Appendix E

Laboratory Chain-of Custody Documentation, Data Quality Assurance Memoranda, and Laboratory Data Packages

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Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: QW23	Turn-around Requested:
ARI Client Company: ECOLOGY AND ENVIRONMENT, INC.	Phone: 206-624-9537
Client Contact: MARK LONGTINE	206 794 9750
Client Project Name: 002330.WD10	
Client Project #: 002330.WD10	Samplers: DON PETERSEN (ML) ~~ROBERTSON~~

Date: 4/21/09
Page: 1 of 1
No. of Coolers: 0
Cooler Temps: Amb

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: ATTERBERG LIMITS ASTM D 4318	CONSOLIDATION ASTM D 2435	GRAIN SIZE + HYDROMETER ASTM D 422	MOISTURE CONTENT ASTM D 2216	POROSITY CALC FROM SPECIFIC GRAVITY ASTM D 854 AND	BULK UNIT WEIGHT ASTM D 2937	UNCONSOLIDATED UNDRAINED TRIAXIAL - STRENGTH ASTM D 2850	VANE SHEAR ASTM D 4648	Notes/Comments
NS05	4/20/09	1305	SEDIMENT	1 CORE 54"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	
NS06	4/20/09	1730	SEDIMENT	1 CORE 18"	0-18"	0-18"	0-18"	0-18"	0-18"	0-18"	0-18"	0-18"	
NS12	4/20/09	1505	SEDIMENT	1 CORE 53"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	
NS18	4/20/09	1620	SEDIMENT	1 CORE 56"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: MARK LONGTINE	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: ECOLOGY + ENVIRONMENT	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alernate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Ecology & Environment
Project Name: 002330.WD10
COC No(s): _____ (NA)
Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____
Assigned ARI Job No: OW23
Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)	Amb	
If cooler temperature is out of compliance fill out form 00070F	Temp Gun ID#:	NA

Cooler Accepted by: _____ Date: 4/21/09 Time: 1120

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: none			
Was sufficient ice used (if appropriate)?	NA	YES	(NO)
Were all bottles sealed in individual plastic bags?		(YES)	NO
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	(NO)
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO

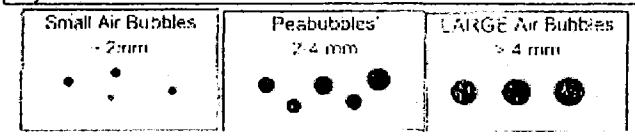
Samples Logged by: JH Date: 4/21/09 Time: 1126

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 0W24	Turn-around Requested:	Page: 1 of 3	
ARI Client Company: Ecology + Environment Inc.	Phone: 206 624-9537	Date: 4/21/09	Ice Present? Yes
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Robertson Petersen JS		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP GrainSize	Notes/Comments
NS01GC10	4/13/09	1244	Sediment	1	X	
NS02GC10	4/13/09	1450			X	
NS02GC20	4/13/09	1450			X	
NS03GC10	4/13/09	1610			X	
NS04GC10	4/15/09	1140			X	
NS04GC20	4/15/09	1140			X	
NS05GC10	4/15/09	1312			X	
NS05GC20	4/15/09	1312			X	
NS06GC10	4/14/09	1015			X	
NS06GC20	4/14/09	1015			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: E+E	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: OW24	Turn-around Requested:	Page: 2 of 3	
ARI Client Company: Ecology + Environment, Inc.	Phone: 206 624-9537	Date: 4/21/09	Ice Present?
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Petersen		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS07GC10	4/14/09	1142	Sediment	1	X	
NS07GC30	4/14/09	1142			X	
NS08GC10	4/14/09	1255			X	
NS09GC10	4/20/09	~~1440~~ 0905 JS			X	
NS10GC10	4/14/09	1440			X	
NS11GC10	4/14/09	1618			X	
NS12GC10	4/14/09	1752			X	
NS12GC20	4/14/09	1752			X	
NS13GC10	4/15/09	1502			X	
NS13GC20	4/15/09	1502			X	

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
	(Signature)	(Signature)	(Signature)	(Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: E+E	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

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Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 0W24	Turn-around Requested:
ARI Client Company: Ecology + Environment, Inc	Phone: 206 624-9537
Client Contact: Mark Longtine	
Client Project Name: 002330.WD10	
Client Project #: 002330.WD10	Samplers: Don Petersen

Page: 3 of 3

Date: 4/21/09 | Ice Present?

No. of Coolers: | Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS14GC10	4/15/09	1625	Sediment	1	X	
NS16GC10	4/15/09	1001			X	
NS17GC10	4/16/09	0933			X	
NS18GC10	4/16/09	1055			X	
NS19GC10	4/16/09	1227			X	
NS19GC20	4/16/09	1227			X	
NS20GC10	4/16/09	1420			X	
NS23GC10	4/17/09	1607			X	
NS24GC10	4/17/09	~~1600~~ 1725			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: Ecology + Environment	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Ecology & Environment
Project Name: 002330-WP10

COC No(s): _____ (NA)
Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other: _____

Assigned ARI Job No: OW24
Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)	13.6	10.8

If cooler temperature is out of compliance fill out form 00070F — Temp Gun ID#: 101886

Cooler Accepted by: KL Date: 4/21/09 Time: 1120

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... (Bubble Wrap) Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		(YES)	NO
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO

Samples Logged by: MM Date: 4/21/09 Time: 1200

*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Small Air Bubbles - 2mm	Peabubbles 2-4 mm	LARGE Air Bubbles > 4 mm
• • •	• • •	● ● ●

Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: OW26	Turn-around Requested:	Page: 2 of 3	
ARI Client Company: Ecology + Environment, Inc.	Phone: 206 624-9537	Date: 4/21/09	Ice Present?
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Petersen		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS07GC10	4/14/09	1142	Sediment	1	X	
NS07GC30	4/14/09	1142			X	
NS08GC10	4/14/09	1255			X	
NS09GC10	4/20/09	~~1410~~ 0905 JS			X	
NS10GC10	4/14/09	1440			X	
NS11GC10	4/14/09	1618			X	
NS12GC10	4/14/09	1752			X	
NS12GC20	4/14/09	1752			X	
NS13GC10	4/15/09	1502			X	
NS13GC20	4/15/09	1502			X	

Comments/Special Instructions

	Relinquished by:	Received by:	Relinquished by:	Received by:
(Signature)				
Printed Name:	Jennifer Schmitt	Rich Hudson		
Company:	E+E	ARI		
Date & Time:	4/21/09 1015	4/21/09 1015		

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: OW26	Turn-around Requested:
ARI Client Company: Ecology + Environment, Inc	Phone: 206 624-9537
Client Contact: Mark Longtine	
Client Project Name: 002330.WD10	
Client Project #: 002330.WD10	Samplers: Don Petersen

Page: 3 of 3

Date: 4/21/09 | Ice Present?

No. of Coolers: | Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS14GC10	4/15/09	1625	Sediment	1	X	
NS16GC10	4/15/09	1001			X	
NS17GC10	4/16/09	0933			X	
NS18GC10	4/16/09	1055			X	
NS19GC10	4/16/09	1227			X	
NS19GC20	4/16/09	1227			X	
NS20GC10	4/16/09	1420			X	
NS23GC10	4/17/09	1607			X	
NS24GC10	4/17/09	~~1600~~ 1725			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: Ecology + Environment	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Ecology & Environment Project Name: 002330-WD10

COC No(s): _____ NA Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other: _____

Assigned ARI Job No: OW26 Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)	13.6	10.8

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 101886

Cooler Accepted by: KL Date: 4/21/09 Time: 1120

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... (Bubble) Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		(YES)	NO
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO

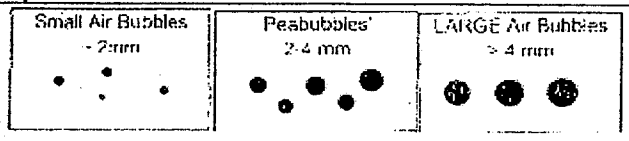
Samples Logged by: MH Date: 4/21/09 Time: 1211

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Laboratory Analyses Required

Project Name: 0904 048

SIC: ________ **Program:** ________

☐ Preliminary Investigation ☐ Monitoring ☐ For HW Designation ☐ For NPDES

Send Results to: MARK LONGTINE **Mail Stop:** ECOLOGY + ENVIRONMENT 720 3rd AVE STE 1700 SEATTLE WA 98104 (206) 624-9537

Date Results needed by: ________

Name/Reference # of QAPP for this project: NORTHLAKE SHIPYARD SANDBLAST GRIT STUDY

Sampling Year: 2009 (Time: Military 0001 - 2400)

Mo	Day	Hr	Mn	Field Station Identification	Manchester Lab Sample Number	Matrix Code	Source Code	No. of Containers	Metals: Individual Elements (TOTAL METALS Cu, Zn, AND Si)	Metals: TCLP M. (PENDING TOTAL RESULTS (SEE COMMENTS))
04	13	12	44	NSØ1GC1Ø	01	40	40	3	X	X
04	13	14	50	NSØ2GC1Ø	02	40	40	3	X	X
04	13	14	50	NSØ2GC2Ø	03	40	40	3	X	X
04	13	16	10	NSØ3GC1Ø	04	40	40	3	X	X
04	15	11	40	NSØ4GC1Ø	05	40	40	3	X	X
04	15	11	40	NSØ4GC2Ø	06	40	40	3	X	X
04	15	13	12	NSØ5GC1Ø	07	40	40	3	X	X
04	15	13	12	NSØ5GC2Ø	08	40	40	3	X	X
04	14	10	15	NSØ6GC1Ø	09	40	40	3	X	X
04	14	10	15	NSØ6GC2Ø	10	40	40	1	X	X (crossed out)
04	14	11	42	NSØ7GC1Ø	11	40	40	3	X	X
04	14	11	42	NSØ7GC3Ø	12	40	40	3	X	X

General Chemistry: Alkalinity, Conductivity, pH, Turbidity, ☐ Chloride ☐ Sulfate, Fluoride, Total Suspended Solids, Total Dissolved Solids, ☐ Total Solids ☐ % Sol ☐ % Vol Sol, TOC, DOC, BOD5, Oil & Grease (HEM), Ammonia, Nitrite/Nitrate, Total Phosphorus, Orthophosphate, TPN, Chlorophyll ☐ filters

Micro: Fecal Coliform ☐ MF ☐ MPN, Total Coliform ☐ MF ☐ MPN, E. Coli ☐ MF ☐ MPN, % Klebsiella, Enterococcus

Metals: PP Mets, Mercury (Hg) ☐ low level, Hardness, Individual Elements (please list) ☐ Total ☐ Dissolved

Organic Chemistry: VOA, BTEX, TPHG, TPHD, HCID Only (Hydrocarbon ID), PCB aroclors, ☐ Pest 1 ☐ w/PCB aroclors, ☐ Pest 2 ☐ w/PCB aroclors, ☐ Pest 3 ☐ w/PCB aroclors, Carbamates, PESTMS, Herbicides, PBDE, BNA, PAH

Project Officer: JOHN KEELING, NWRO

Phone Number: 425/649-7152

Cell Number: ________

Samplers: MARK LONGTINE ECOLOGY + ENVIRONMENT INC. (C) 206-794-9750

Recorder: MARK LONGTINE

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments (Temperature, Preserv., etc.)
[signature]	[signature]	09	04	21	14	55	N/A	N/A	[illegible]

Comments: ANALYZE TOTAL METALS (As, Ba, Cd, Cr, Pb, Hg, Se, Si, Cu, Zn). PROVIDE PRELIMINARY TOTAL METALS RESULTS TO M. LONGTINE (MLONGTINE@ENE.COM). PENDING REVIEW OF TOTAL METALS RESULTS, LONGTINE MAY REQUEST TCLP METALS ANALYSIS.

Laboratory Analyses Required

Project Name: 0904 048

SIC: _____ **Program:** _____

☐ Preliminary Investigation ☐ For HW Designation

☐ Monitoring ☐ For NPDES

Send Results to: MARK LONGTINE **Mail Stop:** ECOLOGY & ENVIRONMENT, INC. 720 3rd AVE. STE. 1100 SEATTLE WA 98104 (206) 624-9537

Date Results needed by: _____

Name/Reference # of QAPP for this project: NORTHLAKE SHIPYARD SANDBLAST GRIT STUDY

Sampling Date (Year: 2009) Mo Day	Sampling Time (Military) 0001 - 2400 Hr Mn	Field Station Identification	Manchester Lab Sample Number	Matrix Code	Source Code	No. of Containers	General Chemistry: Alkalinity; Conductivity; pH; Turbidity; ☐ Chloride ☐ Sulfate; Fluoride; Total Suspended Solids; Total Dissolved Solids; ☐ Total Solids ☐ % Sol ☐ % Vol Sol; TOC; DOC; BOD5; Oil & Grease (HEM); Ammonia; Nitrite/Nitrate; Total Phosphorus; Orthophosphate; TPN; Chlorophyll ☐ filters	Micro: Fecal Coliform ☐ MF ☐ MPN; Total Coliform ☐ MF ☐ MPN; E. Coli ☐ MF ☐ MPN; % Klebsiella; Enterococcus	Metals: PP Mets; Mercury (Hg) ☐ low level; Hardness; Individual Elements (please list); ☐ Total ☐ Dissolved; TOTAL METALS (As, Ba, Cd, Cr, Pb, Hg, Se, Si, Cu, Zn); TCLP METALS (if Required)	Organic Chemistry: VOA; BTEX; TPHG; TPHD; HCID Only (Hydrocarbon ID); PCB aroclors; ☐ Pest 1 ☐ w/PCB aroclors; ☐ Pest 2 ☐ w/PCB aroclors; ☐ Pest 3 ☐ w/PCB aroclors; Carbamates; PESTMS; Herbicides; PBDE; BNA; PAH
04 14	1255	NS1 Ø 2 GC 1 Ø	13	40	40	3			X	X
04 20	0905	NS1 Ø 9 GC 1 Ø	14	40	40	2			X	X
04 14	1440	NS1 1 Ø GC 1 Ø	15	40	40	3			X	X
04 14	1618	NS1 1 1 GC 1 Ø	16	40	40	3			X	X
04 14	1752	NS1 2 GC 1 Ø	17	40	40	3			X	X
04 14	1752	NS1 2 GC 2 Ø	18	40	40	3			X	X
04 15	1502	NS1 3 GC 1 Ø	19	40	40	3			X	X
04 15	1502	NS1 3 GC 2 Ø	20	40	40	3			X	X
04 15	1625	NS1 4 GC 1 Ø	21	40	40	3			X	X
04 15	1901	NS1 6 GC 1 Ø	22	40	40	3			X	X
04 16	0933	NS1 7 GC 1 Ø	23	40	40	3			X	X
04 16	1055	NS1 8 GC 1 Ø	24	40	40	3			X	X

Project Officer: JOHN KEELING, NWRO

Phone Number: 425/649-7152

Cell Number: _____

Samplers: MARK LONGTINE, ECOLOGY & ENVIRONMENT, INC. (c) 206/794-9750

Recorder: MARK LONGTINE

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments (Temperature, Preserv., etc.)
		09	04	17	11	15	N/A	N/A	(Cooler used)

Comments: ANALYZE TOTAL METALS (As, Ba, Cd, Cr, Pb, Hg, Se, Si, Cu, Zn). PROVIDE PRELIMINARY TOTAL METALS RESULTS TO M. LONGTINE (MLONGTINE@ENE.COM). PENDING REVIEW OF TOTAL METALS RESULTS, LONGTINE MAY REQUEST TCLP METALS ANALYSIS.

