100	7.83	700	6.71
92/06/07	22.92	4.78	2000	7.27	700	6.56	500	5.98	2900	7.05	800	5.34	2300	9.29	500	14.60	600	13.60
92/06/08	22.48	5.20	0	7.10	100	6.48	500	6.14	0	7.16	0	5.45	0	8.86	0	17.63	700	28.31
92/06/09	22.85	5.09	2100	7.38	0	6.81	0	6.41	0	7.46	0	5.71	0	9.51	0	13.73	0	7.94
92/06/10	22.25	5.09	1800	7.51	0	6.40	100	6.55	2300	7.61	2300	5.83	2300	9.93	2300	4.74	700	8.95
92/06/11	22.01	5.53	2200	7.66	200	6.32	2200	6.84	200	7.70	200	5.92	0	10.19	0	8.74	700	8.74
92/06/12	10.82	5.27	2100	8.16	0	6.66	0	5.77	600	7.89	0	6.07	0	11.26	1700	8.74	700	7.00
92/06/13	10.88	5.25	2200	8.27	600	6.73	600	6.80	600	7.99	600	6.13	900	10.40	300	8.35	700	7.00
92/06/14	10.72	5.31	2300	8.31	400	6.68	500	6.96	0	8.14	2300	6.31	0	10.39	2300	11.87	800	7.00
92/06/15	12.01	6.21	2000	8.47	0	6.69	300	7.29	0	8.41	0	6.47	0	10.72	0	9.15	800	7.00
92/06/16	14.04	6.75	2100	8.54	400	6.61	200	7.28	200	8.39	200	6.58	0	10.72	100	3.04	700	7.00
92/06/17	13.52	7.13	2200	8.51	200	6.53	100	7.33	200	8.44	500	6.64	1000	10.75	300	8.11	700	7.00
92/06/18	14.20	7.21	2100	8.34	600	6.38	200	7.36	0	8.41	0	6.69	0	10.64	200	16.22	700	7.00
92/06/19	16.93	8.36	1900	8.66	800	6.54	300	7.55	500	8.67	500	6.81	1000	10.74	500	11.21	700	7.00
92/06/20	17.01	7.29	700	8.65	600	6.40	600	7.57	600	8.64	600	6.89	800	11.01	0	12.62	700	7.00
92/06/21	9.77	7.58	300	8.69	2000	6.43	2200	7.52	1000	8.71	1900	6.99	2200	11.93	2300	17.37	2000	7.00
92/06/22	9.76	17.86	1500	9.27	0	6.76	2300	7.71	0	8.94	0	7.17	0	12.59	0	14.42	0	7.00
92/06/23	10.22																	
92/10/18	2400.00	11.41	2200	9.84	1300	11.51	2100	11.27	2100	11.33	1700	10.70	2000	10.62	2100	11.42	1000	11.58
92/10/19	2400.00	11.29	100	-2.71	100	11.41	100	11.19	100	11.18	1600	10.60	100	10.49	100	11.42	1200	11.73
92/10/20	2400.00	11.17	2100	8.52	1400	11.38	2100	11.08	2100	11.22	1600	10.13	100	10.49	2100	11.40	700	11.55
92/10/21	2400.00	11.01	200	8.42	1300	11.25	100	10.94	200	10.94	1600	9.95	200	10.35	100	11.34	1100	11.42
92/10/22	2400.00	10.83	2000	8.76	1500	11.15	2000	10.78	300	11.03	100	9.59	300	10.28	2000	11.36	700	11.42
92/10/23	2400.00	10.75	100	10.10	1500	11.12	100	10.97	100	10.97	1800	9.20	100	10.22	100	11.27	900	11.16
92/10/24	2400.00	10.43	100	11.29	100	10.90	100	10.42	100	10.91	100	8.69	2200	9.93	100	11.30	2300	11.07
92/10/25	2400.00	10.32	100	10.57	1200	10.87	100	10.34	100	10.83	300	8.66	300	9.88	400	11.21	1800	10.77
92/10/26	2400.00	10.14	800	8.69	400	10.76	400	10.13	800	10.77	500	6.84	100	9.68	100	10.88	800	8.63
92/10/27	2400.00	9.91	100	1.00	1400	10.60	300	9.90	100	10.53	200	7.19	2300	8.57	2300	10.78	2000	8.95
92/10/28	2400.00	9.82	100	-1.95	1400	10.43	100	9.68	100	10.45	1400	7.66	0	8.82	0	10.72	1000	9.33
92/10/29	2400.00	9.69	1900	2.94	1500	10.37	1900	9.82	1800	10.43	1700	7.85	1900	9.02	1900	10.69	600	9.35
92/10/30	2400.00	9.65	1800	4.92	1400	10.31	200	9.59	1800	10.42	1600	7.84	1800	9.09	1800	10.67	1100	9.49
92/10/31	2400.00	9.58	1900	7.70	1400	10.32	1900	9.53	1800	10.35	1600	7.79	800	9.18	1900	10.65	1000	9.59
92/11/01	2400.00	9.43	300	-11.19	1200	10.22	800	9.48	800	10.20	1000	7.63	300	9.06	300	10.60	1600	9.64
92/11/02	2400.00	9.30	600	-9.67	1300	10.14	500	9.34	600	10.15	1300	7.38	400	9.04	2200	10.57	2100	9.58
92/11/03	2400.00	9.29	800	-6.45	1200	10.17	700	9.32	600	10.06	700	7.25	700	9.07	700	10.48	1400	9.41
92/11/04	2400.00	8.94	100	-1.86	1400	9.87	800	8.99	800	9.96	800	6.71	100	8.79	100	10.46	1000	9.35
92/11/05	2400.00	8.85	1800	10.87	1300	10.86	1900	8.84	1800	9.85	1700	6.36	1800	8.70	1900	10.46	400	9.18
92/11/06	2400.00	8.60	200	0.66	1400	8.75	200	8.70	200	9.81	100	6.20	100	8.61	100	10.37	1300	9.12
92/11/07	2400.00	8.63	2300	-13.20	100	9.70	2300	8.67	2100	9.69	200	6.28	2300	8.76	2100	10.32	1300	9.12
92/11/08	2400.00	8.59	100	-4.94	1400	9.69	500	8.66	600	9.65	500	6.31	500	8.74	500	10.26	1300	8.92
92/11/09	2400.00	8.41	700	-3.34	1300	9.55	500	8.48	400	9.54	1000	6.15	400	8.62	100	10.23	2300	8.77
92/11/10	2400.00	8.29	800	5.45	1400	9.45	800	8.38	800	9.44	900	6.05	800	8.53	800	10.16	1200	8.59
92/11/11	2400.00	8.08	100	-4.14	2300	9.27	100	8.13	100	9.32	200	5.74	100	8.33	100	10.07	2900	8.56
92/11/12	2400.00	7.86	1900	3.88	1400	9.14	1900	7.93	1800	9.28	1600	5.42	1800	8.13	1900	9.99	1200	8.45
92/11/13	2400.00	7.63	1800	14.31	1300	8.91	100	7.74	200	9.11	1900	5.15	200	7.91	2000	9.87	1300	8.05
92/11/14	2400.00	7.58	1900	3.03	1200	8.86	100	7.63	1900	9.04	200	4.97	1900	7.90	1900	9.89	0	8.13
92/11/15	2400.00	7.49	800	-4.05	1200	8.81	700	7.61	800	8.88	200	4.98	700	7.87	700	9.77	1200	7.99
92/11/15	2400.00	7.49	800	-4.05	1200	8.81	700	7.61	800	8.88	200	4.98	700	7.87	700	9.77	1200	7.99
92/11/16	2400.00	7.18	200	-9.65	1400	8.59	300	7.55	100	8.77	400	4.69	0	7.57	500	9.70	700	7.99
92/11/17	2400.00	7.05	300	-11.35	1400	8.53	800	7.37	500	8.70	300	4.66	1000	7.54	300	9.60	1400	7.84
92/11/18	2400.00	6.99	200	-10.73	1400	8.47	300	7.31	300	8.61	700	4.63	200	7.53	100	9.54	1400	7.77
92/11/19	2400.00	6.86	100	-10.93	1400	8.35	300	7.18	100	8.55	500	4.54	700	7.37	100	9.45	1400	7.65
92/11/20	2400.00	6.74	200	-10.29	1400	8.26	200	7.09	300	8.47	300	4.46	600	7.29	300	9.37	1300	7.53
92/11/21	2400.00	6.63	100	-11.05	1400	8.12	300	6.93	100	8.32	200	4.36	300	7.16	100	9.26	0	7.37
92/11/22	2400.00	6.43	100	-9.85	1600	7.92	100	6.67	100	8.17	100	4.05	100	6.89	100	9.22	0	7.28
92/11/23	2400.00	6.35	400	-11.03	1600	7.84	200	6.55	800	8.07	100	4.06	200	6.80	100	9.15	2100	7.26
92/11/24	2400.00	6.27	100	-11.62	1600	7.72	400	6.48	100	7.95	100	4.06	1000	6.74	0	9.05	1300	7.21
92/11/25	2400.00	6.24	100	-10.67	1700	7.71	400	6.46	400	7.90	200	4.00	100	6.76	100	8.95	1600	7.08
92/11/26	2400.00	6.10	300	-10.76	1700	7.55	1800	6.29	300	7.79	300	3.76	1500	6.54	900	8.96	0	7.00
92/11/27	2400.00	6.19	1500	-4.92	1600	7.55	1400	6.31	1600	7.80	1400	3.53	1600	6.53	1600	8.96	0	6.96
92/11/28	2400.00	6.08	1600	4.09	1400	7.51	2000	6.25	1900	7.69	1600	3.75	1700	6.56	1600	8.79	1200	6.71
92/11/29	2400.00	6.14	1700	10.71	1300	7.51	1700	6.26	1600	7.72	1900	3.66	1600	6.57	1900	8.70	1100	6.96
92/11/30	2400.00																	

TIME_SERIAL	2400.00	3_BLACK_MAX	3_BLACK_MAX_TIME	2_RED_MAX	2_RED_MAX_TIME	2_BLUE_MAX	2_BLUE_MAX_TIME	2_BLACK_MAX	2_BLACK_MAX_TIME	7_BLACK_MAX	7_BLACK_MAX_TIME	1_BLUE_MAX	1_BLUE_MAX_TIME	1_BLACK_MAX	1_BLACK_MAX_TIME	6_RED_MIN	6_RED_MIN_TIME	6_BLUE_MIN
93/01/01	2400.00	4.00	100	-12.96	0	5.37	100	4.17	0	5.48	0	1.59	300	4.46	1000	6.86	0	4.92
93/01/02	2400.00	3.99	2300	-11.13	2300	5.30	2300	4.10	0	5.44	2300	1.55	300	4.46	1000	6.85	800	4.88
93/01/03	2400.00	3.97	100	-11.26	100	5.29	1800	4.38	2100	5.41	100	1.60	1600	4.61	1000	6.77	1000	4.86
93/01/04	2400.00	3.95	1300	-20.36	1600	5.37	600	4.39	100	5.40	1300	1.61	1300	4.50	1300	6.74	500	4.87
93/01/05	2400.00	3.87	100	-8.36	2100	5.21	300	4.08	300	5.33	100	1.55	100	4.37	100	6.65	1500	4.75
93/01/06	2400.00	3.76	100	-8.33	1600	5.07	300	3.92	1100	5.21	200	1.46	200	4.20	200	6.64	0	4.70
93/01/07	2400.00	3.77	1000	-16.51	1600	5.13	1100	4.06	1000	5.18	1200	1.45	1000	4.37	1000	6.63	1300	4.72
93/01/08	2400.00	3.74	300	-10.62	1400	5.08	400	3.98	600	5.15	800	1.44	1100	4.28	300	6.53	1400	4.62
93/01/09	2400.00	3.75	2300	-12.30	1500	5.05	2200	4.00	0	5.08	100	1.42	2300	4.29	2300	6.50	1300	4.60
93/01/10	2400.00	3.82	1800	-26.99	1400	5.10	1400	4.05	1800	5.10	1800	1.46	1800	4.38	1900	6.37	1100	4.53
93/01/11	2400.00	3.93	2000	-28.00	1500	5.04	2100	4.04	1500	5.09	1500	1.46	1600	4.38	2100	6.26	1100	4.45
93/01/12	2400.00	3.73	1000	-18.14	1500	5.05	1000	3.98	1000	5.08	1000	1.48	600	4.25	2200	6.32	100	4.49
93/01/13	2400.00	3.71	700	-20.79	1500	4.98	700	3.95	900	5.03	800	1.45	800	4.25	800	6.29	1500	4.44
93/01/14	2400.00	3.67	2100	-23.64	1400	4.96	800	3.91	600	4.99	100	1.41	1200	4.26	2100	6.31	1400	4.47
93/01/15	2400.00	3.66	2000	-26.82	1500	4.93	1300	3.90	2200	4.95	200	1.38	200	4.25	2000	6.28	1100	4.42
93/01/16	2400.00	3.62	100	-21.79	1500	4.92	100	3.87	100	4.91	1300	1.35	200	4.20	100	6.21	1100	4.37
93/01/17	2400.00	3.57	600	-15.25	1500	4.83	600	3.77	600	4.88	1200	1.29	600	4.15	600	6.17	1400	4.26
93/01/18	2400.00	3.52	700	-14.84	1500	4.78	600	3.70	800	4.80	1300	1.22	700	4.07	800	6.11	1400	4.19
93/01/19	2400.00	3.48	1900	-18.36	400	4.77	2000	3.71	2200	4.74	2100	1.13	2200	4.05	2300	6.11	1300	4.21
93/01/20	2400.00	3.43	1900	-39.84	1300	4.75	200	3.72	200	4.69	1400	1.15	1700	4.05	400	5.95	2300	4.31
93/01/21	2400.00	3.44	0	-23.00	1300	4.70	1300	3.65	200	4.72	1200	1.10	1200	4.07	0	5.98	100	4.29
93/01/22	2400.00	3.42	1500	-14.00	1500	4.68	100	3.60	300	4.69	1300	1.10	1200	4.06	500	5.95	1100	4.23
93/01/23	2400.00	3.40	600	-8.67	1500	4.63	500	3.58	500	4.64	1200	0.98	600	4.01	600	5.88	1300	4.13
93/01/24	2400.00	3.16	100	-6.54	1400	4.40	100	3.24	100	4.50	100	0.70	100	3.85	100	5.99	1700	4.10
93/01/25	2400.00	3.20	1700	-2.29	1500	4.42	1600	3.26	1700	4.50	1600	0.49	1700	3.69	1600	5.98	1300	4.09
93/01/26	2400.00	3.01	1400	-2.97	1200	4.54	0	3.41	0	4.32	1200	0.37	100	3.67	0	5.99	900	4.11
93/01/27	2400.00	3.11	2100	-24.39	1500	4.65	400	3.52	700	4.41	1400	0.46	0	3.78	200	5.80	1200	4.12
93/01/28	2400.00	3.09	800	-12.83	1400	4.43	800	3.34	100	4.36	800	0.49	800	3.72	800	5.78	1400	4.11
93/01/29	2400.00	2.99	600	-6.14	1400	4.32	100	3.26	0	4.29	600	0.38	200	3.61	0	5.72	1300	4.00
93/01/30	2400.00	3.01	100	-16.19	1500	4.28	100	3.28	200	4.27	100	0.35	300	3.64	300	5.75	1600	4.11
93/01/31	2400.00	2.97	500	-34.51	100	4.21	300	3.23	300	4.22	300	0.24	300	3.63	500	5.50	2200	3.91
93/02/01	2400.00	3.06	1700	-23.47	1400	4.33	1700	3.22	2000	4.23	1800	0.24	1500	3.68	1700	5.41	1100	3.85
93/02/02	2400.00	2.95	1800	-27.46	1500	4.17	1500	3.15	1700	4.21	1700	0.14	1600	3.58	2200	5.56	500	3.95
93/02/03	2400.00	2.87	2200	-20.82	1400	3.92	1300	3.12	2200	4.16	200	0.06	200	3.81	2200	5.51	1100	3.96
93/02/04	2400.00	2.87	100	-22.50	1500	4.09	100	3.07	100	4.11	100	-0.06	100	3.52	100	5.54	1300	3.90
93/02/05	2400.00	2.79	1900	-16.00	1400	4.05	2100	2.96	0	4.04	1000	-0.24	1200	3.39	2300	5.54	1300	3.96
93/02/06	2400.00	2.75	100	-22.34	1400	4.04	200	2.98	200	3.99	300	-0.28	300	3.35	200	5.55	1600	3.95
93/02/07	2400.00	2.75	1800	-32.74	1400	3.99	1700	2.92	100	3.94	1800	-0.45	100	3.37	1800	5.27	1100	3.72
93/02/08	2400.00	2.72	1700	-22.92	1300	4.01	1700	2.83	2100	3.93	1500	-0.63	1300	3.30	2000	5.27	1100	3.77
93/02/09	2400.00	2.60	100	-21.50	1400	3.95	300	2.70	100	3.82	1200	-0.81	100	3.16	100	5.45	1300	3.82
93/02/10	2400.00	2.52	100	-24.47	1400	3.81	400	2.68	500	3.76	400	-1.14	100	3.13	2200	5.34	1000	3.80
93/02/11	2400.00	2.38	100	-12.62	1400	3.73	1000	2.51	100	3.66	1300	-1.46	100	2.99	100	5.38	1200	3.78
93/02/12	2400.00	2.28	700	-16.12	1400	3.65	2300	2.37	0	3.55	1100	-1.80	100	2.90	2100	5.36	1300	3.77
93/02/13	2400.00	2.19	100	-8.77	1400	3.59	100	2.34	100	3.49	100	-1.98	100	2.84	300	5.32	900	3.79
93/02/14	2400.00	2.08	100	-21.55	0	3.52	100	2.15	100	3.35	400	-2.21	100	2.69	0	5.28	0	3.64
93/02/15	2400.00	1.83	100	-19.04	1600	3.29	200	1.85	200	3.19	500	-2.50	600	2.43	800	5.28	300	3.63
93/02/16	2400.00	1.77	800	-19.29	1600	3.26	900	1.78	1000	3.08	1000	-2.65	700	2.41	800	5.24	1400	3.60
93/02/17	2400.00	1.72	200	-23.01	1700	3.22	100	1.72	200	3.04	100	-2.68	1200	2.37	100	5.15	1100	3.49
93/02/18	2400.00	1.55	200	-21.06	0	3.07	300	1.56	200	2.90	300	-2.76	600	2.19	200	5.20	1300	3.57
93/02/19	2400.00	1.42	100	-20.49	1500	2.87	100	1.44	100	2.78	500	-2.83	900	2.10	700	5.21	1200	3.58
93/02/20	2400.00	1.31	100	-20.93	100	2.86	1600	1.30	1400	2.65	1400	-2.91	1600	2.01	100	4.97	1100	3.55
93/02/21	2400.00	1.17	100	-21.82	2300	2.79	1500	1.24	1500	2.56	100	-2.90	2000	1.90	200	5.06	1100	3.37
93/02/22	2400.00	1.09	2100	-21.87	100	2.71	1700	1.14	1700	2.47	1500	-2.91	1700	1.83	2200	4.90	1100	3.25
93/02/23	2400.00	0.87	100	-21.97	0	2.50	1700	1.05	2000	2.36	1900	-2.90	0	1.71	2200	4.94	500	3.32
93/02/24	2400.00	0.87	400	-19.48	0	2.56	400	0.92	400	2.23	100	-2.89	1500	1.69	700	5.01	1600	3.34
93/02/25	2400.00	0.87	400	-19.48	0	2.50	400	0.92	400	2.23	100	-2.89	1500	1.69	700	5.01	1600	3.34
93/02/26	2400.00	0.77	200	-18.47	0	2.40	700	0.85	700	2.15	700	-2.91	700	1.54	700	4.96	1500	3.31
93/02/27	2400.00	0.71	300	-18.41	300	2.35	100	0.79	100	2.11	200	-2.91	1200	1.50	100	4.91	1500	3.30
93/02/28	2400.00	0.63	100	-18.35	1300	2.27	700	0.74	200	2.04	100	-2.90	1100	1.44	200	4.91	1600	3.30
93/02/29	2400.00	0.62	100	-18.43	100	2.22	200	0.66	200	1.95	200	-2.85	1300	1.40	200	4.76	1100	3.06
93/03/01	2400.00	0.55	100	-17.74	0	2.17	100	0.64	100	1.90	100	-2.86	1000	1.35	100	4.83	1500	3.17
93/03/02	2400.00	0.50	1800	-15.61	2200	2.02	100	0.59	1800	1.78	1000	-2.80	1700	1.24	800	4.78	1200	3.08
93/03/03	2400.00	0.51	1700	-14.57	2200	2.07	1700	0.59	1700	1.79	1700	-2.74	1700	1.28	1800	4.74	1300	3.11
93/03/04	2400.00	0.48	1700	-14.72	2100	1.93	1500	0.53	1700	1.66	1800	-2.74	1700	1.19	1700	4.74	1200	3.15
93/03/05	2400.00	0.41	100	-15.43	400	1.92	100	0.50	900	1.66	800	-2.75	0	1.18	300	4.76	1400	3.18
93/03/06	2400.00	0.38	100	-16.82	100	1.87	300	0.47	300	1.60	900	-2.72	1200	1.12	300	4.74	1200	3.13
93/03/07	2400.00	0.32	600	-15.83	2200	1.82	500	0.43	200	1.54	500	-2.72	0	1.05	500	4.66	1600	2.99
93/03																		

Table V-3
Temperature Datalogger - Pile 7/12

TIME	SERIAL	TIME	3_BLACK_MAX	3_BLACK_MAX_TIME	2_RED_MAX	2_RED_MAX_TIME	2_BLUE_MAX	2_BLUE_MAX_TIME	2_BLACK_MAX	2_BLACK_MAX_TIME	7_BLACK_MAX	7_BLACK_MAX_TIME	1_BLUE_MAX	1_BLUE_MAX_TIME	1_BLACK_MAX	1_BLACK_MAX_TIME	6_RED_MIN	6_RED_MIN_TIME	6_BLUE_MIN	6_BLUE_MIN_TIME
93/04/10	2400.00	0.09	2200	30.05	1500	1.12	400	0.15	500	0.85	2000	-1.53	2200	0.61	200	4.07	1000	2.30		
93/04/11	2400.00	0.08	300	12.63	1700	1.09	300	0.15	400	0.80	100	-1.53	600	0.58	300	4.05	1200	2.30		
93/04/12	2400.00	0.15	2100	26.68	1400	1.12	2100	0.21	2200	0.87	1500	-1.48	2100	0.64	2200	4.01	0	2.09		
93/04/13	2400.00	0.12	2000	23.34	1500	1.11	2000	0.21	2000	0.85	1800	-1.42	2300	0.65	2200	3.86	900	2.05		
93/04/14	2400.00	0.10	0	-1.13	0	1.12	400	0.20	0	0.71	200	-1.34	0	0.62	400	3.82	2300	2.20		
93/04/15	2400.00	0.23	2200	16.07	1600	1.16	2200	0.29	2200	0.81	1500	-1.10	0	0.73	2200	3.76	1200	1.96		
93/04/16	2400.00	0.18	100	-2.65	1600	1.16	100	0.28	100	0.68	100	-1.16	100	0.73	100	3.78	1600	2.18		
93/04/17	2400.00	0.04	100	19.62	1600	0.98	100	0.17	100	0.86	2300	-1.16	2100	0.51	100	3.78	800	2.11		
93/04/18	2400.00	0.13	0	18.09	0	1.08	0	0.25	0	0.84	200	-1.05	0	0.63	0	3.93	0	2.03		
93/04/19	2400.00	0.16	2300	14.06	1400	1.13	2300	0.28	300	0.83	1800	-0.95	2300	0.71	700	3.70	900	1.89		
93/04/20	2400.00	0	0	7.64	0	1.12	0	0.29	0	0.73	1600	0	0	0.67	0	3.70	900	2.01		
93/04/21	2400.00	0.09	300	29.89	1500	1.04	200	0.26	300	0.80	1900	-0.83	600	0.65	100	3.66	1100	1.80		
93/04/22	2400.00	0.12	500	13.83	100	1.08	700	0.28	500	0.85	100	-0.89	700	0.67	700	3.67	2300	2.13		
93/04/23	2400.00	0.11	2300	12.96	1500	1.07	1500	0.29	1900	0.75	2000	-0.87	2000	0.65	2200	3.61	1300	2.00		
93/04/24	2400.00	0.26	2300	14.20	1500	1.16	2300	0.37	2100	0.79	1700	-0.73	2300	0.79	0	3.54	1000	1.98		
93/04/25	2400.00	0.23	100	12.50	1200	1.17	100	0.37	100	0.75	1300	-0.76	100	0.84	100	3.49	1000	1.93		
93/04/26	2400.00	0.20	2100	11.69	1000	1.15	2100	0.35	2100	0.78	1900	-0.79	2100	0.75	2100	3.58	0	2.17		
93/04/27	2400.00	0.36	2300	15.83	1600	1.26	2200	0.47	2300	0.82	1900	-0.70	2300	0.91	2200	3.50	1200	2.08		
93/04/28	2400.00	0.38	2300	28.28	1600	1.23	2200	0.49	2300	0.89	1500	-0.66	2300	0.93	2200	3.42	1000	1.80		
93/04/29	2400.00	0.40	2200	29.60	1500	1.24	2300	0.49	2100	0.82	1900	-0.67	2200	0.95	2200	3.47	1000	1.99		
93/04/30	2400.00	0.27	2200	16.19	1700	1.16	100	0.45	2100	0.80	2000	-0.71	2100	0.84	100	3.45	900	2.20		
93/05/01	2400.00	0.31	2300	41.48	1500	1.18	2300	0.44	2300	0.83	2000	-0.71	2300	0.85	2300	3.46	1000	2.03		
93/05/02	2400.00	0.48	0	34.20	0	1.48	0	0.57	0	0.84	2200	-0.58	0	1.27	0	3.62	1000	2.28		
93/05/03	2400.00	0.49	100	32.14	1500	1.28	100	0.57	100	0.83	2500	-0.55	100	0.82	100	3.25	900	2.14		
93/05/04	2400.00	0.34	100	43.65	1700	1.17	100	0.44	100	0.82	100	-0.71	100	0.98	100	3.56	1200	2.15		
93/05/05	2400.00	0.22	600	50.32	1300	1.09	500	0.40	600	0.80	500	-0.72	500	0.73	600	3.51	1300	2.15		
93/05/06	2400.00	0.40	0	28.19	1800	1.23	0	0.55	0	0.75	0	-0.56	0	0.90	0	3.57	1700	2.60		
93/05/07	2400.00	0.59	0	39.86	1500	1.30	0	0.62	0	0.82	2300	-0.44	0	1.07	0	3.51	800	2.60		
93/05/08	2400.00	0.55	100	44.58	1600	1.28	100	0.63	100	0.80	1100	-0.43	100	1.08	100	3.49	800	2.59		
93/05/09	2400.00	0.67	2300	33.04	1500	1.36	2300	0.75	2200	0.84	1300	-0.36	0	1.18	2300	3.58	1000	2.93		
93/05/10	2400.00	0.67	0	30.89	1600	1.34	0	0.83	0	0.88	100	-0.31	0	1.19	0	3.41	900	2.95		
93/05/11	2400.00	0.69	100	14.82	1200	1.39	100	0.86	100	0.85	100	-0.16	0	1.18	100	3.48	1000	3.19		
93/05/12	2400.00	0.49	2000	6.48	1800	1.31	1900	0	1.01	0.77	0	0.23	0	1.00	0	3.56	600	3.52		
93/05/13	2400.00	0.51	0	9.01	1600	1.40	0	1.05	1800	0.80	1000	0	0	1.05	900	3.60	1500	3.67		
93/05/14	2400.00	0.96	0	31.18	1300	1.57	0	1.56	0	0.88	2100	0	0	1.29	0	3.53	900	3.78		
93/05/15	2400.00	1.16	0	34.07	1600	1.60	0	1.65	0	0.90	2200	1.48	0	1.28	100	3.66	1000	3.78		
93/05/16	2400.00	1.45	2300	40.96	1300	1.67	200	1.75	2300	0.88	2300	1.74	2300	1.32	200	3.75	900	3.75		
93/05/17	2400.00	1.80	0	35.47	1400	1.86	0	2.02	0	0.94	900	2.29	0	1.51	0	3.86	900	3.92		
93/05/18	2400.00	2.06	0	32.62	1700	1.99	0	2.25	0	1.02	1200	2.83	0	1.65	0	3.84	800	3.98		
93/05/19	2400.00	2.20	0	44.19	1400	2.02	100	2.31	0	1.05	1000	3.05	0	1.67	100	3.84	900	3.87		
93/05/20	2400.00	2.43	0	26.67	1100	2.13	2200	2.53	2200	1.10	2200	3.38	0	1.70	2200	3.99	1100	4.20		
93/05/21	2400.00	2.68	0	19.18	1400	2.29	0	2.75	0	1.18	0	3.74	0	1.83	0	4.07	1100	4.51		
93/05/22	2400.00	2.86	2300	43.90	1300	2.37	0	2.89	0	1.28	0	4.04	0	1.92	0	4.09	1300	4.20		
93/05/23	2400.00	3.12	0	46.78	1600	2.51	0	3.10	0	1.35	0	4.33	0	2.09	0	4.15	1300	4.36		
93/05/24	2400.00	3.25	0	50.80	1500	2.55	200	3.18	200	1.47	500	4.57	0	2.37	0	4.21	1100	4.49		
93/05/25	2400.00	3.44	2300	31.45	900	2.73	0	3.43	0	1.57	0	5.01	0	2.23	0	4.21	900	4.66		
93/05/26	2400.00	3.68	2300	35.52	1100	2.86	2300	3.63	0	1.70	2300	5.38	0	2.40	2300	4.27	1100	4.70		
93/05/27	2400.00	4.00	0	27.93	1300	3.03	0	3.85	2300	1.86	2200	5.81	0	2.60	0	4.36	700	5.07		
93/05/28	2400.00	4.28	0	31.70	1800	3.19	0	4.07	0	1.98	2300	6.16	0	2.80	0	4.40	1100	5.24		
93/05/29	2400.00	4.44	2200	15.78	1100	3.32	2300	4.27	0	2.13	2300	6.90	0	2.99	2300	4.49	1200	5.53		
93/05/30	2400.00	4.80	2200	11.34	1500	3.50	2300	4.49	2300	2.41	0	7.51	900	3.51	0	4.52	100	5.71		
93/05/31	2400.00	5.11	2300	11.81	1300	3.71	0	4.78	0	2.51	2300	7.26	100	3.63	2300	4.59	500	6.05		
93/06/01	2400.00	5.17	2300	10.51	1600	3.83	2200	4.87	0	2.63	2300	6.89	100	3.65	2000	4.67	900	6.10		
93/06/02	2400.00	5.42	2300	28.16	1600	4.02	2300	5.04	2300	2.84	2300	6.68	2300	3.94	2300	4.82	300	6.12		
93/06/03	2400.00	5.46	300	26.43	1800	4.10	0	5.05	2.98	4.10	0	6.65	100	3.94	2300	4.88	700	6.07		
93/06/04	2400.00	5.55	0	25.96	1500	4.32	0	5.23	0	3.06	0	6.62	0	4.13	0	5.00	800	6.21		
93/06/05	2400.00	5.55	100	47.48	1500	4.31	300	5.19	100	3.16	1000	6.61	100	4.18	100	4.86	500	5.98		
93/06/06	2400.00	5.45	0	46.56	1300	4.33	0	5.15	0	3.23	0	6.70	0	4.12	0	5.01	1200	5.94		
93/06/07	2400.00	5.58	200	15.28	100	4.45	200	5.26	400	3.30	1800	6.87	0	4.23	300	5.11	1000	6.39		
93/06/08	2400.00	5.68	2300	36.73	1600	4.53	2300	5.38	2300	3.42	1200	7.25	2300	4.37	2300	5.14	500	6.18		
93/06/09	2400.00	5.68	500	53.52	1600	4.56	600	5.40	500	3.49	1000	7.32	600	4.38	500	5.20	800	6.07		
93/06/10	2400.00	5.73	500	20.50	1600	4.62	2200	5.49	0	3.55	0	7.57	0	4.47	0	5.30	1600	6.49		
93/06/11	2400.00	6.07	0	45.85	1300	4.80	2300	5.67	2300	3.69	0	7.93	0	4.76	0	5.31	800	6.29		
93/06/12	2400.00	6.20	0	43.09	1600	4.84	0	5.78	0	3.77	0	8.04	0	4.84	0	5.36	700	6.46		
93/06/13	2400.00	6.22	200	49.00	1400	4.90	200	5.84	200	3.85	900	8.12	200	4.88	100	5.32	900	6.29		
93/06/14	2400.00	6.17	400	63.58	1700	4.87	400	5.81	900	3.83	800	8.19	0	4.80	400	5.31	1100	6.32		
93/06/15	2400.00	6.29	500	68.94	1600	4.95	600	5.85	1800	3.96	600	8.47	2200	4.89	300	5.28	1000	6.33		
93/																				

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	6_BLUE_MIN	5_RED_MIN	5_RED_MIN	5_BLUE_MIN	5_BLACK_MIN	4_RED_MIN	4_RED_MIN	4_BLUE_MIN	4_BLACK_MIN	4_BLACK_MIN	3_RED_MIN	3_RED_MIN	3_BLUE_MIN	3_BLACK_MIN				
92/05/31	23.37	1200	6.68	1200	6.70	1200	7.86	1400	8.99	1300	7.09	1300	4.56	1700	6.79	1300	1.85	1600	4.43
92/06/01	21.93	1400	6.39	1300	6.74	1400	8.10	1400	9.30	1300	7.14	1500	4.73	1500	7.01	1500	0.91	1900	-2.11
92/06/02	19.88	1100	7.29	1100	6.97	1100	8.51	1100	8.80	200	7.29	1100	5.48	1200	7.45	300	4.17	200	2.84
92/06/03	23.23	100	7.23	900	6.83	1600	8.58	1600	9.95	1600	7.21	1800	5.41	1900	7.58	1600	5.00	1900	3.24
92/06/04	24.04	0	7.50	1100	6.92	1400	8.85	1400	10.19	1000	7.18	1300	5.40	1500	7.12	1300	4.68	1300	3.43
92/06/05	24.69	1500	7.44	900	6.83	900	9.00	900	10.21	800	7.16	1300	5.52	1400	7.40	1300	4.43	1900	2.68
92/06/06	20.79	1400	7.60	1000	6.88	1400	9.12	1300	10.21	1400	7.14	1400	5.56	1400	7.74	900	3.91	2300	2.77
92/06/07	22.92	200	7.61	1400	6.72	1400	8.94	1400	10.04	1800	7.04	1400	5.53	1600	7.55	1500	4.32	100	3.23
92/06/08	22.48	1800	7.64	1200	6.74	1500	9.01	1300	10.10	1300	6.96	1300	5.50	1400	7.50	1300	3.63	1400	3.77
92/06/09	22.85	2200	7.90	1300	6.87	1800	8.30	1600	10.51	100	7.05	1600	5.81	1900	7.81	1300	4.48	1300	3.69
92/06/10	22.25	100	8.20	900	7.09	900	9.67	900	10.96	1600	7.22	1700	5.21	1700	7.93	1300	4.83	1300	3.69
92/06/11	22.01	100	8.16	1400	6.93	1400	8.69	1400	11.11	1800	7.03	1400	5.01	1400	8.33	1300	4.14	1300	3.59
92/06/12	10.82	1700	8.56	1200	7.17	1500	10.09	1200	11.27	700	7.24	1200	6.68	100	8.91	100	4.72	2100	3.83
92/06/13	10.88	100	8.41	1800	6.86	1800	9.94	1800	11.13	1800	7.08	1800	6.80	1800	9.09	1500	4.39	1700	3.98
92/06/14	10.72	100	8.70	1700	7.07	1700	10.21	1700	11.34	1700	7.18	1700	6.73	1700	9.28	1700	4.77	1600	4.21
92/06/15	12.01	100	8.81	1400	7.15	1800	10.37	1300	11.41	1800	7.16	1400	6.94	1700	9.39	1300	5.10	1500	4.39
92/06/16	14.04	100	8.78	900	7.07	1500	10.29	1300	11.38	1500	7.01	1300	6.85	1500	9.33	1300	3.92	1500	3.41
92/06/17	13.52	100	8.63	1100	6.97	1300	10.22	1400	11.33	1400	6.96	1400	6.80	1300	9.29	1300	3.32	1700	2.25
92/06/18	14.20	100	8.75	1100	6.97	1200	10.34	1200	11.34	1200	6.96	1300	6.65	1700	8.89	1300	3.25	1500	0.95
92/06/19	16.93	100	8.88	1300	7.02	1300	10.43	1400	11.53	1400	7.00	1300	6.63	1500	8.74	1800	2.91	1900	1.10
92/06/20	17.01	100	8.89	1100	7.02	1700	10.57	1300	11.80	1700	7.00	1200	6.61	1700	8.21	1300	3.35	1500	1.42
92/06/21	9.77	100	9.42	100	7.38	100	10.93	100	12.18	100	7.13	100	6.30	1300	7.12	2300	3.84	300	1.35
92/06/22	9.78	100	9.53	1300	7.34	1300	11.20	100	12.55	100	7.20	1300	7.04	500	7.56	300	4.45	500	-0.58
92/06/23	10.22																		
92/10/18	2400.00	1100	10.79	1000	12.25	1200	11.63	1200	10.06	1100	11.99	1200	11.42	1300	9.50	1000	11.36	1000	10.89
92/10/19	2400.00	1200	10.97	1200	12.32	1200	11.44	0	10.05	1200	11.95	1200	11.34	1200	9.64	1100	11.36	1100	11.01
92/10/20	2400.00	1300	10.87	1200	11.99	1300	11.10	1100	10.09	1100	11.91	1300	11.13	1400	9.63	1200	11.37	0	10.81
92/10/21	2400.00	1200	10.79	1300	11.83	1300	10.79	1000	10.08	1100	11.83	1100	11.02	0	9.51	1300	11.21	1200	10.62
92/10/22	2400.00	1500	10.91	1400	11.76	1400	10.58	1500	10.10	700	11.80	1200	10.84	0	9.64	1500	11.23	1000	10.59
92/10/23	2400.00	1500	10.84	1400	11.43	1400	10.24	0	10.09	1600	11.71	1400	10.50	0	9.67	1400	11.14	1300	10.33
92/10/24	2400.00	1200	10.89	1300	11.25	1300	10.06	1300	10.11	1300	11.63	1500	10.32	2100	9.63	1100	11.11	1400	10.07
92/10/25	2400.00	0	10.93	2300	10.46	0	9.83	0	10.12	2200	11.52	0	10.09	0	9.70	1400	11.04	0	10.29
92/10/26	2400.00	1600	10.81	400	9.11	0	8.50	0	10.07	0	9.43	0	9.58	0	9.50	1000	10.92	0	9.92
92/10/27	2400.00	1000	10.95	1400	9.11	600	8.16	1400	10.13	2100	11.32	0	9.84	2000	9.70	1400	10.89	0	9.67
92/10/28	2400.00	1000	10.84	1500	9.38	1000	8.22	1000	10.10	600	11.24	1000	9.73	1500	9.67	1000	10.76	0	9.50
92/10/29	2400.00	1000	10.77	1000	9.41	1000	8.27	1000	10.11	1000	11.16	1000	9.68	1100	9.59	1000	10.65	1000	9.23
92/10/30	2400.00	1100	10.87	1100	9.47	1100	8.30	1100	10.13	1000	11.08	1100	9.58	1200	9.67	1100	10.62	1100	9.13
92/10/31	2400.00	1100	10.87	1100	9.50	1400	8.25	1400	10.17	0	11.04	1400	9.46	1300	9.79	1200	10.58	0	9.13
92/11/01	2400.00	1000	10.88	1000	9.53	1000	8.19	1000	10.15	1300	10.96	1300	9.28	2200	9.78	1300	10.50	2200	9.08
92/11/02	2400.00	1100	10.85	1100	9.44	1100	7.99	1100	10.16	1200	10.89	1200	9.12	1200	9.79	1100	10.44	2200	8.96
92/11/03	2400.00	1300	10.76	1300	9.25	1300	7.64	1700	10.13	1400	10.68	1700	8.84	1700	9.66	1300	10.27	1400	8.76
92/11/04	2400.00	1400	10.76	1400	9.01	0	7.42	0	10.14	1100	10.63	2300	8.51	2300	9.69	1500	10.24	1500	8.68
92/11/05	2400.00	1300	10.66	1300	8.79	1300	7.21	1300	10.15	500	10.55	1300	8.21	1300	9.56	1500	10.18	500	8.45
92/11/06	2400.00	1300	10.64	1300	8.58	1300	7.08	1300	10.13	1400	10.45	2200	8.42	0	9.70	1300	10.11	1300	8.30
92/11/07	2400.00	1300	10.64	1300	8.69	1300	7.15	1300	10.13	1200	10.39	1400	8.18	1200	9.78	1400	10.06	1400	8.30
92/11/08	2400.00	1300	10.59	1300	8.59	1300	6.97	1300	10.13	1300	10.30	1400	8.06	1300	9.71	1300	9.96	1300	8.00
92/11/09	2400.00	1300	10.52	1200	8.37	1200	6.81	1300	10.10	1200	10.20	1400	7.88	1300	9.69	1300	9.88	1200	7.88
92/11/10	2400.00	1200	10.40	1300	8.19	1200	6.54	1300	10.10	1300	10.08	1300	7.70	1400	9.64	1200	9.77	1300	7.64
92/11/11	2400.00	2200	10.55	2200	8.05	2200	6.39	2200	10.08	1300	9.92	2300	7.47	2300	9.63	1300	9.63	2200	7.66
92/11/12	2400.00	1400	10.48	1400	7.91	1100	6.26	1100	10.10	0	9.84	2300	7.31	0	9.69	1400	9.58	1200	7.45
92/11/13	2400.00	1300	10.30	1200	7.57	1300	6.00	1200	10.01	1200	9.82	1200	7.10	1200	9.41	1300	9.25	1300	7.17
92/11/14	2400.00	1200	10.33	1100	7.35	1300	5.65	1300	10.07	900	9.61	1200	7.01	1100	9.64	1200	9.39	1200	7.17
92/11/15	2400.00	1200	10.35	1200	7.29	1200	5.50	1100	10.02	1200	9.52	1400	6.96	1200	9.60	1200	9.25	1200	7.05
92/11/16	2400.00	1200	10.41	1400	7.35	1400	7.35	1400	10.02	1400	9.52	1400	6.96	1200	9.26	1300	9.26	1300	7.05
92/11/17	2400.00	1400	10.44	1400	7.22	1500	5.48	1300	10.01	2000	9.52	2100	6.96	2300	9.68	1200	9.22	2000	7.03
92/11/18	2400.00	1300	10.56	1300	7.15	1500	5.53	1300	9.99	1400	9.36	2200	6.63	2100	9.72	1400	9.09	1300	6.91
92/11/19	2400.00	1400	10.50	1400	7.00	1600	5.47	1500	9.99	1500	9.30	0	6.53	1700	9.76	1500	9.03	1400	6.85
92/11/20	2400.00	1400	10.31	1400	6.84	1400	5.36	1300	9.98	1500	9.17	1900	6.43	2100	9.70	1600	8.94	1500	6.71
92/11/21	2400.00	0	10.24	1400	6.77	0	5.32	0	9.92	0	8.84	0	6.13	0	9.60	1400	8.71	0	6.42
92/11/22	2400.00	1200	10.19	1500	6.67	2000	5.20	1200	9.91	2100	8.75	1700	6.05	1500	9.56	900	8.64	0	6.35
92/11/23	2400.00	2100	10.22	1500	6.66	1400	5.23	1600	9.88	2300	8.69	2000	6.00	2200	9.56	600	8.64	2100	6.27
92/11/24	2400.00	1500	10.17	1500	6.62	1600	5.16	1600	9.88	800	8.61	1500	5.99	1500	9.55	1500	8.45	1600	6.18
92/11/25	2400.00	1600	10.06	1400	6.52	1600	5.12	1600	9.82	1300	8.49	0	5.87	2300	9.50	1600	8.33	1600	6.09
92/11/26	2400.00	1300	9.96	1400	6.49	2300	5.07	1											