ECY 040-115 (Rev. 10/05)

Laboratory Analyses Required

Project Name: 0904 048

SIC: ___ **Program:** ___

☐ Preliminary Investigation ☐ Monitoring ☐ For HW Designation ☐ For NPDES

Date Results needed by: ___

Send Results to: MARK LONGTINE **Mail Stop:** ECOLOGY & ENVIRONMENT, INC. 720 3rd AVE. STE. 1700 SEATTLE WA 98104 206/624-9537

Name/Reference # of QAPP for this project: NORTHLAKE SHIPYARD SANDBLAST GRIT STUDY

Analysis columns printed on the form:

- **General Chemistry:** Alkalinity, Conductivity, pH, Turbidity, ☐ Chloride ☐ Sulfate, Fluoride, Total Suspended Solids, Total Dissolved Solids, ☐ Total Solids ☐ % Sol ☐ % Vol Sol, TOC, DOC, BOD5, Oil & Grease (HEM), Ammonia, Nitrite/Nitrate, Total Phosphorus, Orthophosphate, TPN, Chlorophyll ☐ filters
- **Micro:** Fecal Coliform ☐ MF ☐ MPN, Total Coliform ☐ MF ☐ MPN, E. Coli ☐ MF ☐ MPN, % Klebsiella, Enterococcus
- **Metals:** ☐ Total ☐ Dissolved; PP Mets, Mercury (Hg) ☐ low level, Hardness, Individual Elements (please list), TOTAL METALS (SEE LIST BELOW), TCLP METALS (SEE COMMENT)
- **Organic Chemistry:** VOA, BTEX, TPHG, TPHD, HCID Only (Hydrocarbon ID), PCB aroclors, ☐ Pest 1 ☐ w/PCB aroclors, ☐ Pest 2 ☐ w/PCB aroclors, ☐ Pest 3 ☐ w/PCB aroclors, Carbamates, PESTMS, Herbicides, PBDE, BNA, PAH

Date (Year 2009) Mo	Day	Time (Military 0001-2400) Hr	Mn	Field Station Identification	Manchester Lab Sample Number	Matrix Code	Source Code	No. of Containers	Total Metals (see list below)	TCLP Metals (see comment)
04	16	12	27	NS196C1Ø	-25	40	40	3	X	X
04	16	12	27	NS196C2Ø	-26	40	40	3	X	X
04	16	14	20	NS206C1Ø	-27	40	40	3	X	X
04	17	16	07	NS236C1Ø	-28	40	40	3	X	X
04	17	17	25	NS246C1Ø	-29	40	40	3	X	X

Project Officer: JOHN KEELING, NWRO

Phone Number: 425/649-7152

Cell Number: ___

Samplers: MARK LONGTINE ECOLOGY & ENVIRONMENT, INC. (c) 206/794-9750

Recorder: MARK LONGTINE

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments (Temperature, Preserv., etc.)
[illegible]	[illegible]	09	04	21	17	05	NA	NA	[illegible]

Comments: ANALYZE TOTAL METALS (As, Ba, Cd, Cr, Pb, Hg, Se, Si, Cu, Zn). PROVIDE PRELIMINARY TOTAL METALS RESULTS TO M. LONGTINE (MLONGTINE@ENE.COM), PENDING REVIEW OF TOTAL METALS RESULTS, LONGTINE MAY REQUEST TCLP METALS ANALYSIS.

Quality Assurance Review Level 1 Report	Project: Northlake Shipyard Sandblast Girt Study
Date Completed: June 22, 2009	Completed by: David Ikeda

The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness per Washington Department of Ecology (Ecology) Quality Assurance Review Guidance for the quality assurance review level 1 review (QA1, PTI, 1989). Specific criteria for QC limits were obtained from the project Sampling and Analysis Plan (E&E 2009). Compliance with the project QA program is indicated on the in the checklist and tables. Any major or minor concern affecting data usability is summarized below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Table 1 - Sample Summary Tables from Electronic Data Deliverable

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	ID Corrections
OW24	Sediment	NS01GC10	0904048-01	4/13/2009		
OW24	Sediment	NS02GC10	0904048-02	4/13/2009	Triplicate	
OW24	Sediment	NS02GC20	0904048-03	4/13/2009		
OW24	Sediment	NS03GC10	0904048-04	4/13/2009		
OW24	Sediment	NS04GC10	0904048-05	4/15/2009		
OW24	Sediment	NS04GC20	0904048-06	4/15/2009		
OW24	Sediment	NS06GC10	0904048-09	4/14/2009		
OW24	Sediment	NS07GC10	0904048-11	4/14/2009		
OW24	Sediment	NS07GC30	0904048-12	4/14/2009		
OW24	Sediment	NS08GC10	0904048-13	4/14/2009		
OW24	Sediment	NS09GC10	0904048-14	4/20/2009		
OW24	Sediment	NS10GC10	0904048-15	4/14/2009		
OW26	Sediment	NS11GC10	0904048-16	4/14/2009	Triplicate	
OW26	Sediment	NS13GC10	0904048-19	4/15/2009		
OW26	Sediment	NS13GC20	0904048-20	4/15/2009		
OW26	Sediment	NS14GC10	0904048-21	4/15/2009		
OW26	Sediment	NS16GC10	0904048-22	4/15/2009		
OW26	Sediment	NS17GC10	0904048-23	4/16/2009		
OW26	Sediment	NS19GC10	0904048-25	4/16/2009		
OW26	Sediment	NS19GC20	0904048-26	4/16/2009		
OW26	Sediment	NS20GC10	0904048-27	4/16/2009		

Work Orders, Tests and Number of Samples included in this DUSR

Work Order	Result_Method_Code	CountOfSample_ID
OW24	PSEP - Grain size	10
OW26	PSEP - Grain size	9

Quality Assurance Review Level 1 Report	Project: Northlake Shipyard Sandblast Girt Study
Date Completed: June 22, 2009	Completed by: David Ikeda

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	No, after the laboratory received the samples E&E placed several samples on hold. Those samples were not analyzed.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Yes
Frequency of Field QC Samples Correct?	Not applicable.
Case narrative present and complete?	Yes
Any holding time violations (See table below)?	No - All samples were prepared and analyzed within holding times.

General Analytical Methods	
Description	**Notes and Qualifiers**
Triplicate relative standard deviation within QC limits of < 20%?	Yes

Summary of Potential Impacts on Data Usability
Major Concerns
None
Minor Concerns
None

Data Validation Qualifiers:

Code	Description
JG	Analyte was positively identified. Value may be greater than the reported estimate.
JK	Analyte was positively identified. Reported result is an estimate with unknown bias.
JL	Analyte was positively identified. Value may be less than the reported estimate.
JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.
JTG	Analyte was positively identified. Value may be greater than the reported result, which is an estimate below the associated quantitation limit but above the MDL.
JTK	Analyte was positively identified. Reported result is an estimate with unknown bias, below the associated quantitation limit but above the MDL.
JTL	Analyte was positively identified. Value may be less than the reported result which is an estimate below associated quantitation limit but above MDL.
U	Analyte was not detected at or above the reported result.
UJG	Analyte was not detected at or above the reported estimate with likely low bias.
UJK	Analyte was not detected at or above the reported estimate with unknown bias.
UJL	Analyte was not detected at or above the reported estimate with likely high bias.

Quality Assurance Review Level 1 Report	Project: Ecology – Northlake Shipyard Sandblast Grit Study
Date Completed: June 22, 2009	Completed by: David Ikeda

The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness per Washington Department of Ecology (Ecology) Quality Assurance Review Guidance for the quality assurance level 1 review (QA1, PTI, 1989). Specific criteria for QC limits were obtained from the project Sampling and Analysis Plan (E&E 2009). Compliance with the project QA program is indicated on the in the checklist and tables. Any major or minor concern affecting data usability is summarized below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Table 1 - Sample Summary Tables from Electronic Data Deliverable

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	ID Corrections
0904048	Sediment	NS01GC10	0904048-01	4/13/2009	MS/MSD	
0904048	Sediment	NS02GC10	0904048-02	4/13/2009		
0904048	Sediment	NS02GC20	0904048-03	4/13/2009		
0904048	Sediment	NS03GC10	0904048-04	4/13/2009		
0904048	Sediment	NS04GC10	0904048-05	4/15/2009		
0904048	Sediment	NS04GC20	0904048-06	4/15/2009		
0904048	Sediment	NS05GC10	0904048-07	4/15/2009		
0904048	Sediment	NS05GC20	0904048-08	4/15/2009		
0904048	Sediment	NS06GC10	0904048-09	4/14/2009		
0904048	Sediment	NS06GC20	0904048-10	4/14/2009	MS/MSD	
0904048	Sediment	NS07GC10	0904048-11	4/14/2009	MS/MSD	
0904048	Sediment	NS07GC30	0904048-12	4/14/2009		
0904048	Sediment	NS08GC10	0904048-13	4/14/2009		
0904048	Sediment	NS09GC10	0904048-14	4/20/2009		
0904048	Sediment	NS10GC10	0904048-15	4/14/2009		
0904048	Sediment	NS11GC10	0904048-16	4/14/2009		
0904048	Sediment	NS12GC10	0904048-17	4/14/2009		
0904048	Sediment	NS12GC20	0904048-18	4/14/2009		
0904048	Sediment	NS13GC10	0904048-19	4/15/2009	MS/MSD	
0904048	Sediment	NS13GC20	0904048-20	4/15/2009		
0904048	Sediment	NS14GC10	0904048-21	4/15/2009		
0904048	Sediment	NS16GC10	0904048-22	4/15/2009		
0904048	Sediment	NS17GC10	0904048-23	4/16/2009		
0904048	Sediment	NS18GC10	0904048-24	4/16/2009		
0904048	Sediment	NS19GC10	0904048-25	4/16/2009		
0904048	Sediment	NS19GC20	0904048-26	4/16/2009		
0904048	Sediment	NS20GC10	0904048-27	4/16/2009		
0904048	Sediment	NS23GC10	0904048-28	4/17/2009		
0904048	Sediment	NS24GC10	0904048-29	4/17/2009		

Quality Assurance Review Level 1 Report	Project: Ecology – Northlake Shipyard Sandblast Grit Study
Date Completed: June 22, 2009	Completed by: David Ikeda

Work Orders, Tests and Number of Samples included in this DUSR

Work Orders	Matrix	Test Method	Parameters	Number of Samples	Sample Type
0904048	Solid	SM 2540G	Solids	29	Sediment
0904048	Solid	EPA 200.8	Inductively Coupled Plasma - Mass Spectrometry	29	Sediment
0904048	Solid	EPA 245.5	Mercury in Solid or Semisolid Waste (Manual Cold Vapor)	29	Sediment

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	Yes
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Yes
Frequency of Field QC Samples Correct? Field Duplicate – Not required. Equipment Blank – Not required. MS/MSD samples – 1/20 samples, if requested.	Yes
Case narrative present and complete?	No
Any holding time violations?	No - All samples were prepared and analyzed within holding times.

The following tables are presented at the end of this QA1 Review Memorandum and provide summaries of results outside QC criteria.

- Method Blanks Results (Table 2)
- MS/MSD Outside Limits (Table 3)
- LCS Outside Limits (Table 4)
- Re-analysis Results (Table 5)

The inorganic analyses (metals) data was originally reviewed by Dean Momohara, Manchester Environmental Laboratory (MEL) on May 14, 2009. The laboratory provided analytical summaries for samples, including QC samples. No raw data was provided with the deliverable.

Metals by ICP and Mercury by CVAA	
Description	**Notes and Qualifiers**
Any compounds present in method and field blanks as noted on Table 2?	No
For samples, if results are <5 times the blank then "U" flag data.	Samples results below the PQL are reported at the PQL and flagged U. Sample results greater than PQL are not changed and flagged U.
Laboratory QC frequency of one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes

Quality Assurance Review Level 1 Report	Project: Ecology – Northlake Shipyard Sandblast Grit Study
Date Completed: June 22, 2009	Completed by: David Ikeda

Metals by ICP and Mercury by CVAA	
Description	**Notes and Qualifiers**
MS/MSD percent recovery values within QC criteria (see Table 3) of 75-125%? QC limits are not applicable to sample results greater than 4 times spike amount.	No
Sample and duplicate relative percent difference values within QC criteria (see Table 4) of <20%? Apply criteria only when both results are >PQL.	Yes
LCS percent recovery values within QC criteria (see Table 4) of 85-115%? If the value is high with no positive values in the associated data; then no data qualification is required.	Yes
Is there one serial dilution per 20 samples? Are percent difference values within laboratory QC criteria?	Yes. Yes.

Summary of Potential Impacts on Data Usability
Major Concerns
None
Minor Concerns
Chromium and mercury associated samples positive results were qualified estimated bias low (JL), due to high MS/MSD recovery.

Table 2 - List of Positive Results for Blank Samples
None

Table 3 - List MS/MSD Percent Recovery Values and RPDs outside Control Limits

Method	Batch ID	Sample ID	Analyte	MS/MSD Recovery	QC Limit	Associated Sample Qualification
EPA 200.8	B09E001	NS06GC20MS	Chromium	156	75 - 125	JL
EPA 200.8	B09E001	NS06GC20MSD	Chromium	136	75 - 125	JL
EPA 245.5	B09E011	NS07GC10MS	Mercury	149	75 - 125	JL
EPA 245.5	B09E011	NS07GC10MSD	Mercury	131	75 - 125	JL

Table 4 - List LCS Percent Recovery Values outside Control Limits
None

Table 5 –Samples that were Reanalyzed
None

Data Validation Qualifiers:

Code	Description
J	Analyte was positively identified. The reported result is an estimate.
JG	Analyte was positively identified. Value may be greater than the reported estimate.
JK	Analyte was positively identified. Reported result is an estimate with unknown bias.
JL	Analyte was positively identified. Value may be less than the reported estimate.
JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.