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	6_BLUE_MIN	5_RED_MIN	5_BLUE_MIN	5_BLUE_MIN	5_BLACK_MIN	5_BLACK_MIN	4_RED_MIN	4_RED_MIN	4_BLUE_MIN	4_BLUE_MIN	4_BLACK_MIN	4_BLACK_MIN	3_RED_MIN	3_RED_MIN	3_BLUE_MIN	3_BLUE_MIN	3_BLACK_MIN
93/12/31	2400.00	2300	8.57	0	4.44	0	3.33	0	8.72	6.04	0	3.59	2300	8.52	0	6.05	0	3.91
93/01/01	2400.00	700	8.53	900	4.40	900	3.32	900	8.70	200	6.00	900	3.55	1300	8.52	900	6.02	900
93/01/02	2400.00	1100	8.52	1100	4.37	1100	3.32	1000	8.68	500	5.99	600	3.56	800	8.48	800	5.96	1100
93/01/03	2400.00	1100	8.61	0	4.46	2300	3.46	2200	8.70	1900	6.03	1800	3.55	1900	8.60	1900	5.99	1600
93/01/04	2400.00	1400	8.36	0	4.28	1700	3.18	2000	8.62	1800	5.79	1600	3.42	0	8.40	1500	5.86	1400
93/01/05	2400.00	1900	8.27	1700	4.05	1900	3.12	1900	8.55	0	5.74	1500	3.38	2100	8.33	0	5.80	1900
93/01/06	2400.00	1200	8.34	100	4.11	100	3.14	100	8.55	100	5.78	100	3.36	100	8.34	100	5.76	1200
93/01/07	2400.00	1400	8.32	1300	4.14	2100	3.07	2100	8.49	2100	5.71	2100	3.36	2100	8.34	1500	5.69	1400
93/01/08	2400.00	1300	8.25	1400	4.12	1500	3.01	1700	8.48	1300	5.67	1300	3.34	1800	8.29	1500	5.65	1200
93/01/09	2400.00	1100	8.30	1100	4.05	1100	3.15	800	8.43	1100	5.76	900	3.35	1100	8.40	1100	5.57	1100
93/01/10	2400.00	1100	8.29	1100	4.03	800	3.17	800	8.38	1000	5.75	400	3.34	1000	8.35	800	5.49	1000
93/01/11	2400.00	1000	8.26	1600	4.08	1600	3.11	1600	8.47	1000	5.70	1600	3.33	1600	8.32	1600	5.51	1600
93/01/12	2400.00	1500	8.19	1500	4.00	1500	3.11	1600	8.44	1700	5.64	1700	3.31	1800	8.28	1500	5.57	1500
93/01/13	2400.00	1400	8.26	1400	4.03	1400	3.16	1500	8.44	1800	5.63	1800	3.27	1400	8.36	1400	5.59	1100
93/01/14	2400.00	1100	8.29	1700	4.01	1000	3.17	1600	8.42	1600	5.61	1700	3.24	1600	8.35	1500	5.53	1000
93/01/15	2400.00	0	8.16	2200	3.92	2300	3.03	0	8.39	0	5.52	0	3.19	2000	8.29	2300	5.48	1100
93/01/16	2400.00	1400	8.05	1500	3.81	2300	2.88	1800	8.31	2200	5.39	1700	3.07	0	8.18	1800	5.40	1200
93/01/17	2400.00	1400	7.95	1600	3.73	0	2.79	1900	8.26	2300	5.31	1700	2.97	2000	8.08	1700	5.30	1300
93/01/18	2400.00	400	7.92	400	3.72	600	2.78	600	8.22	600	5.29	600	2.97	400	8.09	400	5.34	200
93/01/19	2400.00	1100	8.17	1300	3.86	1100	3.08	1200	8.17	900	5.44	600	2.94	2100	8.15	1200	5.23	2300
93/01/20	2400.00	1400	7.99	1400	3.82	1600	2.92	1600	8.20	100	5.33	1600	2.93	1700	8.12	1600	5.24	100
93/01/21	2400.00	1300	7.98	1500	3.78	1500	2.92	1600	8.18	200	5.20	1600	2.95	2100	8.04	1500	5.17	1300
93/01/22	2400.00	1300	7.85	1500	3.68	2300	2.88	1600	8.12	0	5.09	2300	2.97	1500	7.97	1500	5.09	1300
93/01/23	2400.00	600	7.60	1100	3.51	2300	2.50	1700	7.94	2300	4.88	0	2.55	1700	7.80	2200	5.01	1600
93/01/24	2400.00	1000	7.56	1300	3.47	600	2.47	1200	7.94	700	4.86	0	2.48	1100	7.76	1100	4.99	1100
93/01/25	2400.00	1000	7.53	300	3.47	1900	2.40	1400	7.88	1800	4.82	700	2.46	1600	7.74	900	4.97	300
93/01/26	2400.00	1200	7.58	1300	3.44	1100	2.53	1300	7.99	800	5.11	2200	2.60	2200	7.94	1400	4.91	1100
93/01/27	2400.00	1400	7.55	1400	3.49	1600	2.44	1400	7.95	1900	4.89	1900	2.46	1900	7.78	1500	4.93	1200
93/01/28	2400.00	1300	7.43	1400	3.37	1400	2.31	1400	7.89	1500	4.81	1400	2.40	1400	7.71	1400	4.85	1300
93/01/29	2400.00	1800	7.56	1700	3.45	1600	2.50	1600	7.93	2200	4.83	1900	2.42	1900	7.81	1700	4.88	1200
93/01/30	2400.00	2100	7.46	1200	3.29	1800	2.41	1200	7.78	0	4.86	900	2.34	900	7.82	1200	4.71	2100
93/01/31	2400.00	1100	7.59	1200	3.34	400	2.55	1100	7.77	400	4.88	700	2.36	400	7.84	1200	4.66	1100
93/02/01	2400.00	900	7.59	1300	3.38	1100	2.49	1300	7.87	100	4.89	700	2.37	500	7.83	1200	4.78	900
93/02/02	2400.00	1100	7.54	1300	3.38	800	2.59	1600	7.82	474	4.74	1700	2.32	800	7.82	1100	4.69	1100
93/02/03	2400.00	2000	7.42	2300	3.28	2300	2.37	2000	7.84	2300	4.61	2300	2.23	0	7.69	1500	4.72	2000
93/02/04	2400.00	1300	7.36	1300	3.19	1500	2.27	1600	7.79	1600	4.59	400	2.17	500	7.67	1400	4.67	1300
93/02/05	2400.00	1600	7.37	1700	3.18	1700	2.22	1600	7.79	0	4.56	1700	2.09	2000	7.67	1600	4.66	1200
93/02/06	2400.00	1200	7.38	1200	3.09	700	2.36	1200	7.57	800	4.64	2300	1.93	800	7.61	1200	4.40	1200
93/02/07	2400.00	1100	7.36	1200	3.17	800	2.31	1200	7.65	800	4.51	800	1.87	1000	7.64	1100	4.42	1100
93/02/08	2400.00	1200	7.25	1600	3.10	1600	2.10	1600	7.73	1800	4.41	1600	1.74	1700	7.58	1600	4.54	1300
93/02/09	2400.00	1100	7.25	1400	3.06	1000	2.16	1300	7.65	1000	4.45	800	1.59	0	7.61	1200	4.43	1000
93/02/10	2400.00	1200	7.10	1400	2.98	2200	1.94	1500	7.62	2300	4.23	2000	1.37	2300	7.44	1500	4.42	1200
93/02/11	2400.00	1300	7.07	1500	2.91	1600	2.01	1600	7.59	1600	4.21	1500	1.27	2000	7.49	1400	4.39	1300
93/02/12	2400.00	1300	7.12	1400	3.01	1600	1.96	1300	7.56	1900	4.13	1900	1.13	2000	7.49	1300	4.34	1000
93/02/13	2400.00	1000	6.99	1600	2.85	1600	1.77	1600	7.43	2100	3.89	2000	0.73	2200	7.33	1600	4.25	0
93/02/14	2400.00	1300	6.92	1600	2.75	1500	1.77	1600	7.40	1800	3.89	1800	0.68	1400	7.32	1300	4.07	2200
93/02/15	2400.00	1400	6.90	1500	2.77	1400	1.80	1600	7.40	1800	3.89	1800	0.68	1400	7.32	1300	4.00	1400
93/02/16	2400.00	1100	6.89	1100	2.77	1000	1.86	2200	7.35	900	3.88	1900	0.68	2300	7.29	1100	3.88	1100
93/02/17	2400.00	1600	6.86	1400	2.76	0	1.75	1700	7.33	1800	3.76	0	0.52	1900	7.25	1300	3.95	1300
93/02/18	2400.00	1200	6.81	1500	2.73	1500	1.74	1800	7.30	0	3.74	0	0.48	1600	7.23	1300	3.91	1300
93/02/19	2400.00	1100	6.57	1100	2.52	900	1.52	900	7.08	700	3.49	700	0.25	700	7.01	1100	3.59	1100
93/02/20	2400.00	1100	6.66	1000	2.57	1000	1.61	1000	7.16	800	3.50	900	0.28	700	7.09	1000	3.65	1100
93/02/21	2400.00	1100	6.54	1000	2.42	1000	1.48	800	7.01	1000	3.29	900	0.10	800	6.97	1000	3.45	1100
93/02/22	2400.00	700	6.58	500	2.43	500	1.52	400	7.05	500	3.29	600	0.08	500	7.00	500	3.45	700
93/02/23	2400.00	1500	6.65	1400	2.40	2000	1.55	2000	7.12	2000	3.23	1900	0.11	2000	7.04	1500	3.44	1400
93/02/24	2400.00	1500	6.50	1500	2.35	1900	1.45	1900	7.06	2100	3.12	2100	0.00	1500	7.00	1500	3.30	1500
93/02/25	2400.00	1500	6.57	1400	2.35	1500	1.46	1500	7.03	1700	3.06	1800	-0.00	1600	6.97	1500	3.33	1400
93/02/26	2400.00	1500	6.53	1300	2.36	2000	1.45	1900	7.00	1800	3.00	2000	-0.03	1600	6.95	1500	3.24	1500
93/02/27	2400.00	1600	6.48	1600	2.30	1700	1.41	1700	6.96	1700	2.94	1800	-0.08	1700	6.92	1500	3.17	1800
93/02/28	2400.00	1100	6.33	1100	2.19	1000	1.33	900	6.86	1000	2.83	1000	-0.18	900	6.75	1100	2.89	1100
93/03/01	2400.00	1600	6.41	1500	2.20	2200	1.32	2200	6.88	1800	2.77	2300	-0.18	2300	6.83	1600	3.03	0
93/03/02	2400.00	1100	6.36	1400	2.10	1200	1.22	0	6.84	2300	2.69	2300	-0.23	0	6.78	1300	2.95	1200
93/03/03	2400.00	1200	6.31	1200	2.05	1200	1.22	800	6.77	0	2.64	2300	-0.25	0	6.73	1300	2.89	1200
93/03/04	2400.00	1100	6.29	1100	2.08	1200	1.26	1300	6.75	0	2.63	200	-0.27	1300	6.73	200	2.85	1200
93/03/05	2400.00	1900	6.30	1800	2.17	1500	1.31	1700	6.74	2100	2.62	1800	-0.21	1800	6.71	1800	2.83	1800
93/03/06	2400.00	2200	6.28	2200	2.14	1900	1.31	1400	6.73	2300	2.60	1900	-0.21	2000	6.70	2100	2.78	2000
93/03/07	2400.00	1500	6.19	1500	2.03	2000	1.20	1600	6.65	2000	2.49	1800	-0.27	2				

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	6_BLUE_MIN	5_RED_MIN	5_RED_MIN	5_BLUE_MIN	5_BLUE_MIN	5_BLACK_MIN	5_BLACK_MIN	4_RED_MIN	4_RED_MIN	4_BLUE_MIN	4_BLUE_MIN	4_BLACK_MIN	4_BLACK_MIN	3_RED_MIN	3_RED_MIN	3_BLUE_MIN	3_BLUE_MIN	3_BLACK_MIN
93/04/10	2400.00	1500	4.90	1500	1.20	1500	0.65	1500	5.49	1600	1.51	1500	-0.39	1500	5.25	1500	1.62	1500	-0.33
93/04/11	2400.00	1200	4.87	1400	1.34	1400	0.73	1400	5.45	1200	1.55	1500	-0.38	1400	5.36	1500	1.69	1400	-0.11
93/04/12	2400.00	1200	4.86	1200	1.24	1200	0.62	1200	5.29	1200	1.24	1300	-0.42	1400	5.23	1200	1.73	1000	-0.32
93/04/13	2400.00	1100	4.82	1000	1.24	1500	0.64	1100	5.36	1000	1.51	1400	-0.39	1400	5.16	1000	1.64	1100	-0.24
93/04/14	2400.00	1300	4.94	1300	1.30	1200	0.70	1200	5.36	1100	1.52	1700	-0.34	1200	5.32	1200	1.65	2000	0.85
93/04/15	2400.00	1300	4.72	1300	1.11	1200	0.55	1200	5.26	1300	1.44	1200	-0.43	1200	5.04	1200	1.59	1000	-0.19
93/04/16	2400.00	1700	4.90	1600	1.28	1700	0.77	1700	5.27	1700	1.51	1700	-0.33	1500	5.22	1700	1.59	1600	-0.10
93/04/17	2400.00	1500	4.75	900	1.25	1500	0.69	1500	5.24	1000	1.48	600	-0.32	1600	5.10	1500	1.54	600	-0.16
93/04/18	2400.00	1300	4.79	1400	1.22	1300	0.70	1300	5.28	1300	1.52	1300	-0.29	1300	5.13	1300	1.72	1300	-0.18
93/04/19	2400.00	900	4.57	900	1.16	900	0.64	900	5.20	900	1.51	800	-0.26	1500	4.89	1000	1.56	900	-0.32
93/04/20	2400.00	1100	4.70	1100	1.23	1100	0.87	900	5.15	1100	1.50	1100	-0.29	1100	4.99	1100	1.53	1000	-0.19
93/04/21	2400.00	1500	4.56	1500	1.12	1500	0.58	1500	5.09	1300	1.40	1500	-0.31	1500	4.85	1500	1.46	1500	-0.37
93/04/22	2400.00	1600	4.77	1700	1.34	200	0.84	1500	5.12	200	1.52	1500	-0.23	1600	5.08	1700	1.64	1700	-0.00
93/04/23	2400.00	1500	4.63	1400	1.28	1300	0.73	1500	5.05	1300	1.50	1000	-0.25	1300	4.95	1300	1.53	1300	-0.11
93/04/24	2400.00	1400	4.65	1300	1.28	1500	0.81	1400	5.07	1100	1.50	800	-0.24	1400	4.85	1500	1.54	1500	-0.12
93/04/25	2400.00	900	4.48	1200	1.34	900	0.73	900	4.99	900	1.46	900	-0.25	800	4.78	900	1.38	900	-0.26
93/04/26	2400.00	1000	4.66	200	1.55	500	0.97	600	5.05	500	1.57	1000	-0.11	500	4.96	500	1.61	500	0.01
93/04/27	2400.00	1400	4.46	1400	1.50	1300	0.94	1200	4.97	1400	1.50	1300	-0.11	1200	4.79	1400	1.49	1300	-0.17
93/04/28	2400.00	1000	4.20	1000	1.43	1000	0.80	1000	4.93	1000	1.48	1000	-0.12	1300	4.52	1000	1.31	1000	-0.46
93/04/29	2400.00	1000	4.36	1000	1.59	1300	1.05	1000	4.93	1100	1.52	1300	-0.06	1900	4.66	1000	1.42	1300	-0.27
93/04/30	2400.00	1200	4.49	1600	1.70	1100	1.28	1100	4.90	1600	1.58	1100	-0.03	1700	4.75	1600	1.49	1100	-0.13
93/05/01	2400.00	1200	4.27	1200	1.59	1500	1.31	1200	4.85	1600	1.47	1600	-0.11	1500	4.55	1200	1.40	1200	-0.36
93/05/02	2400.00	1400	4.37	1200	1.77	1400	1.62	1400	4.81	1600	1.40	1400	-0.06	1500	4.70	1500	1.47	1600	-0.19
93/05/03	2400.00	900	4.23	1000	1.89	900	1.86	900	4.80	1000	1.54	1400	0.07	800	4.49	900	1.35	900	-0.23
93/05/04	2400.00	1300	4.24	1300	1.96	1300	1.96	1300	4.80	1700	1.48	1700	-0.02	1700	4.54	1700	1.43	1800	-0.22
93/05/05	2400.00	1300	4.00	1200	2.09	1300	2.41	1200	4.62	1700	1.56	1000	0.07	1700	4.02	0	1.29	1300	-0.41
93/05/06	2400.00	1000	4.38	1000	2.49	1000	2.94	200	4.78	200	1.61	1700	0.24	100	4.51	100	1.51	1000	0.02
93/05/07	2400.00	1000	4.24	1000	2.73	1500	3.43	1800	4.68	1700	1.41	1400	0.10	1500	4.50	1500	1.47	1500	-0.18
93/05/08	2400.00	1000	4.14	900	2.93	1600	3.84	1700	4.57	1700	1.41	1700	0.11	1400	4.42	1000	1.37	1600	-0.16
93/05/09	2400.00	1100	4.27	1100	3.40	1500	4.33	1000	4.69	1400	1.52	1400	0.27	1400	4.55	1000	1.49	1100	-0.09
93/05/10	2400.00	1000	4.13	900	3.62	1600	4.55	900	4.68	900	1.55	1400	0.39	1400	4.33	1000	1.38	900	-0.20
93/05/11	2400.00	1200	4.22	1200	3.85	1200	4.77	1200	4.62	1200	1.68	1000	0.54	1200	4.42	1200	1.48	1200	0.03
93/05/12	2400.00	1100	4.33	1300	4.18	900	5.10	900	4.68	900	1.79	800	0.79	200	4.59	1200	1.60	600	0.31
93/05/13	2400.00	1500	4.28	1500	4.35	400	5.09	1500	4.65	1400	1.80	1200	1.23	200	4.50	1500	1.59	1300	0.36
93/05/14	2400.00	1300	4.13	1300	4.45	1300	4.45	1300	4.45	900	1.70	1300	1.66	100	4.30	1300	1.57	1400	0.07
93/05/15	2400.00	1200	4.09	1200	4.45	1700	4.76	1200	4.59	1300	1.75	1400	1.35	1400	3.24	1500	1.48	1300	0.36
93/05/16	2400.00	1000	4.02	1000	4.31	1400	4.77	1800	4.48	1800	1.83	1500	2.09	1400	4.23	1400	1.47	1400	0.08
93/05/17	2400.00	900	4.15	900	4.45	1400	4.98	1400	4.54	1500	1.94	1400	2.33	1400	4.38	1000	1.50	1000	0.57
93/05/18	2400.00	1000	4.11	1000	4.57	800	5.20	1200	4.55	700	2.11	1400	2.62	1100	4.34	1000	1.67	800	1.29
93/05/19	2400.00	900	3.93	800	4.59	800	5.26	800	4.43	1300	2.06	1400	2.76	1300	4.12	1000	1.61	900	1.35
93/05/20	2400.00	1100	4.20	1100	4.90	1100	5.69	1100	4.54	1100	2.38	1100	3.14	800	4.33	1100	1.86	1100	1.87
93/05/21	2400.00	1100	4.30	1300	5.16	1100	5.97	1100	4.57	1000	2.55	1000	3.42	100	4.43	1200	2.03	1200	2.28
93/05/22	2400.00	1300	3.97	1300	5.00	1300	5.87	1300	4.39	1800	2.35	1300	3.44	1400	4.07	1300	1.94	1300	2.06
93/05/23	2400.00	1300	4.00	1300	5.16	1600	6.03	1600	4.37	1600	2.45	1400	3.69	1400	4.11	1400	1.97	1400	2.37
93/05/24	2400.00	1300	3.98	1300	5.27	1600	6.26	1400	4.28	1300	2.41	1400	3.81	1300	4.10	1400	2.07	1900	2.58
93/05/25	2400.00	900	4.17	900	5.66	1500	6.85	1400	4.45	900	2.83	900	4.25	100	4.20	900	2.19	1300	2.91
93/05/26	2400.00	1100	4.10	1100	5.77	1600	6.97	1600	4.43	1400	2.85	1400	4.46	1400	4.12	1100	2.31	1100	3.03
93/05/27	2400.00	1300	4.27	1300	6.13	1400	7.26	1000	4.48	1500	3.17	1400	4.04	100	4.30	1100	2.55	1100	3.53
93/05/28	2400.00	1400	4.27	1400	6.35	1400	7.52	1800	4.42	1700	3.27	1600	4.99	100	4.26	1600	2.64	1500	3.79
93/05/29	2400.00	1100	4.43	2300	6.66	1100	7.76	1100	4.50	1100	3.49	1000	5.30	100	4.42	1100	2.84	1100	4.19
93/05/30	2400.00	100	4.44	1400	7.27	100	7.83	100	4.53	100	3.61	100	5.43	100	4.40	1400	2.90	100	4.37
93/05/31	2400.00	1200	4.37	1100	7.38	1200	8.08	1600	4.46	1100	3.74	1000	5.60	200	4.33	1100	3.11	1100	4.74
93/06/01	2400.00	1200	4.36	1100	7.19	1700	7.79	2300	4.43	1000	3.81	1000	5.74	1000	4.31	1100	3.24	900	4.94
93/06/02	2400.00	1200	4.32	1100	7.11	1600	7.90	1400	4.44	1600	3.96	1400	5.80	700	4.18	1100	3.34	1100	4.90
93/06/03	2400.00	1000	4.26	1000	6.96	1700	7.29	1400	4.39	1400	3.99	1400	5.79	1400	4.12	1000	3.44	800	4.95
93/06/04	2400.00	900	4.42	800	6.59	1600	7.30	1600	4.45	900	3.92	1500	5.82	1500	4.19	900	3.60	900	5.11
93/06/05	2400.00	1200	4.19	1300	6.59	1500	7.11	1800	4.18	1400	3.99	1400	5.97	1300	3.96	1000	3.51	800	4.79
93/06/06	2400.00	1200	4.15	1200	6.69	1300	7.14	1200	4.16	1300	4.15	1400	5.75	1300	3.92	1200	3.52	1400	4.79
93/06/07	2400.00	1000	4.60	1000	7.09	1000	7.68	1000	4.41	100	4.57	100	6.10	100	4.35	1000	3.92	1000	5.41
93/06/08	2400.00	1700	4.45	1600	6.99	1700	7.73	1700	4.28	1900	4.52	1700	6.05	1800	4.13	1500	3.88	1800	5.18
93/06/09	2400.00	1200	4.25	1200	6.92	1600	7.60	1200	4.17	1500	4.30	1400	5.97	1300	3.97	1500	3.85	1700	5.06
93/06/10	2400.00	800	4.66	800	7.34	800	8.02	800	4.39	100	4.77	100	6.32	100	4.31	800	4.10	800	5.53
93/06/11	2400.00	1200	4.36	1300	7.31	1300	8.04	1300	4.18	1300	4.50	1400	6.17	1300	3.97	1200	4.03	1300	5.30
93/06/12																			

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	3_BLACK_MIN	2_RED_MIN	2_RED_MIN	2_BLUE_MIN	2_BLUE_MIN	2_BLACK_MIN	2_BLACK_MIN	7_BLACK_MIN	7_BLACK_MIN	1_BLUE_MIN	1_BLUE_MIN	1_BLACK_MIN	1_BLACK_MIN
92/05/31	23.37	1200	5.03	1600	5.76	1600	4.63	1400	5.45	1400	4.22	1400	6.63	1300
92/06/01	21.93	900	4.97	1300	5.55	1000	4.41	2100	5.62	1300	4.38	100	6.95	1300
92/06/02	19.88	1100	5.90	1100	5.90	1100	100	100	4.62	100	4.62	500	7.87	1100
92/06/03	23.23	900	6.22	1600	6.32	1600	5.21	1600	6.18	1500	4.75	1900	7.74	1600
92/06/04	24.04	500	6.46	1400	6.43	1400	5.33	1600	6.42	1400	4.90	500	8.17	1400
92/06/05	24.69	800	6.43	900	6.21	900	5.48	1100	6.54	800	4.93	700	8.33	1400
92/06/06	20.79	2100	6.69	1000	6.26	1000	5.64	1300	6.70	1000	5.13	1400	8.41	1300
92/06/07	22.92	100	6.76	1400	6.12	1400	5.82	1400	6.70	1400	5.24	1800	8.23	1400
92/06/08	22.48	900	6.43	1300	6.08	1300	5.70	1300	6.77	1300	5.31	1300	8.35	1300
92/06/09	22.85	900	6.67	1600	5.85	1500	5.87	1600	7.01	1500	5.45	100	8.76	1600
92/06/10	22.25	800	7.13	1500	5.88	1000	6.28	1600	7.35	900	5.72	200	9.50	1200
92/06/11	22.01	800	6.91	1400	5.57	800	6.15	1400	7.31	1400	5.76	1600	9.65	1400
92/06/12	10.82	900	5.75	1200	5.75	1200	5.54	1200	7.67	1200	5.94	200	9.99	1200
92/06/13	10.88	700	7.63	1800	6.19	1800	6.42	1800	7.60	1800	6.01	1500	8.71	1500
92/06/14	10.72	1400	7.73	1700	6.36	1700	6.70	1700	7.87	1700	6.15	100	10.00	1700
92/06/15	12.01	900	7.80	1600	5.98	1700	6.76	1600	7.94	1300	6.32	100	10.10	1600
92/06/16	14.04	900	7.59	1500	5.50	900	6.75	1300	7.94	1300	6.35	500	10.12	1400
92/06/17	13.52	1100	7.50	1700	5.40	1300	6.77	1400	7.90	1400	6.49	1400	10.04	1700
92/06/18	14.20	1100	7.65	1500	5.57	1900	6.93	1200	7.96	1200	6.52	1700	10.04	1500
92/06/19	16.93	1300	7.87	1500	5.26	1100	6.99	1500	8.06	1300	6.66	1400	10.02	1400
92/06/20	17.01	500	7.78	1300	5.49	1100	7.09	1700	8.14	1300	6.68	1500	10.47	1300
92/06/21	9.77	2300	8.30	100	5.71	500	7.39	1900	8.50	100	6.81	100	11.06	100
92/06/22	9.76	1600	8.65	100	6.26	100	7.51	1300	8.71	100	6.99	100	11.74	1300
92/06/23	10.22													
92/10/18	2400.00	1100	-19.42	2300	11.19	1000	11.08	1100	11.13	700	10.44	1300	10.22	1100
92/10/19	2400.00	1400	-19.34	100	11.18	1200	10.98	1200	11.09	500	10.15	2200	10.22	1300
92/10/20	2400.00	1300	-15.74	2100	11.08	1400	10.89	1100	11.07	0	9.89	1400	10.08	1200
92/10/21	2400.00	1100	-15.35	200	10.93	1300	10.71	1100	11.01	900	9.59	0	9.92	1200
92/10/22	2400.00	1500	-15.19	0	10.95	1500	10.62	1500	10.92	0	9.20	0	10.00	1500
92/10/23	2400.00	1400	-15.61	200	10.80	1400	10.43	0	10.87	600	8.87	0	9.80	1400
92/10/24	2400.00	1100	1.27	0	10.80	1600	10.29	1300	10.84	2200	8.48	1100	9.77	1200
92/10/25	2400.00	0	-3.43	700	10.72	0	10.13	0	10.73	1800	7.23	0	9.70	0
92/10/26	2400.00	0	-0.34	0	10.60	0	9.91	0	10.54	0	6.05	1200	8.11	1600
92/10/27	2400.00	1400	-9.52	2300	10.40	0	9.64	0	10.38	0	6.53	100	8.23	100
92/10/28	2400.00	1000	-14.53	0	10.24	1200	9.53	1300	10.32	0	7.21	100	8.57	1000
92/10/29	2400.00	1000	-19.47	800	10.06	1000	9.39	1000	10.27	600	7.55	1400	8.65	1000
92/10/30	2400.00	1100	-22.01	800	9.86	1100	9.36	1100	10.26	2300	7.55	1300	8.74	1100
92/10/31	2400.00	1400	-24.63	800	9.89	1400	9.35	1200	10.17	0	7.38	1500	8.80	1500
92/11/01	2400.00	1000	-26.20											
92/11/02	2400.00	1100	-28.18	2200	9.84	1100	9.17	1800	10.04	0	7.09	1200	8.81	1200
92/11/03	2400.00	1300	-33.37	600	9.74	1300	8.94	1400	9.97	0	6.74	0	8.56	1300
92/11/04	2400.00	1500	-15.06	100	9.63	1500	8.79	0	9.88	0	6.29	0	8.56	1400
92/11/05	2400.00	1300	-5.56	2000	9.58	500	8.66	1300	9.81	0	6.11	1300	8.41	1300
92/11/06	2400.00	1400	-13.02	0	9.52	1400	8.54	2200	9.69	2200	6.05	2200	8.47	1400
92/11/07	2400.00	1400	-34.98	2300	9.48	1400	8.45	1400	9.60	2000	5.96	1200	8.45	1400
92/11/08	2400.00	1200	-34.96	600	9.36	1300	8.30	1300	9.31	2400	5.35	1400	9.35	1300
92/11/09	2400.00	1300	-33.94	700	9.24	1300	8.15	1300	9.40	0	5.71	1500	8.25	1300
92/11/10	2400.00	1400	-35.25	800	9.07	1300	7.87	1300	9.32	2300	5.54	1400	8.05	1400
92/11/11	2400.00	1300	-24.13	100	8.94	2300	7.82	2200	9.20	2300	5.20	2200	7.90	1300
92/11/12	2400.00	1200	-15.57	1900	8.85	1100	7.72	0	9.12	2300	5.16	0	7.87	1100
92/11/13	2400.00	1300	-10.60	300	8.53	1300	7.44	1200	9.01	1300	4.84	1200	7.49	1300
92/11/14	2400.00	1100	-16.78	0	8.68	1200	7.47	1200	8.88	2200	4.74	1300	7.65	1100
92/11/15	2400.00	1200	-29.70	800	8.53	1200	7.29	1200	8.77	0	4.63	1300	7.48	1300
92/11/16	2400.00	0	-29.10	0	8.53	1200	7.29	1200	8.77	0	4.63	1300	7.48	1300
92/11/17	2400.00	1400	-33.26	0	8.48	0	7.22	1500	8.66	2300	4.56	2000	7.47	1000
92/11/18	2400.00	0	-36.33	900	8.39	1800	7.11	1400	8.56	2000	4.52	2000	7.35	1400
92/11/19	2400.00	1600	-38.12	2200	8.27	1900	6.98	1500	8.48	2000	4.43	1900	7.31	1400
92/11/20	2400.00	1400	-35.81	200	8.15	1800	6.88	1600	8.39	2100	4.36	1900	7.16	1600
92/11/21	2400.00	0	-31.06	100	8.05	2000	6.76	1400	8.29	2100	4.28	2000	7.06	1400
92/11/22	2400.00	2300	-12.66	1000	7.94	2100	6.62	0	8.16	2100	4.06	0	6.87	1400
92/11/23	2400.00	1800	-13.21	900	7.82	0	6.53	2200	8.07	2200	3.98	800	6.80	0
92/11/24	2400.00	1500	-23.36	0	7.72	2100	6.47	2100	7.95	0	3.97	2200	6.71	2100
92/11/25	2400.00	1600	-24.22	100	7.67	2000	6.41	1700	7.89	2100	3.93	2100	6.61	1500
92/11/26	2400.00	1400	-12.08	800	7.57	2200	6.29	2200	7.80	0	3.78	2300	6.49	1400
92/11/27	2400.00	2300	-13.36	0	7.50	2200	6.22	2200	7.74	0	3.69	2200	6.45	1400
92/11/28	2400.00	1100	-25.44	800	7.45	2300	6.17	2200	7.64	2300	3.63	700	6.38	2200
92/11/29	2400.00	1100	-25.44	800	7.35	2300	5.98	1400	7.55	2300	3.59	700	6.30	1400
92/11/30	2400.00	0	-21.24	800	7.26	1200	5.81	1300	7.48	1300	3.47	0	6.19	0
92/12/01	2400.00	1300	-20.98	800	7.17	1300	5.90	1500	7.40	2300	3.30	2200	6.11	1500
92/12/02	2400.00	1200	-27.76	600	7.06	1300	5.79	1300	7.32	2300	3.29	2300	5.97	1300
92/12/03	2400.00	2200	-16.41	0	6.98	1200	5.69	1500	7.25	0	3.21	1400	5.86	1500
92/12/04	2400.00	0	-24.91	0	6.94	2000	5.70	1200	7.17	2300	3.11	2100	5.94	1200
92/12/05	2400.00	2000	-37.38	600	6.90	1700	5.66	1400	7.13	0	3.08	400	5.85	1400
92/12/06	2400.00	1500	-37.35	900	6.84	2300	5.66	2100	7.06	1600	3.07	0	5.91	1500
92/12/07	2400.00	1300	-34.90	700	6.81	1500	5.70	100	7.06	0	3.08	100	5.95	1500
92/12/08	2400.00	1400	-37.03	800	6.75	1700	5.58	1300	6.97	1300	3.01	1600	5.78	1300
92/12/09	2400.00	1400	-40.23	900	6.80	100	5.84	1500	6.97	1800	3.02	1500	5.80	1400
92/12/10	2400.00	1500	-43.98	2200	6.75	1700	5.53	1400	6.88	1500	2.94	1400	5.75	1400
92/12/11	2400.00	0	-32.90	100	6.65	1600	5.44	1400	6.86	1500	2.84	1500	5.72	1500
92/12/12	2400.00	0	-24.99	900	6.53	1700	5.30	1400	6.69	2200	2.58	0	5.53	1300
92/12/13	2400.00	2100	-19.74	0	6.44	0	5.24	0	6.60	2300	2.43	0	5.72	1400
92/12/14	2400.00	600	-34.03	2100	6.35	0	5.14	1400	6.53	0	2.30	2300	5.35	1400
92/12/15	2400.00	1100	-29.39	200	6.33	1900	5.09	1400	6.46	2200	2.27	1400	5.35	1400
92/12/16	2400.00	2300	-14.81	100	6.24	1100	4.97	1700	6.42	0	2.16	0	5.15	1200
92/12/17	2400.00	2300	-9.04	0	6.11	2200	4.85	2200						