JTG	Analyte was positively identified. Value may be greater than the reported result, which is an estimate below the associated quantitation limit but above the MDL.
JTK	Analyte was positively identified. Reported result is an estimate with unknown bias, below the associated quantitation limit but above the MDL.
JTL	Analyte was positively identified. Value may be less than the reported result which is an estimate below associated quantitation limit but above MDL.
REJ	Data are unusable for all purposes. Sample results rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	Analyte was not detected at or above the reported result.
UJG	Analyte was not detected at or above the reported estimate with likely low bias.
UJK	Analyte was not detected at or above the reported estimate with unknown bias.
UJL	Analyte was not detected at or above the reported estimate with likely high bias.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Silver

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Silver
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**6.61**		0.10	0.004	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1.18**		0.10	0.004	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	0.10	U	0.10	0.004	04/13/09	05/11/09	B09E001
0904048-04	**NS03GC10**	**2.36**		1.00	0.04	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**5.73**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	1.00	U	1.00	0.04	04/15/09	05/11/09	B09E001
0904048-07	**NS05GC10**	**3.75**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**4.26**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**2.52**		1.00	0.04	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**1.91**		1.00	0.04	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**0.44**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-12	NS07GC30	0.10	U	0.10	0.004	04/14/09	05/11/09	B09E001
0904048-13	**NS08GC10**	**0.53**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-14	**NS09GC10**	**0.61**		0.10	0.004	04/20/09	05/11/09	B09E001
0904048-15	**NS10GC10**	**0.40**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-16	**NS11GC10**	**0.54**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-17	**NS12GC10**	**3.42**		1.00	0.04	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**0.40**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-19	**NS13GC10**	**3.25**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**0.66**		0.10	0.004	04/15/09	05/11/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/11/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	20.5	20			103	85-115		
B09E001-MS1	Matrix Spike	20.3	20	0904048-10	1.91	92	75-125		
B09E001-MSD1	Matrix Spike Dup	20.1	20	0904048-10	1.91	91	75-125	1	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Silver

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Silver
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**1.93**		1.00	0.04	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**1.97**		1.00	0.04	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**2.68**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**2.64**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**1.77**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**0.38**		0.10	0.004	04/16/09	05/11/09	B09E003
0904048-27	**NS20GC10**	**2.84**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**1.91**		1.00	0.04	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**1.36**		1.00	0.04	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.0	20			100	85-115		
B09E003-MS1	Matrix Spike	18.0	20	0904061-01	0.739	86	75-125		
B09E003-MSD1	Matrix Spike Dup	17.8	20	0904061-01	0.739	85	75-125	1	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Arsenic

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Arsenic
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**2680**		10.0	1.63	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**398**		1.00	0.16	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**17.6**		1.00	0.16	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**1180**		1.00	0.16	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**4070**		10.0	1.63	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**151**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**1830**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**838**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**1030**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**284**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**34.3**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**12.5**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**19.0**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**41.2**		1.00	0.16	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**20.5**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**83.1**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**180**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**18.9**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**422**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**33.0**		1.00	0.16	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	20.4	20			102	85-115		
B09E001-MS1	Matrix Spike	312	20	0904048-10	284	144	75-125		
B09E001-MSD1	Matrix Spike Dup	270	20	0904048-10	284	-70	75-125	15	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Arsenic

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Arsenic
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**99.3**		1.00	0.16	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**65.2**		1.00	0.16	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**49.1**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**71.6**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**66.8**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**14.8**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**98.2**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**33.1**		1.00	0.16	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**27.0**		1.00	0.16	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.2	20			101	85-115		
B09E003-MS1	Matrix Spike	36.9	20	0904061-01	17.6	97	75-125		
B09E003-MSD1	Matrix Spike Dup	36.3	20	0904061-01	17.6	94	75-125	2	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Barium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Barium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**269**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**219**		1.00	0.12	04/13/09	05/08/09	B09E001
0904048-03	**NS02GC20**	**38.0**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**186**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**406**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**143**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**276**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**210**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**178**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**153**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**150**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**74.5**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**167**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**147**		1.00	0.12	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**159**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**155**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**121**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**120**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**145**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**86.2**		1.00	0.12	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.5	20			97	85-115		
B09E001-MS1	Matrix Spike	173	20	0904048-10	153	103	75-125		
B09E001-MSD1	Matrix Spike Dup	200	20	0904048-10	153	236	75-125	14	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Barium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Barium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**109**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**105**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**109**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**90.3**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**115**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**161**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**129**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**122**		1.00	0.12	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**130**		1.00	0.12	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.9	20			100	85-115		
B09E003-MS1	Matrix Spike	116	20	0904061-01	156	-198	75-125		
B09E003-MSD1	Matrix Spike Dup	126	20	0904061-01	156	-150	75-125	8	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Cadmium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Cadmium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**7.96**		0.10	0.006	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1.75**		0.10	0.006	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	0.10	U	0.10	0.006	04/13/09	05/11/09	B09E001
0904048-04	**NS03GC10**	**3.75**		1.00	0.06	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**6.88**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	1.00	U	1.00	0.06	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**5.38**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**4.12**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**3.87**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**2.73**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**0.40**		0.10	0.006	04/14/09	05/11/09	B09E001
0904048-12	**NS07GC30**	**0.12**		0.10	0.006	04/14/09	05/11/09	B09E001
0904048-13	**NS08GC10**	**1.71**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**1.20**		1.00	0.06	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**0.44**		0.10	0.006	04/14/09	05/11/09	B09E001
0904048-16	NS11GC10	1.00	U	1.00	0.06	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**2.89**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-18	NS12GC20	1.00	U	1.00	0.06	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**4.07**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**1.25**		1.00	0.06	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	20.3	20			101	85-115		
B09E001-MS1	Matrix Spike	21.7	20	0904048-10	2.73	95	75-125		
B09E001-MSD1	Matrix Spike Dup	21.4	20	0904048-10	2.73	93	75-125	1	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Cadmium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Cadmium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**2.05**		1.00	0.06	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**2.21**		1.00	0.06	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**2.39**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**2.49**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**2.11**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**0.42**		0.10	0.006	04/16/09	05/11/09	B09E003
0904048-27	**NS20GC10**	**2.46**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**1.70**		1.00	0.06	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**1.42**		1.00	0.06	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.8	20			99	85-115		
B09E003-MS1	Matrix Spike	20.6	20	0904061-01	1.18	97	75-125		
B09E003-MSD1	Matrix Spike Dup	20.1	20	0904061-01	1.18	94	75-125	3	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Chromium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Chromium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**77.1**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**64.1**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**28.9**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**98.8**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**96.4**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**53.2**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**170**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**178**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**86.8**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**67.7**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**53.4**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**32.4**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**59.9**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**65.4**		5.00	0.11	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**63.2**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**64.5**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**79.0**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**55.2**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**95.5**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**43.6**		5.00	0.11	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.3	20			96	85-115		
B09E001-MS1	Matrix Spike	98.9	20	0904048-10	67.7	156	75-125		
B09E001-MSD1	Matrix Spike Dup	95.0	20	0904048-10	67.7	136	75-125	4	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Chromium

Project Name: Northlake Shipyard

Work Order: 0904048

Project Officer: Keeling, John

Analyte: Chromium

Method: EPA200.8

Matrix: Sediment/Soil

Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**66.6**		5.00	0.11	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**64.0**		5.00	0.11	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**66.6**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**70.3**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**61.2**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**63.1**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**68.8**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**63.1**		5.00	0.11	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**64.5**		5.00	0.11	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.1	20			101	85-115		
B09E003-MS1	Matrix Spike	86.1	20	0904061-01	65.9	101	75-125		
B09E003-MSD1	Matrix Spike Dup	86.2	20	0904061-01	65.9	101	75-125	0.06	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Copper

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Copper
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**2600**		10.0	1.16	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**605**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**42.2**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**1070**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**2240**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**157**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**3580**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**2110**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**1850**		10.0	1.16	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**647**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**91.0**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**24.8**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**67.4**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**124**		1.00	0.12	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**61.3**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**142**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**627**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**96.3**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**1610**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**141**		1.00	0.12	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.9	20			99	85-115		
B09E001-MS1	Matrix Spike	607	20	0904048-10	647	-200	75-125		
B09E001-MSD1	Matrix Spike Dup	650	20	0904048-10	647	18	75-125	7	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Copper

Project Name: Northlake Shipyard

Work Order: 0904048

Project Officer: Keeling, John

Analyte: Copper

Method: EPA200.8

Matrix: Sediment/Soil

Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**344**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**234**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**1020**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**323**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**328**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**55.9**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**612**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**222**		1.00	0.12	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**141**		1.00	0.12	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.9	20			99	85-115		
B09E003-MS1	Matrix Spike	390	20	0904061-01	579	-941	75-125		
B09E003-MSD1	Matrix Spike Dup	330	20	0904061-01	579	-1240	75-125	17	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Mercury

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Mercury
Method: EPA245.5
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**0.583**		0.0073	0.0020	04/13/09	05/07/09	B09E011
0904048-02	**NS02GC10**	**1.33**		0.0130	0.0036	04/13/09	05/07/09	B09E011
0904048-03	**NS02GC20**	**0.0340**		0.0074	0.0020	04/13/09	05/07/09	B09E011
0904048-04	**NS03GC10**	**1.40**		0.0143	0.0039	04/13/09	05/07/09	B09E011
0904048-05	**NS04GC10**	**1.02**		0.0094	0.0026	04/15/09	05/07/09	B09E011
0904048-06	**NS04GC20**	**0.796**		0.0121	0.0033	04/15/09	05/07/09	B09E011
0904048-07	**NS05GC10**	**1.73**		0.0285	0.0078	04/15/09	05/07/09	B09E011
0904048-08	**NS05GC20**	**5.82**		0.0208	0.0057	04/15/09	05/07/09	B09E011
0904048-09	**NS06GC10**	**12.1**		0.0119	0.0033	04/14/09	05/07/09	B09E011
0904048-10	**NS06GC20**	**1.71**		0.0125	0.0034	04/14/09	05/07/09	B09E011
0904048-11	**NS07GC10**	**0.346**		0.0219	0.0060	04/14/09	05/07/09	B09E011
0904048-12	**NS07GC30**	**0.0665**		0.0378	0.0104	04/14/09	05/07/09	B09E011
0904048-13	**NS08GC10**	**0.441**		0.0183	0.0050	04/14/09	05/07/09	B09E011
0904048-14	**NS09GC10**	**0.991**		0.0196	0.0054	04/20/09	05/07/09	B09E011
0904048-15	**NS10GC10**	**0.507**		0.0184	0.0050	04/14/09	05/07/09	B09E011
0904048-16	**NS11GC10**	**0.633**		0.0179	0.0049	04/14/09	05/07/09	B09E011
0904048-17	**NS12GC10**	**2.00**		0.0304	0.0083	04/14/09	05/07/09	B09E011
0904048-18	**NS12GC20**	**0.761**		0.0149	0.0041	04/14/09	05/07/09	B09E011
0904048-19	**NS13GC10**	**1.83**		0.0353	0.0097	04/15/09	05/07/09	B09E011
0904048-20	**NS13GC20**	**0.985**		0.0149	0.0041	04/15/09	05/07/09	B09E011

QC Results for Batch ID: B09E011

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E011-BLK1	Blank	0.0050	U	0.0050	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E011-BS1	LCS	0.104	0.1			104	85-115		
B09E011-MS1	Matrix Spike	2.87	0.7	0904048-19	1.83	149	75-125		
B09E011-MSD1	Matrix Spike Dup	2.73	0.691	0904048-19	1.83	131	75-125	5	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Mercury

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Mercury
Method: EPA245.5
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**1.49**		0.0222	0.0061	04/15/09	05/12/09	B09E019
0904048-22	**NS16GC10**	**1.82**		0.0244	0.0067	04/15/09	05/12/09	B09E019
0904048-23	**NS17GC10**	**3.30**		0.0270	0.0074	04/16/09	05/12/09	B09E019
0904048-24	**NS18GC10**	**1.58**		0.0311	0.0085	04/16/09	05/12/09	B09E019
0904048-25	**NS19GC10**	**1.69**		0.0263	0.0072	04/16/09	05/12/09	B09E019
0904048-26	**NS19GC20**	**0.518**		0.0168	0.0046	04/16/09	05/12/09	B09E019
0904048-27	**NS20GC10**	**1.68**		0.0272	0.0074	04/16/09	05/12/09	B09E019
0904048-28	**NS23GC10**	**1.45**		0.0237	0.0065	04/17/09	05/12/09	B09E019
0904048-29	**NS24GC10**	**1.16**		0.0211	0.0058	04/17/09	05/12/09	B09E019

QC Results for Batch ID: B09E019

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E019-BLK1	Blank	0.0050	U	0.0050	05/12/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E019-BS1	LCS	0.103	0.1			103	85-115		
B09E019-DUP1	Duplicate	21.8		0904002-01	21.4			2	20
B09E019-MS1	Matrix Spike	1.32	0.566	0904061-05	0.683	113	75-125		
B09E019-MSD1	Matrix Spike Dup	1.18	0.569	0904061-05	0.683	88	75-125	11	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Lead

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Lead
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	NS01GC10	2440		10.0	0.66	04/13/09	05/07/09	B09E001
0904048-02	NS02GC10	417		1.00	0.07	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	15.3		1.00	0.07	04/13/09	05/07/09	B09E001
0904048-04	NS03GC10	1210		10.0	0.66	04/13/09	05/07/09	B09E001
0904048-05	NS04GC10	3400		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	205		1.00	0.07	04/15/09	05/07/09	B09E001
0904048-07	NS05GC10	2360		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-08	NS05GC20	1580		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-09	NS06GC10	1200		10.0	0.66	04/14/09	05/07/09	B09E001
0904048-10	NS06GC20	702	J	10.0	0.66	04/14/09	05/07/09	B09E001
0904048-11	NS07GC10	66.5		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-12	NS07GC30	3.27		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-13	NS08GC10	126		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-14	NS09GC10	194		1.00	0.07	04/20/09	05/07/09	B09E001
0904048-15	NS10GC10	59.1		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-16	NS11GC10	134		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-17	NS12GC10	653		10.0	0.66	04/14/09	05/07/09	B09E001
0904048-18	NS12GC20	121		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-19	NS13GC10	1010		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-20	NS13GC20	164		1.00	0.07	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.3	20			97	85-115		
B09E001-MS1	Matrix Spike	931	20	0904048-10	702	1150	75-125		
B09E001-MSD1	Matrix Spike Dup	1310	20	0904048-10	702	3040	75-125	34	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Lead