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	3_BLACK_MIN_TIME	2_RED_MIN	2_RED_MIN_TIME	2_BLUE_MIN	2_BLUE_MIN_TIME	2_BLACK_MIN	2_BLACK_MIN_TIME	7_BLACK_MIN	7_BLACK_MIN_TIME	1_BLUE_MIN	1_BLUE_MIN_TIME	1_BLACK_MIN	1_BLACK_MIN_TIME
92/12/31	2400.00	0	-14.62	100	5.25	0	4.07	0	5.38	0	1.50	2300	4.36	0
93/01/01	2400.00	500	-12.87	100	900	4.05	1300	5.35	1100	1.47	1200	4.33	900	1.47
93/01/02	2400.00	1100	-47.25	2200	5.19	1100	4.03	300	5.28	1100	1.49	800	4.40	2200
93/01/03	2400.00	100	-48.13	600	5.22	2300	4.06	1800	5.31	400	1.52	2200	4.37	400
93/01/04	2400.00	1300	-22.13	100	5.07	1900	3.88	1500	5.19	1800	1.43	1500	4.17	1300
93/01/05	2400.00	2100	-14.33	0	4.97	0	3.80	2100	5.11	0	1.32	2300	4.12	1900
93/01/06	2400.00	200	-35.49	1000	5.00	100	3.84	100	5.10	200	1.32	200	4.19	100
93/01/07	2400.00	1900	-26.06	900	4.94	2100	3.81	1500	5.05	2100	1.32	1800	4.12	1500
93/01/08	2400.00	1500	-35.72	0	4.91	1400	3.78	1600	5.01	1700	1.29	1800	4.07	1300
93/01/09	2400.00	1100	-45.75	0	4.96	1100	3.90	1100	4.94	1100	1.30	1100	4.13	1100
93/01/10	2400.00	1000	-48.64	2300	4.89	600	3.86	1000	4.87	600	1.25	1000	4.10	1000
93/01/11	2400.00	1500	-43.27	100	4.92	1600	3.87	1600	4.87	100	1.34	1600	4.09	1600
93/01/12	2400.00	1500	-38.62	900	4.86	1800	3.75	1500	4.93	1600	1.23	1600	4.09	1600
93/01/13	2400.00	1900	-40.28	2000	4.86	1900	3.76	1400	4.87	1900	1.31	1400	4.13	1600
93/01/14	2400.00	1000	-44.70	0	4.84	1800	3.73	1600	4.87	1700	1.27	1700	4.13	1100
93/01/15	2400.00	0	-44.21	900	4.77	1600	3.65	1600	4.82	2000	1.22	2300	4.03	2300
93/01/16	2400.00	2300	-38.25	900	4.67	2200	3.55	1700	4.74	1800	1.12	1500	3.96	2300
93/01/17	2400.00	1600	-36.23	900	4.59	1800	3.45	1700	4.69	0	1.05	1800	3.83	1700
93/01/18	2400.00	600	-44.29	0	4.56	400	3.48	400	4.66	600	1.03	1000	3.83	400
93/01/19	2400.00	2300	-51.69	2100	4.64	2300	3.58	1200	4.58	2300	1.04	2100	3.91	1200
93/01/20	2400.00	100	-48.67	200	4.59	1600	3.46	1600	4.60	100	1.00	1700	3.91	1600
93/01/21	2400.00	1500	-53.04	700	4.52	1900	3.35	1600	4.55	1000	0.90	2200	3.81	1600
93/01/22	2400.00	1300	-41.58	700	4.40	2200	3.26	1500	4.50	2300	0.72	2300	3.71	0
93/01/23	2400.00	2200	-11.18	100	4.22	1700	3.11	2300	4.37	1500	0.43	2300	3.48	1600
93/01/24	2400.00	900	-12.61	800	4.00	400	3.07	800	4.34	0	0.38	600	3.48	1100
93/01/25	2400.00	2000	-39.17	0	4.18	600	3.06	800	4.25	1700	0.19	1600	3.42	800
93/01/26	2400.00	1100	-49.06	900	4.44	0	3.28	1500	4.29	900	0.34	800	3.64	1300
93/01/27	2400.00	1400	-41.42	700	4.23	1500	3.02	1400	4.24	1900	0.33	1900	3.44	1500
93/01/28	2400.00	1400	-41.80	0	4.16	1900	2.94	1400	4.18	1900	0.23	1800	3.37	1500
93/01/29	2400.00	1800	-47.89	200	4.13	1700	2.99	1700	4.16	1800	0.23	2000	3.43	1400
93/01/30	2400.00	2100	-66.69	0	4.05	1000	3.09	1500	4.00	2100	0.05	2100	3.45	1700
93/01/31	2400.00	100	-70.60	900	4.04	1100	2.95	1200	4.00	900	0.05	200	3.43	1100
93/02/01	2400.00	500	-52.29	100	4.07	1000	2.99	1300	4.06	900	0.06	900	3.40	1200
93/02/02	2400.00	1100	-56.71	800	4.03	900	2.88	1600	4.00	900	-0.06	1700	3.40	1100
93/02/03	2400.00	2000	-51.48	2000	3.98	2000	2.82	1500	4.00	2300	-0.25	0	3.25	1800
93/02/04	2400.00	1300	-43.55	0	3.93	1600	2.69	1500	3.93	1700	-0.35	1700	3.22	1500
93/02/05	2400.00	1800	-51.26	0	3.89	1900	2.69	1600	3.91	1900	-0.43	2200	3.15	1700
93/02/06	2400.00	1100	-67.89	800	3.79	1200	2.60	1400	3.69	700	-0.65	2300	3.10	1200
93/02/07	2400.00	1100	-65.19	800	3.77	1000	2.51	1200	3.66	800	-0.79	1000	3.06	1100
93/02/08	2400.00	1300	-43.37	100	3.76	1600	2.46	1500	3.72	1500	-1.15	0	3.00	1600
93/02/09	2400.00	1000	-56.92	800	3.70	1000	2.35	1400	3.60	1000	-1.43	0	2.86	1000
93/02/10	2400.00	1900	-46.97	100	3.57	1600	2.19	1400	3.50	2000	-1.79	0	2.72	1600
93/02/11	2400.00	1500	-46.11	0	3.52	1600	2.11	1400	3.43	1800	-2.03	1700	2.70	1300
93/02/12	2400.00	2300	-51.63	700	3.48	1800	1.96	1400	3.33	2000	-2.23	0	2.66	1600
93/02/13	2400.00	0	-35.30	100	3.29	0	1.88	0	3.19	0	-2.50	0	2.43	0
93/02/14	2400.00	2000	-22.51	0	3.20	1500	1.74	2200	3.07	2100	-2.69	2300	2.33	1800
93/02/15	2400.00	1600	-28.66	0	3.12	1900	1.63	1800	2.97	1900	-2.79	1900	2.28	1300
93/02/16	2400.00	1100	-33.72	900	3.06	2100	1.56	2300	2.87	1900	-2.82	900	2.14	1100
93/02/17	2400.00	0	-23.46	100	2.94	1700	1.39	0	2.75	2100	-2.89	2200	2.05	1600
93/02/18	2400.00	1200	-20.96	100	2.88	0	1.29	0	2.67	0	-2.93	0	2.00	1300
93/02/19	2400.00	1100	-22.40	1000	2.82	900	1.07	700	2.41	900	-3.14	700	1.72	1000
93/02/20	2400.00	1100	-22.33	1000	2.85	900	1.09	900	2.42	800	-3.04	600	1.72	1000
93/02/21	2400.00	1000	-22.68	1000	2.45	1000	0.90	1000	2.24	1000	-3.15	900	1.53	1100
93/02/22	2400.00	700	-22.86	900	2.43	500	0.88	500	2.21	500	-3.10	500	1.56	500
93/02/23	2400.00	1400	-21.93	100	2.46	1800	0.81	2100	2.20	2200	-2.96	2200	1.54	1500
93/02/24	2400.00	1000	-20.63	1000	2.35	1900	0.82	1900	2.12	1900	-3.02	1900	1.42	1600
93/02/25	2400.00	1700	-19.42	100	2.30	2000	0.76	1700	2.06	1700	-3.00	1800	1.42	1600
93/02/26	2400.00	1600	-18.76	2000	2.21	2000	0.70	1900	1.97	1900	-2.99	1600	1.37	1600
93/02/27	2400.00	1700	-18.61	900	2.14	1900	0.62	1700	1.90	2000	-2.99	1700	1.33	1500
93/02/28	2400.00	1100	-19.05	1900	1.99	1000	0.52	1000	1.78	900	-3.04	900	1.14	1100
93/03/01	2400.00	0	-18.74	100	2.01	0	0.53	0	1.76	1700	-2.82	2200	1.20	1600
93/03/02	2400.00	1300	-17.70	100	1.96	2300	0.46	0	1.69	0	-2.82	200	1.14	1200
93/03/03	2400.00	1300	-16.79	900	1.90	1300	0.43	2300	1.65	2300	-2.82	900	1.09	1200
93/03/04	2400.00	1100	-16.28	900	1.85	2100	0.37	0	1.58	0	-2.89	1300	1.06	1200
93/03/05	2400.00	1600	-17.97	900	1.81	1700	0.40	1800	1.55	1800	-2.74	100	1.06	1700
93/03/06	2400.00	1800	-17.18	1000	1.79	1900	0.39	0	1.51	2000	-2.87	1100	1.03	1900
93/03/07	2400.00	1600	-17.00	900	1.70	1600	0.33	2100	1.43	1800	-2.78	1900	0.94	1600
93/03/08	2400.00	1500	-16.64	800	1.67	2200	0.28	0	1.39	2100	-2.76	100	0.89	1500
93/03/09	2400.00	1300	-17.12	1100	1.61	1600	0.26	1600	1.35	2100	-2.74	300	0.84	1300
93/03/10	2400.00	1200	-17.33	1100	1.57	2300	0.22	2200	1.30	2200	-2.71	2200	0.80	1200
93/03/11	2400.00	1300	-16.02	1000	1.53	2100	0.21	2100	1.25	1900	-2.69	100	0.80	1300
93/03/12	2400.00	1500	-16.85	0	1.54	300	0.22	200	1.26	1900	-2.66	1700	0.83	1100
93/03/13	2400.00	1200	-19.97	1000	1.50	1700	0.20	1900	1.19	2300	-2.65	0	0.76	1700
93/03/14	2400.00	1400	-15.99	600	1.44	1500	0.18	1400	1.16	2200	-2.64	2200	0.68	1400
93/03/15	2400.00	300	-15.27	100	1.49	2100	0.21	100	1.18	1600	-2.59	100	0.79	1200
93/03/16	2400.00	1400	-17.04	1400	1.39	1700	0.15	0	1.10	1900	-2.57	2300	0.66	1200
93/03/17	2400.00	1200	-14.64	100	1.34	2900	0.04	2300	1.02	2300	-2.57	2300	0.67	1300
93/03/18	2400.00	1600	-21.80	0	1.38	1900	0.07	100	1.06	100	-2.57	200	0.65	1700
93/03/19	2400.00	1500	-25.73	800	1.30	2200	0.02	2300	0.99	2300	-2.57	2300	0.56	1500
93/03/20	2400.00	1100	-24.98	700	1.31	100	0.06	1300	1.01	0	-2.57	100	0.61	1100
93/03/21	2400.00	1400	-12.11	800	1.23	600	-0.01	1400	0.95	0	-2.51	900	0.56	1400
93/03/22	2400.00	2100	-10.86	0	1.19	0	-0.01	2100	0.90	0	-2.47	2300	0.56	800
93/03/23	2400.00	1100	-15.22	900	1.17	2300	-0.02	0	0.87	2300	-2.50	100	0.54	1000
93/03/24	2400.00	1200	-20.84	900	1.17	0	0							

Table V-3
Temperature Datalogger - Pile 7/12

TIME_SERIAL	TIME	3_BLACK_MIN	TIME_2_RED_MIN	TIME_2_RED_MIN	TIME_2_BLUE_MIN	TIME_2_BLUE_MIN	TIME_2_BLACK_MIN	TIME_2_BLACK_MIN	TIME_7_BLACK_MIN	TIME_7_BLACK_MIN	TIME_1_BLUE_MIN	TIME_1_BLUE_MIN	TIME_1_BLACK_MIN	TIME_1_BLACK_MIN
93/04/10	2400.00	1500	5.90	700	0.86	1500	-0.10	1500	0.73	1000	-1.50	1500	0.17	1500
93/04/11	2400.00	1400	2.65	600	0.89	1400	-0.03	1200	0.73	1100	-1.63	1100	0.36	1200
93/04/12	2400.00	1200	-2.93	2300	0.80	1200	0.01	1200	0.73	800	-1.81	1600	0.33	1200
93/04/13	2400.00	1300	-4.35	700	0.88	1100	0.02	1000	0.67	700	-1.72	1400	0.37	1400
93/04/14	2400.00	1300	-16.48	0	0.99	1300	0.05	1200	0.55	2300	-1.53	1100	0.41	1300
93/04/15	2400.00	1200	-19.35	100	0.76	1200	-0.09	1200	0.56	400	-1.52	1600	0.21	1200
93/04/16	2400.00	1500	-10.99	100	0.91	1500	0.06	1600	0.57	1600	-1.29	1100	0.38	1700
93/04/17	2400.00	1500	-5.66	100	0.89	1500	0.04	1400	0.61	400	-1.27	1500	0.33	1500
93/04/18	2400.00	1300	-0.98	0	0.87	1300	0.06	1300	0.75	2200	-1.26	1300	0.35	1300
93/04/19	2400.00	900	-11.22	600	0.82	1000	-0.02	900	0.65	800	-1.24	1400	0.32	1000
93/04/20	2400.00	1100	-10.11	700	0.87	900	0.04	800	0.56	700	-1.09	1100	0.42	1100
93/04/21	2400.00	1500	-6.96	400	0.81	1500	-0.06	1500	0.58	1500	-1.19	1500	0.18	1500
93/04/22	2400.00	1600	-2.02	0	1.00	300	-0.19	1700	0.66	2300	-0.98	1600	0.57	1700
93/04/23	2400.00	1500	-2.93	300	0.86	1300	0.11	1300	0.63	600	-1.01	1200	0.38	1500
93/04/24	2400.00	1400	-8.15	0	0.96	1300	0.18	1300	0.65	800	-1.12	1500	0.42	1500
93/04/25	2400.00	900	-13.59	300	0.79	900	0.01	900	0.59	700	-1.10	1200	0.31	900
93/04/26	2400.00	1400	-6.76	0	0.96	1000	0.22	600	0.69	200	-1.00	1400	0.53	1000
93/04/27	2400.00	1400	-14.50	0	0.89	1200	0.13	1200	0.58	400	-1.29	1600	0.37	1500
93/04/28	2400.00	1000	-21.18	600	0.67	1000	-0.03	1000	0.59	300	-1.30	1300	0.26	1000
93/04/29	2400.00	1000	-8.88	100	0.82	1000	0.11	1000	0.60	700	-1.27	1500	0.27	1300
93/04/30	2400.00	1600	-8.02	300	0.89	1100	0.20	1700	0.59	900	-1.05	1600	0.46	1700
93/05/01	2400.00	1200	-4.22	400	0.79	1100	0.07	1600	0.66	600	-1.33	1500	0.24	1500
93/05/02	2400.00	1300	-7.42	0	0.89	1100	0.14	1600	0.72	1700	-1.18	1500	0.44	1200
93/05/03	2400.00	900	-18.31	600	0.82	900	0.13	800	0.62	1400	-1.09	1400	0.35	1500
93/05/04	2400.00	1700	8.24	500	0.82	1700	0.09	1700	0.69	1700	-1.19	1700	0.29	1700
93/05/05	2400.00	1200	14.43	600	0.69	1200	0.00	1200	0.63	1800	-1.25	1600	0.18	1600
93/05/06	2400.00	1000	3.22	0	0.93	1000	0.25	1000	0.69	1400	-0.92	1800	0.53	1800
93/05/07	2400.00	1500	-0.26	0	0.87	1800	0.19	1700	0.66	1900	-1.21	1500	0.40	1500
93/05/08	2400.00	900	-3.27	300	0.78	1700	0.13	1700	0.66	1700	-1.16	1500	0.41	1700
93/05/09	2400.00	1000	-7.55	0	0.87	1100	0.32	1700	0.72	1700	-1.02	1500	0.60	1500
93/05/10	2400.00	1000	-13.19	600	0.85	1000	0.31	900	0.61	700	-0.97	1600	0.62	900
93/05/11	2400.00	1200	-8.81	100	0.97	1200	0.48	1200	0.62	800	-0.77	1200	0.56	1200
93/05/12	2400.00	1100	-1.87	300	1.18	1000	0.82	800	0.68	1000	-0.15	100	0.82	1100
93/05/13	2400.00	1500	-3.78	900	1.21	1200	1.02	1400	0.72	1400	0.25	100	0.82	1500
93/05/14	2400.00	1300	-3.49	400	1.15	1300	1.05	1300	0.72	1300	0.72	1300	0.54	1300
93/05/15	2400.00	1200	-7.58	300	1.18	1200	1.25	1200	0.72	900	0.90	1500	0.67	1400
93/05/16	2400.00	1000	-0.18	600	1.25	1100	1.37	1500	0.73	1800	1.16	1300	0.71	1300
93/05/17	2400.00	900	1.54	0	1.47	1400	1.62	900	0.85	1700	1.57	1400	0.93	1500
93/05/18	2400.00	1000	-0.66	0	1.51	1100	1.77	800	0.85	600	2.15	1400	1.01	1700
93/05/19	2400.00	1000	-6.17	500	1.55	1000	1.81	800	0.90	1800	2.36	1400	0.95	1400
93/05/20	2400.00	1100	4.72	300	1.82	1100	2.18	1100	0.97	800	2.93	1100	1.29	1100
93/05/21	2400.00	1200	4.77	0	2.06	1200	2.50	1200	1.04	1000	3.36	1000	1.49	1300
93/05/22	2400.00	1300	2.23	100	1.91	1300	2.41	1300	1.11	300	3.41	1300	1.28	1300
93/05/23	2400.00	1200	8.09	0	2.11	1200	2.61	1600	1.23	1600	3.63	1600	1.43	1600
93/05/24	2400.00	1400	8.67	300	2.19	1500	2.74	1700	1.32	1700	3.90	1400	1.58	1600
93/05/25	2400.00	900	14.28	500	2.42	900	3.06	900	1.45	900	4.56	900	1.78	900
93/05/26	2400.00	1100	11.87	600	2.50	1100	3.28	1200	1.56	300	4.90	1300	1.97	1000
93/05/27	2400.00	1300	9.83	2300	2.75	1100	3.57	1100	1.70	400	5.33	1100	2.21	1400
93/05/28	2400.00	1400	5.05	400	2.86	1600	3.76	1800	1.82	600	5.76	1700	2.37	1300
93/05/29	2400.00	1100	5.69	2300	3.14	1100	4.05	100	1.98	300	6.03	1100	2.68	1100
93/05/30	2400.00	100	2.86	2300	3.30	200	4.24	100	2.05	100	7.03	100	3.04	100
93/05/31	2400.00	1100	1.44	0	3.47	200	4.45	300	2.39	200	6.93	1200	3.39	1200
93/06/01	2400.00	1200	0.83	400	3.61	900	4.67	1000	2.47	200	6.58	0	3.44	900
93/06/02	2400.00	1100	4.96	600	3.69	1100	4.74	1100	2.61	100	6.43	1600	3.52	1100
93/06/03	2400.00	1000	0.57	300	3.77	1000	4.77	1000	2.79	400	6.19	1400	3.58	1400
93/06/04	2400.00	900	-0.56	0	4.01	900	4.91	900	2.94	500	6.29	2000	3.75	2000
93/06/05	2400.00	1000	-3.44	500	3.90	1100	4.72	1700	2.94	700	6.09	1400	3.56	1700
93/06/06	2400.00	1200	13.56	400	3.93	1200	4.73	1300	3.08	1600	6.19	1300	3.53	1300
93/06/07	2400.00	1000	5.89	500	4.34	1100	5.16	100	3.21	600	6.74	1100	4.06	1300
93/06/08	2400.00	1200	6.39	600	4.25	1800	5.02	1700	3.28	200	6.76	1600	3.85	1700
93/06/09	2400.00	1200	6.74	600	4.11	1100	4.94	1600	3.32	1600	6.60	1500	3.81	1600
93/06/10	2400.00	800	12.09	600	4.48	800	5.31	800	3.46	200	7.09	800	4.25	800
93/06/11	2400.00	1300	5.28	600	4.31	1100	5.18	1300	3.54	1500	7.15	1300	4.11	1500
93/06/12	2400.00	1000	4.98	100	4.44	1000	5.35	1700	3.60	1900	7.36	1600	4.21	1700
93/06/13	2400.00	1200	6.08	200	4.33	1100	5.32	1400	3.69	1300	7.43	1400	4.21	1400
93/06/14	2400.00	1200	18.04	400	4.43	1100	5.43	1200	3.74	100	7.53	1300	4.29	1300
93/06/15	2400.00	1000	18.91	600	4.45	1100	5.49	1100	3.82	1100	7.92	1300	4.27	1300
93/06/16	2400.00	1000	15.70	600	4.57	1100	5.71	1100	3.85	1200	8.36	1200	4.38	1100
93/06/17	2400.00	1500	14.96	0	4.82	1200	5.97	1500	4.01	1700	8.98	1500	4.53	1500
93/06/18	2400.00	1400	12.78	200	4.98	1400	6.23	1400	4.14	1600	9.50	1400	4.84	1400
93/06/19	2400.00	1200	16.87	0	5.07	1500	6.38	1400	4.19	1800	9.54	1400	4.91	1600
93/06/20	2400.00	1200	9.01	500	5.17	1100	6.57	1300	4.31	1700	9.87	1300	5.05	1300
93/06/21	2400.00	1100	11.56	300	5.33	1100	6.78	1100	4.46	1400	10.23	1300	5.17	1100
93/06/22	2400.00	1300	21.23	2300	5.67	1300	7.19	200	4.64	200	10.60	1300	5.61	1300
93/06/23	2400.00	1100	8.75	0	5.88	100	7.41	100	4.76	200	10.84	100	4.85	800
93/06/24	2400.00	1200	8.08	300	5.92	1100	7.48	1600	4.95	600	11.33	1500	5.93	1700
93/06/25	2400.00	1200	9.12	100	5.85	1500	7.43	1500	5.11	1700	11.02	1700	5.85	1200
93/06/26	2400.00	1000	17.61	0	5.93	1000	7.52	1000	5.17	100	10.78	1300	6.06	1100
93/06/27	2400.00	1100	23.16	0	6.01	1100	7.62	1100	5.24	100	10.87	1400	6.18	1400
93/06/28	2400.00	1000	17.60	500	6.23	1200	7.76	1400	5.40	100	11.01	1500	6.30	1300
93/06/29	2400.00	1100	20.32	300	6.32	1100	8.00	1300	5.54	100	13.46	1900	7.40	1900
93/06/30	2400.00	1100	9.99	0	6.69	1100	8.35	1100	5.85	100	13.22	1300	7.41	1100
93/07/01	2400.00	1100	8.51	300	6.68	1100	8.39	1200	5.95	1900	12.95	1400	7.27	1200
93/07														

Table V-4
 Gas Phase Carbon Dioxide (%) Pile 7/12

Station	Port	Depth (m)	93/11/29	93/12/22	94/02/18	94/03/30	94/05/03	94/06/08
1	1	1.4 m	9.98	9.32	10.80	8.49	8.32	8.83
	2	0.5 m	10.16	9.48	10.78	8.32	8.29	8.76
	3	0.4 m	9.42	8.96	NA	NA	NA	8.61
2	1	3.9 m	11.00	10.50	NA	NA	9.38	8.96
	2	2.4 m	9.69	9.36	12.19	NA	9.27	8.14
	3	1.9 m	8.49	8.18	NA	NA	8.77	7.49
	4	1.4 m	7.60	7.40	9.62	8.31	8.20	7.39
	5	0.9 m	7.41	7.14	9.53	NA	8.08	7.23
	6	0.4 m	6.86	6.76	9.05	NA	7.85	6.94
3	1	4.1 m	10.89	10.55	11.72	NA	9.45	9.18
	2	2.9 m	NA	NA	NA	NA	NA	NA
	3	2.4 m	9.65	9.62	11.66	NA	9.33	8.40
	4	1.9 m	8.08	7.98	10.65	NA	8.55	7.48
	5	1.4 m	7.48	7.42	NA	NA	NA	7.37
	6	0.9 m	7.12	7.12	NA	NA	8.14	7.21
	7	0.4 m	NA	NA	NA	NA	NA	NA
4	1	4.3 m	NA	NA	NA	NA	NA	NA
	2	2.8 m	9.70	9.84	11.05	NA	9.29	8.60
	3	2.3 m	9.12	9.34	10.93	9.00	9.27	8.29
	4	1.8 m	8.56	8.53	10.18	8.90	8.80	7.93
	5	1.3 m	8.28	8.13	9.85	NA	8.56	7.70
	6	0.8 m	6.64	6.61	8.69	7.98	8.06	7.04
	7	0.3 m	6.42	6.44	8.44	7.84	7.96	6.95
5	1	3.7 m	NA	10.38	10.81	NA	NA	9.28
	2	2.3 m	9.29	9.37	10.74	9.29	9.28	8.84
	3	1.7 m	NA	NA	NA	NA	NA	NA
	4	1.2 m	6.33	7.91	9.78	8.97	8.91	8.43
	5	0.7 m	4.41	6.56	8.77	8.32	8.42	7.89
	6	0.2 m	0.92	3.41	7.72	8.09	8.04	7.32
6	1	2.1 m	10.40	10.05	10.45	9.26	9.24	9.31
	2	0.6 m	10.09	9.94	10.61	9.23	9.26	9.24
	3	0.1 m	8.79	9.14	10.24	NA	8.99	9.24

Table V-5
Soil Suction-Heat Dissipation Pile 7/12

TIME	SERIAL	DATE	TIME	T_MULTIP_C	TI_WSC_C	TI_WTL1_C	TI_WSB_C	TI_ESC_C	TI_ETL1_C	TI_ESB_C	TD_WSC_C	TD_WTL1_C	TD_WSB_C	TD_ESC_C	TD_ETL1_C	TD_ESB_C	P_WSC_BAR	P_WTL1_BAR	P_WSB_BAR
12-17	12 17	2400		2.071	0.229	1.067	1.805	0.186	1.357	2.185	6.813	7.380	8.300	6.436	11.210	6.960	1.24	-0.40	-0.16
12-18	12 18	2400		-5.924	0.135	0.923	1.671	0.105	1.192	2.030	7.210	7.450	8.350	7.200	11.340	7.530	0.47	-0.53	-0.25
12-19	12 19	2400		-8.750	0.066	0.893	1.624	0.032	1.188	2.017	7.900	7.440	8.370	8.050	11.200	7.620	-0.87	-0.51	-0.27
12-20	12 20	2400		-0.607	0.143	0.951	1.656	0.113	1.255	1.998	8.140	7.400	8.330	7.810	11.510	7.400	-1.34	-0.44	-0.21
12-21	12 21	2400		-16.890	-0.059	0.864	1.553	0.006	1.125	1.930	7.690	7.390	8.360	8.460	11.130	7.810	-0.47	-0.43	-0.26
12-22	12 22	2400		-7.480	-0.626	0.882	1.562	-0.425	1.182	1.925	7.680	7.400	8.360	7.130	10.960	7.480	-0.45	-0.44	-0.27
12-23	12 23	2400		-4.637	-0.591	0.882	1.549	-0.574	1.160	1.886	7.740	7.430	8.380	7.250	10.920	7.350	-0.56	-0.49	-0.30
12-24	12 24	2400		-19.070	-0.968	0.780	1.458	-0.865	1.182	1.822	7.780	7.430	8.370	7.700	11.050	7.850	-0.64	-0.50	-0.29
12-25	12 25	2400		-18.440	-1.985	0.797	1.479	-1.976	1.102	1.855	8.220	7.420	8.350	8.240	11.010	7.810	-1.48	-0.47	-0.24
12-26	12 26	2400		-17.200	-1.489	0.801	1.483	-1.622	1.088	1.834	7.940	7.440	8.340	8.160	11.470	7.850	-0.94	-0.51	-0.23
12-27	12 27	2400		-21.190	-2.488	0.625	1.367	-2.604	0.977	1.752	8.280	7.520	8.350	8.420	10.890	7.860	-1.61	-0.65	-0.24
12-28	12 28	2400		-9.090	-1.971	0.708	1.449	-2.186	1.068	1.803	8.170	7.610	8.400	8.250	11.160	7.660	-1.39	-0.82	-0.33
12-29	12 29	2400		-8.800	-1.451	0.660	1.418	-1.593	1.003	1.764	7.950	7.670	8.400	8.400	11.340	7.640	-0.96	-0.93	-0.33
12-30	12 30	2400		-8.910	-1.190	0.633	1.399	-1.297	1.002	1.767	7.800	7.710	8.430	7.850	11.310	7.590	-0.68	-1.00	-0.39
12-31	12 31	2400		-5.798	-0.944	0.616	1.365	-1.030	0.988	1.732	7.700	7.730	8.460	7.610	11.230	7.440	-0.48	-1.02	-0.45
01-01	1 1	2400		-14.060	-0.726	0.587	1.333	-0.791	0.922	1.680	7.570	7.730	8.520	7.710	11.110	7.790	-0.24	-1.03	-0.54
01-02	1 2	2400		-18.610	-2.267	0.479	1.217	-2.081	0.839	1.602	8.210	7.750	8.570	8.350	11.130	7.890	-1.48	-1.07	-0.65
01-04	1 4	2400		1.517	8.200	9.780	11.290	-1.256	0.958	1.658	0.005	0.009	0.017	7.360	11.670	6.545	14.45	12.72	14.81
01-05	1 5	2400		-4.706	-0.292	0.479	1.236	-0.005	0.825	1.556	7.860	7.810	8.720	6.680	11.700	6.853	-0.79	-1.17	-0.92
01-06	1 6	2400		-10.600	-0.385	0.468	1.214	-0.050	0.820	1.547	8.060	7.840	8.840	6.961	11.620	7.280	-1.17	-1.22	-1.13
01-07	1 7	2400		-5.855	-1.117	0.474	1.193	-0.396	0.851	1.544	8.240	7.820	8.890	7.060	11.780	7.110	-1.54	-1.19	-1.21
01-08	1 8	2400		-16.120	-1.690	0.447	1.162	-1.427	0.790	1.518	8.390	7.840	8.930	7.930	11.530	7.770	-1.83	-1.23	-1.29
01-09	1 9	2400		-22.830	-4.269	0.242	0.967	-4.425	0.620	1.362	8.710	7.870	9.020	8.190	11.220	7.890	-2.44	-1.28	-1.45
01-10	1 10	2400		-22.370	-5.711	0.178	0.903	-6.055	0.526	1.298	8.730	8.000	9.010	8.220	11.400	7.940	-2.49	-1.51	-1.43
01-11	1 11	2400		-14.110	-5.168	0.341	1.069	-5.516	0.705	1.472	8.660	8.030	9.000	8.110	11.530	7.840	-2.34	-1.56	-1.42
01-12	1 12	2400		-12.840	-5.194	0.267	0.983	-5.502	0.606	1.420	8.750	8.130	9.060	8.120	11.370	7.840	-2.52	-1.75	-1.53
01-13	1 13	2400		-16.180	-5.603	0.184	0.900	-5.843	0.523	1.354	8.740	8.230	9.090	8.170	11.580	7.930	-2.50	-1.91	-1.58
01-14	1 14	2400		-17.140	-6.121	0.095	0.798	-6.356	0.425	1.278	8.910	8.290	9.110	8.180	11.800	7.990	-2.83	-2.03	-1.62
01-15	1 15	2400		-10.890	-6.142	0.055	0.758	-6.342	0.390	1.242	8.820	8.410	9.200	8.110	11.780	7.890	-2.65	-2.24	-1.78
01-16	1 16	2400		-7.800	-5.440	-0.011	0.671	-5.605	0.337	1.193	8.780	8.440	9.210	7.960	12.020	7.680	-2.58	-2.29	-1.79
01-17	1 17	2400		-6.190	-4.871	-0.087	0.564	-4.940	0.255	1.120	8.830	8.540	9.300	7.840	12.340	7.470	-2.67	-2.47	-1.95
01-18	1 18	2400		-17.530	-4.971	-0.264	0.375	-5.028	0.053	0.980	8.700	8.680	9.340	8.220	12.070	8.090	-2.43	-2.72	-2.04
01-19	1 19	2400		-22.180	-7.410	-0.467	0.152	-7.540	-0.128	0.830	8.710	8.780	9.410	8.220	11.980	8.130	-2.44	-2.89	-2.16
01-20	1 20	2400		-15.320	-7.260	-0.369	0.193	-7.330	-0.034	0.905	8.660	8.170	9.430	8.180	12.200	8.090	-2.35	-1.81	-2.20
01-21	1 21	2400		-10.070	-7.320	-0.499	0.016	-7.290	-0.087	0.856	8.720	7.270	9.510	8.030	11.610	7.900	-2.46	-0.21	-2.33
01-22	1 22	2400		-3.401	-6.551	-0.724	-0.201	-6.342	-0.184	0.775	9.130	7.230	7.860	7.400	11.530	7.400	-3.25	-0.74	0.64
01-23	1 23	2400		0.168	-2.064	-0.819	-0.386	-1.742	-0.206	0.740	8.660	7.290	7.880	7.430	10.640	6.892	-2.34	-0.25	0.61
01-24	1 24	2400		0.866	-1.421	-0.730	-0.387	-1.236	-0.220	0.699	8.490	7.230	7.890	7.330	10.590	6.924	-2.02	-0.14	0.59
01-25	1 25	2400		-11.910	-1.207	-0.734	-0.391	-1.142	-0.326	0.587	8.230	7.280	7.910	7.170	11.170	7.940	-1.52	-0.73	0.56
01-26	1 26	2400		-16.870	-5.155	-0.709	-0.365	-5.190	-0.326	0.562	8.670	7.290	7.890	8.190	10.630	8.170	-2.36	-0.24	0.58
01-27	1 27	2400		-8.590	-5.411	-0.817	-0.371	-5.389	-0.285	0.593	8.750	7.310	7.910	8.000	10.930	7.910	-2.51	-0.29	0.55
01-28	1 28	2400		-12.480	-5.091	-1.031	-0.558	-5.000	-0.400	0.535	8.660	7.400	7.980	8.150	10.950	8.140	-2.35	-0.43	0.43
01-29	1 29	2400		-12.510	-5.921	-1.182	-0.718	-5.755	-0.465	0.526	8.690	7.450	8.070	8.100	10.920	8.100	-2.41	-0.53	0.26
01-30	1 30	2400		-27.880	-9.420	-1.791	-1.294	-9.200	-0.958	0.144	8.680	7.570	8.200	8.220	10.670	8.320	-2.38	-0.75	0.03
01-31	1 31	2400		-22.960	-11.240	-2.086	-1.499	-11.110	-1.003	0.218	8.700	7.760	8.370	8.190	9.810	8.300	-2.41	-1.09	-0.28
02-01	2 1	2400		-19.080	-10.730	-2.736	-2.019	-10.400	-1.282	0.219	8.670	8.030	8.630	8.170	10.340	8.300	-2.37	-1.57	-0.75
02-02	2 2	2400		-18.870	-11.150	-3.392	-2.592	-10.730	-1.820	0.014	8.680	8.240	8.810	8.210	10.090	8.370	-2.38	-1.94	-1.08
02-03	2 3	2400		-8.540	-10.030	-3.842	-2.961	-9.450	-2.250	-0.105	8.720	8.340	8.880	8.020	10.410	7.030	-2.46	-2.12	-1.21
02-04	2 4	2400		-16.190	-9.390	-4.056	-3.208	-8.810	-2.711	-0.488	8.810	8.390	8.930	8.170	10.070	7.100	-2.63	-2.20	-1.29
02-05	2 5	2400		-16.870	-9.530	-4.243	-3.351	-8.960	-2.975	-0.811	8.780	8.420	8.950	8.190	10.170	7.300	-2.57	-2.26	-1.32
02-06	2 6	2400		-24.070	-12.430	-4.823	-3.838	-12.060	-3.530	-1.304	8.670	8.500	9.010	8.210	10.470	7.490	-2.37	-2.40	-1.44
02-07	2 7	2400		-18.720	-12.850	-5.240	-4.055	-12.570	-3.869	-1.463	8.590	8.500	8.990	8.140	10.610	7.610	-2.21	-2.40	-1.39
02-08	2 8	2400		-16.830	-11.430	-5.703	-4.461	-11.100	-4.456	-1.914	8.720	8.550	9.040	8.170	10.540	7.790	-2.47	-2.50	-1.49
02-09	2 9	2400		-20.150	-12.350	-5.981	-4.737	-12.130	-4.837	-2.343	8.640	8.580	9.080	8.170	10.600	7.940	-2.30	-2.55	-1.56
02-10	2 10	2400		-8.180	-10.760	-6.140	-4.877	-10.420	-5.046	-2.581	8.820	8.560	9.050	7.990	10.640	7.780	-2.65	-2.51	-1.51
02-11	2 11	2400		-16.520	-10.330	-6.046	-4.873	-10.330	-5.129	-2.769	8.690	8.560	9.050	8.180	10.700	8.040	-2.40	-2.51	-1.50
02-12	2 12	2400		-11.150	-10.650	-6.065	-4.880	-10.620	-5.170	-2.894	8.740	8.590	9.080	8.150	10.720	8.040	-2.50	-2.56	-1.56
02-13	2 13	2400		-4.611	-9.720	-6.041	-4.901	-9.590	-5.200	-3.003	8.710	8.500	9.020	7.840	10.460	7.680	-2.45	-2.40	-1.45
02-14	2 14	2400		-7.740	-8.460	-5.871	-4.855	-8.290	-5.150	-3.095	8.700	8.540	9.050	7.930	10.460	7.780	-2.43	-2.48	-1.51
02-15	2 15	2400		-13.420	-8.070	-5.569	-4.675	-7.880	-4.922	-3.070	8.720	8.570	9.070	8.130	10.530	8.020	-2.47	-2.52	-1.54
02-16	2 16	2400		-9.340	-8.400	-5.395	-4.532	-8.180	-4.731	-2.997	8.730	8.510	9.030	7.980	10.570	7.830	-2.48	-2.43	-1.47
02-17	2 17	2400		-8.7															

Table V-5
Soil Suction-Heat Dissipation Pile 7/12

TIME_SERIAL	DATE	TIME	T_MULTIP_C	TI_WSC_C	TI_WTL1_C	TI_WSB_C	TI_ESC_C	TI_ETL1_C	TI_ESB_C	TD_WSC_C	TD_WTL1_C	TD_WSB_C	TD_ESC_C	TD_ETL1_C	TD_ESB_C	P_WSC_BAR	P_WTL1_BAR	P_WSB_BAR
02-23	2 23	2400	-10.430	-6.934	-5.013	-4.159	-7.460	-4.436	-3.104	8.500	8.690	9.070	7.970	10.400	7.800	-2.41	-2.40	-1.54
02-24	2 24	2400	-7.510	-6.566	-4.903	-4.093	-7.050	-4.353	-3.086	8.730	8.470	9.060	7.770	10.300	7.500	-2.48	-2.35	-1.53
02-25	2 25	2400	-12.070	-6.198	-4.760	-3.980	-6.603	-4.218	-3.007	8.630	8.420	9.010	7.960	10.430	7.810	-2.29	-2.26	-1.44
02-26	2 26	2400	-11.700	-5.984	-4.643	-3.880	-6.450	-4.071	-2.938	8.600	8.410	8.970	7.980	10.470	7.790	-2.24	-2.24	-1.36
02-27	2 27	2400	-12.500	-5.807	-4.535	-3.828	-6.268	-3.997	-2.925	8.620	8.400	8.970	8.040	10.730	7.880	-2.26	-2.23	-1.36
02-28	2 28	2400	-13.160	-5.776	-4.435	-3.729	-6.315	-3.867	-2.817	8.630	8.400	8.960	8.000	10.610	7.820	-2.28	-2.22	-1.35
03-01	3 1	2400	-6.641	-5.667	-4.354	-3.671	-6.119	-3.779	-2.777	8.380	8.710	8.970	7.800	10.580	7.530	-2.45	-2.18	-1.36
03-02	3 2	2400	-4.327	-5.304	-4.238	-3.581	-5.646	-3.707	-2.736	8.720	8.350	8.980	7.660	10.590	7.300	-2.46	-2.13	-1.37
03-03	3 3	2400	-3.468	-4.976	-4.110	-3.484	-5.275	-3.579	-2.665	8.720	8.320	8.950	7.710	10.780	7.370	-2.46	-2.07	-1.32
03-04	3 4	2400	-7.050	-4.870	-4.017	-3.437	-5.190	-3.524	-2.661	8.660	8.300	8.910	7.930	10.820	7.710	-2.35	-2.04	-1.25
03-05	3 5	2400	-11.000	-5.084	-3.936	-3.348	-5.501	-3.400	-2.549	8.670	8.330	8.910	8.060	10.900	7.850	-2.36	-2.11	-1.26
03-06	3 6	2400	-11.160	-5.145	-3.875	-3.296	-5.562	-3.344	-2.497	8.630	8.310	8.890	8.050	10.990	7.840	-2.29	-2.06	-1.21
03-07	3 7	2400	-8.040	-4.990	-3.851	-3.285	-5.350	-3.362	-2.521	8.680	8.290	8.880	7.990	11.130	7.730	-2.39	-2.03	-1.21
03-08	3 8	2400	-4.249	-4.635	-3.809	-3.269	-4.960	-3.333	-2.544	8.750	8.300	8.910	7.810	11.170	7.500	-2.53	-2.04	-1.26
03-09	3 9	2400	-6.501	-4.689	-3.702	-3.171	-5.040	-3.236	-2.460	8.790	8.250	8.880	7.860	11.260	7.510	-2.59	-1.96	-1.20
03-10	3 10	2400	-5.224	-4.645	-3.663	-3.162	-5.005	-3.201	-2.468	8.800	8.240	8.940	7.740	11.450	7.290	-2.62	-1.94	-1.31
03-11	3 11	2400	-6.462	-4.552	-3.609	-3.095	-4.869	-3.139	-2.397	8.730	8.230	8.890	7.810	11.450	7.410	-2.49	-1.92	-1.21
03-12	3 12	2400	-14.140	-4.525	-3.546	-3.049	-4.898	-3.093	-2.346	8.640	8.230	8.880	8.100	11.400	7.860	-2.31	-1.92	-1.20
03-13	3 13	2400	-6.423	-4.838	-3.497	-3.009	-5.285	-3.009	-2.307	8.700	8.220	8.850	7.910	11.630	7.530	-2.42	-1.90	-1.15
03-14	3 14	2400	-7.700	-4.647	-3.496	-3.000	-5.055	-3.008	-2.288	8.700	8.190	8.810	7.900	11.680	7.560	-2.42	-1.86	-1.08
03-15	3 15	2400	-13.730	-4.784	-3.515	-3.017	-5.383	-3.009	-2.296	8.680	8.230	8.900	8.070	11.540	7.820	-2.38	-1.92	-1.23
03-16	3 16	2400	-3.786	-5.136	-3.510	-2.988	-5.791	-2.971	-2.247	8.810	8.230	8.920	7.670	12.070	7.110	-2.63	-1.92	-1.28
03-17	3 17	2400	-5.726	-4.049	-3.543	-3.038	-4.395	-3.051	-2.323	8.800	8.240	8.940	7.700	12.040	7.130	-2.62	-1.93	-1.31
03-18	3 18	2400	-15.490	-4.912	-3.486	-2.993	-5.216	-2.989	-2.281	8.690	8.250	8.890	8.040	11.670	7.750	-2.41	-1.95	-1.23
03-19	3 19	2400	-4.859	-4.898	-3.505	-3.004	-4.907	-3.004	-2.289	8.670	8.210	8.880	7.900	11.880	7.510	-2.36	-1.89	-1.20
03-20	3 20	2400	0.261	-3.630	-3.419	-2.914	-3.725	-2.970	-2.221	8.800	8.200	8.890	7.610	12.230	6.876	-2.61	-1.86	-1.22
03-21	3 21	2400	-0.698	-3.101	-3.204	-2.821	-2.972	-2.881	-2.205	8.750	8.150	8.860	7.560	12.310	6.759	-2.53	-1.77	-1.17
03-22	3 22	2400	-2.704	-2.836	-2.969	-2.681	-2.280	-2.706	-2.134	8.730	8.060	8.820	7.570	12.400	6.771	-2.48	-1.62	-1.09
03-23	3 23	2400	-4.211	-2.882	-2.839	-2.568	-2.244	-2.563	-2.068	8.770	8.060	8.820	7.760	12.180	7.140	-2.56	-1.62	-1.09
03-24	3 24	2400	-0.006	-2.325	-2.721	-2.420	-1.925	-2.351	-1.900	8.660	8.020	8.750	7.640	12.380	6.842	-2.34	-1.54	-0.97
03-25	3 25	2400	5.589	-1.426	-2.503	-2.267	-1.301	-2.074	-1.709	8.510	7.980	8.740	7.400	12.940	6.460	-2.05	-1.47	-0.96
03-26	3 26	2400	7.680	-0.828	-2.243	-2.080	-0.682	-1.818	-1.595	8.320	7.930	8.720	7.360	12.820	6.781	-1.69	-1.38	-0.92
03-27	3 27	2400	8.400	-0.524	-1.973	-1.895	-0.392	-1.608	-1.449	8.110	7.830	8.630	7.330	12.380	7.070	-1.27	-1.21	-0.74
03-28	3 28	2400	4.188	-0.384	-1.846	-1.816	-0.260	-1.515	-1.382	7.950	7.740	8.540	7.310	11.940	7.250	-0.96	-1.04	-0.58
03-29	3 29	2400	1.576	-0.323	-1.691	-1.729	-0.224	-1.420	-1.309	7.840	7.630	8.480	7.340	11.860	7.320	-0.76	-0.86	-0.48
03-30	3 30	2400	3.643	-0.181	-1.488	-1.565	-0.100	-1.244	-1.166	7.840	7.650	8.470	7.340	11.660	7.310	-0.76	-0.88	-0.47
03-31	3 31	2400	-5.568	-0.334	-1.514	-1.622	-0.321	-1.295	-1.209	7.780	7.570	8.430	7.560	11.180	7.520	-0.64	-0.75	-0.39
04-01	4 1	2400	-0.034	-0.346	-1.307	-1.431	-0.278	-1.092	-1.058	7.840	7.540	8.380	7.550	11.210	7.480	-0.75	-0.68	-0.30
04-02	4 2	2400	-4.634	-0.691	-1.279	-1.408	-0.545	-1.064	-1.030	7.940	7.490	8.350	7.700	11.060	7.500	-0.95	-0.60	-0.24
04-03	4 3	2400	-2.639	-0.985	-1.157	-1.285	-0.749	-0.959	-0.938	8.100	7.450	8.310	7.760	10.920	7.380	-1.26	-0.53	-0.17
04-04	4 4	2400	0.158	-0.440	-1.031	-1.151	-0.281	-0.903	-0.864	7.900	7.420	8.260	7.600	10.900	7.380	-0.87	-0.47	-0.08
04-05	4 5	2400	2.705	-0.247	-0.932	-1.026	-0.161	-0.859	-0.808	7.820	7.410	8.220	7.590	10.960	7.410	-0.73	-0.46	-0.00
04-06	4 6	2400	4.514	-0.058	-0.854	-0.927	0.010	-0.794	-0.752	7.770	7.400	8.200	7.550	11.100	7.430	-0.62	-0.44	0.03
04-07	4 7	2400	6.481	0.066	-0.785	-0.845	0.109	-0.725	-0.683	7.730	7.390	8.180	7.550	11.030	7.440	-0.55	-0.43	0.07
04-08	4 8	2400	3.641	0.073	-0.792	-0.826	0.103	-0.714	-0.684	7.750	7.370	8.150	7.510	11.010	7.420	-0.59	-0.39	0.13
04-09	4 9	2400	9.750	0.230	-0.629	-0.655	0.209	-0.543	-0.530	7.850	7.380	8.130	7.520	10.670	7.380	-0.77	-0.40	0.16
04-10	4 10	2400	9.140	0.371	-0.573	-0.595	0.273	-0.492	-0.492	7.860	7.350	8.110	7.520	10.530	7.350	-0.80	-0.35	0.20
04-11	4 11	2400	7.990	1.523	-0.527	-0.548	0.337	-0.428	-0.441	8.050	7.330	8.110	7.690	10.400	7.180	-1.16	-0.31	0.19
04-12	4 12	2400	3.773	2.486	-0.559	-0.572	2.379	-0.495	-0.495	8.030	7.290	8.050	8.320	10.300	7.240	-1.13	-0.24	0.29
04-13	4 13	2400	3.956	2.406	-0.514	-0.523	2.377	-0.437	-0.459	8.040	7.280	8.020	8.280	10.100	7.170	-1.14	-0.23	0.35
04-14	4 14	2400	-3.497	0.209	-0.631	-0.626	0.282	-0.558	-0.554	8.020	7.280	8.020	8.330	10.090	7.230	-1.10	-0.23	0.35
04-15	4 15	2400	2.727	1.259	-0.451	-0.464	1.251	-0.408	-0.438	8.030	7.260	8.000	8.280	10.120	7.160	-1.13	-0.19	0.39
04-16	4 16	2400	0.380	0.142	-0.449	-0.445	0.172	-0.381	-0.411	7.990	7.260	7.970	8.260	9.980	7.100	-1.04	-0.19	0.44
04-17	4 17	2400	10.080	2.911	-0.205	-0.210	2.779	-0.094	-0.175	8.190	7.250	7.980	7.860	9.850	6.391	-1.43	-0.18	0.42
04-18	4 18	2400	5.349	2.637	-0.286	-0.278	2.624	-0.218	-0.269	8.170	7.290	7.990	8.070	10.190	6.730	-1.39	-0.24	0.40
04-19	4 19	2400	4.464	2.099	-0.254	-0.233	2.069	-0.186	-0.241	8.090	7.260	7.950	8.250	10.490	7.040	-1.25	-0.19	0.48
04-20	4 20	2400	1.413	0.942	-0.294	-0.268	1.023	-0.238	-0.281	8.030	7.250	7.930	8.300	10.460	7.110	-1.13	-0.18	0.51
04-21	4 21	2400	12.360	3.376	-0.057	-0.022	3.163	0.067	-0.022	8.370	7.290	7.970	7.640	10.240	5.373	-1.79	-0.24	0.45
04-22	4 22	2400	2.644	2.146	-0.199	-0.161	2.171	-0.122	-0.169	8.200	7.270	7.940	7.950	10.520	6.328	-1.46	-0.21	0.50
04-23	4 23	2400	4.481	2.221	-0.149	-0.093	2.195	-0.042	-0.119	8.280	7.280	7.920	7.830	10.580	6.028	-1.60	-0.24	0.53
04-24	4 24	2400	2.835	2.191	-0.175	-0.132	2.089	-0.128	-0.179	8.200	7.320	7.950	8.010	10.680	6.417	-1.46	-0.31	0.48
04-25	4 25	2400	4.102	1.494	-0.104	-0.048	1.438	-0.031	-0.091	8.210	7.320	7.920	7.980	10.670	6.358	-1.47	-0.30	0.53
04-26	4 26	2400	1.198	1.845	-0.172	-0.121	1.832	-0.116	-0.168	8.160	7.380	7.950	8.090	10.730	6.551	-1.3		