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Lead
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**312**		1.00	0.07	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**312**		1.00	0.07	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**327**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**427**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**344**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**59.6**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**601**		10.0	0.66	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**266**		1.00	0.07	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**299**		1.00	0.07	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.6	20			98	85-115		
B09E003-MS1	Matrix Spike	159	20	0904061-01	144	72	75-125		
B09E003-MSD1	Matrix Spike Dup	168	20	0904061-01	144	118	75-125	6	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Percent Solids

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Solids
Method: SM2540G
Matrix: Sediment/Soil
Units: %

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	NS01GC10	68.3				04/13/09	04/22/09	B09D218
0904048-02	NS02GC10	37.1				04/13/09	04/22/09	B09D218
0904048-03	NS02GC20	61.7				04/13/09	04/22/09	B09D218
0904048-04	NS03GC10	33.9				04/13/09	04/22/09	B09D218
0904048-05	NS04GC10	50.7				04/15/09	04/22/09	B09D218
0904048-06	NS04GC20	40.2				04/15/09	04/22/09	B09D218
0904048-07	NS05GC10	17.4				04/15/09	04/22/09	B09D218
0904048-08	NS05GC20	22.7				04/15/09	04/22/09	B09D218
0904048-09	NS06GC10	42.2				04/14/09	04/22/09	B09D218
0904048-10	NS06GC20	38.9				04/14/09	04/22/09	B09D218
0904048-11	NS07GC10	21.7				04/14/09	04/22/09	B09D218
0904048-12	NS07GC30	12.3				04/14/09	04/22/09	B09D218
0904048-13	NS08GC10	25.2				04/14/09	04/22/09	B09D218
0904048-14	NS09GC10	25.0				04/20/09	04/22/09	B09D218
0904048-15	NS10GC10	25.9				04/14/09	04/22/09	B09D218
0904048-16	NS11GC10	27.2				04/14/09	04/22/09	B09D218
0904048-17	NS12GC10	16.4				04/14/09	04/22/09	B09D218
0904048-18	NS12GC20	32.2				04/14/09	04/22/09	B09D218
0904048-19	NS13GC10	13.2				04/15/09	04/22/09	B09D218
0904048-20	NS13GC20	30.7				04/15/09	04/22/09	B09D218
0904048-21	NS14GC10	22.2				04/15/09	04/22/09	B09D218
0904048-22	NS16GC10	19.3				04/15/09	04/22/09	B09D218
0904048-23	NS17GC10	18.4				04/16/09	04/22/09	B09D218
0904048-24	NS18GC10	15.3				04/16/09	04/22/09	B09D218
0904048-25	NS19GC10	18.5				04/16/09	04/22/09	B09D218
0904048-26	NS19GC20	29.5				04/16/09	04/22/09	B09D218
0904048-27	NS20GC10	17.5				04/16/09	04/22/09	B09D218
0904048-28	NS23GC10	19.7				04/17/09	04/22/09	B09D218
0904048-29	NS24GC10	22.1				04/17/09	04/22/09	B09D218

QC Results for Batch ID: B09D218

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09D218-BLK1	Blank	-0.04	U		04/22/09
B09D218-BLK2	Blank	0.2			04/22/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09D218-DUP1	Duplicate	68.1		0904048-01	68.3			0.2	20
B09D218-DUP2	Duplicate	22.5		0904048-21	22.2			1	20
B09D218-DUP3	Duplicate	19.7		0904048-28	19.7			0.5	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Selenium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Selenium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**4.39**		0.50	0.30	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1.22**		0.50	0.30	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	5.00	U	5.00	3.03	04/13/09	05/07/09	B09E001
0904048-04	NS03GC10	5.00	U	5.00	3.03	04/13/09	05/07/09	B09E001
0904048-05	NS04GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-07	NS05GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-08	NS05GC20	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-09	NS06GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-10	NS06GC20	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-11	NS07GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-12	NS07GC30	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-13	NS08GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-14	NS09GC10	5.00	U	5.00	3.03	04/20/09	05/07/09	B09E001
0904048-15	NS10GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-16	NS11GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-17	NS12GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-18	NS12GC20	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-19	NS13GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-20	NS13GC20	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result		%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	21.7	20				109	85-115		
B09E001-MS1	Matrix Spike	18.5	20	0904048-10	5.00	U	93	75-125		
B09E001-MSD1	Matrix Spike Dup	19.2	20	0904048-10	5.00	U	96	75-125	3	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Selenium

Project Name: Northlake Shipyard

Work Order: 0904048

Project Officer: Keeling, John

Analyte: Selenium

Method: EPA200.8

Matrix: Sediment/Soil

Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	NS14GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E003
0904048-22	NS16GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E003
0904048-23	NS17GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-24	NS18GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-25	NS19GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-26	NS19GC20	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-27	NS20GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-28	NS23GC10	5.00	U	5.00	3.03	04/17/09	05/07/09	B09E003
0904048-29	NS24GC10	5.00	U	5.00	3.03	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.7	20			104	85-115		
B09E003-MS1	Matrix Spike	21.6	20	0904061-01	0.802	104	75-125		
B09E003-MSD1	Matrix Spike Dup	20.8	20	0904061-01	0.802	100	75-125	4	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Zinc

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Zinc
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**7050**		500	21.8	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1330**		50.0	2.2	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**69.4**		50.0	2.2	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**3680**		500	21.8	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**10600**		500	21.8	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**582**		50.0	2.2	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**6040**		500	21.8	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**3420**		500	21.8	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**3650**		500	21.8	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**1500**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**223**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**60.2**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**800**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**309**		50.0	2.2	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**164**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**333**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**1010**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**226**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**2130**		50.0	2.2	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**300**		50.0	2.2	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	5.0	U	5.0	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	21.7	20			109	85-115		
B09E001-MS1	Matrix Spike	1470	20	0904048-10	1500	-108	75-125		
B09E001-MSD1	Matrix Spike Dup	1600	20	0904048-10	1500	525	75-125	8	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Zinc

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Zinc
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**530**		50.0	2.2	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**491**		50.0	2.2	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**554**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**580**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**579**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**144**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**1360**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**387**		50.0	2.2	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**311**		50.0	2.2	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	5.0	U	5.0	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.9	20			104	85-115		
B09E003-MS1	Matrix Spike	454	20	0904061-01	453	5	75-125		
B09E003-MSD1	Matrix Spike Dup	458	20	0904061-01	453	22	75-125	0.8	20

Authorized by: _____ **Release Date:** _____

Analytical Resources, Incorporated
Analytical Chemists and Consultants

April 29, 2009

Mark Longtine
Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

RE: Project: 002330.WD10
ARI Job: OW24

Dear Mark:

Please find enclosed the original chain of custody documentation and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.
Bob Longtine
FOR
Susan D. Dunnihoo
Director, Client Services
sue@arilabs.com
206-695-6207

cc: eFile OW24

Enclosures

Chain of Custody
Documentation

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW24

prepared
by

Analytical Resources, Inc.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 1 of 3	
ARI Client Company: Ecology + Environment Inc.	Phone: 206 624-9537	Date: 4/21/09	Ice Present? YES
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Robertson Petersen JS		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP GrainSize	Notes/Comments
NS01GC10	4/13/09	1244	Sediment	1	X	
NS02GC10	4/13/09	1450			X	
NS02GC20	4/13/09	1450			X	
NS03GC10	4/13/09	1610			X	
NS04GC10	4/15/09	1140			X	
NS04GC20	4/15/09	1140			X	
NS05GC10	4/15/09	1312			X	
NS05GC20	4/15/09	1312			X	
NS06GC10	4/14/09	1015			X	
NS06GC20	4/14/09	1015			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: E+E	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 2 of 3	
ARI Client Company: Ecology + Environment, Inc.	Phone: 206 624-9537	Date: 4/21/09	Ice Present?
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Petersen		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS07GC10	4/14/09	1142	Sediment	1	X	
NS07GC30	4/14/09	1142			X	
NS08GC10	4/14/09	1255			X	
NS09GC10	4/20/09	~~1440~~ 0905 35			X	
NS10GC10	4/14/09	1440			X	
NS11GC10	4/14/09	1618			X	
NS12GC10	4/14/09	1752			X	
NS12GC20	4/14/09	1752			X	
NS13GC10	4/15/09	1502			X	
NS13GC20	4/15/09	1502			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitt	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: E+E	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 3 of 3	
ARI Client Company: Ecology + Environment, Inc	Phone: 206 624-9537	Date: 4/21/09	Ice Present?
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Petersen		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS14GC10	4/15/09	1625	Sediment	1	X	
NS16GC10	4/15/09	1001			X	
NS17GC10	4/16/09	0933			X	
NS18GC10	4/16/09	1055			X	
NS19GC10	4/16/09	1227			X	
NS19GC20	4/16/09	1227			X	
NS20GC10	4/16/09	1420			X	
NS23GC10	4/17/09	1607			X	
NS24GC10	4/17/09	~~1600~~ 1725			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: Ecology + Environment	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Ecology & Environment
Project Name: 002330.WP10
COC No(s): _____ (NA)
Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other: _____
Assigned ARI Job No: OW24
Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)	13.6	10.8

If cooler temperature is out of compliance fill out form 00070F — Temp Gun ID#: 101886

Cooler Accepted by: KL Date: 4/21/09 Time: 1120

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES (NO)

What kind of packing material was used? (Bubble Wrap) Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		(YES)	NO
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO

Samples Logged by: KL Date: 4/21/09 Time: 1200

*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Small Air Bubbles < 2mm	Peabubbles 2-4 mm	LARGE Air Bubbles > 4 mm
• • •	• • •	● ● ●

Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Case Narrative

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW24

prepared
by

Analytical Resources, Inc.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Ecology & Environment	**ARI Project No.:** OW24
Client Project: 002330.WD10	**Client Project No.:** 002330.WD10

Case Narrative

1. Twelve samples were submitted for grain size analysis according to Puget Sound Estuary Protocol (PSEP) methodology on April 21, 2009.
2. The samples were run in a single batch and one sample from this job, NS02GC10, was chosen for triplicate analysis. The triplicate data is reported on the QA summary.
3. Samples NS01GC10, NS02GC20, NS03GC10, NS04GC10, NS06GC10, NS07GC10 and NS07GC30 contained woody or other organic matter, which may have broken down during the sieving process, affecting grain size analysis.
4. Samples NS01GC10, NS04GC10, NS06GC10, NS08GC10 and NS09GC10 contained an oil-like sheen and/or smell.
5. The data is provided in summary tables and plots.
6. There were no other noted anomalies in this project.

Approved by: Elizabeth Noble Date: 4/29/09
Lead Technician

Data Reporting Qualifiers

Effective 12/28/04

Inorganic Data

U Indicates that the target analyte was not detected at the reported concentration

* Duplicate RPD is not within established control limits

B Reported value is less than the CRDL but ≥ the Reporting Limit

N Matrix Spike recovery not within established control limits

NA Not Applicable, analyte not spiked

H The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible

L Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U Indicates that the target analyte was not detected at the reported concentration

* Flagged value is not within established control limits

B Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.

J Estimated concentration when the value is less than ARI's established reporting limits

D The spiked compound was not detected due to sample extract dilution

NR Spiked compound recovery is not reported due to chromatographic interference

E Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.

S Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte

NA The flagged analyte was not analyzed for

NS The flagged analyte was not spiked into the sample

M Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses

M2 The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"

Y The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.

C The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column

P The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference

Geotechnical Data

A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.

F Samples were frozen prior to particle size determination

SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations

SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis

W Weight of sample in some pipette aliquots was below the level required for accurate weighting

Laboratory Data Package

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW24

prepared
by

Analytical Resources, Inc.

Geotechnical Analysis

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW24

prepared
by

Analytical Resources, Inc.

Ecology & Environment
002330.WD10

Apparent Grain Size Distribution Summary
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
Phi Size	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Sieve Size (microns)	3/8"	#4 (4750)	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (63)	31.00	15.60	7.80	3.90	2.00	1.00
NS02GC10	100.0	100.0	99.7	97.5	94.1	90.6	87.4	83.3	75.3	55.5	39.8	26.2	18.1	11.3
	100.0	100.0	99.9	97.0	94.1	90.9	88.1	84.4	75.0	57.8	40.3	27.3	18.6	11.6
	100.0	100.0	99.3	96.6	92.7	89.2	85.9	81.3	74.0	57.0	40.4	26.9	18.4	11.7
NS01GC10	100.0	99.3	93.7	75.3	51.4	33.4	25.2	21.1	16.0	11.1	7.4	4.0	2.3	1.4
NS02GC20	100.0	99.7	95.3	88.9	76.9	48.0	19.9	9.1	7.5	6.1	5.1	3.9	2.8	1.8
NS03GC10	100.0	100.0	99.5	96.3	90.9	85.4	79.3	74.4	70.4	55.9	38.9	24.9	15.6	9.2
NS04GC10	100.0	96.8	93.2	80.9	60.6	40.5	31.0	26.5	23.6	18.2	14.3	10.1	7.0	4.3
NS04GC20	100.0	100.0	99.6	98.8	97.6	96.5	95.6	94.1	89.4	72.8	53.1	36.0	24.1	14.8
NS06GC10	100.0	98.2	96.5	89.3	78.2	57.1	34.8	26.0	20.5	18.4	11.5	6.6	4.0	2.1
NS07GC10	100.0	100.0	99.2	97.3	96.0	94.8	91.8	85.6	73.8	60.0	49.3	33.2	23.5	15.2
NS07GC30	100.0	100.0	99.7	96.9	96.4	96.1	95.8	94.8	94.3	86.9	70.1	52.9	27.8	15.3
NS08GC10	100.0	100.0	100.0	98.9	97.7	97.2	96.9	95.4	90.6	77.4	60.6	42.0	28.8	17.6
NS09GC10	100.0	100.0	100.0	99.4	98.8	98.4	97.9	97.2	93.7	85.0	65.6	44.6	30.1	18.3
NS10GC10	100.0	100.0	99.8	99.7	99.2	98.8	98.6	98.3	95.4	84.2	67.2	45.7	31.8	19.1

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

Ecology & Environment
002330.WD10

Apparent Grain Size Distribution Summary
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay			Total Fines
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10	<4
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0	<230 (<62)
NS02GC10	0.3	2.2	3.5	3.5	3.2	4.1	8.0	19.8	15.7	13.6	8.1	6.8	11.3	83.3
	0.1	2.8	2.9	3.2	2.8	3.7	9.4	17.2	17.4	13.0	8.7	7.0	11.6	84.4
	0.7	2.7	3.9	3.4	3.4	4.6	7.3	16.9	16.7	13.5	8.5	6.6	11.7	81.3
NS01GC10	6.3	18.4	24.0	18.0	8.2	4.1	5.1	5.0	3.7	3.4	1.7	0.9	1.4	21.1
NS02GC20	4.7	6.4	12.0	28.9	28.1	10.8	1.5	1.5	0.9	1.2	1.1	0.9	1.8	9.1
NS03GC10	0.5	3.2	5.4	5.5	6.1	5.0	4.0	14.4	17.1	14.0	9.3	6.4	9.2	74.4
NS04GC10	6.8	12.3	20.3	20.1	9.5	4.5	2.9	5.4	3.9	4.2	3.1	2.7	4.3	26.5
NS04GC20	0.4	0.8	1.2	1.1	0.9	1.5	4.6	16.7	19.7	17.1	11.8	9.4	14.8	94.1
NS06GC10	3.5	7.2	11.1	21.1	22.3	8.8	5.4	2.1	6.9	4.9	2.7	1.8	2.1	26.0
NS07GC10	0.8	1.9	1.2	1.3	2.9	6.3	11.8	13.8	10.6	16.2	9.7	8.2	15.2	85.6
NS07GC30	0.3	2.8	0.5	0.3	0.3	1.0	0.5	7.3	16.8	17.2	25.1	12.5	15.3	94.8
NS08GC10	0.0	1.1	1.2	0.5	0.3	1.5	4.8	13.2	16.8	18.6	13.2	11.2	17.6	95.4
NS09GC10	0.0	0.6	0.6	0.4	0.5	0.7	3.5	8.7	19.4	21.0	14.5	11.9	18.3	97.2
NS10GC10	0.2	0.2	0.4	0.5	0.2	0.2	3.0	11.2	17.0	21.6	13.9	12.7	19.1	98.3

Notes to the Testing:
1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

OW24

QA SUMMARY

Client:	Ecology & Environment	Project No.:	002330.WD10
ARI Trip. Sample ID:	OW24B	Batch No.:	OW24-1
Client Trip. Sample ID:	NS02GC10	Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
NS02GC10	100.0	100.0	99.7	97.5	94.1	90.6	87.4	83.3	75.3	55.5	39.8	26.2	18.1	11.3
	100.0	100.0	99.9	97.0	94.1	90.9	88.1	84.4	75.0	57.8	40.3	27.3	18.6	11.6
	100.0	100.0	99.3	96.6	92.7	89.2	85.9	81.3	74.0	57.0	40.4	26.9	18.4	11.7
AVE	NA	100.00	99.63	97.05	93.60	90.25	87.13	83.00	74.75	56.76	40.16	26.78	18.34	11.54
STDEV	NA	0.00	0.29	0.47	0.82	0.88	1.14	1.57	0.70	1.17	0.32	0.57	0.27	0.24
%RSD	NA	0.00	0.29	0.49	0.88	0.98	1.31	1.89	0.94	2.06	0.79	2.13	1.47	2.10

The Triplicate Applies To The Following Samples

Client ID	Date Sampled	Date Extracted	Date Complete	QA Ratio (95-105)	Data Qualifiers	Pipette Portion (5.0-25.0g)
NS02GC10	4/13/2009	4/23/2009	4/28/2009	97.6		7.9
	4/13/2009	4/23/2009	4/28/2009	97.5		7.5
	4/13/2009	4/23/2009	4/28/2009	97.8		7.4
NS01GC10	4/13/2009	4/23/2009	4/28/2009	102.3		7.8
NS02GC20	4/13/2009	4/24/2009	4/28/2009	100.6		7.0
NS03GC10	4/13/2009	4/23/2009	4/28/2009	96.5		6.4
NS04GC10	4/15/2009	4/24/2009	4/28/2009	102.2		20.2
NS04GC20	4/15/2009	4/23/2009	4/28/2009	97.1		9.0
NS06GC10	4/14/2009	4/23/2009	4/28/2009	100.3		5.8
NS07GC10	4/14/2009	4/24/2009	4/28/2009	96.5		14.1
NS07GC30	4/14/2009	4/24/2009	4/28/2009	95.0		15.4
NS08GC10	4/14/2009	4/23/2009	4/28/2009	97.5		5.9
NS09GC10	4/20/2009	4/23/2009	4/28/2009	95.6		6.2
NS10GC10	4/14/2009	4/23/2009	4/28/2009	97.2		6.0

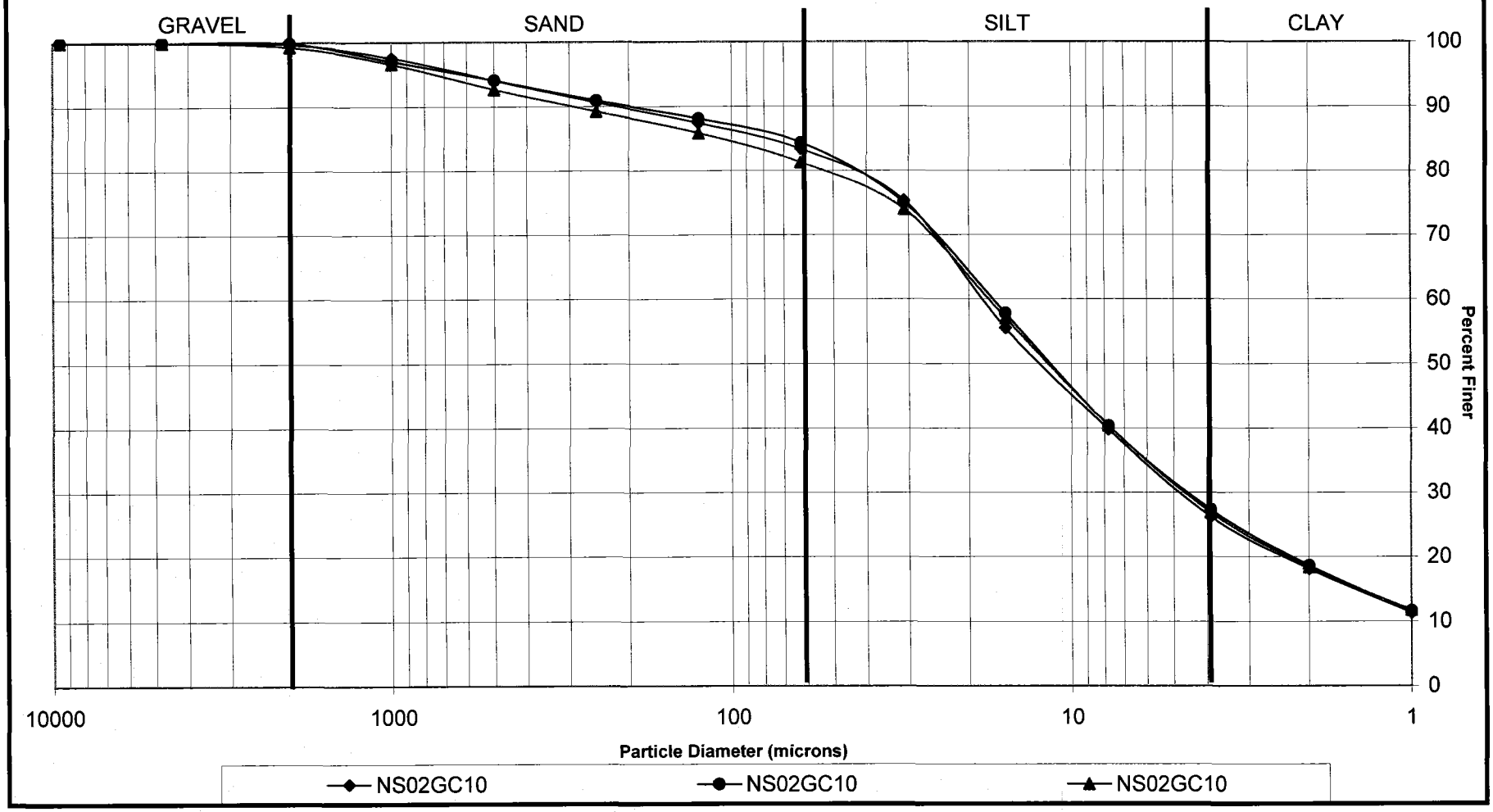
* ARI Internal QA limits = 95-105%

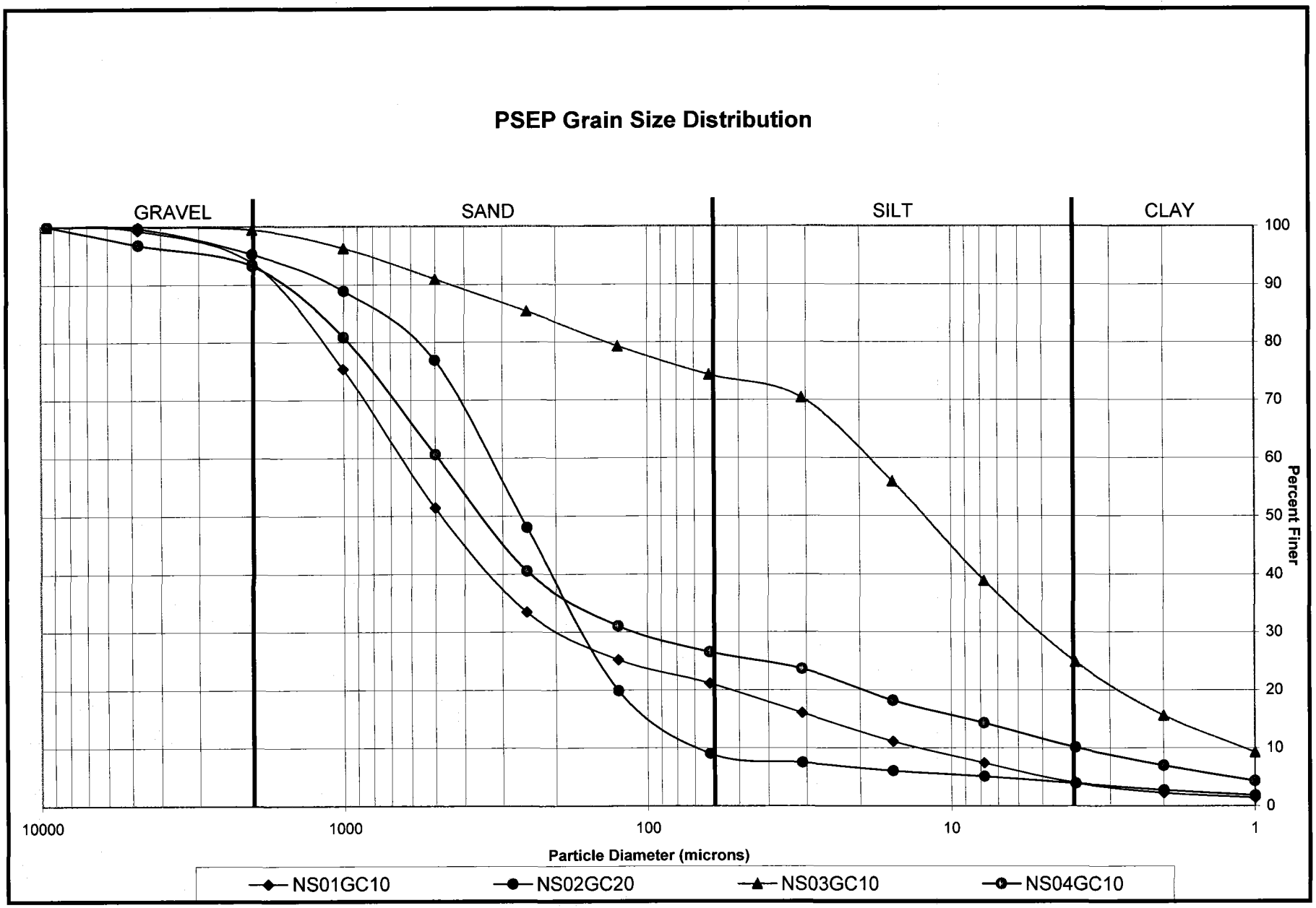
Notes to the Testing:

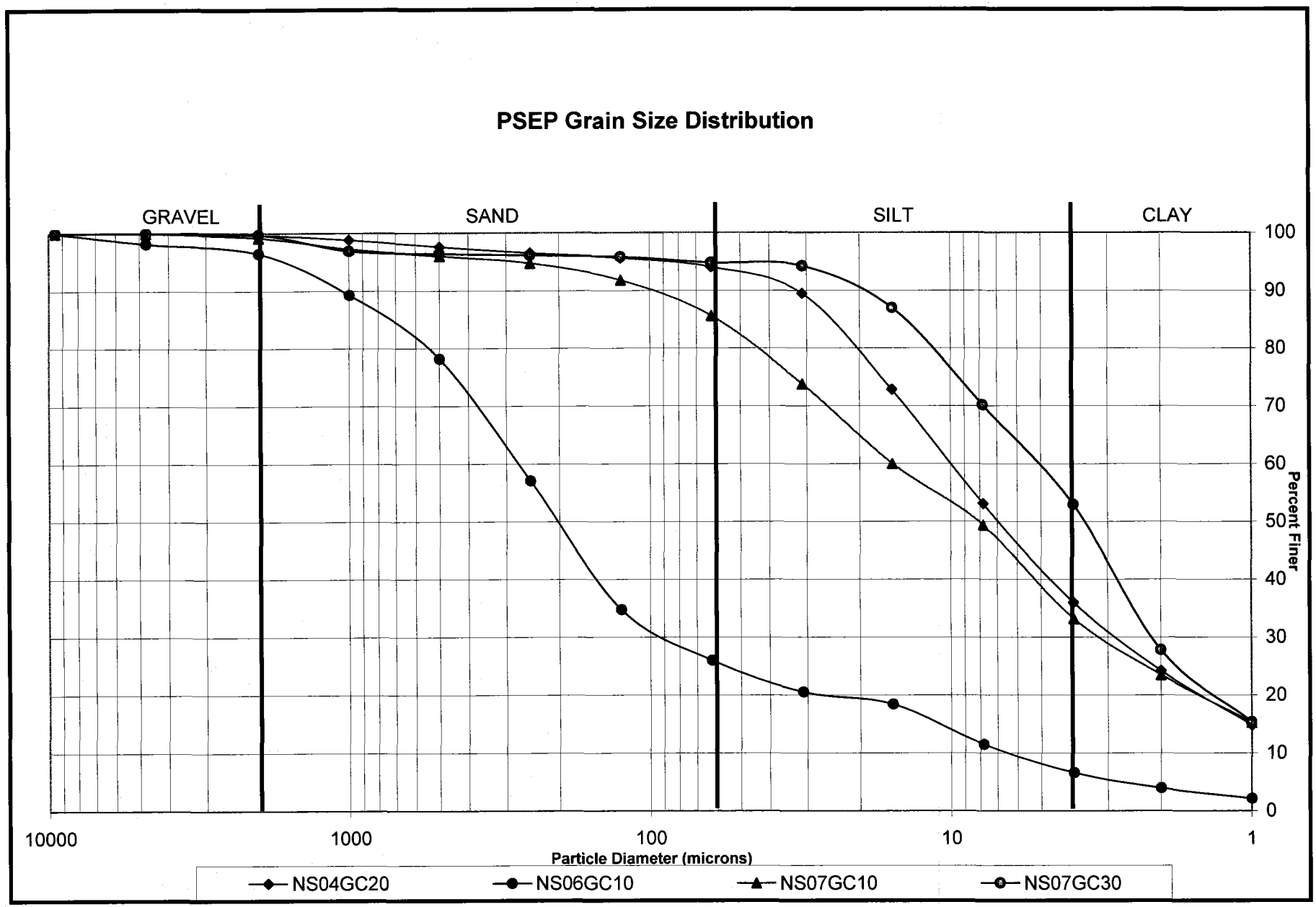
1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