Table V-5
Soil Suction-Heat Dissipation Pile 7/12

TIME	SERIAL	DATE	TIME	T_MULTIP_C	TL_WSC_C	TL_WTL1_C	TL_WSB_C	TL_ESC_C	TL_ETL1_C	TL_ESB_C	TD_WSC_C	TD_WTL1_C	TD_WSB_C	TD_ESC_C	TD_ETL1_C	TD_ESB_C	P_WSC_BAR	P_WTL1_BAR	P_WSB_BAR
05-01	5 1	2400	11.000	5.410	0.161	0.178	5.076	0.169	0.062	8.130	7.940	7.840	8.180	11.270	6.655	-1.32	-1.40	0.67	
05-02	5 2	2400	8.010	6.177	0.146	0.121	5.712	0.074	-0.020	8.090	7.820	7.870	8.460	11.310	7.120	-1.24	-1.20	0.62	
05-03	5 3	2400	11.060	5.779	0.678	0.204	5.229	0.183	0.063	8.070	7.340	7.920	8.380	11.220	7.020	-1.21	-0.34	0.53	
05-04	5 4	2400	16.320	6.924	1.268	0.313	6.173	0.241	0.079	8.150	7.340	8.630	8.470	11.550	7.130	-1.35	-0.33	-0.75	
05-05	5 5	2400	19.490	9.210	2.171	1.308	8.240	0.230	0.021	8.240	7.390	8.920	8.490	11.280	7.090	-1.53	-0.43	-1.27	
05-06	5 6	2400	11.140	8.880	3.443	2.316	8.070	0.745	0.100	8.170	7.410	8.830	8.310	11.010	6.860	-1.39	-0.46	-1.12	
05-07	5 7	2400	9.920	9.040	4.033	3.001	8.110	1.512	0.117	8.110	7.370	8.770	8.400	10.940	7.040	-1.27	-0.40	-1.00	
05-08	5 8	2400	16.690	9.690	4.491	3.487	8.390	2.264	0.297	8.090	7.380	8.740	8.450	10.990	7.230	-1.25	-0.41	-0.95	
05-09	5 9	2400	5.478	9.240	4.878	3.855	8.030	2.852	0.853	8.100	7.390	8.700	8.620	10.920	8.080	-1.26	-0.43	-0.88	
05-10	5 10	2400	6.912	8.720	5.140	4.279	7.500	3.405	1.412	8.080	7.390	8.660	8.560	10.910	7.960	-1.22	-0.43	-0.80	
05-11	5 11	2400	2.484	5.977	5.053	4.362	4.947	3.623	2.018	8.090	7.400	8.650	8.520	11.030	7.970	-1.23	-0.45	-0.78	
05-12	5 12	2400	4.437	5.285	4.683	4.297	4.365	3.605	2.512	8.100	7.440	8.650	8.490	11.150	7.890	-1.27	-0.52	-0.79	
05-13	5 13	2400	4.449	4.841	4.341	4.124	4.082	3.479	2.683	8.140	7.400	8.620	8.400	11.160	7.760	-1.34	-0.43	-0.73	
05-14	5 14	2400	7.970	6.799	4.200	4.001	6.098	3.428	2.786	8.140	7.400	8.550	8.400	11.320	7.610	-1.34	-0.44	-0.60	
05-15	5 15	2400	10.540	8.090	4.518	4.183	7.340	3.776	3.046	8.140	7.360	8.490	8.350	11.410	7.520	-1.33	-0.38	-0.50	
05-16	5 16	2400	15.440	9.560	5.006	4.507	8.720	4.202	3.345	8.120	7.360	8.490	8.420	11.320	7.590	-1.29	-0.38	-0.51	
05-17	5 17	2400	8.630	9.160	5.501	4.853	8.460	4.680	3.700	8.110	7.390	8.480	8.600	11.280	7.750	-1.28	-0.43	-0.48	
05-18	5 18	2400	11.090	9.070	5.791	5.203	8.390	5.115	4.136	8.050	7.370	8.430	8.660	11.120	7.730	-1.16	-0.39	-0.38	
05-19	5 19	2400	13.000	10.020	5.970	5.413	9.510	5.383	4.431	8.040	7.370	8.410	8.740	11.310	7.740	-1.15	-0.40	-0.36	
05-20	5 20	2400	9.970	9.340	6.282	5.656	8.980	5.728	4.704	8.110	7.420	8.460	8.750	11.360	7.750	-1.29	-0.48	-0.44	
05-21	5 21	2400	9.010	8.830	6.414	5.857	8.500	5.971	5.002	8.140	7.390	8.450	8.630	11.490	7.600	-1.34	-0.42	-0.43	
05-22	5 22	2400	13.510	10.510	6.474	5.976	10.240	6.111	5.207	8.140	7.390	8.440	8.690	11.720	7.600	-1.34	-0.42	-0.41	
05-23	5 23	2400	14.630	11.560	6.926	6.252	11.240	6.488	5.458	8.140	7.420	8.460	8.840	11.830	7.650	-1.33	-0.49	-0.44	
05-24	5 24	2400	17.150	12.890	7.410	6.633	12.550	6.945	5.806	8.080	7.400	8.450	9.190	11.510	7.760	-1.21	-0.44	-0.42	
05-25	5 25	2400	11.560	11.290	8.030	7.130	11.070	7.560	6.295	8.120	7.400	8.430	9.040	11.900	7.640	-1.30	-0.44	-0.38	
05-26	5 26	2400	11.980	11.650	8.160	7.390	11.390	7.830	6.644	8.100	7.360	8.380	9.020	11.640	7.590	-1.27	-0.37	-0.31	
05-27	5 27	2400	9.560	10.730	8.250	7.540	10.520	8.040	6.906	8.200	7.450	8.460	9.020	11.750	7.610	-1.45	-0.52	-0.44	
05-28	5 28	2400	12.980	11.090	8.240	7.650	10.850	8.100	7.110	8.140	7.380	8.390	8.900	11.700	7.540	-1.35	-0.40	-0.32	
05-29	5 29	2400	5.631	8.800	8.130	7.590	8.780	8.050	7.140	8.200	7.420	8.460	8.610	12.020	7.580	-1.46	-0.48	-0.44	
05-30	5 30	2400	4.569	7.930	7.750	7.450	7.960	7.900	7.250	8.180	7.400	8.410	8.610	11.700	7.530	-1.42	-0.44	-0.35	
05-31	5 31	2400	5.035	7.410	7.350	7.180	7.530	7.640	7.190	7.390	7.400	8.410	8.570	11.830	7.530	-1.48	-0.42	-0.35	
06-01	6 1	2400	5.464	6.794	7.000	6.946	6.819	7.350	7.030	8.280	7.410	8.430	8.510	11.740	7.370	-1.61	-0.46	-0.38	
06-02	6 2	2400	7.530	7.980	6.766	6.749	7.860	7.100	6.859	8.300	7.390	8.400	8.560	12.100	7.320	-1.66	-0.42	-0.33	
06-03	6 3	2400	11.800	9.240	6.895	6.755	9.110	7.150	6.823	8.290	7.390	8.400	8.640	12.090	7.230	-1.62	-0.42	-0.33	
06-04	6 4	2400	8.520	9.490	7.170	6.856	9.440	7.300	6.805	8.250	7.370	8.370	8.700	12.010	7.400	-1.55	-0.40	-0.28	
06-05	6 5	2400	16.880	11.410	7.400	7.030	11.170	7.500	6.947	8.270	7.390	8.380	9.050	11.820	7.400	-1.58	-0.42	-0.30	
06-06	6 6	2400	14.010	11.870	7.980	7.390	11.830	7.930	7.190	8.160	7.350	8.330	9.020	11.670	7.560	-1.38	-0.35	-0.20	
06-07	6 7	2400	6.220	8.760	8.170	7.610	8.760	8.210	7.380	8.170	7.400	8.370	8.830	11.570	7.610	-1.39	-0.43	-0.27	
06-08	6 8	2400	13.600	10.630	8.040	7.700	10.400	8.190	7.570	8.170	7.360	8.310	8.860	11.580	7.480	-1.40	-0.37	-0.17	
06-09	6 9	2400	17.290	12.630	8.180	7.710	12.500	8.230	7.550	8.160	7.420	8.390	8.910	11.350	7.680	-1.37	-0.48	-0.31	
06-10	6 10	2400	10.420	11.010	8.740	8.090	10.990	8.750	7.850	8.160	7.380	8.330	8.930	11.370	7.580	-1.38	-0.41	-0.20	
06-11	6 11	2400	11.600	12.360	8.840	8.270	12.400	8.950	8.120	8.120	7.380	8.330	9.050	11.280	7.640	-1.30	-0.40	-0.21	
06-12	6 12	2400	13.650	13.080	9.110	8.500	13.170	9.220	8.340	8.190	7.390	8.340	8.890	11.270	7.630	-1.44	-0.43	-0.23	
06-13	6 13	2400	22.210	14.890	9.400	8.710	14.780	9.480	8.510	8.180	7.340	8.290	8.930	11.350	7.610	-1.42	-0.34	-0.13	
06-14	6 14	2400	23.690	16.700	10.120	9.170	16.600	10.030	8.840	8.230	7.320	8.250	8.790	11.210	7.600	-1.51	-0.30	-0.07	
06-15	6 15	2400	26.420	18.330	10.880	9.750	18.090	10.700	9.280	8.170	7.330	8.270	8.910	11.100	7.660	-1.40	-0.32	-0.10	
06-16	6 16	2400	18.700	17.350	11.740	10.450	17.250	11.520	9.900	8.210	7.340	8.320	8.780	10.890	7.730	-1.48	-0.34	-0.19	
06-17	6 17	2400	16.880	16.910	12.110	10.940	16.740	11.990	10.420	8.210	7.320	8.280	8.760	10.670	7.750	-1.46	-0.30	-0.11	
06-18	6 18	2400	18.890	16.210	12.190	11.140	16.040	12.200	10.730	8.310	7.360	8.350	8.760	10.540	7.710	-1.67	-0.38	-0.24	
06-19	6 19	2400	20.010	17.400	12.280	11.290	17.200	12.280	10.910	8.240	7.340	8.300	8.780	10.270	7.730	-1.53	-0.33	-0.15	
06-20	6 20	2400	19.370	17.950	12.550	11.510	17.850	12.500	11.110	8.290	7.340	8.310	8.800	10.340	7.820	-1.63	-0.33	-0.17	
06-21	6 21	2400	15.830	16.210	12.920	11.840	16.200	12.900	11.460	8.360	7.340	8.360	8.800	10.310	7.760	-1.77	-0.34	-0.26	
06-22	6 22	2400	14.970	15.690	12.890	11.970	15.700	12.990	11.670	8.400	7.320	8.350	8.620	10.190	7.640	-1.84	-0.30	-0.25	
06-23	6 23	2400	8.710	12.800	12.610	11.900	12.890	12.830	11.710	8.310	7.330	8.360	8.660	10.220	7.740	-1.67	-0.31	-0.26	
06-24	6 24	2400	14.610	13.840	12.090	11.650	13.790	12.410	11.620	8.270	7.310	8.340	8.650	10.130	7.750	-1.59	-0.28	-0.23	
06-25	6 25	2400	23.070	16.110	11.900	11.350	15.780	12.080	11.320	8.310	7.340	8.380	8.660	10.130	7.770	-1.67	-0.33	-0.30	
06-26	6 26	2400	23.120	17.500	13.370	11.590	17.250	12.390	11.400	8.330	7.290	8.340	8.580	10.130	7.710	-1.70	-0.25	-0.23	
06-27	6 27	2400	23.620	18.840	12.000	11.990	18.510	12.840	11.620	8.280	7.310	8.370	8.630	10.040	7.770	-1.62	-0.28	-0.28	
Average:			-1.056	0.945	1.007	1.166	0.762	1.141	1.409	8.281	7.701	8.502	8.131	11.105	7.499	-1.611	-0.977	-0.518	
Minimum:			-27.880	-12.850	-6.140	-4.901	-12.570	-5.200	-3.179	0.005	0.009	0.017	6.436	9.810	5.373	-3.253	-2.892	-2.333	
Maximum:			26.420	18.840	13.000	11.990	18.510	12.990	11.710	9.130	8.780	9.510	9.190	12.940	8.370	14.450	12.720	14.810	
Median:			-0.020	-0.385	-0.174	-0.017	-0.301	-0.046	0.181	8.240	7.445	8.455	8.155	11.115	7.590	-1.531	-0.520	-0.430	
Standard Deviation:			12.211	7.															

Table V-5
Soil Suction-Heat Dissipation Pile 7/12

TIME_SERIAL	P_ESC_BAR	P_ETL1_BAR	P_ESB_BAR	P_WSC_kpa	P_WTL1_kpa	P_WSB_kpa	P_ESC_kpa	P_ETL1_kpa	P_ESB_kpa
12-17	3.20	-11.62	2.19	123.89	-39.90	-15.90	320.28	-1161.94	218.79
12-18	1.78	-11.97	0.49	47.00	-52.70	-24.50	177.59	-1196.94	48.60
12-19	0.20	-11.57	0.22	-87.10	-50.80	-27.30	20.30	-1156.94	21.70
12-20	0.64	-12.44	1.73	-133.99	-43.60	-21.40	64.30	-1243.94	173.29
12-21	-0.58	-11.39	-0.32	-46.50	-43.30	-26.20	-57.70	-1138.94	-32.10
12-22	1.91	-10.90	0.64	-45.00	-44.20	-26.90	190.99	-1089.95	63.80
12-23	1.68	-10.81	1.02	-56.20	-49.40	-29.70	168.29	-1080.95	101.99
12-24	0.84	-11.18	-0.45	-63.90	-50.30	-28.80	84.20	-1117.94	-45.30
12-25	-0.17	-11.04	-0.34	-148.19	-47.20	-24.10	-16.80	-1103.95	-33.60
12-26	-0.01	-12.35	-0.45	-94.20	-51.10	-23.40	-1.30	-1234.94	-44.60
12-27	-0.50	-10.70	-0.48	-160.99	-65.30	-24.10	-49.90	-1069.95	-48.40
12-28	-0.18	-11.48	0.12	-139.29	-81.60	-33.40	-17.50	-1147.94	12.00
12-29	0.21	-11.98	0.16	-96.20	-92.60	-33.10	20.90	-1197.94	16.20
12-30	0.57	-11.90	0.31	-67.90	-99.80	-38.80	57.10	-1189.94	30.90
12-31	1.02	-11.67	0.78	-47.70	-102.29	-45.10	101.59	-1166.94	77.60
01-01	0.84	-11.34	-0.26	-23.90	-102.89	-54.30	83.50	-1133.94	-25.90
01-02	-0.37	-11.40	-0.57	-147.79	-106.99	-64.80	-37.00	-1139.94	-57.30
01-04	1.48	-12.88	3.42	1444.93	1271.94	1480.93	148.29	-1287.94	341.98
01-05	2.75	-12.98	2.51	-79.00	-117.09	-92.00	275.19	-1297.94	250.49
01-06	2.22	-12.76	1.23	-117.39	-121.99	-113.19	222.39	-1275.94	123.09
01-07	2.04	-13.21	1.74	-153.59	-119.39	-121.09	203.99	-1320.93	173.99
01-08	0.42	-12.50	0.01	-182.69	-123.39	-128.49	42.20	-1249.94	-20.60
01-09	-0.06	-11.65	0.00	-243.49	-127.99	-144.99	-5.90	-1164.94	-57.00
01-10	-0.12	-12.15	0.73	-248.49	-150.79	-142.89	-11.60	-1214.94	-73.20
01-11	0.08	-12.50	-0.43	-234.19	-155.89	-142.29	8.00	-1249.94	-43.20
01-12	0.06	-12.06	-0.41	-252.29	-174.69	-152.99	6.20	-1205.94	-41.30
01-13	-0.04	-12.64	-0.70	-250.09	-191.19	-158.39	-3.60	-1263.94	-70.20
01-14	-0.06	-13.25	-0.86	-283.29	-202.59	-162.39	-5.60	-1324.93	-86.10
01-15	0.09	-13.19	-0.57	-265.19	-223.79	-177.69	8.90	-1318.93	-57.40
01-16	0.36	-13.86	0.04	-258.09	-228.89	-178.99	36.30	-1385.93	4.30
01-17	0.60	-14.76	0.68	-266.99	-247.29	-195.39	59.50	-1475.93	68.40
01-18	-0.13	-14.00	-1.17	-242.99	-272.19	-203.49	-12.70	-1399.93	-116.49
01-19	-0.12	-13.77	-1.28	-244.09	-289.19	-215.49	-11.50	-1376.93	-127.49
01-20	-0.05	-14.38	-1.17	-235.29	-180.59	-219.89	-4.50	-1437.93	-117.19
01-21	0.24	-12.74	-0.60	-245.49	-20.50	-233.29	23.80	-1273.94	-59.60
01-22	0.82	-12.51	0.89	-325.28	-14.30	64.30	82.00	-1250.94	89.10
01-23	1.35	-10.01	2.39	-233.79	-25.10	60.90	134.59	-1000.95	238.99
01-24	1.55	-9.89	2.30	-201.79	-14.00	59.00	154.49	-988.95	229.49
01-25	0.71	-11.50	-0.72	-151.99	-22.70	56.00	70.90	-1149.94	-71.60
01-26	-0.07	-9.98	-1.40	-235.99	-24.40	58.00	-7.10	-997.95	-140.09
01-27	0.28	-10.83	-0.64	-251.09	-28.90	55.30	28.40	-1082.95	-64.30
01-28	0.01	-10.87	-1.32	-234.89	-43.40	42.90	1.10	-1086.95	-131.99
01-29	0.10	-10.79	-1.19	-240.89	-52.70	25.80	10.00	-1078.95	-119.29
01-30	-0.11	-10.10	-1.84	-237.69	-74.50	3.40	-11.30	-1009.95	-183.99
01-31	-0.07	-7.71	-1.77	-241.39	-108.69	-27.80	-6.80	-770.96	-177.39
02-01	-0.03	-9.17	-1.78	-237.09	-156.79	-74.70	-3.00	-916.95	-177.59
02-02	-0.10	-8.49	-1.99	-237.99	-194.39	-107.89	-10.00	-848.96	-198.89
02-03	0.26	-9.37	1.98	-246.29	-211.79	-120.59	25.70	-936.95	197.99
02-04	-0.03	-8.42	1.79	-263.09	-220.09	-129.29	-2.90	-841.96	178.79
02-05	-0.07	-8.70	1.19	-257.09	-225.99	-132.09	-6.90	-869.96	119.19
02-06	-0.10	-9.55	0.61	-237.19	-240.19	-143.99	-9.90	-954.95	60.90
02-07	0.02	-9.95	0.26	-220.49	-240.09	-139.39	2.00	-994.95	26.10
02-08	-0.03	-9.73	-0.29	-246.49	-249.79	-148.99	-3.00	-972.95	-28.50
02-09	-0.03	-9.90	-0.72	-230.29	-254.69	-155.49	-2.90	-989.95	-72.40
02-10	0.31	-10.01	-0.23	-264.69	-250.49	-150.99	31.20	-1000.95	-23.30
02-11	-0.05	-10.18	-1.02	-240.09	-250.59	-150.09	-5.10	-1017.95	-101.79
02-12	0.01	-10.25	-1.01	-249.79	-255.99	-156.19	0.50	-1024.95	-100.70
02-13	0.59	-9.51	0.07	-244.69	-240.19	-144.89	59.10	-950.95	6.50
02-14	0.43	-9.52	-0.24	-242.89	-247.79	-150.59	42.70	-951.95	-24.00
02-15	0.05	-9.71	-0.96	-247.09	-251.99	-153.79	5.30	-970.95	-96.40
02-16	0.32	-9.81	-0.38	-247.59	-242.49	-146.49	31.70	-980.95	-37.80
02-17	0.36	-9.35	-0.29	-246.89	-236.89	-145.59	35.80	-934.95	-28.60
02-18	-0.08	-9.65	-1.13	-230.09	-241.49	-147.49	-7.80	-964.95	-113.19
02-19	0.01	-9.37	-0.96	-233.49	-240.99	-150.89	1.20	-936.95	-95.90
02-20	0.01	-9.79	-1.07	-226.39	-236.29	-149.09	1.40	-978.95	-106.79
02-21	-0.13	-10.17	-1.25	-230.89	-244.19	-153.99	-12.90	-1016.95	-124.89
02-22	-0.01	-9.74	-1.02	-229.59	-240.09	-149.59	-1.10	-973.95	-101.69

Table V-5
Soil Suction-Heat Dissipation Pile 7/12

TIME_SERIAL_	P_ESC_BAR	P_ETL1_BAR	P_ESB_BAR	P_WSC_kpa	P_WTL1_kpa	P_WSB_kpa	P_ESC_kpa	P_ETL1_kpa	P_ESB_kpa
02-23	0.35	-9.34	-0.30	-240.49	-239.79	-153.79	35.20	-933.95	-30.30
02-24	0.71	-9.07	0.59	-247.49	-234.89	-152.79	71.30	-906.96	58.70
02-25	0.36	-9.42	-0.32	-228.49	-225.79	-143.79	35.70	-941.95	-32.20
02-26	0.32	-9.55	-0.27	-223.49	-223.89	-135.69	32.40	-954.95	-26.50
02-27	0.21	-10.26	-0.54	-226.19	-222.79	-135.49	21.40	-1025.95	-53.60
02-28	0.29	-9.95	-0.35	-228.09	-221.99	-134.69	28.90	-994.95	-34.70
03-01	0.66	-9.84	0.51	-244.49	-218.29	-136.29	65.90	-983.95	50.70
03-02	0.92	-9.88	1.17	-245.49	-212.49	-137.29	92.40	-987.95	116.89
03-03	0.83	-10.42	0.99	-245.69	-207.29	-132.09	82.60	-1041.95	98.60
03-04	0.41	-10.52	-0.05	-235.29	-203.89	-124.99	41.40	-1051.95	-4.70
03-05	0.17	-10.76	-0.46	-235.49	-210.69	-125.79	17.10	-1075.95	-46.30
03-06	0.19	-11.00	-0.43	-228.69	-205.59	-121.39	18.70	-1099.95	-43.10
03-07	0.31	-11.39	-0.09	-239.09	-202.69	-120.79	31.40	-1138.94	-9.10
03-08	0.64	-11.49	0.60	-252.79	-204.09	-126.09	64.20	-1148.94	59.70
03-09	0.54	-11.75	0.55	-259.19	-195.79	-120.09	54.20	-1174.94	54.80
03-10	0.77	-12.28	1.22	-262.09	-193.99	-131.29	76.90	-1227.94	121.99
03-11	0.65	-12.28	0.86	-248.79	-191.79	-121.29	64.70	-1227.94	85.90
03-12	0.10	-12.14	-0.47	-231.29	-192.19	-119.59	9.80	-1213.94	-47.20
03-13	0.46	-12.79	0.49	-241.99	-189.69	-114.59	46.30	-1278.94	49.10
03-14	0.48	-12.92	0.42	-241.89	-185.59	-108.19	48.00	-1291.94	41.90
03-15	0.16	-12.55	-0.35	-238.29	-192.39	-122.89	16.00	-1254.94	-34.80
03-16	0.91	-14.01	1.75	-263.09	-191.49	-127.79	91.00	-1400.93	175.29
03-17	0.85	-13.92	1.69	-261.99	-193.19	-131.19	85.10	-1391.93	169.19
03-18	0.21	-12.89	-0.15	-240.89	-194.99	-122.59	21.30	-1288.94	-14.50
03-19	0.48	-13.47	0.55	-235.69	-188.99	-119.99	47.70	-1346.93	54.50
03-20	1.01	-14.47	2.44	-260.89	-186.39	-121.79	101.30	-1446.93	243.69
03-21	1.11	-14.69	2.79	-252.89	-176.99	-117.29	110.99	-1468.93	278.49
03-22	1.09	-14.95	2.75	-248.19	-162.19	-109.39	108.69	-1494.93	274.79
03-23	0.74	-14.33	1.66	-255.89	-161.89	-108.49	73.60	-1432.93	166.09
03-24	0.97	-14.87	2.54	-233.59	-154.19	-97.40	96.80	-1486.93	253.89
03-25	1.41	-16.46	3.67	-204.89	-147.29	-95.70	140.89	-1645.92	367.18
03-26	1.48	-16.10	2.72	-168.99	-137.79	-91.50	147.89	-1609.92	271.89
03-27	1.53	-14.88	1.88	-127.19	-120.49	-74.20	152.79	-1487.93	187.49
03-28	1.57	-13.64	1.33	-96.10	-103.99	-58.40	156.59	-1363.93	133.09
03-29	1.53	-13.44	1.12	-76.40	-85.50	-48.30	152.49	-1343.93	111.59
03-30	1.52	-12.88	1.15	-75.80	-87.90	-46.90	151.99	-1287.94	114.69
03-31	1.11	-11.54	0.53	-63.70	-74.80	-39.40	111.19	-1153.94	53.00
04-01	1.12	-11.62	0.65	-75.20	-68.40	-29.60	111.89	-1161.94	64.50
04-02	0.84	-11.19	0.58	-95.10	-60.00	-24.30	84.10	-1118.94	57.90
04-03	0.74	-10.79	0.94	-125.79	-52.50	-17.40	74.40	-1078.95	93.90
04-04	1.03	-10.74	0.95	-87.00	-47.40	-7.50	102.89	-1073.95	94.90
04-05	1.05	-10.90	0.86	-72.50	-45.70	-0.20	104.69	-1089.95	86.10
04-06	1.14	-11.31	0.79	-61.80	-44.30	2.70	113.59	-1130.94	78.60
04-07	1.14	-11.11	0.76	-55.00	-42.80	6.70	113.49	-1110.95	75.70
04-08	1.21	-10.48	0.83	-58.60	-39.30	12.50	120.99	-1047.95	82.70
04-09	1.19	-10.11	0.95	-77.40	-40.10	15.70	118.99	-1010.95	94.70
04-10	1.19	-9.71	1.05	-80.20	-34.70	19.70	118.89	-970.95	104.59
04-11	0.87	-9.35	1.54	-115.89	-31.40	18.50	86.90	-934.95	153.59
04-12	-0.30	-9.07	1.37	-112.79	-24.30	29.40	-30.00	-906.96	136.69
04-13	-0.24	-8.50	1.56	-113.99	-22.80	34.70	-23.70	-849.96	155.79
04-14	-0.34	-8.49	1.40	-109.49	-22.70	35.40	-33.60	-848.96	139.59
04-15	-0.24	-8.57	1.60	-112.89	-18.60	39.00	-24.10	-856.96	160.39
04-16	-0.20	-8.18	1.77	-103.89	-18.60	44.30	-19.60	-817.96	176.59
04-17	0.55	-7.80	3.88	-142.59	-17.80	42.30	55.20	-779.96	387.58
04-18	0.16	-8.75	2.87	-138.99	-24.30	40.20	16.20	-874.96	286.89
04-19	-0.18	-9.60	1.94	-124.59	-19.20	47.70	-18.20	-959.95	194.29
04-20	-0.27	-9.52	1.73	-113.29	-17.70	50.70	-26.60	-951.95	173.09
04-21	0.95	-8.91	6.90	-178.99	-23.90	44.70	95.00	-890.96	689.47
04-22	0.38	-9.69	4.06	-145.49	-21.10	49.60	37.50	-968.95	406.28
04-23	0.61	-9.85	4.95	-160.19	-23.60	52.50	60.80	-984.95	495.08
04-24	0.27	-10.14	3.80	-145.89	-30.60	47.70	27.00	-1013.95	379.78
04-25	0.33	-10.09	3.97	-146.99	-30.30	52.50	32.80	-1008.95	397.18
04-26	0.12	-10.28	3.40	-138.49	-41.60	47.20	12.40	-1027.95	340.18
04-27	-0.19	-10.52	2.56	-131.49	-55.50	52.80	-19.20	-1051.95	255.79
04-28	-0.29	-10.59	2.20	-119.49	-61.80	70.10	-29.10	-1058.95	219.59
04-29	-0.41	-10.49	2.01	-116.79	-80.60	75.40	-41.20	-1048.95	200.99
04-30	-0.36	-10.93	2.24	-122.49	-110.39	71.10	-36.20	-1092.95	223.59

Table V-6
Soil Suction - Gypsum Block Pile 7/12

TIME_SERIAL_gypsum	R_WSC_KO	R_WTL3_KO	R_WTL2_KO	R_WTL1_KO	R_WSB_KO	R_WWR_KO	R_ESC_KO	R_ETL3_KO	R_ETL2_KO	R_ETL1_KO	R_ESB_KO	R_EWR_KO	P_WSC_BAR	P_WTL2_BAR	P_WTL1_BAR	P_WSB_BAR	P_WWR_BAR	P_ESC_BAR	
12-17	129.5	2439	9.46	1.393	0.72	0.294	206.7	90.7	1.687	2.985	0.299	0.245				3.981	0.875	0.56	0.332
12-18	37.22	3854	7.69	1.241	0.684	0.319	82.9	55.76	1.21	2.822	0.305	0.247	13.75	3.094	0.808	0.542	0.346		2854
12-19	21.51	2648	5.924	1.014	0.627	0.33	46.68	33.17	0.767	2.311	0.306	0.249	14.02	2.401	0.704	0.513	0.352		21.86
12-20	24.24	1979	-1	0.829	0.579	0.327	53.02	24.07	0.4	1.913	0.292	0.249	15.87	-0.55	0.615	0.488	0.351		69.89
12-21	31.47	1613	-1	0.698	0.547	0.324	63.46	19.66	0.362	1.608	0.287	0.248	16.68	-0.55	0.549	0.471	0.349		361.7
12-22	134.3	1530	-1	0.579	0.514	0.316	196.7	24.39	0.357	1.23	0.281	0.248		-0.55	0.488	0.453	0.344		
12-23	137.3	2017	3.775	0.528	0.495	0.308	220.7	32.89	0.356	1.122	0.275	0.248		1.714	0.461	0.443	0.34		
12-24	174	3624	3.877	0.511	0.494	0.301	247	33.3	0.363	1.123	0.279	0.251		1.746	0.451	0.442	0.336		
12-25	535.5	3228	4.241	0.542	0.499	0.296	500.7	70.2	0.37	1.116	0.278	0.249		1.857	0.468	0.445	0.333		
12-26	529.9	5007	7.42	0.67	0.541	0.297	569.1	102.6	0.45	1.186	0.281	0.249		2.977	0.535	0.467	0.334		
12-27	682.9	2347	10.14	0.926	0.621	0.307	682.9	165.8	0.72	1.469	0.286	0.248		4.381	0.662	0.51	0.339		
12-28	929	3358	17.77	1.487	0.892	0.325	1057	195.4	2.825	1.825	0.305	0.249		10.71	0.915	0.646	0.349		
12-29	692.9	1871	33.6	2.617	1.981	0.371	635.7	166.4	3.664	2.683	0.362	0.253		15.77	1.341	1.112	0.375		
12-30	647	4032	78.7	3.465	3.1	0.423	553.8	147.7	3.679	3.52	0.468	0.261		19.54	1.617	1.501	0.404		
12-31	399.2		40.22	3.91	3.882	0.487	445.5	127	3.551	4.401	0.616	0.263		12.77	1.756	1.747	0.439		
01-01	362.9	6344	40.46	3.91	4.262	0.649	317.8	105.9	3.193	4.786	0.667	0.271		12.77	1.756	1.864	0.524		
01-02	769	1913	56.61	3.638	4.189	0.899	427.2	115.9	2.806	4.653	0.642	0.284		130.5	1.671	1.842	0.649		
01-03	1034		60.53	4.232	4.909	1.137	1194	205.1	3.866	5.076	0.748	0.296		240	1.855	2.065	0.761		
01-03	1034		60.53	4.232	4.909	1.137	1194	205.1	3.866	5.076	0.748	0.296		240	1.855	2.065	0.761		
01-04	615.8	2195	168.6	5.005	5.926	1.423	570.2	176.4	4.729	6.535	1.066	0.316			2.096	2.402	0.888		
01-05	0.385	1811	104.4	5.942	6.781	1.671	0.381	107.4	4.77	8.02	1.342	0.334	0.383		2.407	2.716	0.991	0.381	
01-06	0.39	2799	87	5.483	6.706	2.038	0.54	65.69	3.924	7.92	1.31	0.348	0.386		2.251	2.687	1.134	0.467	
01-07	1.744	3208	200	5.458	6.89	2.397	79.9	96.2	3.156	7.35	1.216	0.361	1.02		2.243	2.758	1.265	2.192	
01-08	110	4907	90.3	6.157	7.73	2.7	251.5	124.4	3.162	7	1.126	0.369			2.483	3.109	1.369		
01-09	594.8	2611	202.4	6.992	8.57	2.876	861	285.4	4.425	7.63	1.109	0.373			2.799	3.506	1.428		
01-10	1429	3217	741	8.09	9.54	3.123	2270	575.1	5.983	9.44	1.391	0.385			3.274	4.028	1.509		
01-11	1043	5532	919	9.97	11.17	3.42	1430	575.3	7.82	12.56	1.87	0.402			4.283	5.055	1.603		
01-12	1282	962	1099	12.54	13.43	3.771	1282	549.7	9.95	16.39	2.549	0.426			6.067	6.781	1.713		
01-13	1203	5457	1040	15.2	15.41	4.077	2260	740	11.9	19.24	3.178	0.457			8.33	8.52	1.807		
01-14	1552	1943	1106	18.8	18.07	4.426	1552	551.6	40.74	23.21	3.89	0.499			11.67	10.99	1.915		
01-15	3098		1188	22.5	20.96	5.014		816	84.3	26.52	4.712	0.583			14.77	13.58	2.099		
01-16	2382	2382	3445	30.1	24.38	5.311	3445	932	123	31.14	5.348	0.706			17.03	15.95	2.195		
01-17	1234	1815	2373	58.27	28.44	5.892	3427	752	152.6	36.43	6.241	0.885			170.5	17.14	2.39		
01-18	1660	2915	1160	89.2	31.36	6.37	1160	609.5	151.5	40.15	7.09	1.119				16.72	2.56		
01-19	3173	1420	1038	113.5	36.04	6.989	1199	1199	189.9	45.39	7.8	1.359				14.4	2.798		
01-20	2637	4005	1965	187.6	65.02	7.51	1566	973	265.9	49.81	8.67	1.608				444.3	3.015		
01-21		-6366	1333	337.7	188.2	7.85		990	370.3	56.69	9.31	1.853					3.166		
01-22	1472	1472	3441	317.5	346.1	8.56	1819	834	331.2	127.2	10.47	2.101					3.505		
01-23	634.5	2452	1861	424.4	424.4	9.36	760	586.2	332.5	201.4	11.45	2.278					3.927		
01-24	437.9	2150	2980	300.7	374	10.46	393.1	374	222.2	204.4	12.34	2.499					4.586		
01-25	333.7	3732	956	284.2	348.8	12.29	319.8	255.8	191.7	201.8	12.81	2.751					5.868		
01-26	1771	1771	1440	237.6	291.9	12.56	1440	678.7	181.3	181.3	11.82	2.952					6.08		
01-27	1111		1561	335.5	335.5	12.62	3975	971	285.5	213.8	11.37	3.171					6.124		
01-28	1178	1696	1390	357.3	465.5	13.77	1390	807	269.4	236.2	12.56	3.365					7.07		
01-29	2546	2546	1914	427.2	591.5	14.92	2546	1097	366.1	295.6	12.96	3.573					8.07		
01-30	3984		3984	483.3	776	16.91		971	386.2	406.6	13.93	3.804					9.91		
01-31	1446	2312	1446	624.8	925	22.3	2312	1446	420.1	444.3	15.45	4.023					14.63		
02-01	5356	-4956	1198	914	1198	66.46	2243	3162	573.4	533.6	23.02	4.229					532.5		
02-02	2669	-6974	2669	779	1983	130.1	2669	867	779	648.2	64.49	4.511							
02-03	2139	2960	2139	1167	1675	172.1		1675	803	1376	118.5	4.758							
02-04	5833	1785	3321	2322	3321	262.2	2322	1785	1053	1220	173.2	5.357							
02-05	1869		1869	1259	1259	264.1	1869	1259	949	1504	206.9	6.395							
02-06		6764	1256	1256	1256	347.7		1863	844	1501	239.2	8.3							
02-07	5529	3222	1430	1430	1430	315.5	2272	1755	1206	1206	315.5	15.62							
02-08	2193	3064	1398	1398	1398	415.9	3064	2193	1026	1183	341.8	79.8							
02-09	1635	4485	793	1148	1349	411.5	1349	1349	1635	2074	411.5	160.8							
02-10	3410	3410	1232	2365	1810	504.8	3410	1810	933	1232	421.7	238.3							
02-11			1270	1520		479.2		2509	1270	1520	638.2	348.7							
02-12	2601		1107	968	3924	454	2601	1107	1553	1553	551.8	385.6							
02-13			1542	2571	1928	550.3		1928	964	1928	642.2	453							
02-14	2705	2705	982	982	2705	599.6	1318	1318	1125	2002	650.3	518.7							
02-15	2613	2613	1109	970	1952	552.3	3952	1296	970	1952	704	552.3							
02-16	4823	4823	1168	1677	2967	611.6	1677	1677	1377	1677	727	464							
02-17	4123	1584	781	1584	4123	518.1	1584	2687	869	1584	598.7	431							
02-18	2836	1635	719	999	2074	490.2	1635	999	884	2836	460.8	523.5							
02-19	2255	1745	916	2255	2255	574.2	2255	1745	916	1201	534.3	499.6							
02-20	2351	1801	831	931	1460	539.6	2351	1228	931	931	539.6	473.2							
02-21	2572		701	2572	964	481.5	2572	857	1286	1543	513.7	701							
02-22	1357	2877	796	1357	1154	524.8	1648	2095	796	2095	461.8	461.8							
02-23	1253	2445	759	1496	1496	544.4	1857	946	1078	1496	585.8	508.4							
02-24	6087	3403	1231	1464	1808	580.8	6087	1464	1464	1464	504.6	580.8							
02-25			834	6222	6222	582	3445	1819	1065	1819	834	685.7							
02-26		4837	728																

TIME_SERIAL	gypsum	R_WSC_KO	R_WTL3_KO	R_WTL2_KO	R_WTL1_KO	R_WSB_KO	R_WWR_KO	R_ESC_KO	R_ETL3_KO	R_ETL2_KO	R_ETL1_KO	R_ESB_KO	R_EWR_KO	P_WSC_BAR	P_WTL2_BAR	P_WTL1_BAR	P_WSB_BAR	P_WWR_BAR	P_ESC_BAR
03-04		2176	1697	808	808	1391	393.9	2176	902	1022	1391	393.9	568.8						
03-05		1278	2541	591.2	853	3790	549	1532	768	853	960	512.4	549						
03-06		1976		707	1117	1306	516.8	4050	975	866	2656	430.1	647.4						
03-07		3706		637.9	1268	1089	479	1268	765	849	1268	547.2	589.1						
03-08		1419	3166	674	1037	2245	441.7	1198	739	739	1419	417.7	533.7						
03-09		2719	4198	711	872	984	600.3	2719	984	784	784	457.5	486.4						
03-10		2395	3474	687	938	1828	541.8	2395	1068	687	1477	541.8	506.2						
03-11		1162	4712	565	800	1162	492.7	1162	1010	725	1368	436.7	526.4						
03-12		1988	4103	555.1	868	4103	430.7	1580	978	708	1988	430.7	555.1						
03-13		1795	1795	929	929	1795	445.2	1225	1225	929	1456	472.6	579.5						
03-14		2351	1802	580.3	931	3382	445.7	1228	831	683.3	1228	399.4	627.5						
03-15		2775	4334	559.2	788	1614	410	2041	878	991	1614	410	559.2						
03-16		2067	4452	657	883	1345	523	1345	997	605.3	997	371.4	561.2						
03-17		1254	3590	586.1	946	1859	424.4	1498	760	946	1254	424.4	449.2						
03-18		2373		752	1469	1814	446.4	1814	1234	1063	1063	446.4	505.1						
03-19		2094	1647	796	659.7	2094	391.2	1647	888	722	1154	372.2	461.7						
03-20		1065	3438	1065	753	2378	422.1	1235	753	685.5	1065	380.3	541						
03-21		1130	2016	600.9	785	1599	457.8	1324	785	651.8	1599	409.1	557.3						
03-22		1584	2687	555.5	869	1314	431	1122	649.2	709	1314	431	485.4						
03-23		1090	2509	547.5	589.4	1893	479.2	1893	589.4	850	955	383.5	479.2						
03-24		1506	2470	509.4	762	1506	424.9	949	545.6	587.2	845	402.7	477.8						
03-25		915	1421	499.3	674.5	1742	441.9	1038	534	573.9	1200	396.3	573.9						
03-26		302.7	3191	396.5	675	1202	418.1	620.6	469.2	574.3	1202	359.4	469.2						
03-27		267.3	2048	338.1	559.7	993	370.7	459.4	353.7	559.7	993	353.7	459.4						
03-28		109	6497	331.9	543.1	1246	331.9	201.1	318.1	448.1	1246	293.8	475.8						
03-29		35.15	2998	289.5	464.8	1173	326.5	91.4	251.5	374.3	1018	269.2	393.4	14.92					
03-30		3.882	1915	307.4	366.1	1279	320.2	39.2	240	366.1	854	247.8	384.4	1.747					12.94
03-31		2.074	2689	257.5	322.4	649.4	257.5	11.89	208.4	309.4	649.4	220.4	352	1.147					5.572
04-01		3.757	1909	284.5	295.4	768	256	14.69	196.7	307.3	853	207.4	349.2	1.708					7.87
04-02		6.883	3342	224	304	626.2	253.7	18.24	205.9	253.7	748	185.9	316.6	2.756					11.15
04-03		74.3	2200	279.6	269.8	811	222.7	44.81	260.6	279.6	669.8	172.4	314	1281					16.66
04-04		110.6	1245	318.1	246.5	584	212.3	103.1	263.4	293.7	542.8	169.8	263.4						
04-05		33.23	2209	269.9	252.2	616.9	189.6	47.71	260.7	301.8	571.1	168.7	260.7	15.96					26.05
04-06		18.53	3538	263.5	263.5	632.7	162.6	25.51	201.2	293.8	689.4	159.2	254.8	11.43					16.48
04-07		3.694		234.2	241.6	519.8	153.9	6.076	171.2	276.4	712	150.9	276.4	1.686					2.454
04-08		0.359	3018	229	260.2	438.7	137.9	0.343	130.8	251.6	666.9	140.5	251.6	0.368					0.359
04-09		0.342	1668	204.2	209.8	493.1	118.5	0.351	96	215.7	610.5	135.3	228.6	0.359					0.364
04-10		0.317	172.4	189.6	199.5	439.9	113.4	0.331	53.94	194.4	531.1	135.6	216.4	0.345					0.353
04-11		0.31	124.9	330	185.8	398.4	105.7	0.319	16.9	181.4	537.9	124.9	205.8	0.341					0.346
04-12		0.296	119.9	369.2	175	387.9	93.3	0.305	0.358	153.8	486.1	116.2	202.9	0.333					0.338
04-13		0.287	125	272.2	159	317.3	92.8	0.305	0.337	136.2	421.9	112.1	195.6	0.328					0.338
04-14		0.307	129	143.6	133.5	315.5	83.5	0.33	0.333	113.6	359.9	100.1	181.1	0.339				2994	0.352
04-15		0.314	151.1	242.1	126.1	298.8	77.2	0.313	0.32	102.3	389.9	98.3	179.6	0.343					0.343
04-16		0.308	153.5	240.4	107.8	240.4	71.8	0.337	0.318	86.7	320.9	88.8	163.3	0.34					0.356
04-17		0.297	140	277.4	98.3	221.3	63.48	0.3	0.302	78.8	311.1	83.2	148.2	0.334					0.335
04-18		0.282	143.1	199.1	93.6	210.1	60.97	0.298	0.294	71.4	278.9	79.8	145.8	0.325					0.334
04-19		0.299	134.9	121.9	85	197.9	56.26	0.301	0.297	65.66	258	74.8	139.8	0.335					0.336
04-20		0.306	147.9	76.3	76.3	175.1	53.04	0.324	0.296	58.91	266.6	69.92	130.2	0.339	1564	1564			0.349
04-21		0.267	145.6	58.08	70	157.6	49.24	0.296	0.286	51.63	242.7	67.52	124.2	0.317	165.3	811			0.333
04-22		0.287	141.8	42.59	66.08	147.2	44.12	0.295	0.29	47.22	232.4	62.76	119.5	0.328	13.58	507.9			0.332
04-23		0.297	139.2	36.1	58.35	129.7	40.71	0.298	0.285	11.59	219.1	61.22	109.2	0.334	14.37	172.5			0.334
04-24		0.285	133.5	35.69	51.74	117.1	35.35	0.308	0.282	17.54	205.5	56.45	105.7	0.327	14.6	55.11			0.34
04-25		0.283	134.7	42.89	46.68	106.4	32.29	0.316	0.288	18.16	187.8	54.18	95.6	0.326	13.83	21.88			0.344
04-26		0.274	135.7	45.38	40.85	94.9	29.82	0.305	0.28	16.41	176.6	52.07	93.8	0.321	17.94	12.8			0.338
04-27		0.267	129.8	47.85	36.11	87.7	25.17	0.292	0.282	14.38	159.7	49.78	87.7	0.316	26.71	14.37			0.331
04-28		0.254	174.2	11.21	31.43	76.1	21.84	0.278	0.273	11.74	156.3	46.34	83.8	0.309	5.086	16.7	1538		0.323
04-29		0.259	184.2	47.65	26.4	68.74	19.12	0.273	0.267	8.79	148.3	45.04	78	0.312	25.77	16.8	699.4		0.32
04-30		0.273	223.8	27.66	21.1	61.09	16.3	0.282	0.271	4.446	136	41.81	73.7	0.32	17.08	13.69	260.2		0.325
05-01		0.244	204.3	23.08	12.62	53.91	14.39	0.26	0.26	1.284	120.4	40.59	67.56	0.304	15.17	6.13	81.9	7.6	0.313
05-02		0.243	246.7	29.86	0.251	46.31	12.01	0.247	0.253	0.316	99	37.95	62.71	0.303	17.07	0.307	20.6	5.662	0.305
05-03		0.249	323.3	28.26	0.281	16.01	9.88	0.257	0.258	0.288	85	35.28	55.02	0.307	17.13	0.325	9.07	4.224	0.311
05-04		0.247	340.2	37.67	0.279	0.738	7.65	0.252	0.255	0.273	67.53	32.61	48.92	0.305	13.53	0.323	0.57	3.074	0.308
05-05		0.217	304.6	36.98	0.269	0.394	6.139	0.236	0.246	0.264	5.025	27.25	41.35	0.288	13.88	0.317	0.388	2.477	0.299
05-06		0.217	168.2	33.83	0.253	0.344	5.187	0.229	0.239	0.256	0.336	16.25	32.47	0.288	15.65	0.309	0.36	2.155	0.294
05-07		0.216	256.7	34.75	0.237	0.3	3.604	0.235	0.249	0.308	1.038	0.352	24.82	0.287	15.15	0.3	0.335	1.661	0.298
05-08		0.208	313.8	35.49	0.233	0.283	2.18	0.224	0.243	0.308	1.126	0.32	15.13	0.282	14.72	0.297	0.326	1.186	0.292
05-09		0.237	355.5	40.14	0.235	0.275	1.296	0.221	0.241	0.314	1.156	0.301	4.806	0.299	12.78	0.298	0.321	0.832	0.29
05-10		0.256	350.8	40.74	0.231	0.271	0.826	0.242	0.245	0.302	1.145	0.293	0.272	0.31	12.79	0.296	0.319	0.614	0.302
05-11		0.292	339.7	43.97	0.23	0.271	0.553	0.268	0.253	0.295	1.126	0.285	0.234	0.331	15.16	0.296	0.319	0.474	0.317
05-12		0.265	198	41.7	0.231	0.271	0.371	0.269	0.263	0.308	1.164	0.276	0.222	0.316	13.04	0.296	0.319	0.375	0.318
05-13		0.253	155.9	44.09	0.224														

Table V-6
Soil Suction - Gypsum Block Pile 7/12

TIME_SERIAL_gypsum	R_WSC_KO	R_WTL3_KO	R_WTL2_KO	R_WTL1_KO	R_WSB_KO	R_WWR_KO	R_ESC_KO	R_ETL3_KO	R_ETL2_KO	R_ETL1_KO	R_ESB_KO	R_EWR_KO	P_WSC_BAR	P_WTL2_BAR	P_WTL1_BAR	P_WSB_BAR	P_WWR_BAR	P_ESC_BAR
05-21	0.219	136.5	31.01	0.179	0.232	0.155	0.236	0.235	0.28	1.127	0.241	0.191	0.289	16.82	0.266	0.296	0.252	0.299
05-22	0.209	153.5	26.47	0.197	0.233	0.154	0.227	0.233	0.289	1.019	0.234	0.187	0.283	16.82	0.276	0.297	0.251	0.293
05-23	0.211	220.3	21.71	0.2	0.227	0.155	0.212	0.226	0.284	1.163	0.23	0.185	0.284	14.18	0.278	0.293	0.251	0.285
05-24	0.188	211.4	20.13	0.189	0.224	0.152	0.215	0.22	0.278	1.206	0.219	0.182	0.271	12.87	0.271	0.292	0.25	0.287
05-25	0.206	136.6	21.3	0.188	0.221	0.147	0.224	0.223	0.267	1.135	0.219	0.183	0.281	13.85	0.271	0.29	0.247	0.292
05-26	0.198	148.2	18.26	0.162	0.22	0.146	0.232	0.217	0.258	0.955	0.216	0.184	0.277	11.18	0.256	0.289	0.246	0.296
05-27	0.199	154.1	18.6	0.171	0.218	0.144	0.22	0.22	0.262	1.16	0.212	0.184	0.277	11.49	0.261	0.288	0.245	0.29
05-28	0.206	154.5	18.46	0.179	0.218	0.149	0.219	0.22	0.267	1.242	0.211	0.184	0.281	11.36	0.266	0.288	0.248	0.289
05-29	0.21	151.8	15.84	0.175	0.219	0.145	0.235	0.218	0.249	0.806	0.209	0.182	0.284	8.91	0.263	0.289	0.246	0.298
05-30	0.23	179.1	15.75	0.18	0.221	0.159	0.244	0.227	0.278	0.856	0.207	0.185	0.296	8.83	0.266	0.29	0.254	0.303
05-31	0.22	187.7	16.79	0.185	0.222	0.175	0.246	0.233	0.292	1.238	0.208	0.189	0.289	9.8	0.269	0.291	0.263	0.305
06-01	0.242	188.8	18.36	0.195	0.223	0.184	0.258	0.242	0.288	1.172	0.208	0.193	0.302	11.27	0.275	0.292	0.269	0.311
06-02	0.222	182.3	17.87	0.199	0.226	0.191	0.24	0.238	0.293	1.215	0.211	0.196	0.29	10.81	0.278	0.293	0.273	0.301
06-03	0.202	212.3	17.15	0.184	0.225	0.203	0.236	0.236	0.291	1.408	0.213	0.202	0.279	10.14	0.269	0.292	0.279	0.299
06-04	0.208	193.4	17.01	0.175	0.223	0.21	0.227	0.23	0.286	1.486	0.212	0.202	0.283	10	0.263	0.291	0.284	0.294
06-05	0.194	283.5	16.07	0.177	0.222	0.218	0.211	0.227	0.288	1.543	0.211	0.205	0.275	9.13	0.264	0.291	0.288	0.284
06-06	0.193	321.1	17.08	0.181	0.22	0.212	0.206	0.222	0.284	1.526	0.205	0.201	0.274	10.07	0.267	0.289	0.285	0.281
06-07	0.212	176.9	14.12	0.177	0.219	0.213	0.234	0.225	0.266	1.288	0.203	0.198	0.285	7.37	0.265	0.289	0.286	0.298
06-08	0.198	184.4	18.27	0.182	0.219	0.211	0.232	0.232	0.275	1.429	0.201	0.202	0.277	11.18	0.268	0.289	0.285	0.296
06-09	0.183	236.4	16.73	0.181	0.217	0.208	0.207	0.224	0.277	1.501	0.202	0.201	0.268	9.73	0.267	0.288	0.283	0.282
06-10	0.203	170.1	16.19	0.176	0.217	0.213	0.227	0.218	0.269	1.163	0.202	0.2	0.28	9.23	0.264	0.288	0.285	0.294
06-11	0.193	183.7	15.47	0.173	0.215	0.214	0.213	0.217	0.271	1.451	0.199	0.202	0.274	8.57	0.262	0.287	0.286	0.286
06-12	0.189	275.5	16.27	0.187	0.212	0.208	0.21	0.216	0.274	1.515	0.193	0.201	0.272	9.31	0.271	0.285	0.283	0.284
06-13	0.176	280.5	16.77	0.178	0.211	0.207	0.198	0.213	0.271	1.525	0.19	0.2	0.264	9.77	0.265	0.284	0.282	0.277
06-14	0.171	249.2	14.41	0.17	0.208	0.211	0.187	0.202	0.266	1.535	0.192	0.198	0.261	7.62	0.261	0.283	0.285	0.27
06-15	0.168	220.9	15.82	0.172	0.205	0.202	0.178	0.197	0.262	1.527	0.19	0.195	0.259	8.89	0.261	0.281	0.279	0.265
06-16	0.185	298.4	20.45	0.181	0.2	0.188	0.191	0.199	0.259	1.495	0.186	0.195	0.269	13.15	0.267	0.278	0.271	0.273
06-17	0.204	298.4	24.67	0.173	0.198	0.182	0.211	0.208	0.257	1.472	0.176	0.194	0.28	16.1	0.262	0.277	0.268	0.284
06-18	0.238	298.9	53.46	0.18	0.198	0.18	0.23	0.215	0.26	1.48	0.185	0.189	0.3	75.6	0.267	0.277	0.267	0.296
06-19	0.243	277.6	54.65	0.184	0.197	0.174	0.241	0.217	0.262	1.485	0.184	0.19	0.303	93.4	0.269	0.276	0.263	0.302
06-20	0.248	278	54.27	0.18	0.197	0.174	0.263	0.218	0.261	1.468	0.18	0.188	0.305	87.4	0.266	0.276	0.263	0.314
06-21	0.287	293.4	53.66	0.181	0.195	0.178	0.298	0.229	0.252	1.414	0.18	0.189	0.328	78.4	0.267	0.275	0.265	0.334
06-22	0.183	75.7	42.22	0.186	0.196	0.178	0.196	0.209	0.258	1.426	0.175	0.186	0.268	13.31	0.27	0.275	0.265	0.276
06-23	0.197	150.5	24.74	0.176	0.195	0.178	0.22	0.208	0.236	1.059	0.172	0.187	0.276	16.14	0.264	0.275	0.265	0.29
06-24	0.187	155.9	23.41	0.181	0.197	0.182	0.212	0.208	0.261	0.999	0.171	0.186	0.27	15.39	0.267	0.276	0.268	0.285
06-25	0.173	208.4	19.81	0.183	0.197	0.184	0.198	0.203	0.26	1.385	0.175	0.185	0.262	12.59	0.268	0.276	0.268	0.277
06-26	0.167	162.7	19.14	0.171	0.195	0.184	0.189	0.198	0.253	1.419	0.177	0.188	0.258	11.99	0.261	0.275	0.268	0.272
06-27	0.161	181.2	19.62	0.175	0.193	0.175	0.181	0.191	0.251	1.421	0.175	0.187	0.255	12.42	0.263	0.274	0.264	0.267
Average:	882.269	1556.234	512.534	408.158	649.146	152.066	798.284	470.241	313.877	511.541	150.682	165.953	14.626	63.432	34.296	33.180	59.701	58.588
Minimum:	0.161	-6974.000	-1.000	0.162	0.193	0.144	0.178	0.191	0.236	0.336	0.171	0.182	0.255	-0.550	0.256	0.274	0.245	0.265
Maximum:	6087.000	6764.000	3984.000	6222.000	6222.000	611.600	6087.000	3162.000	1760.000	3266.000	834.000	804.000	1281.000	1954.000	1564.000	1538.000	2994.000	2854.000
Median:	33.230	1584.000	200.000	55.005	72.420	12.150	71.680	128.900	49.425	142.150	13.445	4.370	0.303	13.230	0.299	0.319	0.439	0.307
Standard Deviation:	1317.532	1903.745	721.076	696.454	1004.616	208.813	1129.116	627.334	423.637	681.822	210.997	226.907	129.303	263.574	180.037	176.498	323.766	364.556
Population:	187.000	177.000	193.000	194.000	192.000	194.000	188.000	194.000	194.000	194.000	194.000	194.000	97.000	88.000	102.000	97.000	123.000	96.000

Table V-6
Soil Suction - Gypsum Block Pile 7/12

TIME_SERIAL	gypsum	P_ETL3_BAR	P_ETL2_BAR	P_ETL1_BAR	P_ESB_BAR	P_EWR_BAR	P_WSC_kpa	P_WTL2_kpa	P_WTL1_kpa	P_WSB_kpa	P_WWR_kpa	P_ESC_kpa	P_ETL3_kpa	P_ETL2_kpa	P_ETL1_kpa	P_ESB_kpa	P_EWR_kpa
12-17		0.997	1.464	0.335	0.304	0.00	0.00	398.08	87.50	56.00	33.20	0.00	0.00	99.70	146.39	33.50	30.40
12-18	113.2	0.794	1.41	0.338	0.305	1374.93	1374.93	309.38	80.80	54.20	34.60	285385.92	11319.44	79.40	140.99	33.80	30.50
12-19	15.99	0.584	1.234	0.339	0.306	1401.93	1401.93	240.09	70.40	51.30	35.20	2185.89	1598.92	58.40	123.39	33.90	30.60
12-20	15.78	0.391	1.086	0.331	0.306	1586.92	1586.92	-55.00	61.50	48.80	35.10	6988.66	1577.92	39.10	108.59	33.10	30.60
12-21	12.45	0.37	0.965	0.328	0.306	1667.92	1667.92	-55.00	54.90	47.10	34.90	36168.22	1244.94	37.00	96.50	32.80	30.60
12-22	15.96	0.367	0.803	0.324	0.306	0.00	0.00	-55.00	48.80	45.30	34.40	0.00	1595.92	36.70	80.30	32.40	30.60
12-23	16.12	0.367	0.754	0.321	0.306	0.00	0.00	171.39	46.10	44.30	34.00	0.00	1611.92	36.70	75.40	32.10	30.60
12-24	15.92	0.371	0.755	0.324	0.307	0.00	0.00	174.59	45.10	44.20	33.60	0.00	1591.92	37.10	75.50	32.40	30.70
12-25	830	0.375	0.752	0.323	0.306	0.00	0.00	185.69	46.80	44.50	33.30	0.00	82995.90	37.50	75.20	32.30	30.60
12-26		0.419	0.784	0.325	0.306	0.00	0.00	297.69	53.50	46.70	33.40	0.00	0.00	41.90	78.40	32.50	30.60
12-27		0.561	0.907	0.327	0.305	0.00	0.00	438.08	66.20	51.00	33.90	0.00	0.00	56.10	90.70	32.70	30.50
12-28		1.411	1.052	0.338	0.306	0.00	0.00	1070.95	91.50	64.60	34.90	0.00	0.00	141.09	105.19	33.80	30.60
12-29		1.679	1.363	0.37	0.309	0.00	0.00	1576.92	134.09	111.19	37.50	0.00	0.00	167.89	136.29	37.00	30.90
12-30		1.684	1.635	0.428	0.313	0.00	0.00	195390.36	161.69	150.09	40.40	0.00	0.00	168.39	163.49	42.80	31.30
12-31		1.644	1.907	0.507	0.314	0.00	0.00	1276.94	175.59	174.69	43.90	0.00	0.00	164.39	190.69	50.70	31.40
01-01		1.531	2.027	0.533	0.319	0.00	0.00	1276.94	175.59	186.39	52.40	0.00	0.00	153.09	202.69	53.30	31.90
01-02		1.405	1.985	0.521	0.326	0.00	0.00	13049.36	167.09	184.19	64.90	0.00	0.00	140.49	198.49	52.10	32.60
01-03		1.742	2.119	0.575	0.333	0.00	0.00	23998.82	185.49	206.49	76.10	0.00	0.00	174.19	211.89	57.50	33.30
01-03		1.742	2.119	0.575	0.333	0.00	0.00	23998.82	185.49	206.49	76.10	0.00	0.00	174.19	211.89	57.50	33.30
01-04		2.009	2.622	0.728	0.344	0.00	0.00	209.59	240.19	88.80	0.00	0.00	0.00	200.89	262.19	72.80	34.40
01-05		2.022	3.241	0.853	0.355	38.30	38.30	0.00	240.69	271.59	99.10	38.10	0.00	202.19	324.08	85.30	35.50
01-06	483.6	1.76	3.195	0.839	0.362	38.60	38.60	0.00	225.09	268.69	113.39	46.70	48357.61	175.99	319.48	83.90	36.20
01-07		1.519	2.946	0.797	0.369	101.99	101.99	0.00	224.29	275.79	126.49	219189.18	0.00	151.89	294.59	79.70	36.90
01-08		1.521	2.803	0.756	0.374	0.00	0.00	0.00	248.29	310.88	136.89	0.00	0.00	152.09	280.29	75.60	37.40
01-09		1.915	3.065	0.749	0.376	0.00	0.00	0.00	279.89	350.58	142.79	0.00	0.00	191.49	306.48	74.90	37.60
01-10		2.422	3.971	0.874	0.383	0.00	0.00	0.00	327.38	402.78	150.89	0.00	0.00	242.19	397.08	87.40	38.30
01-11		3.15	6.078	1.07	0.392	0.00	0.00	0.00	428.28	505.48	160.29	0.00	0.00	314.98	607.77	106.99	39.20
01-12		4.269	9.42	1.318	0.406	0.00	0.00	0.00	606.67	678.07	171.29	0.00	0.00	426.88	941.95	131.79	40.60
01-13		5.578	12.08	1.527	0.423	0.00	0.00	0.00	832.96	851.96	180.69	0.00	0.00	557.77	1207.94	152.69	42.30
01-14		12.79	15.25	1.749	0.445	0.00	0.00	0.00	1166.94	1098.95	191.49	0.00	0.00	1278.94	1524.92	174.89	44.50
01-15			16.83	2.004	0.49	0.00	0.00	0.00	1476.93	1357.93	209.89	0.00	0.00	0.00	1682.92	200.39	49.00
01-16			16.79	2.207	0.554	0.00	0.00	0.00	1702.92	1594.92	219.49	0.00	0.00	0.00	1678.92	220.69	55.40
01-17			14.18	2.513	0.643	0.00	0.00	0.00	17049.16	1713.92	238.99	0.00	0.00	0.00	1417.93	251.29	64.30
01-18			12.78	2.838	0.753	0.00	0.00	0.00	0.00	1671.92	255.99	0.00	0.00	0.00	1277.94	283.79	75.30
01-19			17.97	3.141	0.86	0.00	0.00	0.00	0.00	1439.93	279.79	0.00	0.00	0.00	1796.91	314.08	86.00
01-20			38.39	3.561	0.965	0.00	0.00	0.00	0.00	44427.81	301.49	0.00	0.00	0.00	3838.81	356.08	96.50
01-21			132.1	3.897	1.063	0.00	0.00	0.00	0.00	0.00	316.58	0.00	0.00	0.00	13209.35	389.68	106.29
01-22				4.589	1.158	0.00	0.00	0.00	0.00	0.00	350.48	0.00	0.00	0.00	0.00	458.88	115.79
01-23				5.251	1.222	0.00	0.00	0.00	0.00	0.00	392.68	0.00	0.00	0.00	0.00	525.07	122.19
01-24				5.912	1.3	0.00	0.00	0.00	0.00	0.00	458.58	0.00	0.00	0.00	0.00	591.17	129.99
01-25				6.276	1.387	0.00	0.00	0.00	0.00	0.00	586.77	0.00	0.00	0.00	0.00	627.57	138.69
01-26				5.517	1.453	0.00	0.00	0.00	0.00	0.00	607.97	0.00	0.00	0.00	0.00	551.67	145.29
01-27				5.197	1.524	0.00	0.00	0.00	0.00	0.00	612.37	0.00	0.00	0.00	0.00	519.67	152.39
01-28				6.076	1.586	0.00	0.00	0.00	0.00	0.00	706.97	0.00	0.00	0.00	0.00	607.57	158.59
01-29				6.397	1.651	0.00	0.00	0.00	0.00	0.00	806.96	0.00	0.00	0.00	0.00	639.67	165.09
01-30				7.21	1.723	0.00	0.00	0.00	0.00	0.00	990.95	0.00	0.00	0.00	0.00	720.96	172.29
01-31				8.55	1.79	0.00	0.00	0.00	0.00	0.00	1462.93	0.00	0.00	0.00	0.00	854.96	178.99
02-01				15.13	1.854	0.00	0.00	0.00	0.00	0.00	53247.37	0.00	0.00	0.00	0.00	1512.93	185.39
02-02				414.7	1.941	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41467.95	194.09
02-03					2.018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	201.79
02-04					2.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220.99
02-05					2.569	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.89
02-06					3.375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	337.48
02-07					8.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	870.96
02-08					2175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	217489.27
02-09						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-10						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-11						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-12						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-13						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-14						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-15						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-16						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-17						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-18						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-19						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-20						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-21						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-22						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-23						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-24						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-25						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02-26																	

Table V-6
Soil Suction - Gypsum Block Pile 7/12

TIME_SERIAL	gypsum	P_ETL3_BAR	P_ETL2_BAR	P_ETL1_BAR	P_ESB_BAR	P_EWR_BAR	P_WSC_kpa	P_WTL2_kpa	P_WTL1_kpa	P_WSB_kpa	P_WWR_kpa	P_ESC_kpa	P_ETL3_kpa	P_ETL2_kpa	P_ETL1_kpa	P_ESB_kpa	P_EWR_kpa
03-04							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-05							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-06							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-07							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-08							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-09							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-10							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-11							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-12							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-13							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-14							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-15							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-16							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-17							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-18							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-19							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-20							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-21							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-22							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-23							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-24							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-25							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-26							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-27							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-28							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-29							1491.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-30							174.69	0.00	0.00	0.00	0.00	1293.94	0.00	0.00	0.00	0.00	0.00
03-31							114.69	0.00	0.00	0.00	0.00	557.17	0.00	0.00	0.00	0.00	0.00
04-01							170.79	0.00	0.00	0.00	0.00	786.96	0.00	0.00	0.00	0.00	0.00
04-02							275.59	0.00	0.00	0.00	0.00	1114.94	0.00	0.00	0.00	0.00	0.00
04-03							128093.68	0.00	0.00	0.00	0.00	1665.92	0.00	0.00	0.00	0.00	0.00
04-04							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04-05							1595.92	0.00	0.00	0.00	0.00	2604.87	0.00	0.00	0.00	0.00	0.00
04-06							1142.94	0.00	0.00	0.00	0.00	1647.92	0.00	0.00	0.00	0.00	0.00
04-07							168.59	0.00	0.00	0.00	0.00	245.39	0.00	0.00	0.00	0.00	0.00
04-08							36.80	0.00	0.00	0.00	0.00	35.90	0.00	0.00	0.00	0.00	0.00
04-09							35.90	0.00	0.00	0.00	0.00	36.40	0.00	0.00	0.00	0.00	0.00
04-10	82.4						34.50	0.00	0.00	0.00	0.00	35.30	8239.59	0.00	0.00	0.00	0.00
04-11	9.9						34.10	0.00	0.00	0.00	0.00	34.60	989.95	0.00	0.00	0.00	0.00
04-12	0.368						33.30	0.00	0.00	0.00	0.00	33.80	36.80	0.00	0.00	0.00	0.00
04-13	0.356						32.80	0.00	0.00	0.00	0.00	33.80	35.60	0.00	0.00	0.00	0.00
04-14	0.354						33.90	0.00	0.00	0.00	299385.23	35.20	35.40	0.00	0.00	0.00	0.00
04-15	0.347						34.30	0.00	0.00	0.00	169791.62	34.30	34.70	0.00	0.00	0.00	0.00
04-16	0.346						34.00	0.00	0.00	0.00	98995.11	35.60	34.60	0.00	0.00	0.00	0.00
04-17	0.336	1981			2914		33.40	0.00	0.00	0.00	36268.21	33.50	33.60	198090.23	0.00	291385.62	0.00
04-18	0.332	947			2164		32.50	0.00	0.00	0.00	25578.74	33.40	33.20	94695.33	0.00	216389.32	0.00
04-19	0.334	481.7			1349		33.50	0.00	0.00	0.00	12309.39	33.60	33.40	48167.62	0.00	134893.34	0.00
04-20	0.333	188.4			801		33.90	156392.28	156392.28	0.00	7009.65	34.90	33.30	18839.07	0.00	80096.05	0.00
04-21	0.328	54.05			605.2		31.70	16529.18	81096.00	0.00	3443.83	33.30	32.80	5404.73	0.00	60517.01	0.00
04-22	0.33	23.95			329		32.80	1357.93	50787.49	0.00	1538.92	33.20	33.00	2394.88	0.00	32898.38	0.00
04-23	0.327	5.353			265.2		33.40	1436.93	17249.15	0.00	1277.94	33.40	32.70	535.27	0.00	26518.69	0.00
04-24	0.325	10.5			126.9		32.70	1459.93	5510.73	0.00	1479.93	34.00	32.50	1049.95	0.00	12689.37	0.00
04-25	0.328	11.08			86.1		32.60	1382.93	2187.89	0.00	1637.92	34.40	32.80	1107.95	0.00	8609.58	0.00
04-26	0.324	9.44			58.66		32.10	1793.91	1279.94	0.00	1706.92	33.80	32.40	943.95	0.00	5865.71	0.00
04-27	0.325	7.59			38.11		31.60	2670.87	1436.93	0.00	1633.92	33.10	32.50	758.96	0.00	3810.81	0.00
04-28	0.32	5.459			20.7		30.90	508.57	1669.92	153792.41	1426.93	32.30	32.00	545.87	0.00	2069.90	0.00
04-29	0.317	3.619			17.14	1841	31.20	2576.87	1679.92	69936.55	1196.94	32.00	31.70	361.88	0.00	1713.92	184090.92
04-30	0.319	1.921			13.08	1204	32.00	1707.92	1368.93	26018.72	932.95	32.50	31.90	192.09	0.00	1307.94	120394.06
05-01	0.313	0.827			12.78	608.5	30.40	1516.93	612.97	8189.60	759.96	31.30	31.30	82.70	0.00	1277.94	60847.00
05-02	0.309	0.345			13.39	326.8	30.30	1706.92	30.70	2059.90	566.17	30.50	30.90	34.50	0.00	1338.93	32678.39
05-03	0.311	0.329			14.85	99.7	30.70	1712.92	32.50	906.96	422.38	31.10	31.10	32.90	0.00	1484.93	9969.51
05-04	0.31	0.32	606.6		16.24	32.47	30.50	1352.93	32.30	57.00	307.38	30.80	31.00	32.00	60657.01	1623.92	3246.84
05-05	0.305	0.315	2.102		17.01	12.91	28.80	1387.93	31.70	38.80	247.69	29.90	30.50	31.50	210.19	1700.92	1290.94
05-06	0.301	0.31	0.356		9.29	16.3	28.80	1564.92	30.90	36.00	215.49	29.40	30.10	31.00	35.60	928.95	1629.92
05-07	0.306	0.34	0.715		0.365	16.18	28.70	1514.93	30.00	33.50	166.09	29.80	30.60	34.00	71.50	36.50	1617.92
05-08	0.303	0.34	0.756		0.347	8.26	28.20	1471.93	29.70	32.60	118.59	29.20	30.30	34.00	75.60	34.70	825.96
05-09	0.302	0.343	0.77		0.336	2.033	29.90	1277.94	29.80	32.10	83.20	29.00	30.20	34.30	77.00	33.60	203.29
05-10	0.304	0.336	0.765		0.331	0.319	31.00	1278.94	29.60	31.90	61.40	30.20	30.40	33.60	76.50	33.10	31.90
05-11	0.309	0.333	0.756		0.327	0.298	33.10	1515.93	29.60	31.90	47.40	31.70	30.90	33.30	75.60	32.70	29.80
05-12	0.314	0.34	0.774		0.322	0.291	31.60	1303.94	29.60	31.90	37.50	31.80	31.40	34.00	77.40	32.20	29.10
05-13	0.314	0.34	0.682		0.318	0.289	30.80	1533.92	29.20	30.70	28.00	31.70	31.40	34.00	68.20	31.80	28.90
05-14	0.303	0.34	0.689		0.316	0.285	29.30	1419.93	28.50	30.80	26.30	31.20	30.30	34.00	68.90	31.60	28.50
05-15	0.302	0.339	0.724		0.313	0.284	29.20	1581.92	28.20	30.60	25.90	30.50	30.20	33.90	72.40	31.30	28.40
05-16	0.299	0.333	0.76		0.31	0.281	28.80	1699.92	28.20	30.40	25.70	29.90	29.90	33.30	76.00	31.00	28.10
05-17	0.298	0.332	0.772		0.305	0.279	29.20	1690.92	28.50	30.10	25.20	30.60	29.80	33.20	77.20	30.50	27.90
05-18	0.297	0.331	0.788		0.305	0.277	29.30	1597.92	28.00	29.90	25.50	30.40	29.70	33.10	78.80	30.50	27.70
05-19	0.299	0.333	0.787		0.304	0.275	29.00	1685									

Table V-6
Soil Suction - Gypsum Block File 7/12

TIME_SERIAL_gypsum	P_ETL3_BAR	P_ETL2_BAR	P_ETL1_BAR	P_ESB_BAR	P_EWR_BAR	P_WSC_kpa	P_WTL2_kpa	P_WTL1_kpa	P_WSB_kpa	P_WWR_kpa	P_ESC_kpa	P_ETL3_kpa	P_ETL2_kpa	P_ETL1_kpa	P_ESB_kpa	P_EWR_kpa
05-21	0.298	0.324	0.757	0.302	0.272	28.90	1681.92	26.60	29.60	25.20	29.90	29.80	32.40	75.70	30.20	27.20
05-22	0.297	0.329	0.706	0.298	0.27	28.30	1681.92	27.60	29.70	25.10	29.30	29.70	32.90	70.60	29.80	27.00
05-23	0.293	0.326	0.773	0.295	0.269	28.40	1417.93	27.80	29.30	25.10	28.50	29.30	32.60	77.30	29.50	26.90
05-24	0.29	0.323	0.792	0.289	0.268	27.10	1286.94	27.10	29.20	25.00	28.70	29.00	32.30	79.20	28.90	26.80
05-25	0.291	0.317	0.76	0.289	0.268	28.10	1384.93	27.10	29.00	24.70	29.20	29.10	31.70	76.00	28.90	26.80
05-26	0.288	0.311	0.676	0.287	0.269	27.70	1117.94	25.60	28.90	24.60	29.60	28.80	31.10	67.60	28.70	26.90
05-27	0.289	0.314	0.771	0.285	0.269	27.70	1148.94	26.10	28.80	24.50	29.00	28.90	31.40	77.10	28.50	26.90
05-28	0.29	0.316	0.809	0.284	0.269	28.10	1135.94	26.60	28.80	24.80	28.90	29.00	31.60	80.90	28.40	26.90
05-29	0.288	0.306	0.603	0.283	0.267	28.40	890.96	26.30	28.90	24.60	29.80	28.80	30.60	60.30	28.30	26.70
05-30	0.293	0.323	0.628	0.282	0.269	29.60	882.96	26.60	29.00	25.40	30.30	29.30	32.30	62.80	28.20	26.90
05-31	0.297	0.331	0.807	0.283	0.272	28.90	979.95	26.90	29.10	26.30	30.50	29.70	33.10	80.70	28.30	27.20
06-01	0.302	0.329	0.777	0.283	0.274	30.20	1126.94	27.50	29.20	26.90	31.10	30.20	32.90	77.70	28.30	27.40
06-02	0.3	0.331	0.797	0.284	0.275	29.00	1080.95	27.80	29.30	27.30	30.10	30.00	33.10	79.70	28.40	27.50
06-03	0.299	0.33	0.881	0.286	0.279	27.90	1013.95	26.90	29.20	27.90	29.90	29.90	33.00	88.10	28.60	27.90
06-04	0.295	0.328	0.914	0.285	0.279	28.30	999.95	26.30	29.10	28.40	29.40	29.50	32.80	91.40	28.50	27.90
06-05	0.293	0.328	0.938	0.284	0.281	27.50	912.95	26.40	29.10	28.80	28.40	29.30	32.80	93.80	28.40	28.10
06-06	0.291	0.326	0.931	0.281	0.278	27.40	1006.95	26.70	28.90	28.50	28.10	29.10	32.60	93.10	28.10	27.80
06-07	0.293	0.316	0.829	0.279	0.277	28.50	736.96	26.50	28.90	28.60	29.80	29.30	31.60	82.90	27.90	27.70
06-08	0.297	0.321	0.89	0.279	0.279	27.70	1117.94	26.80	28.90	28.50	29.60	29.70	32.10	89.00	27.90	27.90
06-09	0.292	0.322	0.921	0.279	0.278	26.80	972.95	26.70	28.80	28.30	28.20	29.20	32.20	92.10	27.90	27.80
06-10	0.289	0.318	0.773	0.279	0.278	28.00	922.95	26.40	28.80	28.50	29.40	28.90	31.80	77.30	27.90	27.80
06-11	0.288	0.319	0.9	0.277	0.279	27.40	856.96	26.20	28.70	28.60	28.60	28.80	31.90	90.00	27.70	27.90
06-12	0.287	0.321	0.927	0.274	0.278	27.20	930.95	27.10	28.50	28.30	28.40	28.70	32.10	92.70	27.40	27.80
06-13	0.285	0.319	0.931	0.272	0.278	26.40	976.95	26.50	28.40	28.20	27.70	28.50	31.90	93.10	27.20	27.80
06-14	0.279	0.316	0.935	0.273	0.277	26.10	761.96	26.10	28.30	28.50	27.00	27.90	31.60	93.50	27.30	27.70
06-15	0.276	0.314	0.932	0.272	0.275	25.90	888.96	26.10	28.10	27.90	26.50	27.60	31.40	93.20	27.20	27.50
06-16	0.278	0.312	0.918	0.27	0.275	26.90	1314.94	26.70	27.80	27.10	27.30	27.80	31.20	91.80	27.00	27.50
06-17	0.283	0.311	0.908	0.264	0.274	28.00	1609.92	26.20	27.70	26.80	28.40	28.30	31.10	90.80	26.40	27.40
06-18	0.287	0.313	0.912	0.269	0.272	30.00	7559.63	26.70	27.70	26.70	29.60	28.70	31.30	91.20	26.90	27.20
06-19	0.288	0.314	0.914	0.268	0.272	30.30	9339.54	26.90	27.60	26.30	30.20	28.80	31.40	91.40	26.80	27.20
06-20	0.289	0.313	0.907	0.267	0.271	30.50	8739.57	26.60	27.60	26.30	31.40	28.90	31.30	90.70	26.70	27.10
06-21	0.295	0.308	0.884	0.266	0.271	32.80	7839.61	26.70	27.50	26.50	33.40	29.50	30.80	88.40	26.60	27.10
06-22	0.283	0.311	0.889	0.263	0.27	26.80	1330.93	27.00	27.50	26.50	27.60	28.30	31.10	88.90	26.30	27.00
06-23	0.283	0.299	0.725	0.262	0.27	27.60	1613.92	26.40	27.50	26.50	29.00	28.30	29.90	72.50	26.20	27.00
06-24	0.283	0.313	0.697	0.261	0.27	27.00	1538.92	26.70	27.60	26.80	28.50	28.30	31.30	69.70	26.10	27.00
06-25	0.279	0.312	0.871	0.263	0.269	26.20	1258.94	26.80	27.60	26.80	27.70	27.90	31.20	87.10	26.30	26.90
06-26	0.277	0.309	0.886	0.264	0.271	25.80	1198.94	26.10	27.50	26.80	27.20	27.70	30.90	88.60	26.40	27.10
06-27	0.273	0.308	0.887	0.263	0.27	25.50	1241.94	26.30	27.40	26.40	26.70	27.30	30.80	88.70	26.30	27.00
Average:	18.577	37.330	10.763	77.821	55.736	731.258	2877.181	1803.124	1658.939	3784.961	2899.042	842.609	1962.629	510.375	4853.567	3303.770
Minimum:	0.273	0.299	0.356	0.261	0.267	0.000	-54.997	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum:	830.000	1981.000	606.600	2914.000	2175.000	128093.679	195390.358	156392.283	153792.411	299385.226	285385.917	82995.904	198090.225	60657.007	291385.621	217489.268
Median:	0.302	0.340	0.907	0.338	0.306	12.749	0.000	26.149	13.699	26.799	0.000	0.000	30.948	0.000	28.299	27.199
Standard Deviation:	101.888	220.311	64.110	359.648	290.446	9171.828	18029.622	13165.695	12589.487	25938.640	25810.229	6923.882	16082.421	4447.281	28651.014	22528.053
Population:	88.000	102.000	92.000	121.000	115.000	194.000	194.000	194.000	194.000	194.000	194.000	194.000	194.000	194.000	194.000	194.000