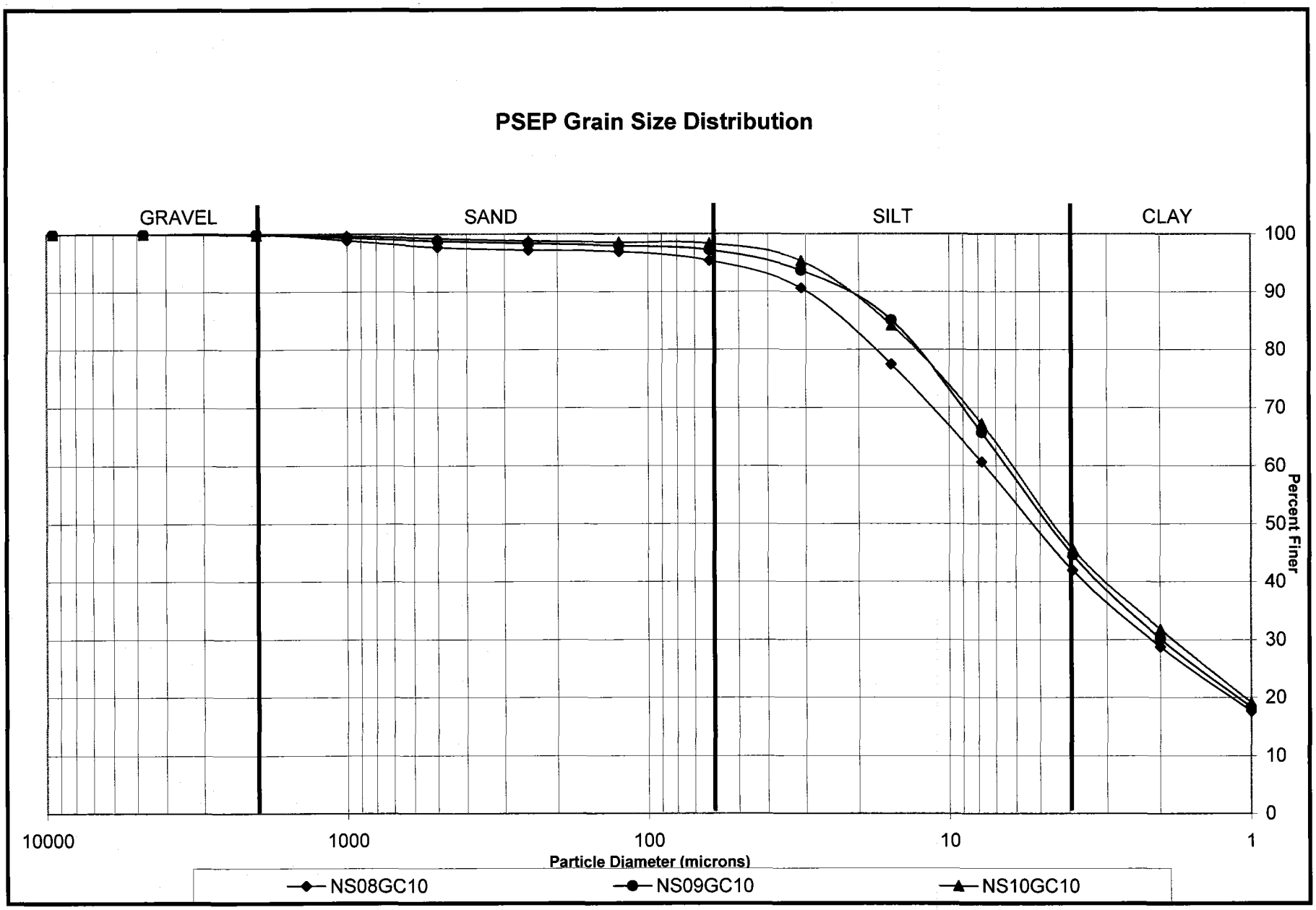
PSEP Grain Size Distribution

Triplicate Sample Plot




PSEP Grain Size Distribution
GRAVEL
SAND
SILT
CLAY
100
90
80
70
60
50
40
30
20
10
0
Percent Finer
10000
1000
100
10
1
Particle Diameter (microns)
NS01GC10
NS02GC20
NS03GC10
NS04GC10


PSEP Grain Size Distribution
GRAVEL
SAND
SILT
CLAY
100
90
80
70
60
50
40
30
20
10
0
Percent Finer
10000
1000
100
10
1
Particle Diameter (microns)
NS04GC20
NS06GC10
NS07GC10
NS07GC30


PSEP Grain Size Distribution
GRAVEL
SAND
SILT
CLAY
100
90
80
70
60
50
40
30
20
10
0
Percent Finer
10000
1000
100
10
1
Particle Diameter (microns)
NS08GC10
NS09GC10
NS10GC10

PSEP GRAIN SIZE ANALYSIS

Job No. DW24 ARI Sample No. B-1 Client Sample No. NS02GC10

Set-up Date: 4/23/09 Sample Description: Silty clay

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	176
Tare Weight	1.5298
Wet Weight + Tare	22.7376
Dry Weight + Tare	9.5060

Test Sample	Initials EG
Container No.	176
Tare Weight	50.3548
Wet Weight + Tare	75.4182
Dry Weight + Tare	51.9632

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.3538
4	50.3538
10	50.3799
18	50.5872
35	50.9143
60	51.2410
120	51.5406
230	51.9247
PAN	0.0747

4/27/2009

Temp:23

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
B-1-1	1.5318	1.7029	10:21:00
B-1-2	1.5148 (05)	1.6692	10:21:20
B-1-3	1.5195	1.6360	10:22:46
B-1-4	1.5043	1.5905	10:28:05
B-1-5	1.5025	1.5624	10:49:18
B-1-6	1.5159	1.5601	12:14:00
B-1-7	1.5423	1.5734	15:47:00
			8:57:00

alt Correction

are Wt.	
are + Dry Sample	
alt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. DW24 ARI Sample No. B-2 Client Sample No. NSD26C10

Set-up Date: 4/23/09 Sample Description: silty clay

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	190
Tare Weight	1.5448
Wet Weight + Tare	29.4867
Dry Weight + Tare	11.9149

Test Sample	Initials EG
Container No.	190
Tare Weight	51.5011
Wet Weight + Tare	75.4282
Dry Weight + Tare	52.98902

AR

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	51.5158
4	51.5158
10	51.5282
18	51.7785
35	52.0393
60	52.3232
120	52.5720
230	52.9039
PAN	0.0791

4/27/2009

Temp:23

PIPETTE ANALYSIS
Initials EG

TIME

Tare ID	Tare Wt	Dry Wt & Tare	
B-2-1	1.5432	1.67070	10:24:00
B-2-2	1.5404	1.6864	10:24:20
B-2-3	1.5300	1.6446	10:25:46
B-2-4	1.5136	1.5964	10:31:05
B-2-5	1.52754 (AS)	1.5865	10:52:18
B-2-6	1.5133	1.5565	12:17:00
B-2-7	1.5155	1.5460	15:50:00
			9:00:00

alt Correction

are Wt.	
are + Dry Sample	
alt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. B-3 Client Sample No. NiS026C10

Set-up Date: 4/23/09 Sample Description: silty clay

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	113
Tare Weight	1.5464
Wet Weight + Tare	24.9553
Dry Weight + Tare	10.2228

Test Sample	Initials EG
Container No.	113
Tare Weight	50.4245
Wet Weight + Tare	75.1163
Dry Weight + Tare	52.1795

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.4206
4	50.4206
10	50.4841
18	50.7341
35	51.0927
60	51.4046
120	51.7134
230	52.1332
PAN	0.0745

4/27/2009

Temp:23

lt Correction	
re Wt.	
re + Dry Sample	
lt Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
B-3-1	1.5210	1.6833	10:27:00
B-3-2	1.5131	1.6609	10:27:20
B-3-3	1.5021	1.6182	10:28:46
B-3-4	1.5051	1.5890	10:34:05
B-3-5	1.5028	1.5624	10:55:18
B-3-6	1.5384	1.5821	12:20:00
B-3-7	1.5279	1.5592	15:53:00
			9:03:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. A Client Sample No. NSD16C10

Set-up Date: 4/23/09 Sample Description: gravely silt, organic debris & fines, (1" rock excluded) SHEET 1

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials: EG
Container No.	186
Tare Weight	1.5498
Wet Weight + Tare	45.3644
Dry Weight + Tare	30.9635

Test Sample	Initials EG
Container No.	186
Tare Weight	49.6534
Wet Weight + Tare	104.7374
Dry Weight + Tare	79.1796

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.6515
4	49.9178
10	51.9650
18	58.7711
35	67.6336
60	74.2782
120	77.3210
230	78.8271
PAN	0.4261

4/27/2009

Temp:23

Salt Correction	
Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
A-1	1.5437	1.6925	10:30:00
A-2	1.5006	1.6259	10:30:20
A-3	1.5492	1.6387	10:31:46
A-4	1.4931	1.5558	10:37:05
A-5	1.4627	1.5007	10:58:18
A-6	1.5356	1.5612	12:23:00
A-7	1.5396	1.5590	15:56:00
			9:06:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. C Client Sample No. NSØ2CC2 Ø

Set-up Date: 4/24/09 Sample Description: ORGANIC DEBRIS & FINES, SANDY SILT

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials GS
Container No.	170
Tare Weight	1.5479
Wet Weight + Tare	25.0879
Dry Weight + Tare	16.5899

Test Sample	Initials EJS
Container No.	17C
Tare Weight	49.4760
Wet Weight + Tare	170.1124
Dry Weight + Tare	120.1926

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.4767
4	49.7087
10	53.1196
18	58.0231
35	67.2938
60	89.5644
120	111.2380
230	119.5781
PAN	0.5844

4/27/2009

Temp:23

t Correction	
e Wt.	
e + Dry Sample	
t Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
C-1	1.5390	1.76790	10:33:00
C-2	1.5481	1.64727	10:33:20
C-3	1.5202	1.6224	10:34:46
C-4	1.5171	1.6048	10:40:05
C-5	1.5128	1.5825	11:01:18
C-6	1.5162	1.5683	12:26:00
C-7	1.5443	1.5819	15:59:00
			9:09:00

OW24: 00023
SAMPLE CONSUME(S)

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. D Client Sample No. NS03GC10

Set-up Date: 4/23/09 Sample Description: Silty clay, ORGANICS

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	111
Tare Weight	1.5447
Wet Weight + Tare	21.6681
Dry Weight + Tare	8.2631 AR

Test Sample	Initials EG
Container No.	111
Tare Weight	49.6623
Wet Weight + Tare	75.5789
Dry Weight + Tare	51.9984

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.6591
4	49.6591
10	49.7037
18	49.9814
35	50.4461
60	50.9246
120	51.4492
230	51.8780
PAN	0.1400

4/27/2009
Temp:23

Salt Correction	
Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
D-1	1.5463	1.6905	10:36:00
D-2	1.5346	1.6701	10:36:20
D-3	1.4964	1.6060	10:37:46
D-4	1.5247	1.6037	10:43:05
D-5	1.5254	1.5793	11:04:18
D-6	1.5245	1.5618	12:29:00
D-7	1.5298	1.5557	16:02:00
			9:12:00

PSEP GRAIN SIZE ANALYSIS

Job No. QW24 ARI Sample No. E Client Sample No. NS04GC10

Set-up Date: 4/24/09 Sample Description: ORGANIC DEBRIS & FINES, OIL/FUEL SMELL/SHEEN, ROCKS, SILTY CLAY

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials GS
Container No.	222
Tare Weight	1.5148
Wet Weight + Tare	29.5040
Dry Weight + Tare	16.2266

Test Sample	Initials GS
Container No.	222
Tare Weight	49.6620
Wet Weight + Tare	194.9724
Dry Weight + Tare	107.1508

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.6813
4	52.1433
10	54.9036
18	64.2849
35	79.7695
60	95.1085
120	102.3668
230	105.8097
PAN	1.6104

4/27/2009

Temp:23

PIPETTE ANALYSIS
Initials CE

Tare ID	Tare Wt	Dry Wt & Tare	TIME
E-1	1.5262	1.9071	10:39:00
E-2	1.5627	1.9247	10:39:20
E-3	1.5540	1.8350	10:40:46
E-4	1.5430	1.7656	10:46:05
E-5	1.5521	1.7124	11:07:18
E-6	1.5521	1.6655	12:32:00
E-7	1.5593	1.6327	16:05:00
			9:15:00

alt Correction

are Wt.	
are + Dry Sample	
alt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. F Client Sample No. NS046C20

Set-up Date: 4/23/09 Sample Description: silty clay

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials eg
Container No.	122
Tare Weight	1.5375
Wet Weight + Tare	38.3891 eg
Dry Weight + Tare	16.4789

Test Sample	Initials eg
Container No.	122
Tare Weight	50.4781
Wet Weight + Tare	73.9753
Dry Weight + Tare	51.0719 AR

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.4746
4	50.4746
10	50.5104
18	50.5906
35	50.7033
60	50.8092
120	50.8935
230	51.0409
PAN	0.0348

4/27/2009

Temp:23

Salt Correction	
Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials eg

Tare ID	Tare Wt	Dry Wt & Tare	TIME
F-1	1.5372	1.7315	10:42:00
F-2	1.5346	1.7195	10:42:20
F-3	1.5460	1.6982	10:43:46
F-4	1.5410	1.6545	10:49:05
F-5	1.5732	1.6531	11:10:18
F-6	1.5404	1.5971	12:35:00
F-7	1.5444	1.5827	16:08:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. I Client Sample No. NSDGC10

Set-up Date: 4/23/09 Sample Description: Oil/fuel sheen, organic debris & fines, silty clay

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	212
Tare Weight	1.5307
Wet Weight + Tare	32.0254
Dry Weight + Tare	14.6092

Test Sample	Initials EG
Container No.	212
Tare Weight	49.8338
Wet Weight + Tare	101.7671
Dry Weight + Tare	66.5166