VOLUME OF COLLECTED WATER, PILE 7/12

DATE (YY/MM/DD)	CENTRE DRAIN (litre)	PERIMETER DRAIN (litre)	EAST LYSIMETER (litre)	WEST LYSIMETER (litre)	TOTAL
92/04/22	0.00	0.00	0.00	50.00	
92/06/24	45.00	0.00	0.00	0.00	
92/07/14	2.30	250.00	16.25	12.25	
92/08/18	3.20	136.00	9.70	12.10	
93/03/19	frozen	frozen	frozen	frozen	
93/04/28	1.50	3.00	0.00	0.00	
93/05/21	0.50	25.00	0.10	2.20	
93/07/13	7.00	44.00	10.50	9.50	
93/09/10	22.00	20.00	11.00	12.50	
93/10/01	2.00	150.00	9.00	9.00	
93/10/28	32.00	101.00	12.50	17.00	
93/11/29	frozen	frozen	frozen	frozen	
94/02/18	frozen	frozen	frozen	frozen	
94/03/30	frozen	frozen	frozen	frozen	
94/05/03	frozen?	9.00	frozen?	frozen?	
94/06/08	31.50	2.50	330.00	12.00	
94/07/12	8.00	34.00	9.00	3.00	
94/08/15	7.00	36.00	11.00	0.00	
94/09/20	7.00	30.00	12.50	5.00	
94/11/16	3.25	13.60	5.30	17.50	
TOTAL:	172.25	854.10	436.85	162.05	1625.25

APPENDIX VI

Chemical Analysis Results

List of Tables

Table VI-1 Chemical Data, Pile 17 VI-1
Table VI-2 Chemical Data, Pile 7/12 VI-4

COLLECTION DITCH

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	Pb (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Sulphate (mg/l)
87-02-04	Surface			81.0						0.140		139.2			2.8		
87-02-12	Surface			84.4						0.235		161.2			2.7		
87-02-20	Surface			84.2						0.207		157.6			2.9		
87-02-28	Surface			83.8						0.206		155.8			3.0		
87-03-08	Surface			94.2						0.230		168.6			2.8		
87-03-17	Surface			90.1						0.189		155.2			3.3		
87-03-24	Surface			3.1						0.095		4.4			3.8		
87-04-02	Surface			3.4						0.172		6.9			2.9		
87-04-09	Surface			116.6						0.123		232.4			2.7		
87-04-17	Surface			79.2						0.222		147.8			2.9		
87-04-25	Surface			102.6						0.520		305.6			2.8		
87-05-03	Surface			91.4						0.209		190.0			2.9		
87-05-11	Surface			55.6						0.160		100.6			2.9		
87-05-19	Surface			107.7						0.273		220.6			2.8		
87-05-27	Surface			116.0						0.209		229.6			2.9		
87-06-04	Surface			124.2						0.275		256.8			3.0		
87-06-12	Surface			128.2						0.241		235.0			3.0		
87-06-20	Surface			136.4						0.376		251.2			2.8		
87-06-28	Surface			70.3						0.100		268.0			3.4		
87-07-06	Surface			35.8						0.005		70.8			3.1		
87-07-15	Surface			42.4						0.030		97.6			3.2		
87-07-22	Surface			75.6						0.152		166.6			3.0		
87-07-30	Surface			59.8						0.157		128.0			3.0		
87-08-07	Surface			76.6						0.133		143.2			3.1		
87-08-15	Surface			78.0						0.127		137.6			3.0		
87-08-23	Surface			57.6						0.148		138.4			3.2		
87-08-31	Surface			45.0						0.353		88.0			3.1		
87-09-08	Surface			39.4						0.158		72.8			3.0		
87-09-16	Surface			88.2						0.317		138.0			3.0		
87-09-24	Surface			49.8						0.339		76.6			3.1		
87-10-02	Surface			100.6						0.425		185.0			3.1		
87-10-10	Surface			109.2						0.236		191.6			3.1		
87-10-18	Surface			143.2						0.262		269.0			3.1		
87-10-26	Surface			87.6						0.278		163.6			3.1		
87-11-03	Surface			84.2						0.239		169.4			2.6		
87-11-11	Surface			123.0						0.302		237.0			2.5		
87-11-19	Surface			120.4						0.244		189.0			2.4		
87-11-27	Surface			139.4						0.295		260.0			2.4		
87-12-05	Surface			127.6						0.278		216.2			2.4		
87-12-13	Surface			180.0						0.348		414.0			2.5		
87-12-22	Surface			177.0						0.227		406.8			2.4		
87-12-30	Surface			170.8						0.348		376.4			2.4		

COLLECTION DITCH

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	Pb (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Sulphate (mg/l)
88-01-06	Surface			159.2						0.227		352.0			2.8		
88-01-14	Surface			149.6						0.202		272.0			2.7		
88-01-22	Surface			38.6						0.154		76.2			2.9		
88-01-30	Surface			81.0						0.271		182.4			3.0		
88-02-07	Surface			38.4						0.251		72.6			2.8		
88-02-15	Surface			63.2						0.233		132.8			3.3		
88-02-23	Surface			108.2						0.337		267.6			3.8		
88-03-02	Surface			94.6						0.410		235.4			2.9		
88-03-10	Surface			105.0						0.362		266.8			2.7		
88-03-18	Surface			125.6						0.408		302.8			2.9		
88-03-26	Surface			15.4						0.047		55.2			2.8		
88-05-05	Surface			77.2						0.256		203.6			2.9		
88-05-13	Surface			79.8						0.326		218.2			2.9		
88-05-21	Surface			148.8						0.358		410.0			2.8		
88-05-21	Surface			128.2						0.370		368.8			2.9		
88-06-06	Surface			141.2						0.379		370.0			3.0		
88-06-14	Surface			174.0						0.373		411.4			3.0		
88-06-22	Surface			168.0						0.359		341.2			2.8		
88-06-30	Surface			39.6						0.214		99.8			3.4		
88-07-10	Surface			57.4						0.005		109.0			3.1		
88-07-18	Surface			93.0						0.005		187.2			3.2		
88-07-27	Surface			92.2						0.005		188.8			3.0		
88-08-03	Surface			124.0						0.005		240.8			3.0		
88-08-11	Surface			42.0						0.190		118.2			3.1		
88-08-18	Surface			101.6						0.256		257.6			3.0		
88-08-25	Surface			207.8						0.339		404.2			3.2		
88-09-02	Surface			133.0						0.337		344.2			3.1		
88-09-10	Surface			141.8						0.343		343.6			3.0		
88-09-18	Surface			162.4						0.441		380.0			3.0		
88-09-26	Surface			148.2						0.323		393.8			3.1		
88-10-04	Surface			128.4						0.305		374.2			3.1		
88-10-12	Surface			131.2						0.398		346.0			3.1		
88-10-20	Surface			104.0						0.179		315.0			3.1		
88-10-28	Surface			218.2						0.936		422.0			3.1		
88-11-05	Surface			181.4						0.505		409.0			2.6		

COLLECTION DITCH

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	Pb (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Sulphate (mg/l)
89-01-10	Surface			183.6						0.403		397.4			2.0		
89-01-18	Surface			175.2						0.360		371.2			2.1		
89-01-26	Surface			166.8						0.463		390.4			2.3		
89-02-03	Surface			188.2						0.553		443.4			2.1		
89-02-11	Surface			155.8						0.475		383.2			2.1		
89-02-19	Surface			147.4						0.445		379.7			2.2		
89-02-25	Surface			200.2						0.581		358.6			2.0		
89-03-05	Surface			195.1						0.510		344.7			2.2		
89-03-13	Surface			222.4						0.492		400.8			2.2		
89-03-22	Surface			30.4						0.181		143.1			2.4		
89-03-29	Surface			48.2						0.262		51.2			2.1		
89-04-06	Surface			20.5						0.220		212.0			2.4		
89-04-14	Surface			88.8						0.311		144.8			2.1		
89-04-21	Surface			56.0						0.286		70.8			2.1		
89-04-30	Surface			60.8						0.428		84.6			2.1		
89-05-08	Surface			62.7						0.400		91.5			2.2		
89-05-16	Surface			110.2						0.452		266.8			2.0		
89-05-24	Surface			117.8						0.365		267.1			2.1		
89-05-30	Surface			131.6						0.437		286.4			2.0		
89-06-05	Surface			112.4						0.473		226.2			2.1		
89-06-15	Surface			116.6						0.561		253.4			2.0		
89-06-19	Surface			88.4						0.451		207.0			2.1		
89-06-26	Surface			88.0						0.419		177.6			2.0		
89-07-03	Surface			95.4						0.040		196.0			2.0		
89-07-10	Surface			92.6						0.080		195.0			2.1		
89-07-17	Surface			113.2						0.010		212.8			2.1		
89-07-31	Surface			124.0						0.010		261.6			2.1		
90-04-17	Surface			74.0						0.200		146.0				2910	

BEFORE PLACEMENT OF COVER

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Alkalinity (mg/l)	Sulphate (mg/l)
89-07-01	Surface			320	1700						8000			2.80	22000		22970
89-08-01	Surface			430	9810						13350			2.00	45500		54285
89-09-01	Surface			420	6590						11000			3.00	40100		47500
90-04-01	Surface				10600									2.40	48500		70500
90-05-01	Surface				16900									2.40	44700		40000
90-08-01	Surface	2160			18800						6930			2.10	62000		
90-09-28	Surface				23020									2.27	80700		96330
90-10-12	Surface				18046									2.35	11800		75690
90-10-18	Surface													2.15			
90-10-23	Surface													2.12			
90-10-28	Surface													2.13			
90-11-03	Surface													2.13			
90-11-08	Surface													2.11			
90-11-13	Surface				27480									2.07	75650		80100
89-07-01	Underdrains			970	5100						12700			2.40	44000		43440
89-08-01	Underdrains			615	3550						7895			2.20	15800		21328
89-09-01	Underdrains			910	2800						8000			2.80	30500		28000
90-04-01	Underdrains				3510									2.50	16400		17000
90-05-01	Underdrains				5510									2.40	16400		12700
90-08-01	Underdrains				13767									2.10	44800		
90-09-28	Underdrains				14620						9730			2.31	67500		20440
90-10-12	Underdrains				24120						8700			2.30	13420		94272
90-10-18	Underdrains													2.24			
90-10-23	Underdrains													2.23			
90-10-28	Underdrains													2.22			
90-11-03	Underdrains													2.22			
90-11-08	Underdrains				25880									2.22	71500		70080
91-07-21	Underdrains				22860									2.19	80350		67710
91-07-25	Underdrains				22600									2.21	75950		68069
91-07-28	Underdrains				18904									2.19	77220		59489
91-08-02	Underdrains				10368									2.28	43560		34616
91-08-10	Underdrains				13122									2.20	42570		37935

Table VI-2
Chemical Data - Pile 7/12

CENTRE DRAIN

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Alkalinity (mg/l)	Sulphate (mg/l)
91-10-30	Total				19590									2.3	54450		71042
92-06-24	Total				12.7									3.1	401		428
92-06-24	Total				2										3.3	162	201
92-06-29	Total				10500									2.4	35000		5140
92-07-14	Total													2.8			
92-08-17	Total				3720										14400		14800
92-09-29	Total				5250									2.87	15800		15400
92-10-19	Total													2.94			
92-11-03	Total													3			
93-07-13	Total	89.8	98.8	2.5	5000	24.6	128	51.6	9.8	3300	496	4.1	8400	3.2			9970
93-09-10	Total	681	503	16.5	30600	19.7	1044	331	<0.01	23800	3015	4.6	35000	3.0			71440
93-10-01	Total	806	555	10.9	30844	592	589	278	<0.01		2860	5.3	29000	3.0			73854
93-11-05	Total	416	496	10.78	29840	0.28	693	<0.01	4.87		1835	5.4	25000	2.8			2184
94-06-09	Total	983	376	4.07	33600	1	707	163	<5	24700	2470	29	74700	2.9	63500	<0.4	74100
94-06-09	Soluble	940	139	3.73	26900	1	286	47.3	<5	24500	1700						73600
94-07-12	Total	633	459	2.78	73600	5.52	614	141	3.4	19500	3060	<0.5	44400	3.0	28900	<0.4	43400
94-07-12	Soluble	581	429	2.51	35800	4.48	577	122	2.1	16000	2790						
94-08-15	Total	141	164	0.46	7750	40	146	69	<1	6930	660	<0.5	34000	3.1	13200	<0.5	16300
94-08-15	Soluble	229	203	0.6	8050	<2	159	68	0.5	7115	722	<0.5	38200	3.1	14700	<0.5	
94-09-21	Total	88.5	184	0.56	5850	0.2	136	47.8	0.8	3730	544	2.1	8450	2.3	5750	<0.4	11200
94-09-21	Soluble	32.9	107	0.33	3560	0.1	71.3	31.1	0.8	1790	276						
94-11-22	Total	17.74	59	0.21	1208	6.3	36.4	12.9	4.8	96.6	102	2.3	3070	3.1		<0.5	290

PERIMETER DRAIN

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Alkalinity (mg/l)	Sulphate (mg/l)
91-10-30	Total				651									2.5	1980		2706
92-06-24	Total				2									3.3	162		201
92-07-14	Total													3.76			
92-09-29	Total				1600									3.25	4200		3880
92-10-19	Total													3.29			
92-11-03	Total													3.63			
93-05-21	Total		65.8	10.5	3690	0.3	117	51.3	18.1		753	3.9	29200	3		<1	8380
93-07-13	Total	107	98.6	2.3	5300	18.9	148	56.5	5	3800	573	3.4	9600	3.2			11490
93-10-01	Total	11.7	34.7	<0.01	726	62.1	18.7	23.2	1.8		84.3	1.06	2500	3.6			1710
92-08-17	Total				1250										3950		4300
93-09-10	Total	255	256	2.8	12600	5.5	390	139	4.9	9000	1479	3.7	20000	3.3			27100
93-11-05	Total	7.28	13.19	0.1	317	2.22	16.24	1.82	2.35		40.11	1.6	1440	2.9			708
94-05-17	Total	307	263	1.4	10147	0.72	307	59.1	3.4		1401	30	30600	3.1	17146		22200
94-06-09	Soluble	171	46.4	3.85	747	0.31	61.8	18.6	<5	1660	239						4990
94-06-09	Total	173	116	3.89	1100	1.3	67.0	26.9	<5	1850	239	18.5	9450	2.8	4070	<0.4	5850
94-07-12	Soluble	187	205	2.1	12200	5.57	204	51	2.7	5920	1070						
94-07-12	Total	221	231	2.22	28900	7.22	234	53.2	2.8	6010	2500	1.1	21000	3.0	10800	<0.4	14500
94-08-15	Soluble	58.5	61	0.37	1500	10	41.9	21	4.7	1850	195	<0.5	4880	3.2	3080	<0.5	
94-08-15	Total	53	36	0.53	1310	7	35	19	3	997	171	<0.5	4660	3.1	2910	<0.5	3450
94-09-21	Soluble	63	66.3	1.2	587	0.9	52.3	24.4	2.7	822	149						
94-09-21	Total	65	75.3	1.2	787	1	52.3	24.2	2.9	1091	196	2.4	2260	2.4	2086	<0.4	3273
94-11-22	Total	53.2	48	<0.01	558	5.8	36.4	14	5	573	88.2	8	2700	2.6	1865	<0.5	1720

WEST LYSIMETER

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Alkalinity (mg/l)	Sulphate (mg/l)
92-04-22	Total													7.36			
92-07-14	Total													6.55			
92-09-29	Total													6.21			
92-11-03	Total																
93-05-21	Total		45.3	<0.01	0.5	4.8	6.2	9.8	13		0.43	7.10	369	6.5		14.5	32
93-10-01	Total	0.1	28.3	<0.01	0.1	7.8	22	17.6	15		<0.01	3.88	280	6			59.4
93-11-05	Total	<0.01	19.31	<0.01	<0.01	3.8	7.58	2.94	18.68		0.10	3.90	330	6			65.58
94-06-09	Soluble	0.08	37.6	0.01	<0.01	2.7	12	19.6	8.0	75.9	1.03						
94-06-09	Total	0.24	41.6	0.06	1.1	2.8	12.9	22.1	9.0	76.3	1.55	2.70	660	5.9		59	229
94-07-12	Soluble	0.21	78.3	0.01	3.6	3.5	24.6	20.0	8.5	97	3.60						
94-07-12	Total	0.23	124	0.01	3.7	3.63	27.2	21.7	8.5	99.3	4.20	2.90	635	6.0		43.5	290
94-09-21	Soluble	0	60.4	<0.01	0.05	3.9	16.7	35.5	12.6	145	0.94						
94-09-21	Total	0.6	59	0.01	0.1	3.9	16.6	37.4	12.6	165	0.00	2.10	574	6.1		48	495
94-11-22	Total	1	67.3	<0.01	0.1	7.8	22	17.6	15	90	0.90	1.90	587	6.1		49.9	270

EAST LYSIMETER

Date (YY-MM-DD)	Comment	Al (mg/l)	Ca (mg/l)	Cu (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	S (mg/l)	Zn (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	pH	Acidity (mg/l)	Alkalinity (mg/l)	Sulphate (mg/l)
92-07-14	Total													5.9			
92-09-29	Total													6.16			
92-11-03	Total													6.78			
93-10-01	Total	0.19	22.8	<0.01	0.07	50.3	16.6	22.4	14.2		<0.01	2.45	680	5.8			305
93-11-05	Total	<0.01	53.4	<0.01	<0.01	4.77	35.05	56.53	25.99		<0.01	2.80	7200	5.7			256
94-06-09	Soluble	0.07	34.9	0.01	0.03	2.7	15	43	6.0	88	0.16						264
94-06-09	Total	0.45	34.9	0.06	0.33	3.2	15.8	55.9	9.0	88.6	0.17	2.20	703	5.9	124	55.7	266
94-07-12	Soluble	0.23	58.8	0.01	<0.01	4.93	32.8	62.4	8.2	124	0.40						
94-07-12	Total	0.23	75.2	0.02	<0.01	5.89	43.3	75.2	12.7	165	0.50	3.20	794	6.3	47.9	54.2	398
94-08-15	Soluble	6.2	70	0.01	202	7	35.7	82	13.5	427	27.00	1.90	2740	4.5	552	9.4	
94-08-15	Total	2	36	<0.01	<0.5	4	29	81	16	96	3.10	1.50	910	6.1	66.4	54.8	422
94-09-21	Soluble	0.1	87	0.01	0.06	5.4	33	94.6	13	254	0.03						
94-09-21	Total	0.2	110	0.2	0.1	5.4	37	95.4	13.1	266	0.10	2.30	894	6	90.1	53.8	798
94-11-22	Total	0.74	58	<0.01	0.91	7.4	29	69	13.5	122	0.36	2.00	755	6	217	47.7	366

CWQG	Drinking			1	0.3		0.05	200		5.00	250.00		6.5-8.5			500
	Aquatic	0.005-0.1	0.00006	0.002-0.004	0.3						0.03			6.5-9.0		

APPENDIX VII

Paper

Yanful, E.K., Bell, A.V. and Woyshner, M.R. 1993

“CONSTRUCTION AND MONITORING OF A
COMPOSITE SOIL COVER ON AN EXPERIMENTAL
WASTE ROCK PILE NEAR NEWCASTLE,
NEW BRUNSWICK, CANADA”

Canadian Geotech. Journal, Volume30, pp. 578-587.

Design of a composite soil cover for an experimental waste rock pile near Newcastle, New Brunswick, Canada

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The Heath Steele Waste Rock Project was initiated in 1989 under Canada's Mine Environment Neutral Drainage (MEND) Program to develop and test strategies for managing acid-generating waste rock. The multiphase project involved the identification and selection of a few waste rock piles for field evaluation at the Heath Steele mine site located at about 50 km northeast of Newcastle, New Brunswick. As part of the evaluation, a 0.25-ha acid-generating pile, pile 7/12, was relocated and reconstructed on an impermeable synthetic membrane by end dumping from the perimeter and pushing into the middle section. The pile, which contains about 14 000 t of mine waste rock, has been producing an acidic seepage characterized by high dissolved iron (3.5–13.5 g/L) and sulphate (12.7–43.4 g/L) concentrations. Following the definition of the baseline acid-generating characteristics of the pile and laboratory investigation of potential soil cover materials in the vicinity of the site, a three-layer cover design is proposed. The design calls for a 60 cm thick saturated impermeable cover sandwiched between a 30 cm thick sand base and a 30 cm thick, overlying granular layer. The principal objectives of the design are to obtain a low gas diffusion coefficient to minimize oxygen fluxes and, also, to attain a low hydraulic conductivity to reduce infiltration into the pile. Both objectives can be achieved by compacting the impermeable cover at a density of 95% of Modified Proctor or greater and a water content slightly higher than the optimum value. The design of the cover and the anticipated resulting low gaseous-oxygen fluxes are confirmed by one-dimensional diffusion modelling. The potential for the impermeable layer to remain nearly fully saturated, even under an evaporative flux, is demonstrated by flow modelling. It is noted that the assessment of the durability of the cover with respect to variable climatic conditions (drying, freezing, and thawing) is a critical component of the performance evaluation.

Key words: acid rock drainage, soil cover, capillary barrier, oxygen flux, infiltration.

Le projet Heath Steele Waste Rock a été amorcé en 1989 dans le cadre du programme Neutralisation des eaux de drainage dans l'environnement minier (NEDEM) du Canada pour développer et tester des stratégies pour la gestion des stériles de roches générateurs d'acide. Le projet multiphase a impliqué l'identification et la sélection de quelques piles de stériles rocheux pour une évaluation du site minier de Heath Steele localisé à environ 50 km au nord-est de Newcastle, Nouveau-Brunswick. Comme partie de l'évaluation, une pile de 0,25 ha de stériles générateurs d'acide, pile 7/12, a été relocalisée et reconstruite sur une membrane synthétique par déversement arrière à partir du périmètre et en poussant les stériles vers la section centrale. La pile qui contient environ 14 000 tonnes de stériles rocheux produisait une infiltration acide caractérisée par des concentrations élevées de fer (3,5–13,5 g/L) et de sulfate (12,7–43,4 g/L) en solution. À la suite de la définition des caractéristiques de génération d'acide à la base de la pile, et d'investigation en laboratoire de sols qui ont un potentiel comme matériau de couvert à proximité du site, une conception de couvert à trois couches est proposée. La conception fait appel à un couvert imperméable saturé de 60 cm d'épaisseur en sandwich entre une fondation de sable de 30 cm d'épaisseur et une couche granulaire susjacente de 30 cm d'épaisseur. Les principaux objectifs de la conception sont d'obtenir un faible coefficient de diffusion du gaz pour minimiser le flux d'oxygène et aussi pour atteindre une faible conductivité hydraulique de façon à réduire l'infiltration dans la pile. Les deux objectifs peuvent être atteints en compactant le couvert imperméable à une densité de 95% du Proctor modifié ou plus grande, et à une teneur en eau légèrement inférieure à la valeur optimale. La conception du couvert et le faible flux gazeux d'oxygène anticipé qui en résulte sont confirmés au moyen d'un modèle unidimensionnel de diffusion. Le potentiel pour la couche imperméable de demeurer presque complètement saturée, même sous un flux d'évaporation, est démontré par une modélisation d'écoulement. L'on note que l'évaluation de la durabilité du couvert dans des conditions climatiques variables (séchage, gel et dégel) est une composante critique de l'évaluation de la performance.

Mots clés : drainage de roche acide (ARD), couvert de sol, barrière capillaire, flux d'oxygène, infiltration.

[Traduit par la rédaction]

Can. Geotech. J. 30, 578–587 (1993)

Introduction

The management of waste rock produced from the mining of sulphidic base-metal ores in underground and open-pit operations poses an environmental challenge to mining com-

panies. Iron sulphide minerals (principally pyrite and pyrrhotite) contained in the rock may oxidize upon contact with oxygen and air to produce an acidic solution containing high concentrations of dissolved ferrous iron and sulphate:

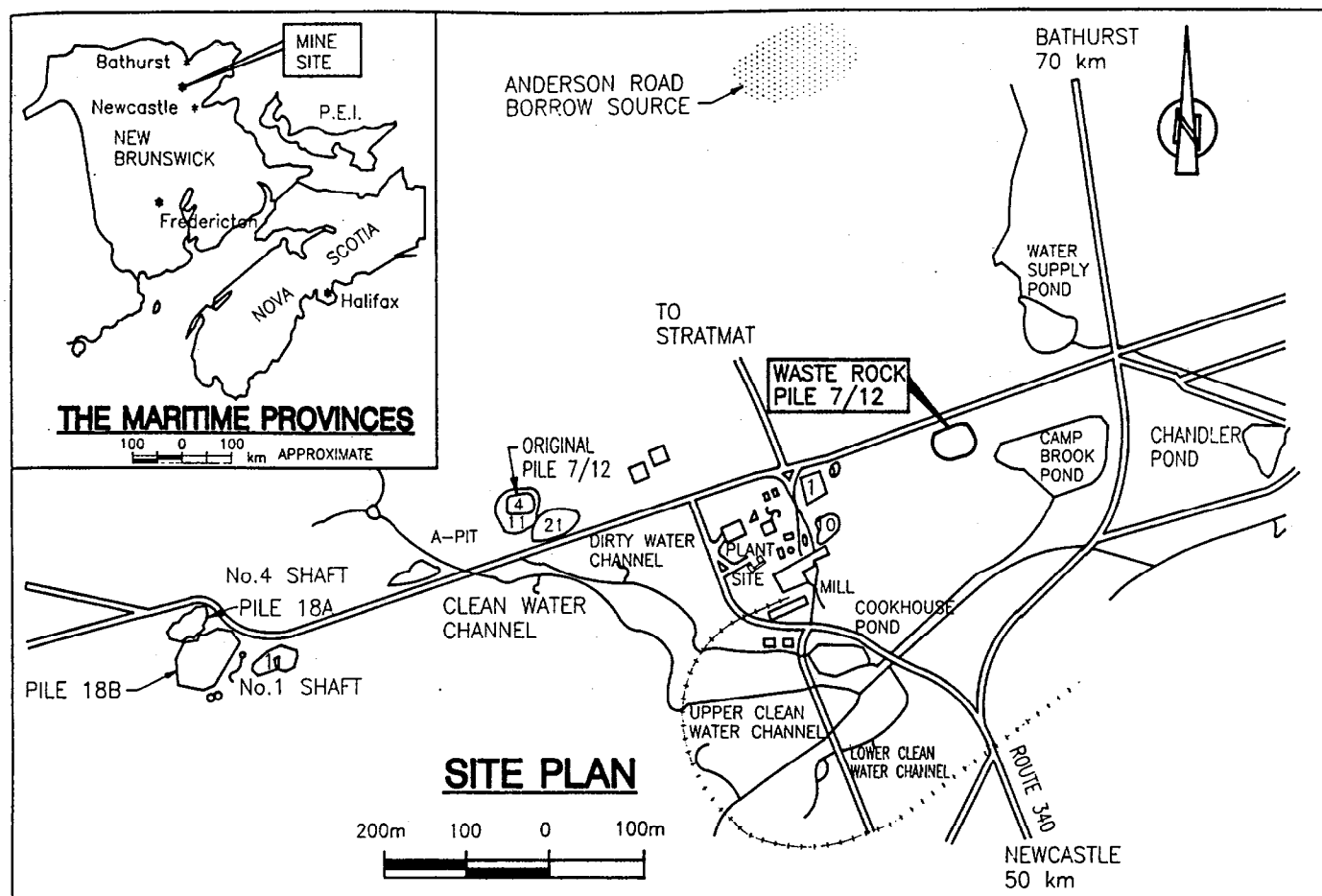
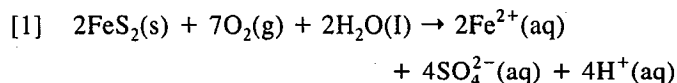


FIG. 1. Location of Heath Steele mine site and waste rock pile 7/12.



The ferrous iron (Fe^{2+}) may in turn oxidize to ferric iron (Fe^{3+}) under bacterial mediation at low pH (1.5–3.5) conditions. The ferric iron released into solution can oxidize other heavy-metal sulphides present, such as galena (PbS), sphalerite (ZnS), and chalcopyrite (CuFeS_2). The final acidic solution seeping from the rock may therefore also contain high concentrations of heavy metals. This solution is generally referred to as acid rock drainage (ARD) and is considered the single largest environmental problem facing the mining industry (Filion and Ferguson 1989).

Generally, the waste rock is left underground after mining, or in the case of open pits it is piled on the ground surface and any acidic seepage produced is collected and treated by lime neutralization. At cessation of mining operations, the pile may be decommissioned either by covering or by continuing the collection and treatment of the seepage. In recent years, waste-rock decommissioning practices have also involved moving the rock back into the pit and flooding. Flooding requires successfully maintaining a certain depth of water above the acid-generating rock in the pit. This may be difficult if the bedrock in the pit area is fractured or if excessive drought conditions occur. Sometimes the residual iron sulphide minerals in the exposed pit walls oxidize, requiring further treatment of the pit water. Most cases of waste rock covering involve the use of engineered soil

covers. The principal function of these covers is to minimize the transport of oxygen and water into the rock.

In 1989 a program was initiated by Brunswick Mining and Smelting Corporation Limited to develop and test strategies for long-term management of several acid generating waste rock piles located at the Heath Steele mine site. The program was conducted in four phases under the auspices of Mine Environment Neutral Drainage (MEND), Canada's national task force for ARD research (Filion and Ferguson 1989; Wheeland and Feasby 1991). The four phases comprised the selection of a few rock piles for field trials, definition of physicochemical characteristics of the selected piles; identification and evaluation of suitable candidate soils for a cover; and the design, installation, and monitoring of the cover on a selected pile.

This paper deals with the design of the composite soil cover installed on the selected waste rock pile, pile 7/12. Modelling results used in the design are discussed along with the geotechnical specifications for the cover materials. The physicochemical characteristics of the waste rock pile, prior to cover installation, and the history of mining and milling operations at the Heath Steele mine are briefly discussed. The construction, instrumentation, and monitoring of the cover are described in Yanful et al. (1993).

Site location and history

The Heath Steele mine site is located approximately 50 km northwest of Newcastle, New Brunswick, and about 60 km

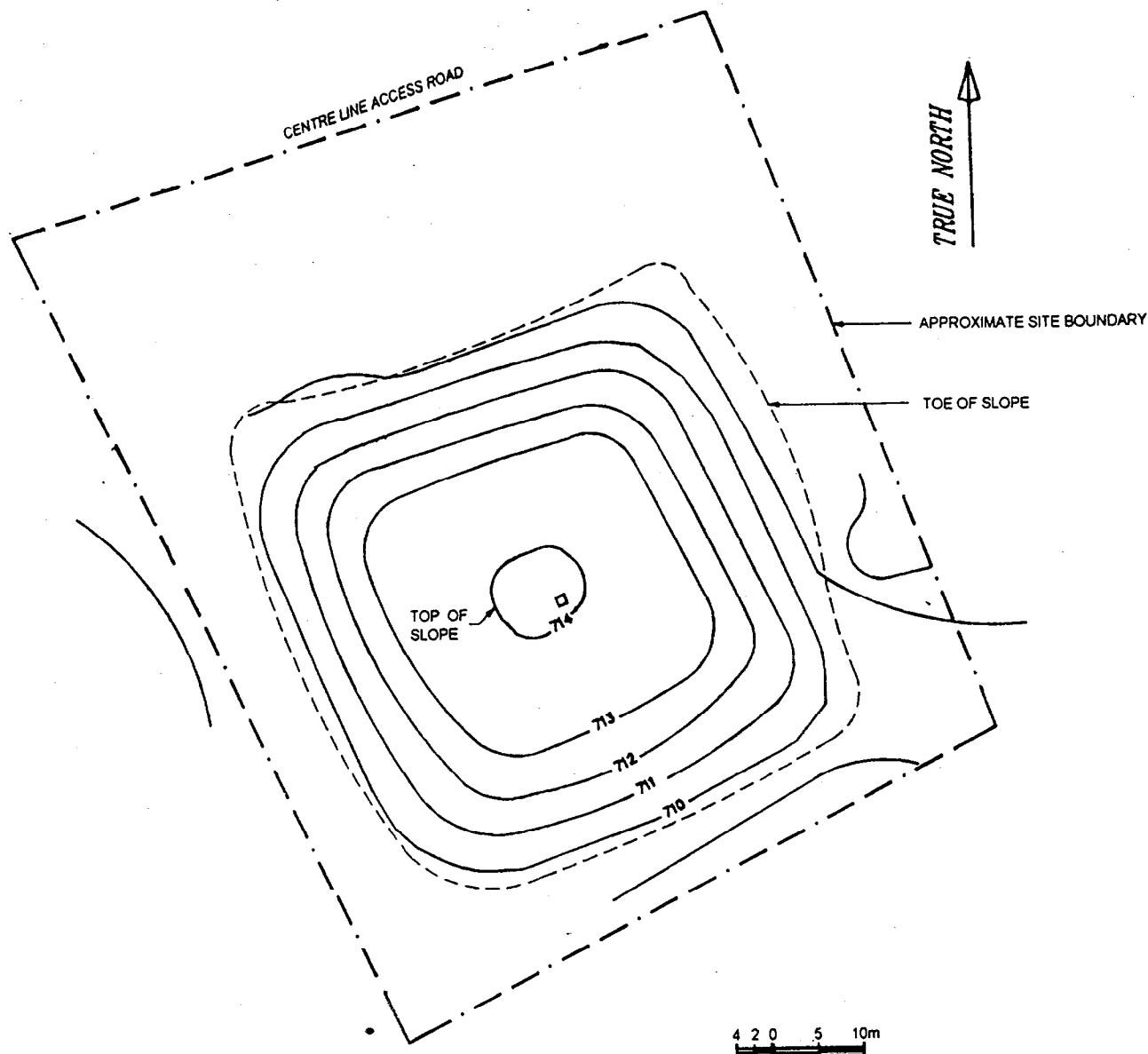


FIG. 2. Configuration of pile 7/12. Contours are in metres.

southwest of Bathurst, within the drainage basin of the Northwest Mirimichi River (Fig. 1). Massive sulphide ore deposits at the site were discovered in 1953. Mine development commenced in 1955 and ore beneficiation in 1957. Operations were suspended twice between 1958 and 1984 as a result of low base-metal prices and metallurgical problems encountered in the processing of oxidized portions of the ore. During suspension of production in May 1983, milling was continued with a modification of the concentrator to process silver-gold gossan ore that had been stockpiled on site for over 20 years. Processing of the gossan ore continued until October 1984. Following a lengthy shut-down, operations resumed in September 1989. Surface water and mine drainage from the site are collected by means of a comprehensive site-drainage collection system and pumped either to the mill for recycling or to the tailings pond for treatment.

In total, some 750 000 t of potentially acid-generating waste rock and reject ore are currently stockpiled in more than 20 piles at the site. The total projected waste-rock

TABLE 1. Physicochemical characteristics of relocated waste-rock pile 7/12

Surface area	2100 m ²
Average depth	2.9 m
Maximum depth	5.0 m
Estimated volume	6200 m ³
Estimated tonnage ^a	14 700 t
Sulphide mineralogy	
Pyrite	7-10%
FeS	5-7%
Pyrrhotite	<1%
Other sulphides (galena, sphalerite, etc.)	<1%
Total sulphur	5%
Theoretical acid production (as CaCO ₃)	210.7 kg/t
Acid consumption (as CaCO ₃)	0.4 kg/t

^aBased on a rock density of 2.35 t/m³.

inventory at closure in 1994 (including waste rock from active operations) is 2.3 Mt.

TABLE 2. Summary of water-quality data for pile 7/12 from the period July 1989 – October 1990

	Surface runoff	Underdrains
pH	2.0–3.0	2.1–2.8
Acidity (as CaCO ₃) (mg/L)	22 000 – 67 850	15 800 – 73 250
Sulphate (mg/L)	22 970 – 70 500	12 700 – 43 440
Dissolved iron (mg/L)	3600 – 18 800	3510 – 13 767

Waste-rock pile 7/12

Pile 7/12 was one of the four acid-generating waste rock piles at Heath Steele mine selected for monitoring and evaluation of remedial measures. It is located approximately 1 km from the Heath Steele mill complex off the main haul road (Fig. 1). The pile was moved to its present location and reconstructed in June 1989 as part of an ongoing test program to evaluate soil covers. It was placed on a prepared sand base, underlain by an impermeable membrane, by truck end dumping from the perimeter and pushing into the middle section with a loader. Placement on the impermeable membrane would permit the collection of leachate at the base of the pile before and after placement of the soil cover. Reconstruction included recontouring the pile to a maximum slope of approximately 3:1 (H:V). It was also isolated from the influence of any neighbouring topographical features. The reconstruction resulted in a more uniform pile configuration that was likely to minimize any shape-induced effects on the monitoring results and also facilitate the placement of monitoring instrumentation. A perimeter ditch was also constructed to allow for separate collection of surface runoff. The pile configuration prior to installation of the cover is presented in Fig. 2.

The relocated pile contains approximately 14 000 t of pyritic waste rock with maximum depth of 5 m. The predominant constituent sulphide mineral is pyrite (FeS₂), and total sulphur content averages about 5%. The physico-chemical characteristics of the pile are presented in Table 1. The pile was instrumented with seven sets of thermocouples and six sets of pore-gas samplers. It is the only pile at the mine for which a water and contaminant balance can be determined and was therefore selected for cover placement and monitoring.

Although pile 7/12 has a maximum height of only 5 m, pre-cover temperature and gaseous oxygen data indicated behaviour similar to large waste rock dumps (of average height of 20 m) at the Rum Jungle site in Australia (Harries and Ritchie 1981, 1985). For instance, oxygen concentrations within the pile were found to be high enough (up to 19%) to allow oxidation to occur. Elevated temperatures tended to occur at locations where low oxygen concentrations were observed, confirming the exothermic nature of the oxidation process. In addition, thermal convection was found to be an important mechanism for oxygen transport into the pile through the base.

Waste-rock oxidation and cover requirements

Pile 7/12, like the other acid-generating waste-rock piles at Heath Steele mine, has already started oxidizing and presumably contains a large volume of stored acidity. Water quality of underdrain flows reported for the period April–October 1990 showed pH values in the range of 2.1–2.5, sulphate levels of 17 000 – 33 000 mg/L, and dissolved-

iron levels of 3000 – 17 000 mg/L. Acidity, which is a measure of the total concentration of dissolved species capable of consuming alkaline materials, ranged from 16 000 to 73 000 mg/L. Surface runoff was also characterized by low pH and high acidity, sulphate, and iron (Table 2). These chemical characteristics are definitely indicative of acidic conditions. The mineralogical data (Table 1) also indicate that there is a substantial amount of unoxidized sulphide minerals left in the pile. Therefore, the two key aspects of an effective cover system are the control or mitigation of water infiltration and oxygen ingress into the pile. High infiltration rates would flush out large volumes of stored acid, resulting in high treatment costs. Residual iron sulphide minerals left in the pile will oxidize if the pile is exposed to air and moisture. Placement of an effective soil cover will decrease both infiltration and oxygen flux into the pile. Although the cover could decrease further oxidation to an insignificant level, release of stored acidity would continue, probably at a reduced rate, for a few years.