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.8391
4	50.2411
10	50.6263
18	52.2257
35	54.7047
60	59.4024
120	64.3715
230	66.3253
PAN	0.2437

AR

4/27/2009

Temp:23

alt Correction	
are Wt.	
are + Dry Sample	
alt Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
I-1	1.5467	1.6705	10:45:00
I-2	1.5278	1.6284	10:45:20
I-3	1.5424	1.6335	10:46:46
I-4	1.5467	1.6097	10:52:05
I-5	1.5778	1.6165	11:13:18
I-6	1.5431	1.5700	12:38:00
I-7	1.5331	1.5519	16:11:00
			9:21:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. K Client Sample No. NS076C10

Set-up Date: 4/24/09 Sample Description: SILTY CLAY, organic fines

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials GS
Container No.	178
Tare Weight	1.5491
Wet Weight + Tare	29.8675
Dry Weight + Tare	7.6161

Test Sample	Initials GS
Container No.	178
Tare Weight	49.5727
Wet Weight + Tare	126.6968
Dry Weight + Tare	52.1964

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.5766
4	
10	49.7128
18	50.0301
35	50.2357
60	50.4436
120	50.9239
230	51.9585
PAN	0.2468

4/27/2009

Temp:23

alt Correction	
are Wt.	
are + Dry Sample	
alt Correction (x 50)	

PIPETTE ANALYSIS
Initials GS

Tare ID	Tare Wt	Dry Wt & Tare	TIME
K-1	1.5305	1.8346	10:48:00
K-2	1.5556	1.8175	10:48:20
K-3	1.5804	1.7951	10:49:46
K-4	1.5835	1.7618	10:55:05
K-5	1.5828	1.7057	11:16:18
K-6	1.5798	1.6695	12:41:00
K-7	1.5371	1.59846	16:14:00
			9:24:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. L Client Sample No. NSØ7GC3Ø

Set-up Date: 4/24/09 Sample Description: SILTY CLAY, organic fines

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials GS
Container No.	150
Tare Weight	1.5383
Wet Weight + Tare	25.1708
Dry Weight + Tare	4.2680

Test Sample	Initials GS
Container No.	150
Tare Weight	49.9740
Wet Weight + Tare	190.5874
Dry Weight + Tare	50.8913

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.9814
4	
10	50.0247
18	50.4867
35	50.5658
60	50.6078
120	50.6627
230	50.8277
PAN	0.0782

4/27/2009

Temp:23

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
L-1	1.5749	1.9091	10:51:00
L-2	1.5700	1.9015	10:51:20
L-3	1.5646	1.8701	10:52:46
L-4	1.5797	1.8287	10:58:05
L-5	1.5766	1.7667	11:19:18
L-6	1.5550	1.6593	12:44:00
L-7	1.5370	1.5986	16:17:00
			9:27:00

PSEP GRAIN SIZE ANALYSIS

Job No. DW24 ARI Sample No. M Client Sample No. N8086C10

Set-up Date: 4/23/09 Sample Description: oil/fuel smell/sheen silty clay

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EO
Container No.	156
Tare Weight	1.5531
Wet Weight + Tare	31.3850
Dry Weight + Tare	9.1603

Test Sample	Initials EO
Container No.	156
Tare Weight	50.5512
Wet Weight + Tare	74.8718
Dry Weight + Tare	50.8676

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.5478
4	50.5478
10	50.5478
18	50.6179
35	50.6918
60	50.7218
120	50.7400
230	50.8340
PAN	0.0332

4/27/2009

Temp:23

alt Correction	
are Wt.	
are + Dry Sample	
alt Correction (x 50)	

PIPETTE ANALYSIS
Initials EO

Tare ID	Tare Wt	Dry Wt & Tare	TIME
M-1	1.5471	1.6779	10:54:00
M-2	1.5613	1.6859	10:54:20
M-3	1.5742	1.6820	10:55:46
M-4	1.5358	1.6222	11:01:05
M-5	1.5225	1.5852	11:22:18
M-6	1.5314	1.5773	12:47:00
M-7	1.5188	1.5505	16:20:00
			9:30:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. N Client Sample No. N8MEC1D

Set-up Date: 4/28/09 Sample Description: oil/fuel sheen & smell

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EJ
Container No.	132
Tare Weight	1.5448
Wet Weight + Tare	33.1695
Dry Weight + Tare	9.6606

Test Sample	Initials EJ
Container No.	132
Tare Weight	49.4159
Wet Weight + Tare	74.3905
Dry Weight + Tare	49.6116

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.4143
4	49.4143
10	49.4143
18	49.4540
35	49.4905
60	49.5172
120	49.5465
230	49.5913
PAN	0.0189

4/27/2009

Temp:23

TIME

Correction	
Wt.	
+ Dry Sample	
Correction (x 50)	

PIPETTE ANALYSIS
Initials EJ

Tare ID	Tare Wt	Dry Wt & Tare	TIME
N-1	1.5179	1.6577	10:57:00
N-2	1.5203	1.6552	10:57:20
N-3	1.5428	1.66671	10:58:46
N-4	1.5447	1.6420	11:04:05
N-5	1.5125	1.5816	11:25:18
N-6	1.5566	1.6006	12:50:00
N-7	1.5494	1.5832	16:23:00
			9:33:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW24 ARI Sample No. 0 Client Sample No. NSIDGC10

Set-up Date: 4/23/09 Sample Description: silty clay

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/24/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	187
Tare Weight	1.5720
Wet Weight + Tare	28.6642
Dry Weight + Tare	8.6806

Test Sample	Initials EG
Container No.	187
Tare Weight	51.6891
Wet Weight + Tare	75.0428
Dry Weight + Tare	51.8013

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	51.6863
4	51.6863
10	51.6968
18	51.7072
35	51.7325
60	51.7603
120	51.7749
230	51.7881
PAN	0.0065

4/27/2009

Temp:23

Salt Correction	
Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials EG

Tare ID	Tare Wt	Dry Wt & Tare	TIME
			11:00:00
D-1	1.5355	1.669189	11:00:20
D-2	1.5484	1.6780	11:01:46
D-3	1.5436	1.6591	11:07:05
D-4	1.5426	1.63167	11:28:18
D-5	1.5760	1.6429	12:53:00
D-6	1.5823	1.6317	16:26:00
D-7	1.5745	1.6079	9:36:00

Analytical Resources, Incorporated
Analytical Chemists and Consultants

May 1, 2009

Mark Longtine
Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

RE: Project: 002330.WD10
ARI Job: OW26

Dear Mark:

Please find enclosed the original chain of custody documentation and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.
Bob Congleton
- For -
Susan D. Dunnihoo
Director, Client Services
sue@arilabs.com
206-695-6207

cc: eFile OW26

Enclosures

Chain of Custody
Documentation

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW26

prepared
by

Analytical Resources, Inc.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: OW26	Turn-around Requested:	Page: 2 of 3	
ARI Client Company: Ecology + Environment, Inc. Phone: 206 624-9537		Date: 4/21/09	Ice Present?
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Petersen		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS07GC10	4/14/09	1142	Sediment	1	X	
NS07GC30	4/14/09	1142			X	
NS08GC10	4/14/09	1255			X	
NS09GC10	4/20/09	~~1440~~ 0905 35			X	
NS10GC10	4/14/09	1440			X	
NS11GC10	4/14/09	1618			X	
NS12GC10	4/14/09	1752			X	
NS12GC20	4/14/09	1752			X	
NS13GC10	4/15/09	1502			X	
NS13GC20	4/15/09	1502			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: E+E	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: OW26	Turn-around Requested:	Page: 3 of 3	
ARI Client Company: Ecology + Environment, Inc	Phone: 206 624-9537	Date: 4/21/09	Ice Present?
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Petersen		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP Grain Size	Notes/Comments
NS14GC10	4/15/09	1625	Sediment	1	X	
NS16GC10	4/15/09	1001			X	
NS17GC10	4/16/09	0933			X	
NS18GC10	4/16/09	1055			X	
NS19GC10	4/16/09	1227			X	
NS19GC20	4/16/09	1227			X	
NS20GC10	4/16/09	1420			X	
NS23GC10	4/17/09	1607			X	
NS24GC10	4/17/09	~~1400~~ 1725			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: Ecology + Environment	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 1 of 3	
ARI Client Company: Ecology + Environment Inc.	Phone: 206 624-9537	Date: 4/21/09	Ice Present? YES
Client Contact: Mark Longtine		No. of Coolers:	Cooler Temps:
Client Project Name: 002330.WD10			
Client Project #: 002330.WD10	Samplers: Don Robertson Petersen DS		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: PSEP GrainSize	Notes/Comments
NS01GC10	4/13/09	1244	Sediment	1	X	
NS02GC10	4/13/09	1450			X	
NS02GC20	4/13/09	1450			X	
NS03GC10	4/13/09	1610			X	
NS04GC10	4/15/09	1140			X	
NS04GC20	4/15/09	1140			X	
NS05GC10	4/15/09	1312			X	
NS05GC20	4/15/09	1312			X	
NS06GC10	4/14/09	1015			X	
NS06GC20	4/14/09	1015			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Jennifer Schmitz	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: E+E	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Ecology & Environment Project Name: 002330.WP10

COC No(s): _____ NA Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other: _____

Assigned ARI Job No: 0W26 Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)	13.6	10.8

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 101886

Cooler Accepted by: KL Date: 4/21/09 Time: 1120

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		(YES)	NO
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO

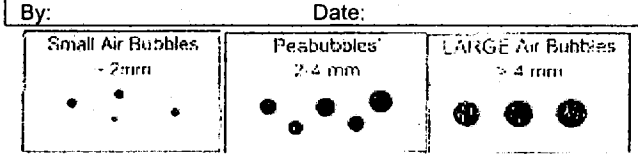
Samples Logged by: MH Date: 4/21/09 Time: 1211

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Case Narrative

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW26

prepared
by

Analytical Resources, Inc.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Ecology & Environment **ARI Project No.:** OW26

Client Project: 002330.WD10

Case Narrative

1. Nine samples were submitted for grain size analysis according to Puget Sound Estuary Protocol (PSEP) methodology on April 21, 2009.
2. The samples were run in a single batch and one sample from this job was chosen for triplicate analysis. The triplicate data is reported on the QA summary.
3. Six samples contained woody or other organic matter, which may have broken down during the sieving process, affecting grain size analysis.
4. Four samples contained an oil-like sheen and/or smell. This is an organic contaminant which is not appropriate for PSEP analysis and may have affected the data.
5. The data is provided in summary tables and plots.
6. There were no other noted anomalies in this project.

Approved by: _____ Date: 5/1/09
Lead Technician

Data Reporting Qualifiers

Effective 12/28/04

Inorganic Data

U Indicates that the target analyte was not detected at the reported concentration

* Duplicate RPD is not within established control limits

B Reported value is less than the CRDL but ≥ the Reporting Limit

N Matrix Spike recovery not within established control limits

NA Not Applicable, analyte not spiked

H The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible

L Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U Indicates that the target analyte was not detected at the reported concentration

* Flagged value is not within established control limits

B Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.

J Estimated concentration when the value is less than ARI's established reporting limits

D The spiked compound was not detected due to sample extract dilution

NR Spiked compound recovery is not reported due to chromatographic interference

E Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.

S Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte

NA The flagged analyte was not analyzed for

NS The flagged analyte was not spiked into the sample

M Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses

M2 The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"

Y The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.

C The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column

P The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference

Geotechnical Data

A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.

F Samples were frozen prior to particle size determination

SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations

SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis

W Weight of sample in some pipette aliquots was below the level required for accurate weighting

Laboratory Data Package

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW26

prepared
by

Analytical Resources, Inc.

Geotechnical Analysis

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW26

prepared
by

Analytical Resources, Inc.

Ecology & Environment
002330.WD10

Apparent Grain Size Distribution Summary
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
Phi Size	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Sieve Size (microns)	3/8"	#4 (4750)	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (63)	31.00	15.60	7.80	3.90	2.00	1.00
NS11GC10	100.0	100.0	100.0	97.6	95.6	94.7	94.0	93.1	89.9	79.8	60.9	46.4	30.7	18.8
	100.0	100.0	99.6	96.4	94.0	93.0	92.3	91.5	89.2	77.4	63.0	45.1	29.2	18.8
	100.0	100.0	99.5	96.8	94.9	94.1	93.5	92.8	89.7	79.7	63.0	45.6	29.8	18.7
NS13GC10	100.0	100.0	100.0	99.8	99.6	99.1	95.4	85.8	79.5	65.4	40.7	23.4	16.5	10.0
NS13GC20	100.0	100.0	100.0	98.7	97.4	96.1	94.2	85.4	71.7	51.9	38.2	25.1	15.9	9.3
NS14GC10	100.0	100.0	99.9	97.2	95.5	94.7	93.5	91.8	88.3	77.3	61.1	41.6	26.7	16.6
NS16GC10	100.0	100.0	100.0	99.3	99.1	98.3	96.3	93.8	90.2	79.6	63.4	42.2	28.3	18.4
NS17GC10	100.0	100.0	99.9	99.8	99.6	99.0	97.9	95.9	72.0	63.1	51.4	37.7	26.9	18.9
NS19GC10	100.0	100.0	99.9	99.8	99.6	98.9	96.6	91.5	84.5	72.2	56.1	37.4	25.6	16.6
NS19GC20	100.0	100.0	99.5	97.5	96.1	95.7	95.2	92.5	83.9	73.7	58.2	42.3	29.3	19.0
NS20GC10	100.0	100.0	99.7	99.3	98.2	92.8	79.2	69.1	62.4	52.8	39.6	25.7	16.2	11.1

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

Ecology & Environment
002330.WD10

Apparent Grain Size Distribution Summary
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay			Total Fines
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10	<4
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0	<230 (<62)
NS11GC10	0.0	2.4	2.0	1.0	0.7	0.8	3.3	10.1	18.9	14.5	15.7	11.8	18.8	93.1
	0.4	3.2	2.4	0.9	0.7	0.8	2.3	11.8	14.4	17.9	15.9	10.4	18.8	91.5
	0.5	2.7	1.9	0.8	0.6	0.8	3.0	10.1	16.6	17.5	15.8	11.0	18.7	92.8
NS13GC10	0.0	0.2	0.3	0.5	3.7	9.6	6.4	14.0	24.7	17.3	7.0	6.5	10.0	85.8
NS13GC20	0.0	1.3	1.3	1.3	1.9	8.8	13.7	19.8	13.7	13.1	9.3	6.6	9.3	85.4
NS14GC10	0.1	2.8	1.6	0.8	1.2	1.7	3.5	11.0	16.2	19.5	14.8	10.1	16.6	91.8
NS16GC10	0.0	0.7	0.3	0.7	2.0	2.5	3.6	10.7	16.1	21.3	13.8	10.0	18.4	93.8
NS17GC10	0.1	0.1	0.1	0.6	1.2	2.0	24.0	8.9	11.7	13.7	10.8	8.0	18.9	95.9
NS19GC10	0.1	0.1	0.2	0.7	2.4	5.1	7.0	12.2	16.1	18.7	11.7	9.0	16.6	91.5
NS19GC20	0.5	2.0	1.3	0.4	0.5	2.7	8.6	10.2	15.5	16.0	12.9	10.4	19.0	92.5
NS20GC10	0.3	0.5	1.1	5.4	13.6	10.1	6.6	9.6	13.2	13.9	9.5	5.0	11.1	69.1