For the cover to be effective, it should have a low hydraulic conductivity and a high degree of water saturation. The high saturation results in a low oxygen diffusion coefficient which, in turn, leads to a low oxygen flux, since the flux F is proportional to the effective diffusion coefficient D_e according to Fick's first law:

$$[2] \quad F = -D_e \frac{\delta C}{\delta z}$$

where C is the gaseous oxygen concentration in the pores, and z is the distance in the direction of diffusion.

The cover will remain effective as long as it retains the properties of low hydraulic conductivity and high saturation. In adverse climatic conditions such as drying, freezing and thawing, these requirements may not be met in a single-layer cover. Moisture losses by evaporation and drainage will lead to desaturation and, possibly, cracking. Covers constructed from soils with high plasticities may develop shrinkage cracks upon freezing (Chamberlain and Gow 1979). The integrity of such covers could also be adversely affected by differential settlement of the underlying waste rock. Differential settlement may not be a major problem in pile 7/12 because of its small size. However, other aspects of the performance evaluation of the cover (such as the effects of freezing and thawing and reductions in temperature following cover placement) would still be applicable to other waste-rock piles. Vick (1983) noted that mill tailings, because of their low cohesion, could tolerate up to 1 m of settlement without fracturing. This would seem to suggest that covers constructed from soils with low cohesion such as silts would undergo less cracking as a result of differential settlement in the underlying waste.

In mill tailings where the grain-size distribution is finer than in waste rock, the water table can occur close to the

ground surface and could result in a substantial portion of a cover being saturated by capillarity. In a waste-rock pile, the large pores would preclude this possibility; therefore, maintenance of high saturation in the cover becomes a major design and construction challenge.

Another important factor that has to be considered is the upward transfer of heat generated in the pile as a result of sulphide oxidation. High temperatures (up to 56°C) have been observed in waste-rock piles in Australia (Harries and Ritchie 1981). Much higher temperatures (in excess of 80°C) have been reported for dumps of low-grade copper in Bulgaria (Groudev et al. 1978) and in the United States (Beck 1967). Temperature monitoring in Heath Steele pile 7/12, prior to the placement of the cover, indicated values up to 48°C within the pile. These elevated temperatures can be attributed to the heat released by sulphide oxidation reactions within the piles. The presence of an effective oxygen barrier such as a cover on the pile may curtail sulphide oxidation and heat production. On the other hand, if the cover becomes ineffective as a result of desaturation or cracking, heat released from oxidation may be available for upward transfer to the overlying cover and lead to further deterioration.

These foregoing requirements put severe constraints on the availability of suitable candidate cover materials. It would seem that the most desirable material for a waste-rock pile cover will be a silty soil with a low clay content. An important design consideration for such soils will be the potential for frost heaving. One approach will be to place the cover below the zone of frost penetration and overlay it with a coarse-grained soil layer. The depth of frost penetration can reach 2 m in parts of eastern Canada. In New Brunswick, the expected frost penetration is about 1.2 m (Crawford 1968). In most waste rock rehabilitation projects, placement of the entire cover below the depth of frost penetration will be economically unacceptable, since it will require a fairly thick (of the order of 2 m) and therefore expensive cover system. Therefore, a field pilot study such as described in this paper provides a good opportunity to assess the effects of freezing and thawing on the durability of a soil cover, at least for the scale under consideration.

Design of composite soil cover

Moisture drainage characteristics

As part of the Heath Steele Waste Rock Project, several soil-cover design scenarios were investigated. The design philosophy was based on the concept of the capillary barrier. In a capillary barrier, a coarse-grained soil layer underlying a fine-grained layer is relied upon to reduce moisture loss in the latter by drainage. The coarse layer has a higher air-entry pressure ψ_a and is the first to start draining as the pressure head in the system becomes negative. The air-entry pressure is the pressure required to initiate drainage, and any soil initially saturated will not drain unless the applied suction exceeds ψ_a (Rasmuson and Eriksson 1986; Nicholson et al. 1989). Figure 3 shows moisture drainage curves for a till and a sand obtained from the Heath Steele mine site used in the design of the cover. The curve for the sand was obtained from laboratory measurements. Attempts to obtain a reliable drainage curve for the till were unsuccessful because of consolidation of the sample during testing. The curve for the till was therefore derived from the literature (Gillham 1984; Nicholson et al. 1989) and by estimating

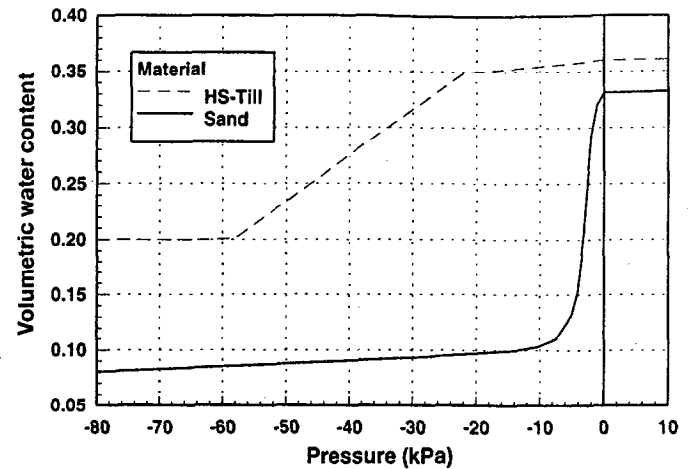


FIG. 3. Moisture drainage characteristics of Heath Steele till (HS-Till) and sand.

the air-entry value from data presented by Lambe and Whitman (1969).

In a fully saturated cover system consisting of the Heath Steele till underlain by sand, the sand will begin to drain as the suction exceeds -10 cm. As more suction is applied the sand will continue to drain until it attains its residual water content θ_r of about 10%. As shown, this will occur at a pressure head close to -50 cm. Since ψ_a of the till is higher than -50 cm, it will remain saturated at this pressure head. The thickness of the till, H_i , that will remain saturated in this simple two-layer cover system, ignoring evaporation for the time being, can be estimated as follows:

$$[3] \quad H_i = \theta_r - \psi_a$$

To reduce evaporation from the till, it may be overlain by a coarse-grained layer. Following rainfall and considerable infiltration, the rate of moisture loss by evaporation is initially high but decreases with time. Work done by Wilson (1990) and ongoing laboratory measurements at the Noranda Technology Centre confirmed this phenomenon. Unpublished data obtained from another site with a similar three-layer cover system by Noranda Technology Centre personnel have indicated suction values in the range of 8 m of water (78.5 kPa) in an upper sand layer. Laboratory measurements at lower evaporation rates gave much lower suctions, typically 3 m of water (29 kPa). These suctions are higher than that of the upper coarse layer at residual saturation. Wilson (1990) made empirical calculations to show that, at suctions exceeding 10 kPa the unsaturated hydraulic conductivity of a sandy soil is lower than 1×10^{-8} cm/s. The low hydraulic conductivity of the sand, and the fact that that of the compacted underlying till is also low will result in a low net flux of water from the till.

Figure 4 depicts the results of saturated-unsaturated flow modelling of the three-layer cover design proposed for pile 7/12. The underlying and overlying sands were each assigned a thickness of 30 cm, whereas a thickness of 60 cm was used for the till. An evaporative flux function consisting of a maximum of about 5 mm/day, which dropped gradually to almost zero over a period of 60 days (Fig. 5), was stipulated for the upper sand surface. The evaporation function was obtained from laboratory column measurements. As shown in Fig. 4, although very high suctions are developed in the upper sand (up to 30 m of water), the till layer

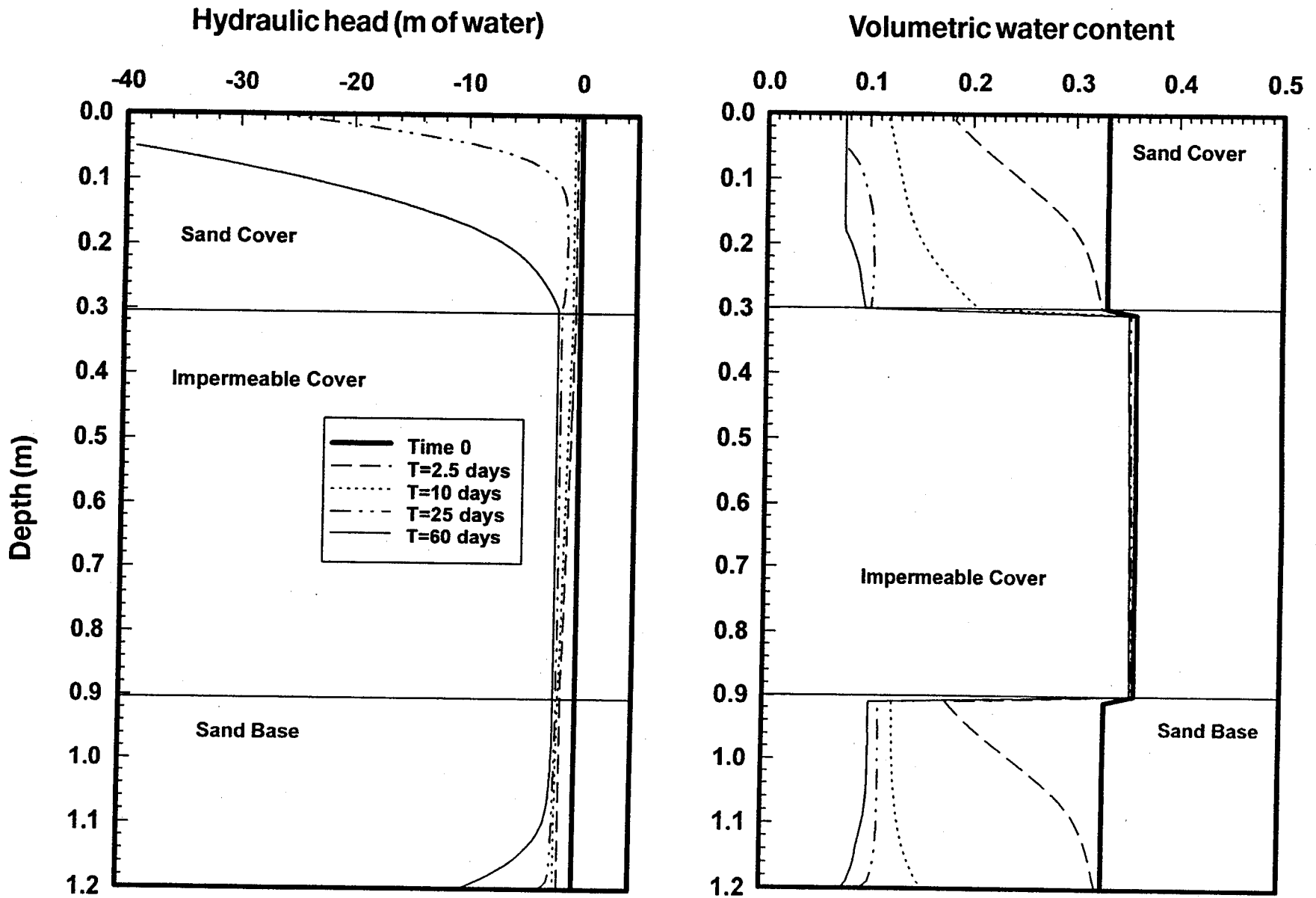


FIG. 4. Modelled hydraulic heads and water contents in composite soil cover.

remains nearly fully saturated, with only a marginal decrease in the water content. The modelling assumes that during the 60-day period no precipitation would occur to replenish the cover (Fig. 5). For the Heath Steele mine site area, where the average annual precipitation is about 1100 mm of which 750 mm is rainfall, 60 days is a reasonable maximum period without precipitation.

In addition to being an evaporation barrier, the upper sand will also promote replenishment of moisture to the till. During infiltration, the sand provides storage of water and reduces runoff, thus allowing more water to reach the till.

Prediction of oxygen flux

Continual saturation of the till will result in a low oxygen flux because the diffusion coefficient of gaseous oxygen through the till is low. The effective diffusion coefficient of oxygen determined in the laboratory on till HS-C at varying degrees of water saturation from 75 to 92% was typically $9 \times 10^{-9} \text{ m}^2/\text{s}$. Diffusion coefficients for sand HS-D were higher and ranged from 2.2×10^{-6} to $1.2 \times 10^{-5} \text{ m}^2/\text{s}$ at water saturations of 50 and 0.6%, respectively.

Predicted oxygen fluxes in the three-layer cover system using different diffusion coefficients of the till are plotted against thickness in Fig. 6. A diffusion coefficient of $1 \times 10^{-5} \text{ m}^2/\text{s}$ was assigned to the sand layers to reflect conditions at residual water saturation. The plot indicates that at a diffusion coefficient of $1 \times 10^{-7} \text{ m}^2/\text{s}$, a till layer with a thickness of less than 60 cm is required to reduce the flux to a minimum value. As expected, the flux is lower and a much smaller thickness is required when the diffusion coefficient is $1 \times 10^{-8} \text{ m}^2/\text{s}$. The key to the design of an effective cover, therefore, is to specify that it be placed under maximum water saturation conditions in the field without compromising on its capacity to withstand high shear forces. This can be achieved by placing the cover at a water content slightly above the optimum compaction value. As an approximation, the shear strength c_u (in kPa) of the compacted till can be predicted from the following relationship (Leroueil et al. 1992):

$$[4] \quad c_u = 140 \exp \left[-5.8 \frac{(w - w_{\text{opt}})}{I_p} \right]$$

where w_{opt} is the optimum water content, w the moulding water content, and I_p is the plasticity index of the till.

Design specifications

On the basis of the results of the computer modelling presented above, the design of the cover for the pile called for a 60 cm thick saturated till layer sandwiched between two sand layers, each of a thickness of 30 cm. The predicted oxygen concentrations in the composite cover are presented in Fig. 7 along with the profile for a single cover. As shown by the plots, oxygen penetration into the cover is effectively contained in the till layer because of its lower diffusion coefficient. A deeper oxygen profile is obtained in the single cover because of the higher diffusion coefficient. The depth of oxygen penetration is not as important as the flux in assessing cover effectiveness.

To be effective as an oxygen barrier, the till layer has to be placed at conditions as close to full saturation as practicable. A secondary requirement is that the till also be an effective water barrier to reduce infiltration into the waste rock pile. The hydraulic conductivity of a clay soil com-

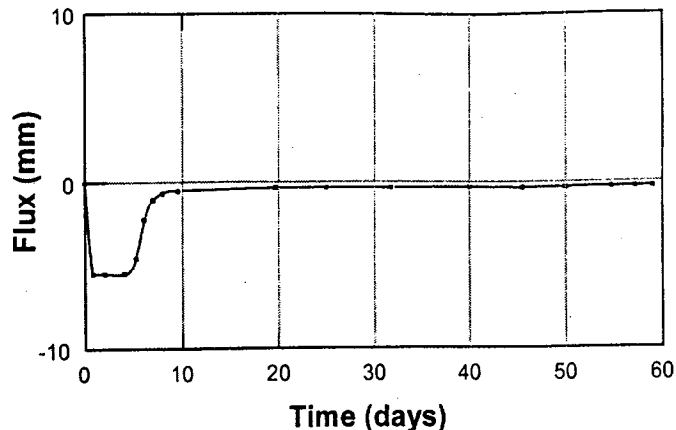


FIG. 5. Evaporation function used in flow modelling.

acted at water contents higher than the optimum value would be low, provided a good placement protocol (for example, destruction of soil clods and adequate interlift bonding; Elsbury et al. 1990) is followed. It was therefore specified in the design that the till be moulded at a field water content of 2–3% higher than its optimum water content and compacted at a density of about 95% of the maximum Modified Proctor compaction. It can be shown from moisture–density relations that this compaction specification results in a degree of saturation close to 95% and satisfies the first requirement noted above. The high saturation would also lead to low oxygen fluxes across the cover. The geotechnical specifications for the three-layer cover system are presented in Table 3. The sand base refers to the bottom sand layer required to be placed directly above the prepared surface of the waste rock pile and would function as a capillary barrier minimizing moisture drainage from an overlying finer material. The fine-grained layer (compacted till), referred to as the impermeable cover, was required to function both as an oxygen and water barrier, while the overlying granular cover would reduce evaporation. From [4] and the preconstruction geotechnical properties obtained on the soils, a shear strength in the range of 7–13 kPa was predicted for the impermeable cover at the specified placement water content. This shear strength is higher than the overburden stresses expected from the granular cover. The pile is located in an isolated area where vehicular traffic on the cover is expected to be minimal; thus, the shear strength of the till would be adequate.

The capillary-barrier concept used in the three-layer cover design has been evaluated in a series of detailed laboratory investigations at the Noranda Technology Centre. Results have shown that the three-layer cover system effectively reduces moisture and oxygen fluxes. Earlier work involving fundamental research on the hydraulic behaviour and gaseous oxygen diffusion were conducted in collaboration with the University of Waterloo. Numerical modelling was later conducted that confirmed the laboratory observations (Akindunni et al. 1991; Nicholson et al. 1991). A field evaluation of the design was initiated in September 1990 in a test program at the Waite Amulet tailings site (Yanful and St-Arnaud 1991). Results obtained to date are in agreement with the laboratory observations and model predictions and do indicate 90–98% reduction in acid production (Yanful 1993). The Heath Steele Waste Rock Project provides a unique

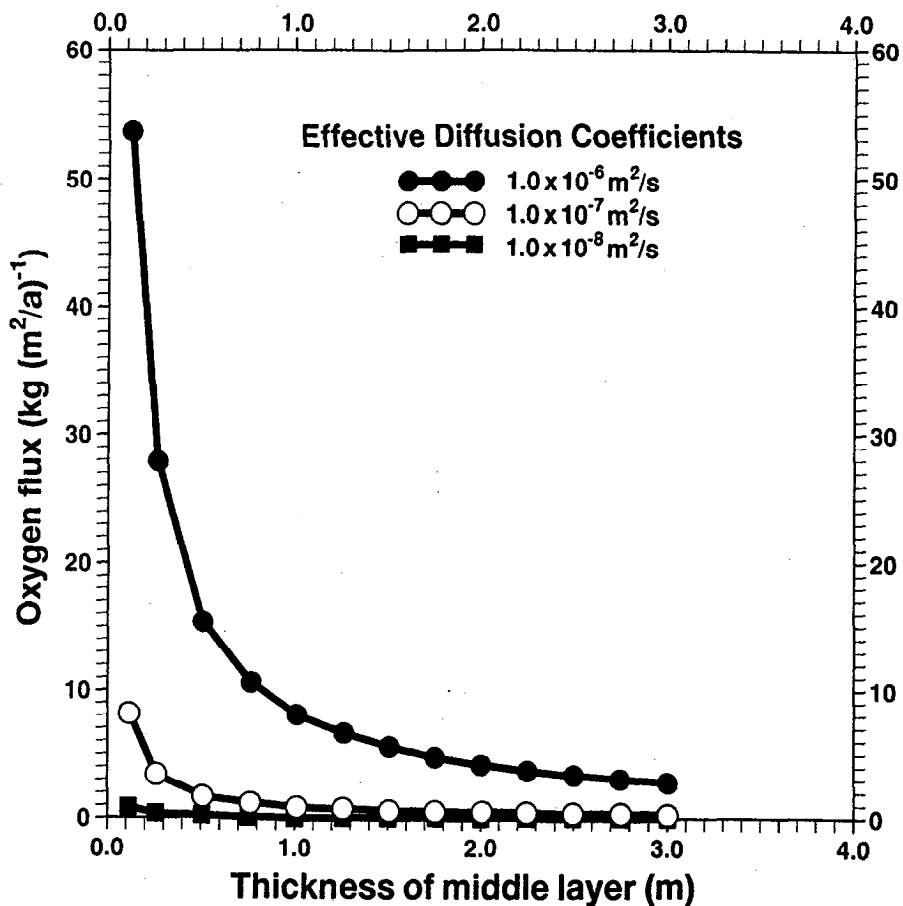


FIG. 6. Predicted oxygen flux vs. thickness of compacted till layer as a function of oxygen diffusion coefficient.

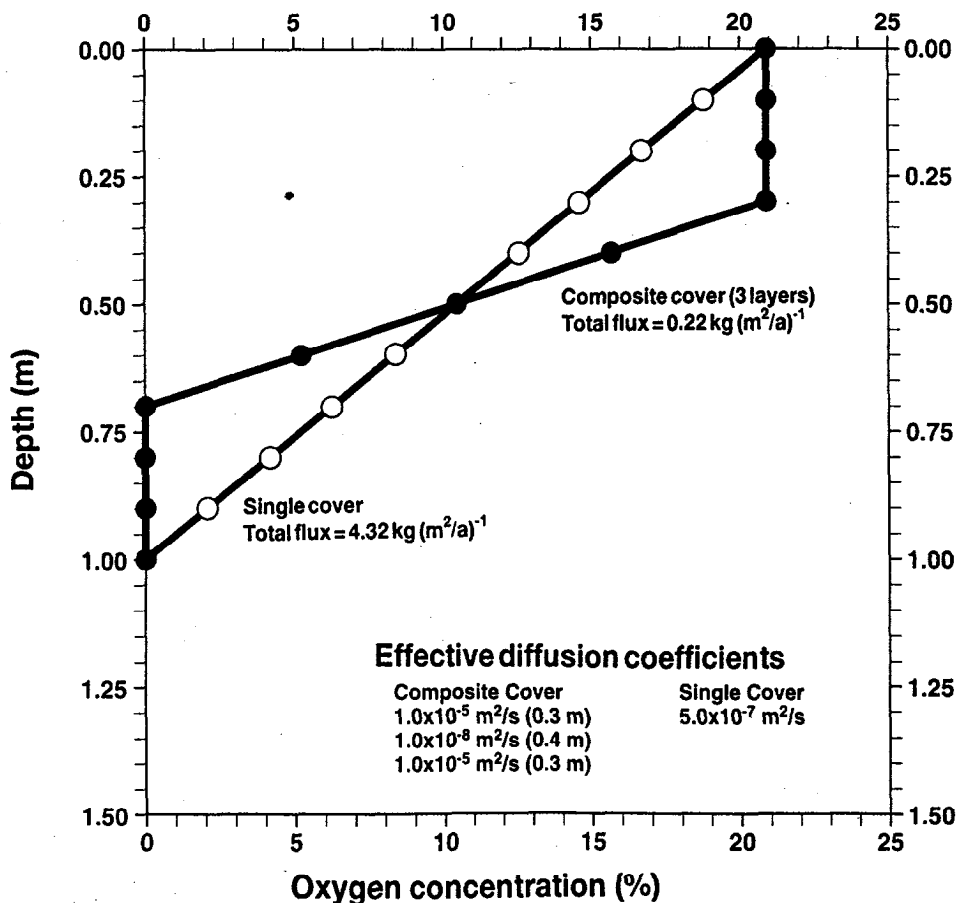


FIG. 7. Predicted depth of oxygen penetration in a composite soil cover compared with the penetration in a single cover.

TABLE 3. Specifications for cover materials

Layer	Specifications
Sand base	Non-acid-generating, well-graded, coarse-grained material meeting the following requirements: 60% ranging between 0.5 and 4.0 mm particle diameter D_{10} ranging between 0.35 and 0.40 mm compaction to 92% of maximum Modified Proctor density in 15-cm thick lifts to a finished thickness of 30 cm
Impermeable cover	Non-acid-generating glacial till meeting the following requirements: (i) Percent finer than 0.075 mm greater than 40% (dry wt). (ii) Maximum particle size of 30 mm. (iii) Percent finer than 0.002 mm greater than 10% (dry wt). (iv) D_{10} ranging between 0.001 and 0.003 mm. (v) Moulding moisture content of -2 to 4% of optimum moisture content. (vi) Compaction to at least 95% of maximum Modified Proctor density in 20-cm thick lifts to a finished thickness of 60 cm. (vii) Liquid limit greater than 30% and plasticity index greater than 15%. (viii) Hydraulic conductivity of 1×10^{-7} cm/s or less.
Granular cover	Non-acid-generating, well-graded pit run sand and gravel or equivalent crushed rock meeting the following requirements: (i) Percent finer than 0.075 mm less than 8% (dry wt). (ii) Maximum particle size of 50 mm. (iii) Compaction to 92% maximum Modified Proctor density in 15-cm thick lifts to a finished thickness of 30 cm

opportunity to evaluate the design concept on an acid-generating waste rock pile in a Canadian climate.

Summary

The development of strategies for managing acid generation in waste rock produced from the mining of base-metal ores is receiving attention in the MEND program. As part of the program, several waste-rock piles located at Heath Steele mines, near Newcastle, New Brunswick, were selected for baseline physicochemical characterization. An engineered soil cover was subsequently proposed for one of the acid-generating rock piles, pile 7/12. The objective was to design a cover that was effective in reducing gaseous oxygen flux and water infiltration into the underlying pile. The final design was a three-layer cover system consisting of a 60 cm thick saturated fine-grained soil layer sandwiched between two 30 cm thick, coarse-grained soil layers. The coarse layers serve as capillary barriers to minimize moisture losses in the fine layer due to evaporation and drainage. Modelling of gaseous oxygen transport, using laboratory-measured diffusion coefficients, suggests flux through such a cover would be low because of potentially high water saturation of the fine layer. The potential for the fine layer to remain nearly fully saturated, even under an evaporative flux, is confirmed by flow modelling. The requirements of high water saturation and low hydraulic conductivity for the fine layer can both be achieved by placing and compacting it at a water content slightly higher than the optimum value and about 95% of the maximum Modified Proctor density.

The three-layer cover system has been extensively evaluated in laboratory, modelling, and field studies involving acid-generating mill tailings. The results of these evaluations all indicate that the system is effective in reducing acid generation by at least 90%. The Heath Steele Waste Rock Project provides an opportunity to assess the performance of the cover for an acid-generating waste-rock pile.

Although differential settlements in the 5 m high pile could be much smaller than those associated with large piles (of several metres high), other aspects of the performance evaluation of the cover (such as the effects of freezing and thawing and reductions in temperature resulting from cover placement) would be applicable to other piles.

Acknowledgements

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APPENDIX VIII

Soil Laboratory Test Results



PARTICLE SIZE DISTRIBUTION

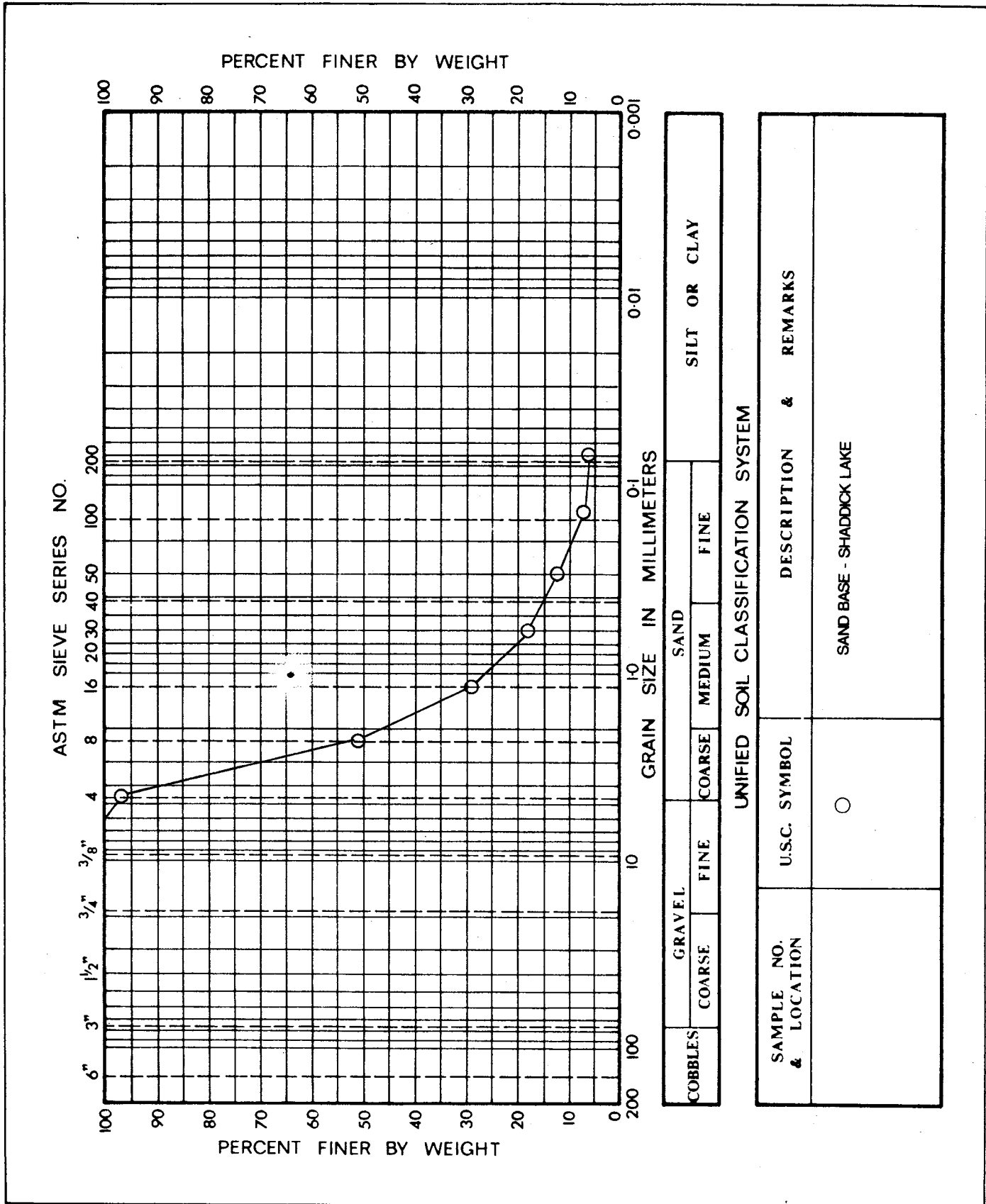
PROJECT NO. F91-057

FIG. NO. II-1

PROJECT PHASE IV ACID WASTE ROCK STUDY - COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE JULY 1991





PARTICLE SIZE DISTRIBUTION

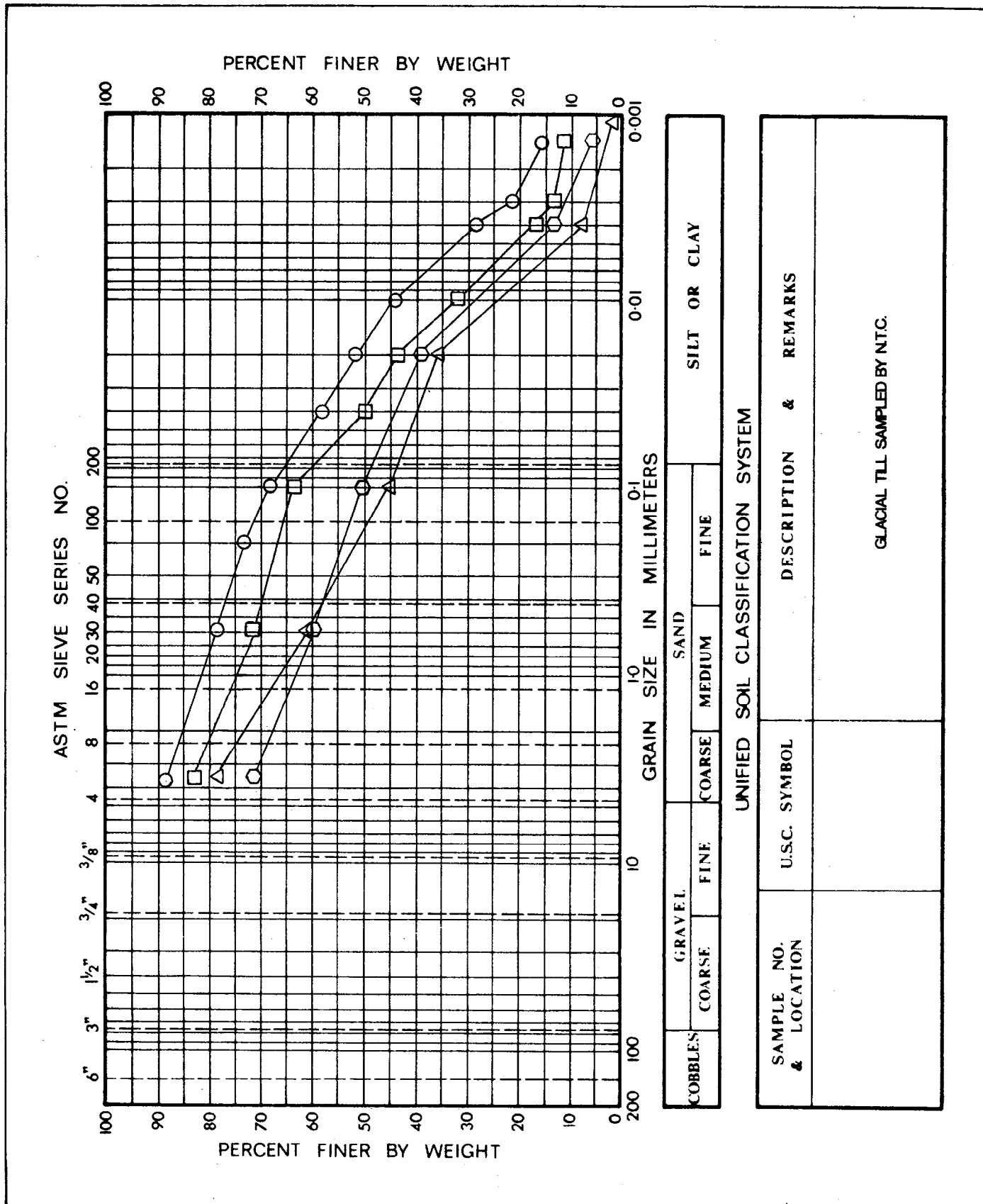
PROJECT NO. F91-057

FIG. NO. II-2

PROJECT PHASE IV ACID WASTE ROCK STUDY - COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE _____





PARTICLE SIZE DISTRIBUTION

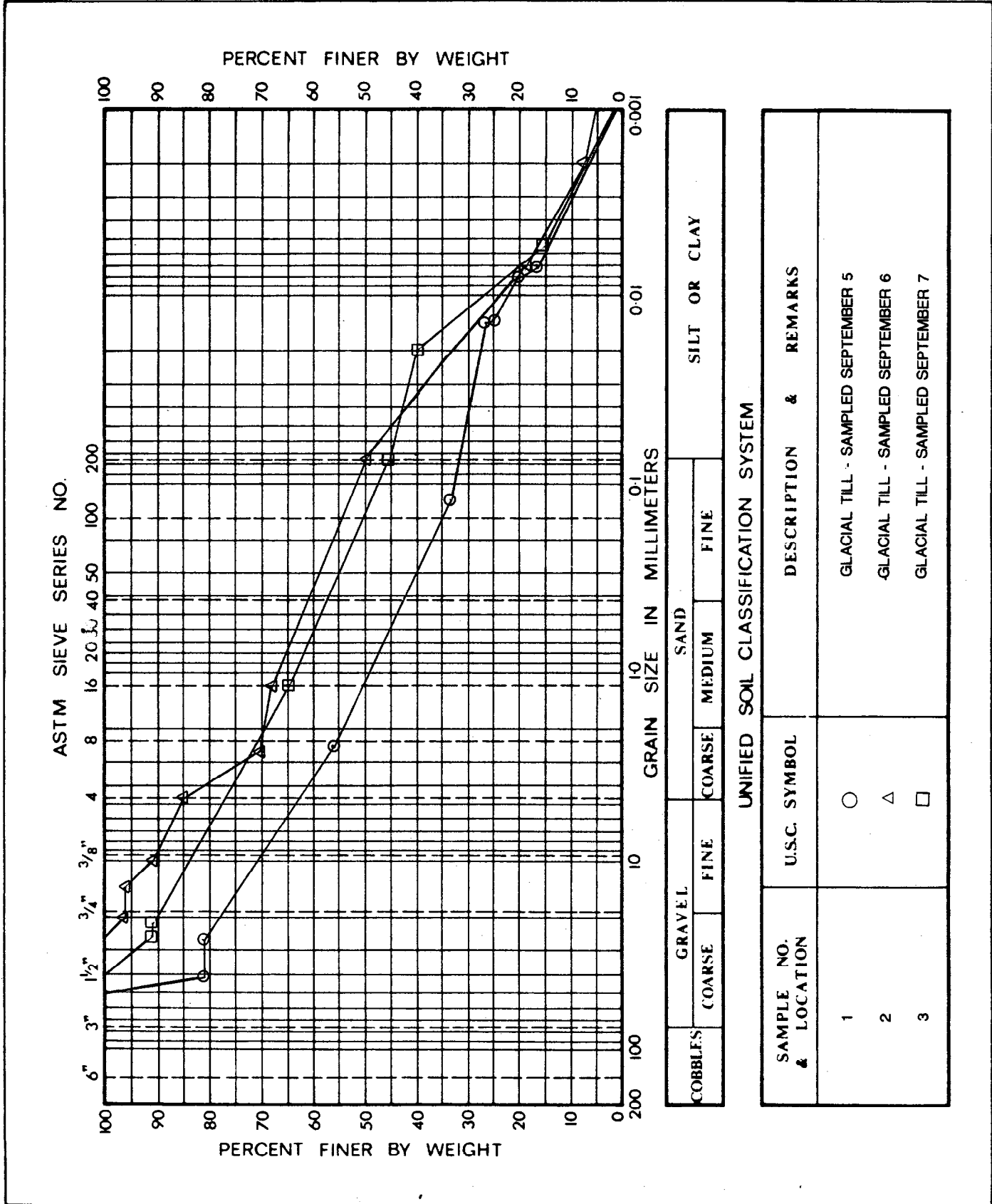
PROJECT NO. F91-057

FIG. NO. II-3

PROJECT PHASE IV ACID WASTE ROCK STUDY - COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE DECEMBER, 1991





PARTICLE SIZE DISTRIBUTION

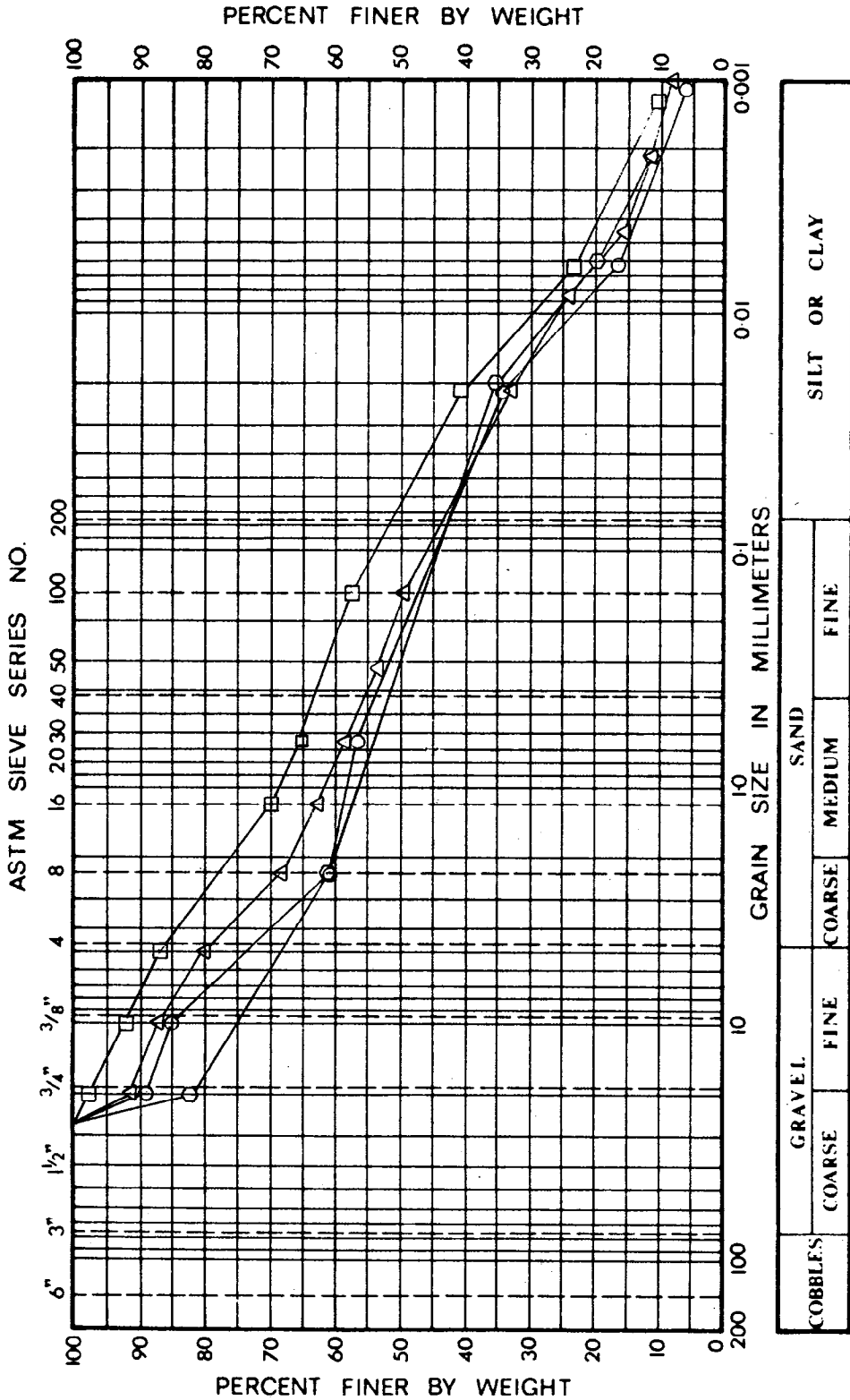
PROJECT NO. F91-057

FIG. NO. II-4

PROJECT PHASE IV ACID WASTE ROCK STUDY -COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE DECEMBER, 1991



UNIFIED SOIL CLASSIFICATION SYSTEM

SAMPLE NO. & LOCATION	U.S.C. SYMBOL	DESCRIPTION & REMARKS
4	○	GLACIAL TILL - SAMPLED SEPTEMBER 8
5	△	GLACIAL TILL - SAMPLED SEPTEMBER 9
6	□	GLACIAL TILL - SAMPLED SEPTEMBER 12
7	◑	GLACIAL TILL - SAMPLED SEPTEMBER 13





MOISTURE DENSITY RELATIONS

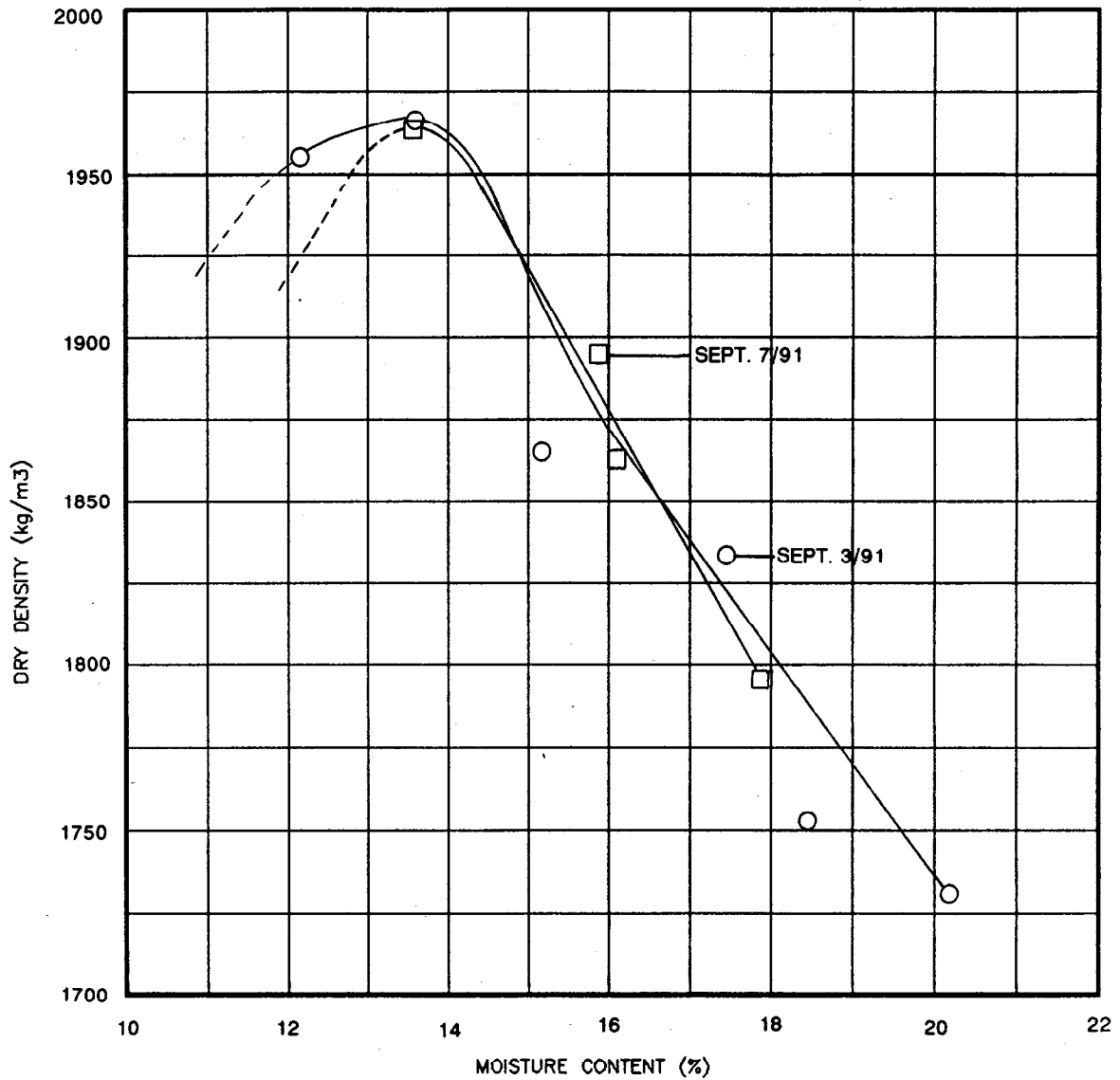
PROJECT NO. F91-057

FIG. NO. II-5

PROJECT PHASE IV ACID WASTE ROCK STUDY - COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE SEPTEMBER 1991



SAMPLE DESCRIPTION	<u>GLACIAL TILL</u>
TEST	<u>ASTM D 1557</u>
γ_d MAX	<u>1965 kg/m³</u>
OPT. w.	<u>13.5%</u>



PARTICLE SIZE DISTRIBUTION

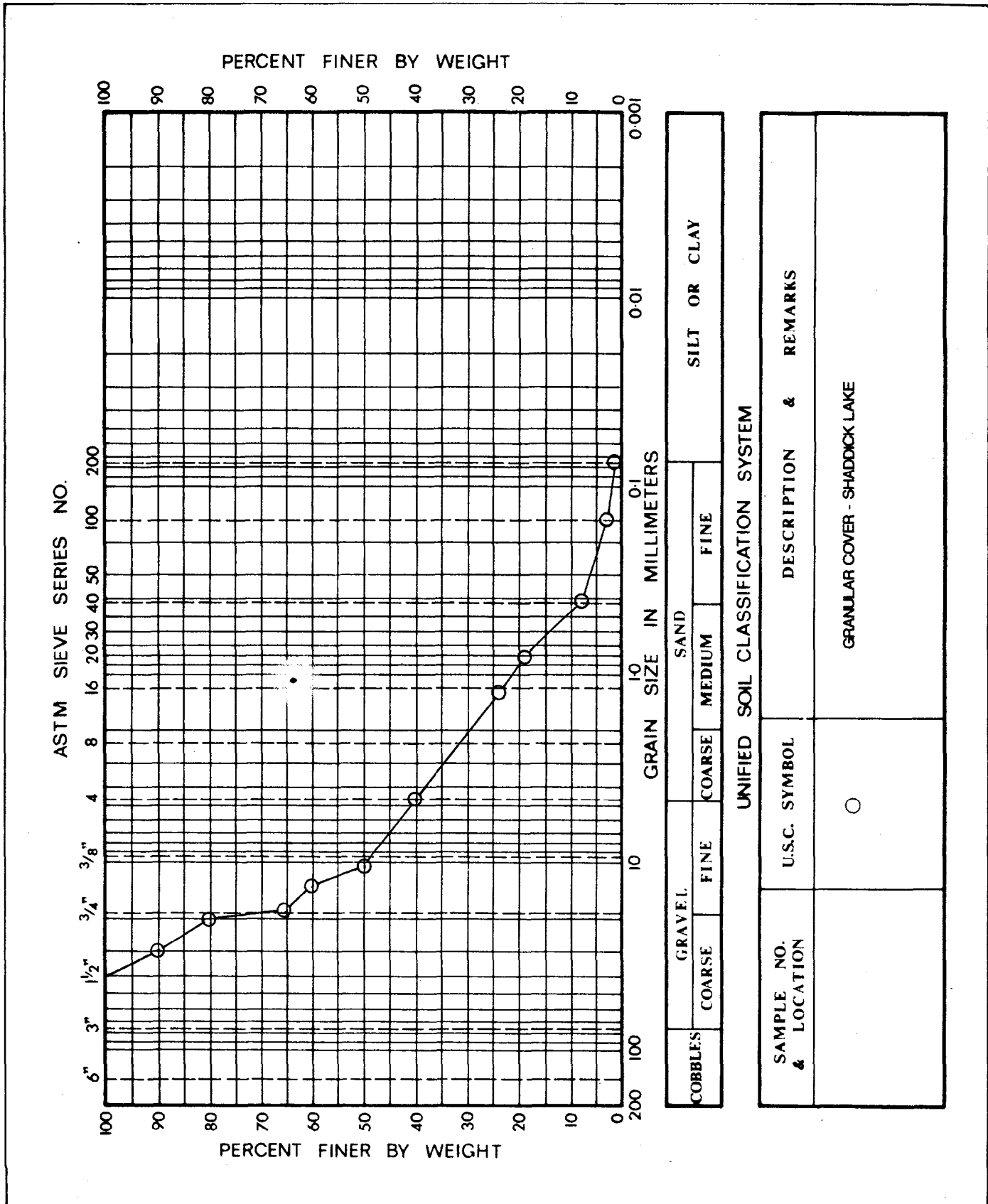
PROJECT NO. F91-057

FIG. NO. II-6

PROJECT PHASE IV ACID WASTE ROCK STUDY - COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE SEPTEMBER 1991





MOISTURE DENSITY RELATIONS

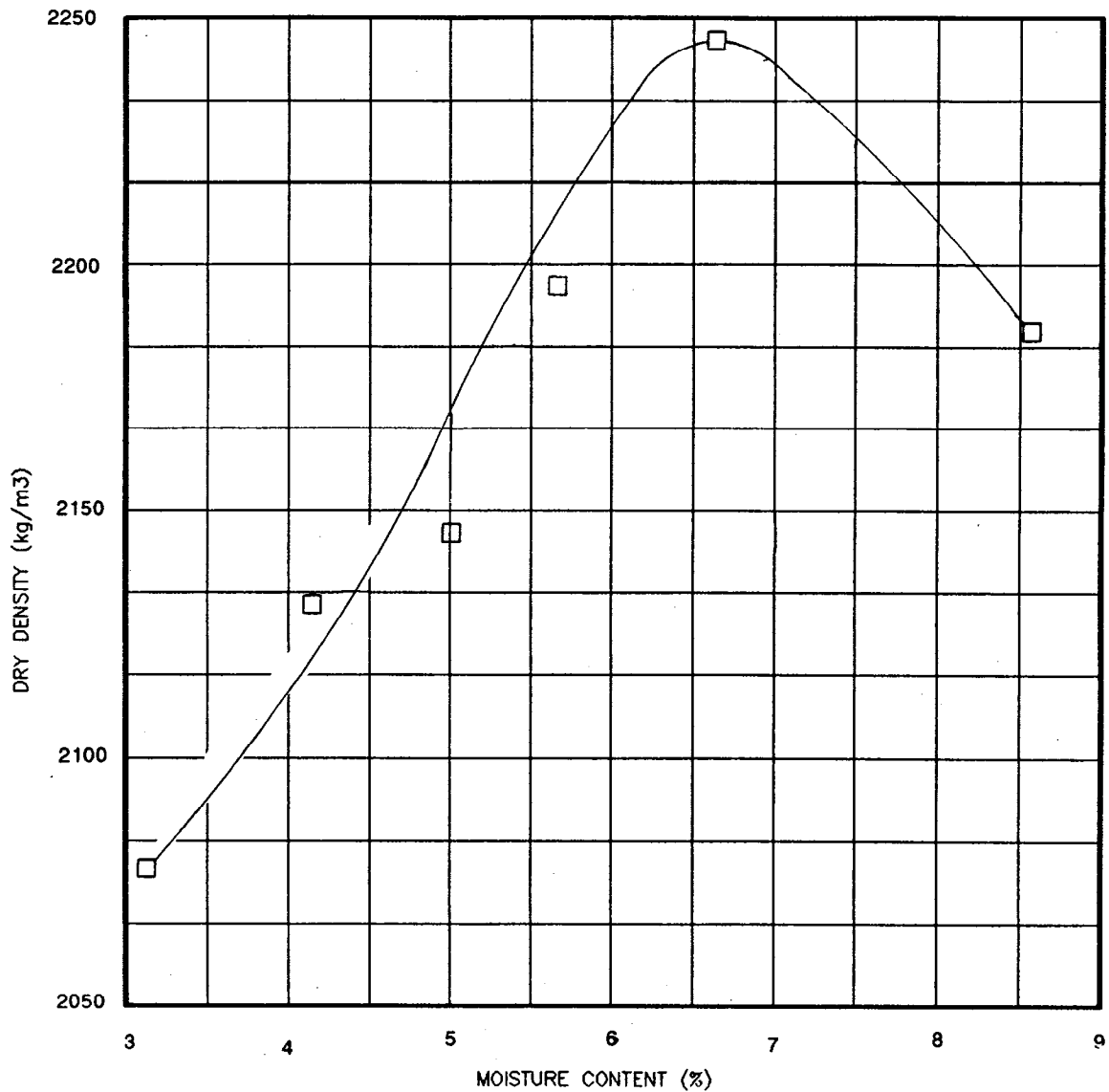
PROJECT NO. F91-057

FIG. NO. II-7

PROJECT PHASE IV ACID WASTE ROCK STUDY - COMPOSITE SOIL COVER

LOCATION HEATH STEELE MINES

DATE SEPTEMBER 1991



SAMPLE DESCRIPTION	<u>GRANULAR COVER - SHADDICK LAKE</u>
TEST	<u>ASTM D1557</u>
γ_d MAX	<u>2240 kg/m³</u>
OPT. w.	<u>6.5</u>

APPENDIX IX

In Situ Density Test Results

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
1	PILE: South Side, East End, Top of Slope First Lift	Sand & Gravel	5.6	2041	91	Sept. 10/91
6	PILE: South Side, West End, Midslope First Lift	Silty Clayey TILL	18.2	1874	96	Sept. 4/91
7	PILE: South Side, Midpile, Midslope First Slope	Silty Clayey TILL	18.1	1880	96	Sept. 4/91
8	PILE: South Side, East End, Midslope First Lift	Silty Clayey TILL	18.6	1906	97	Sept. 4/91
9	PILE: South Side, East End, Top of Slope First Lift	Silty Clayey TILL	17.9	1908	97	Sept. 4/91
10	PILE: South Side, West End, Top of Slope, First Lift	Silty Clayey TILL	18.4	1926	98	Sept. 4/91
11	PILE: South Side, Midpile, Top of Slope First Lift	Silty Clayey TILL	17.5	1866	95	Sept. 4/91
12	PILE: South Side, Midpile, Bottom of Slope, First Lift	Silty Clayey TILL	16.4	1893	96	Sept. 4/91
13	PILE: South Side, Midpile, Bottom of Slope, First Slope	Silty Clayey TILL	17.1	1872	95	Sept. 4/91
14	PILE: South Side East End, Midslope First Lift	Silty Clayey TILL	16.5	1864	95	Sept. 4/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
15	PILE: South Side, East End, Midslope First Lift	Silty Clayey TILL	16.7	1895	97	Sept. 4/91
16	PILE: East Side, South End, Midslope First Lift	Silty Clayey TILL	16.0	1886	96	Sept. 4/91
17	PILE: West Side, South End, Midslope First Lift	Silty Clayey TILL	16.6	1907	97	Sept. 4/91
18	PILE: West Side, South End, Top of Slope First Lift	Silty Clayey TILL	16.9	1892	96	Sept. 4/91
19	PILE: East Side, North End, Midslope First Lift	Silty Clayey TILL	17.6	1870	95	Sept. 4/91
20	PILE: East Side, North End, Top of Slope First Lift	Silty Clayey TILL	20.0	1830	93	Sept. 4/91
21	PILE: East Side, North End, Top of Slope First Lift	Silty Clayey TILL	16.6	1953	96	Sept. 4/91
22	PILE: East Side, South End, Midslope First Lift	Silty Clayey TILL	15.1	1953	100	Sept. 4/91
23	PILE: South Side, East End, Top of Slope, Second Lift	Silty Clayey TILL	18.0	1874	96	Sept. 4/91
24	PILE: South Side, Midpile, Top of Slope Second Lift	Silty Clayey TILL	17.0	1866	95	Sept. 4/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
25	PILE: South Side, West End, Midslope Second Lift	Silty Clayey TILL	16.5	1864	95	Sept. 4/91
26	PILE: South Side Midpile, Midslope Second Lift	Silty Clayey TILL	18.4	1885	96	Sept. 4/91
27	PILE: South Side, East End, Top of Slope Second Lift	Silty Clayey TILL	17.2	1891	96	Sept. 4/91
28	PILE: East Side South End, Midslope Second Lift	Silty Clayey TILL	17.8	1885	96	Sept. 4/91
29	PILE: West Side South End, Top of Slope Second Lift	Silty Clayey TILL	15.6	1978	101	Sept. 4/91
30	PILE: West Side Midpile, Midslope Second Lift	Silty Clayey TILL	17.7	1923	98	Sept. 4/91
31	PILE: East Side Midpile, Midslope Second Lift	Silty Clayey TILL	15.8	1979	101	Sept. 4/91
32	PILE: East Side Midpile, Bottom of Slope, Second Lift	Silty Clayey TILL	17.3	1906	97	Sept. 4/91
33	PILE: East Side North End, Midslope Second Lift	Silty Clayey TILL	17.0	1942	99	Sept. 4/91
34	PILE: East Side North End, Bottom of Slope, Second Lift	Silty Clayey TILL	17.7	1927	98	Sept. 4/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m3)	% MAX DRY DENSITY	DATE TESTED
35	PILE: East Side, North End, Midslope Second Lift	Silty Clayey TILL	14.7	1962	100	Sept. 4/91
36	PILE: East Side, South End, Top of Slope, Second Lift	Silty Clayey TILL	15.4	1947	99	Sept. 4/91
37	PILE: East Side, South End, Midslope, Second Lift	Silty Clayey TILL	16.4	1887	96	Sept. 4/91
38	PILE: South Side East End, Top of Slope Third Lift	Silty Clayey TILL	17.3	1906	97	Sept. 4/91
39	PILE: South Side Midpile, Top of Slope, Third Lift	Silty Clayey TILL	16.4	1880	96	Sept. 4/91
40	PILE: South Side, West End, Top of Slope, Third Lift	Silty Clayey TILL	15.8	1899	97	Sept. 4/91
41	PILE: South Side, West End, Bottom of Slope, Third Lift	Silty Clayey TILL	16.8	1901	97	Sept. 4/91
42	PILE: South Side, Midpile, Bottom of Slope, Third Lift	Silty Clayey TILL	18.4	1857	95	Sept. 4/91
43	PILE: South Side, Midpile, Bottom of Slope(retest)Third Lift	Silty Clayey TILL	16.6	1927	98	Sept. 4/91
44	PILE: South Side, East End, Midslope, Third Lift	Silty Clayey TILL	17.8	1912	97	Sept. 4/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m3)	% MAX DRY DENSITY	DATE TESTED
45	PILE: South Side, East End, Top of Slope Third Lift	Silty Clayey TILL	17.9	1903	97	Sept. 4/91
46	PILE: West Side, South End, Top of Slope, Third Lift	Silty Clayey TILL	18.7	1850	94	Sept. 4/91
47	PILE: West Side, Midpile, Top of Slope Third Lift	Silty Clayey TILL	17.7	1852	94	Sept. 4/91
48	PILE: West Side, North End, Bottom of Slope, Third Lift	Silty Clayey TILL	18.6	1837	94	Sept. 4/91
49	PILE: West Side, North End, Bottom of Slope, Third Lift	Silty Clayey TILL	18.2	1892	96	Sept. 4/91
50	PILE: West Side, Retest South End, Midslope, Fortysix, Third Lift	Silty Clayey TILL	15.6	1930	98	Sept. 4/91
51	PILE: West Side, North End, Top of Slope Third Lift	Silty Clayey TILL	16.4	1951	99	Sept. 8/91
52	PILE: West Side, Retest Midpile, Midslope, Fortyseven, Third Lift	Silty Clayey TILL	17.0	1915	98	Sept. 8/91
53	PILE: Top East End, Midpile, First Lift	Silty Clayey TILL	18.3	1883	96	Sept. 8/91
54	PILE: Top North End, Midpile, First Lift	Silty Clayey TILL	18.4	1872	95	Sept. 8/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
55	PILE: Top Northwest Corner, First Lift	Silty Clayey TILL	17.4	1876	96	Sept. 8/91
56	PILE: North Side, West End, Midpile, First Lift	Silty Clayey TILL	15.2	1924	98	Sept. 8/91
57	PILE: North Side, East Side, Midslope, First Lift	Silty Clayey TILL	18.7	1920	98	Sept. 8/91
58	PILE: Top Noerth End, Midpile, First Lift	Silty Clayey TILL	17.5	1869	95	Sept. 8/91
59	PILE: Top Southeast Corner, First Lift	Silty Clayey TILL	17.0	1889	96	Sept. 8/91
60	PILE: North Side Midpile, Midslope, Second Lift	Silty Clayey TILL	17.5	1940	99	Sept. 8/91
61	PILE: Top West Side, Midslope, Second Lift	Silty Clayey TILL	17.8	1908	97	Sept. 8/91
62	PILE: Top East Side, Midpile Second Lift	Silty Clayey TILL	18.4	1875	96	Sept. 8/91
63	PILE: Top West Side, North End, Second Lift	Silty Clayey TILL	16.3	1894	97	Sept. 8/91
64	PILE: North Side, East End, Midslope Second Lift	Silty Clayey TILL	17.8	1885	96	Sept. 8/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m3)	% MAX DRY DENSITY	DATE TESTED
65	PILE: North Side, East End, Top of Slope Second Lift	Silty Clayey TILL	18.4	1895	97	Sept. 8/91
66	PILE: Top, Center of Pile, Third Lift	Silty Clayey TILL	14.7	1908	97	Sept. 8/91
67	PILE: Top, South Side, Center Third Lift	Silty Clayey TILL	16.5	1940	99	Sept. 8/91
68	PILE: Top, North Side, Center, Third Lift	Silty Clayey TILL	17.0	1885	96	Sept. 8/91
69	PILE: Top, East End, Center, Third Lift	Silty Clayey TILL	15.6	1976	101	Sept. 8/91
70	PILE: North Side, West End, Top of Slope, Second Lift	Silty Clayey TILL	16.3	1915	98	Sept. 8/91
71	PILE: North Slope East End, Top of Slope Second Lift	Silty Clayey TILL	14.5	1965	100	Sept. 8/91
72	PILE: North Slope, East End, Top of Slope Second Lift	Silty Clayey TILL	16.5	1915	98	Sept. 8/91
73	PILE: North Slope, East End, Midslope, Second Lift	Silty Clayey TILL	16.6	1887	96	Sept. 8/91
74	PILE: North Side, Midpile, Midslope Second Lift	Silty Clayey TILL	16.4	1887	96	Sept. 8/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
75	PILE: North Side West End, Midslope Third Lift	Silty Clayey TILL	15.6	1955	100	Sept. 8/91
76	PILE: North Slope East End, Bottom of Slope, Third Lift	Silty Clayey TILL	15.9	1950	99	Sept. 8/91
77	PILE: North Side West End, Bottom of Slope, Third Lift	Silty Clayey TILL	16.8	1935	99	Sept. 8/91
78	PILE: North Side, East End, Midslope Third Lift	Silty Clayey TILL	18.4	1916	98	Sept. 8/91
79	PILE: North Side, West End, Top of Slope, Third Lift	Silty Clayey TILL	14.5	1983	101	Sept. 8/91
80	PILE: North Side, Midpile, Bottom of Slope, Third Lift	Silty Clayey TILL	17.0	1884	96	Sept. 8/91
81	PILE: North Side, Midpile, Midslope Third Lift	Silty Clayey TILL	16.7	1916	98	Sept. 8/91
82	PILE: North Side, Midpile, Top of Slope Third Lift	Silty Clayey TILL	17.1	1896	97	Sept. 8/91
83	PILE: North Side, East End, Bottom of Slope, Third Lift	Silty Clayey TILL	15.5	1971	100	Sept. 8/91
84	PILE: North Side, East End, Midslope, Third Lift	Silty Clayey TILL	15.9	1943	99	Sept. 8/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
85	PILE: North Side, East End, Top of Slope, Third Lift	Silty Clayey TILL	15.5	1939	99	Sept. 8/91
86	PILE: North Side, Midpile Top of Slope, Third Lift	Silty Clayey TILL	18.5	1880	96	Sept. 8/91
87	PILE: North Side, East End, Bottom of Slope, Third Lift	Silty Clayey TILL	17.2	1915	98	Sept. 8/91
88	PILE: North Side, West End, Bottom of Slope, Third Lift	Silty Clayey TILL	18.5	1860	95	Sept. 8/91
89	PILE: South Side, West End, Midslope, Third Lift	Silty Clayey TILL	20.3	1851	94	Sept. 8/91
90	PILE: South Side, Midpile, Midslope, Third Lift	Silty Clayey TILL	18.6	1878	96	Sept. 8/91
91	PILE: South Side, East End, Midslope, Third Lift	Silty Clayey TILL	18.1	1880	96	Sept. 8/91
92	PILE: East Side, South End, Top of Slope, Third Lift	Silty Clayey TILL	16.2	1906	97	Sept. 8/91
93	PILE: East Side, Midpile, Top of Slope Third Lift	Silty Clayey TILL	16.5	1895	97	Sept. 8/91
94	PILE: East Side, North End, Bottom of Slope, Third Lift	Silty Clayey TILL	18.0	1871	95	Sept. 8/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
95	PILE: West Side, North End, Bottom of Slope, Third Lift	Silty Clayey TILL	16.7	1898	97	Sept. 8/91
96	PILE: West Side, Midpile, Midslope, Third Lift	Silty Clayey TILL	16.3	1888	96	Sept. 8/91
97	PILE: West Side, South End, Top of Slope, Third Lift	Silty Clayey TILL	20.0	1863	95	Sept. 8/91
98	PILE: Top, Northwest Corner, Second Lift	Silty Clayey TILL	17.8	1885	96	Sept. 8/91
99	PILE: Top, Center Third Lift	Silty Clayey TILL	15.6	1969	100	Sept. 8/91
102	PILE: South Side, Midpile, Midslope First Lift	Sand & Gravel	5.2	2064	92	Sept. 10/91
103	PILE: South Side, West Side, Bottom of Slope, First Lift	Sand & Gravel	4.6	2083	93	Sept. 10/91
104	PILE: South Side, Midpile, Midslope, First Lift	Sand & Gravel	5.0	2091	93	Sept. 10/91
105	PILE: South Side, West End, Top of Slope First Lift	Sand & Gravel	6.2	2240	92	Sept. 10/91
106	PILE: West Side, South End, Top of Slope, First Lift	Sand & Gravel	6.2	2068	92	Sept. 10/91

NO.	LOCATION	SOIL TYPE	MOISTURE CONTENT	DRY DENSITY (kg/m ³)	% MAX DRY DENSITY	DATE TESTED
107	PILE: West Side, Midpile, Midslope, First Slope	Sand & Gravel	6.2	2068	92	Sept. 13/91
108	PILE: West Side, North End, Bottom of Slope, First Lift	Sand & Gravel	6.2	2090	93	Sept. 13/91
109	PILE: West Side, South End, Bottom of Slope, Second Lift	Sand & Gravel	6.4	2094	94	Sept. 13/91
110	PILE: West Side, Midpile, Top of Slope, Second Lift	Sand & Gravel	6.9	2099	94	Sept. 13/91
111	PILE: West Side, North End, Midslope, Second Lift	Sand & Gravel	4.9	2112	94	Sept. 16/91
112	PILE: East Side, North End, Top of Slope, First Lift	Sand & Gravel	6.9	2114	94	Sept. 16/91
113	PILE: East Side, Midpile, Midslope, First Lift	Sand & Gravel	4.5	2135	95	Sept. 16/91
114	PILE: East Side, South End, Bottom of Slope, First Lift	Sand & Gravel	5.7	2100	94	Sept. 16/91
115	PILE: East Side, North End, Bottom of Slope, Second Lift	Sand & Gravel	5.9	2096	94	Sept. 16/91
116	PILE: East Side, Midpile, Top of Slope, Second Lift	Sand & Gravel	4.1	2133	95	Sept. 16/91

APPENDIX X

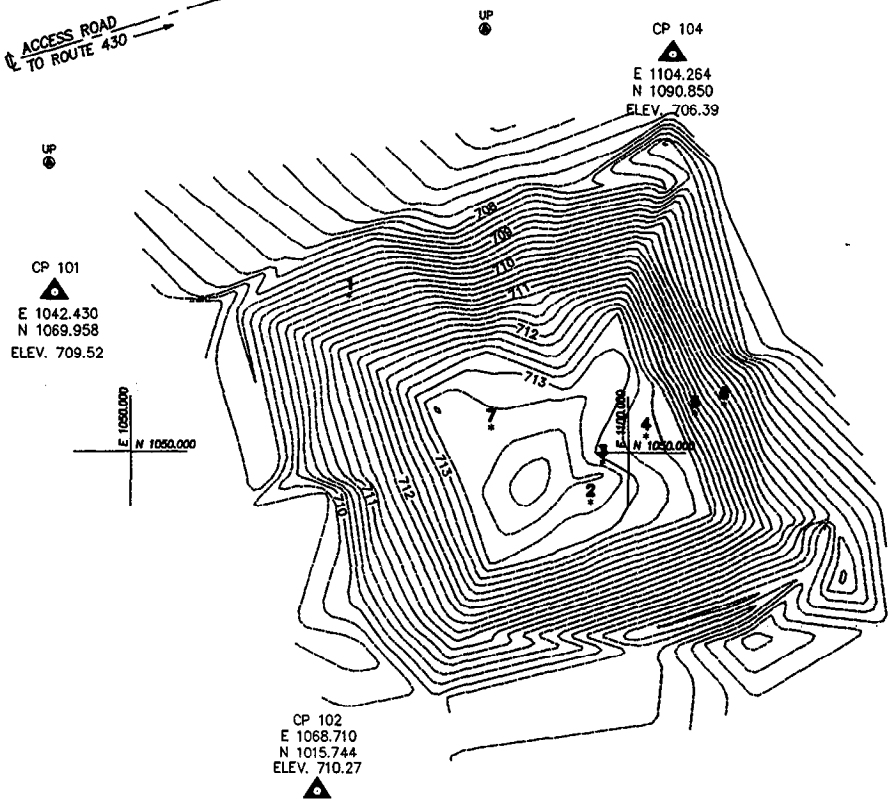
Drawings

NOTE:
 COORDINATES AND ELEVATIONS ARE
 BASED ON AN ASSUMED LOCAL GRID.
 CONTOUR INTERVAL 200mm

LEGEND
 UP
 ⊕ UTILITY POLE
 7 INSTRUMENT CLUSTER AND NUMBER
 CP 101
 ▲ IRON BAR CONTROL POINT & NUMBER



ACCESS ROAD
 TO ROUTE 430



CP 101
 ▲
 E 1042.430
 N 1069.958
 ELEV. 709.52

CP 104
 ▲
 E 1104.264
 N 1090.850
 ELEV. 706.39

CP 103
 ▲
 E 1133.155
 N 1032.317
 ELEV. 709.20

CP 102
 ▲
 E 1068.710
 N 1015.744
 ELEV. 710.27



Scale: 1:500

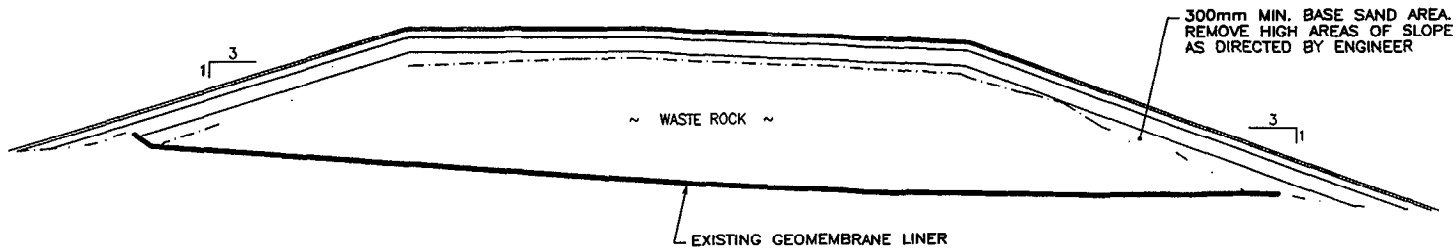


ADI NOLAN DAVIS

SITE PLAN
COMPOSITE SOIL COVER
WASTE ROCK PILE 7/12

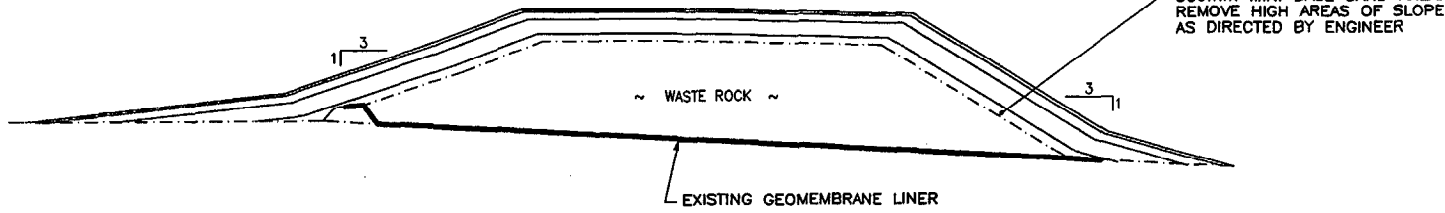
Drawn By: JAM	Checked By:
Date: JULY 1994	Project #: F91-057-1

ELEVATION (m)
716
715
714
713
712
711
710
709
708
707

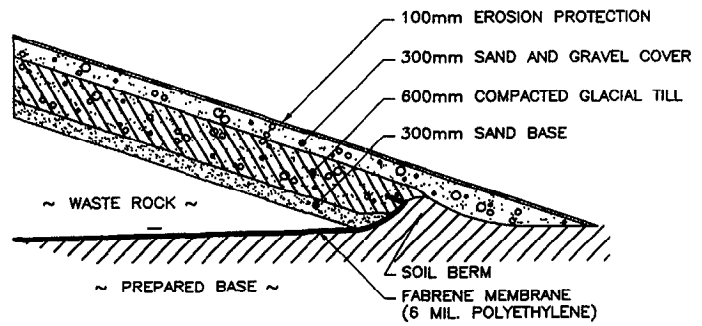


SECTION A
1:100 HORIZ.
1:200 VERT.

ELEVATION (m)
716
715
714
713
712
711
710
709
708
707



SECTION B
1:100 HORIZ.
1:50 VERT.



COMPOSITE SOIL COVER DETAIL
N.T.S.

Scale: AS SHOWN



ADI NOLAN DAVIS

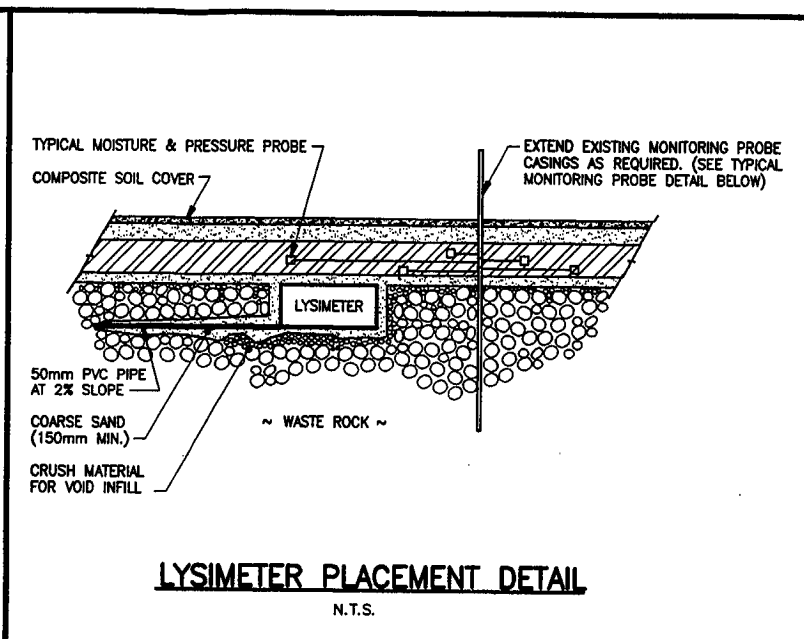
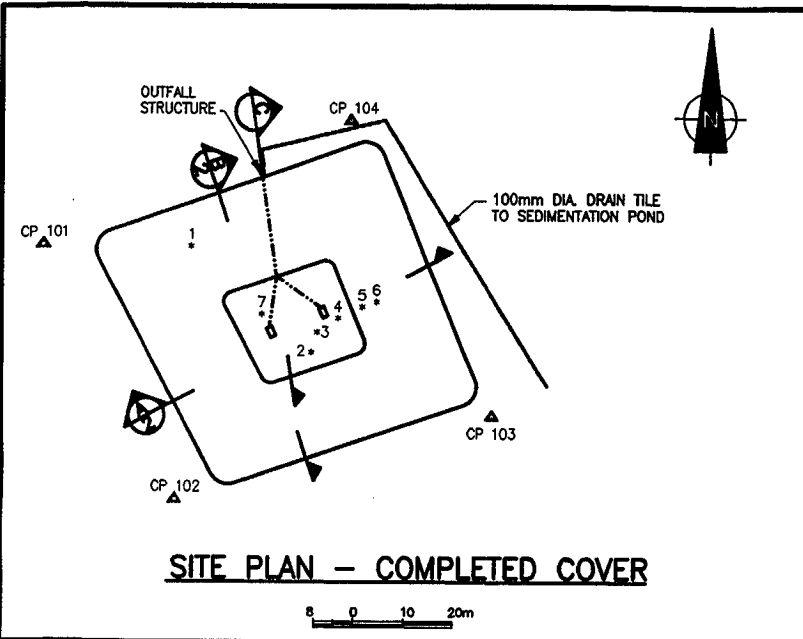
CONSTRUCTION DETAILS
COMPOSITE SOIL COVER
WASTE ROCK PILE 7/12

Drawn By: JAM

Checked By:

Date: 94/10

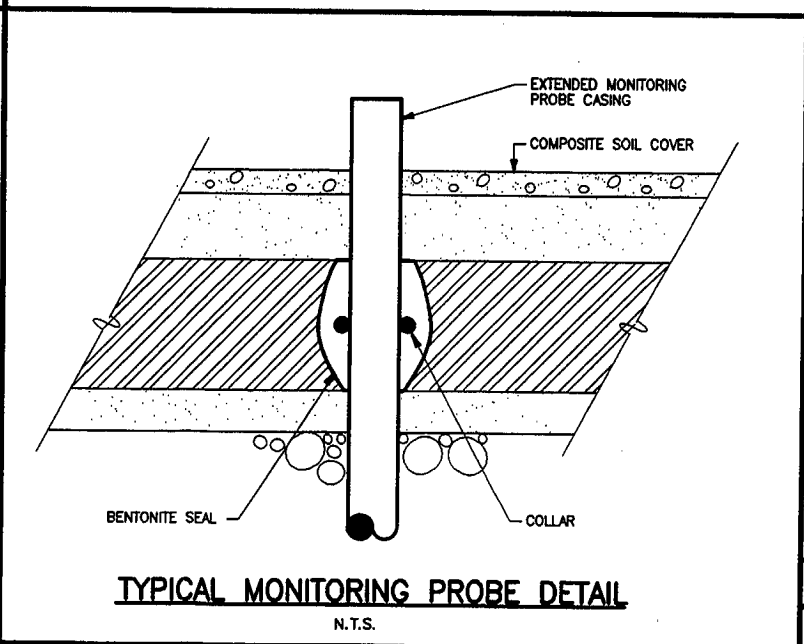
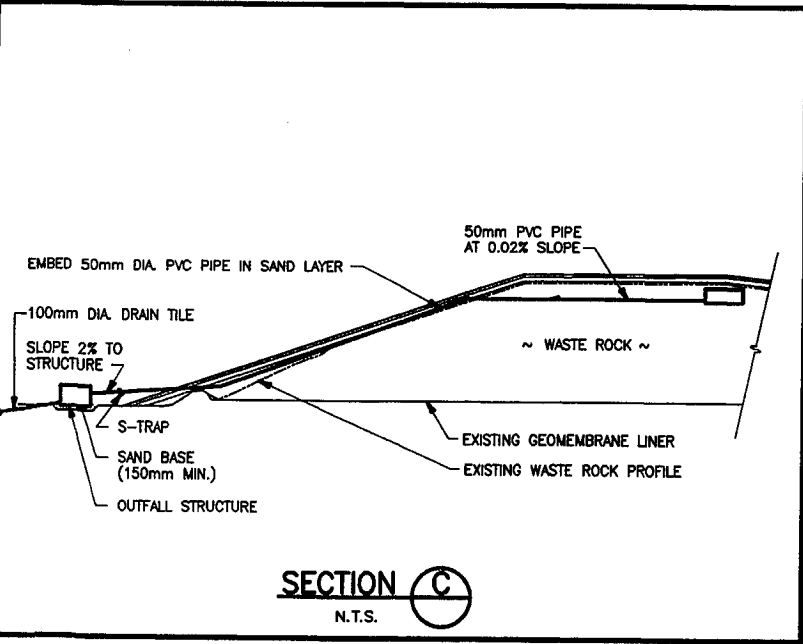
Project #: F91-057-2




LEGEND

- ⊕ EXISTING MONITORING PROBE
- ▲ CP 101 IRON BAR CONTROL POINT & NUMBER
- ⓐ SECTION LETTER
- ⓐ DRAWING DESTINATION (IF REQUIRED)

Scale: AS SHOWN




 ADI NOLAN DAVIS

CONSTRUCTION DETAILS
COMPOSITE SOIL COVER
WASTE ROCK PILE 7/12

Drawn By: JAM	Checked By:
Date: 94/10	Project #: F91-057-3