Notes to the Testing:
1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

QA SUMMARY

Client:	Ecology & Environment	Project No.:	002330.WD10
ARI Trip. Sample ID:	OW26A	Batch No.:	OW26-1
Client Trip. Sample ID:	NS11GC10	Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
NS11GC10	100.0	100.0	100.0	97.6	95.6	94.7	94.0	93.1	89.9	79.8	60.9	46.4	30.7	18.8
	100.0	100.0	99.6	96.4	94.0	93.0	92.3	91.5	89.2	77.4	63.0	45.1	29.2	18.8
	100.0	100.0	99.5	96.8	94.9	94.1	93.5	92.8	89.7	79.7	63.0	45.6	29.8	18.7
AVE	NA	100.00	99.69	96.92	94.82	93.93	93.25	92.45	89.60	78.97	62.32	45.68	29.86	18.78
STDEV	NA	0.00	0.28	0.63	0.84	0.84	0.89	0.88	0.35	1.33	1.22	0.65	0.76	0.04
%RSD	NA	0.00	0.28	0.65	0.89	0.89	0.95	0.95	0.39	1.68	1.95	1.42	2.54	0.24

The Triplicate Applies To The Following Samples

Client ID	Date Sampled	Date Extracted	Date Complete	QA Ratio (95-105)	Data Qualifiers	Pipette Portion (5.0-25.0g)
NS11GC10	4/14/2009	4/23/2009	4/30/2009	97.0		5.8
	4/14/2009	4/23/2009	4/30/2009	96.0		6.4
	4/14/2009	4/23/2009	4/30/2009	96.7		6.5
NS13GC10	4/15/2009	4/28/2009	4/30/2009	104.4		10.9
NS13GC20	4/15/2009	4/23/2009	4/30/2009	99.8		6.6
NS14GC10	4/15/2009	4/23/2009	4/30/2009	97.4		5.3
NS16GC10	4/15/2009	4/28/2009	4/30/2009	102.8		11.0
NS17GC10	4/16/2009	4/28/2009	4/30/2009	95.9		11.6
NS19GC10	4/16/2009	4/28/2009	4/30/2009	103.9		10.1
NS19GC20	4/16/2009	4/23/2009	4/30/2009	97.3		6.6
NS20GC10	4/16/2009	4/28/2009	4/30/2009	97.5		10.4

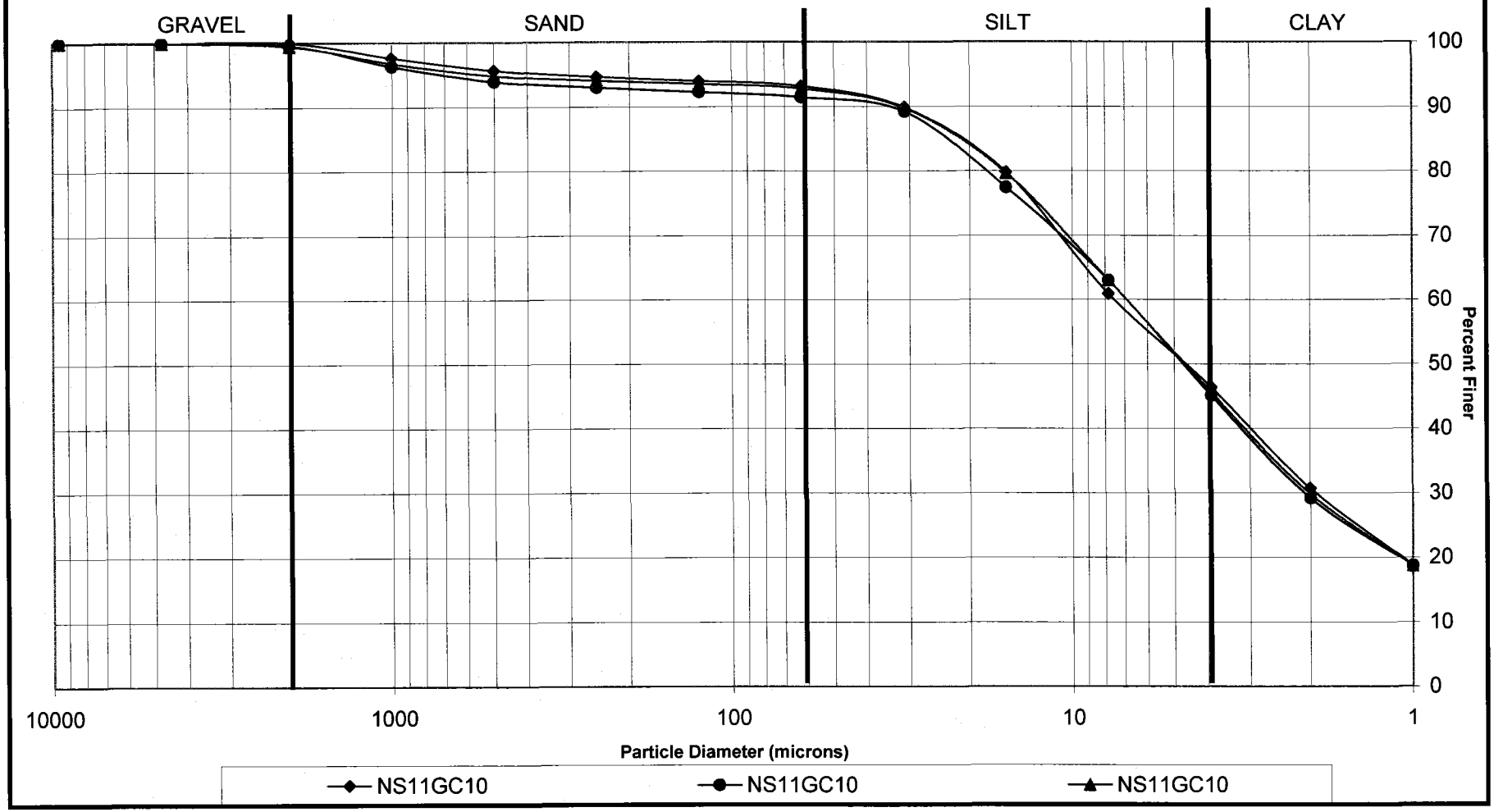
* ARI Internal QA limits = 95-105%

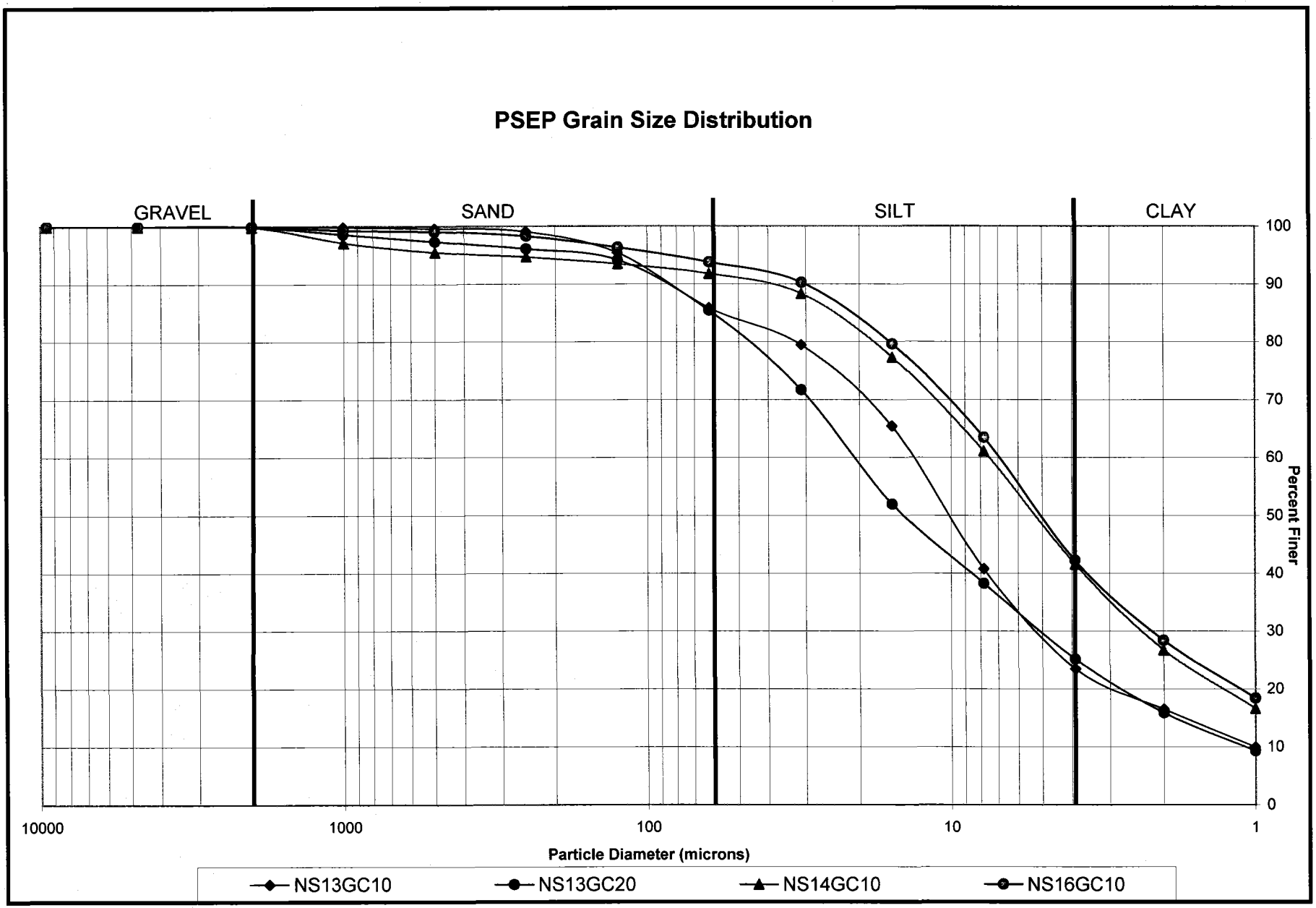
Notes to the Testing:

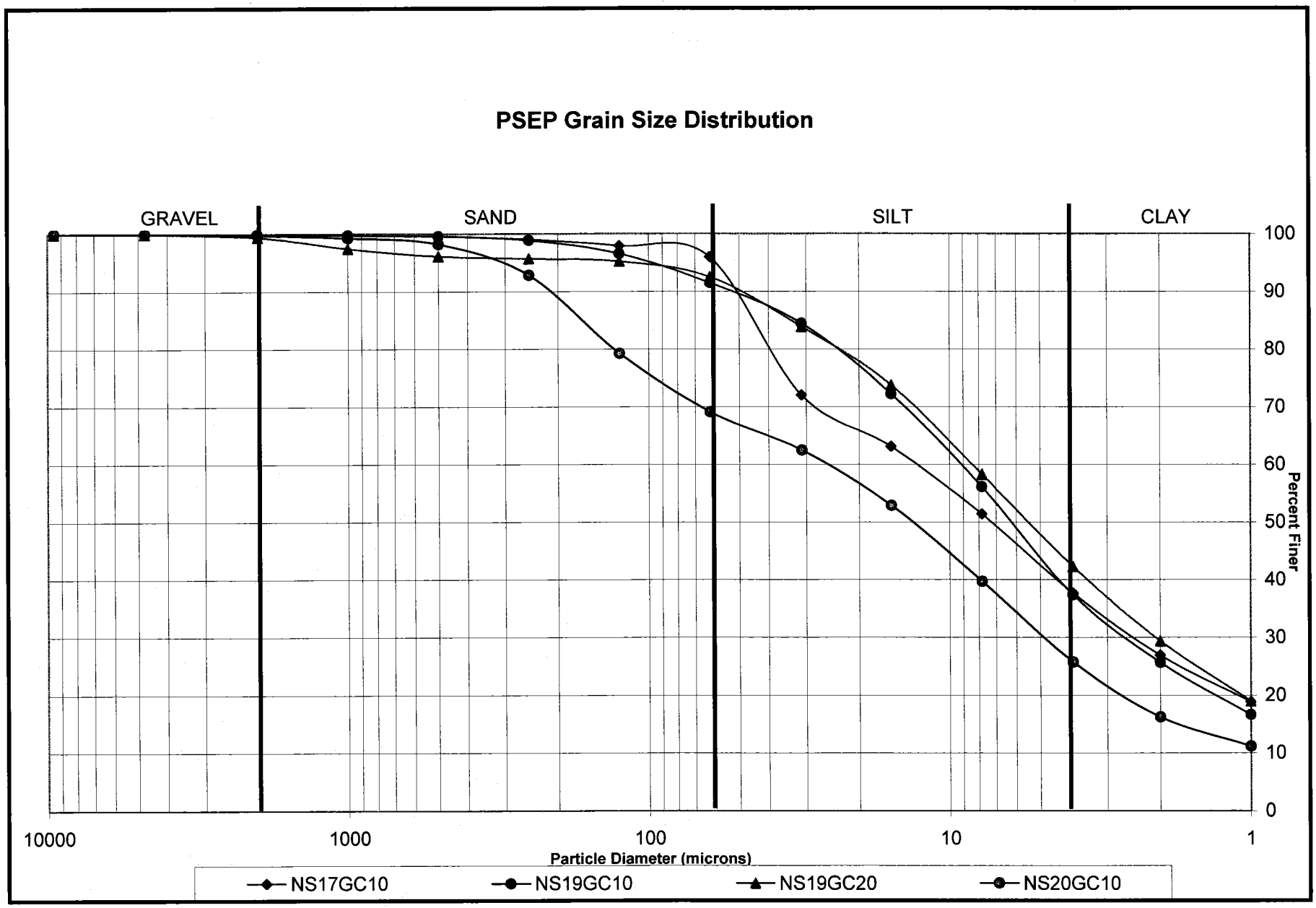
1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

PSEP Grain Size Distribution

Triplicate Sample Plot




PSEP Grain Size Distribution
GRAVEL
SAND
SILT
CLAY
100
90
80
70
60
50
40
30
20
10
0
Percent Finer
10000
1000
100
10
1
Particle Diameter (microns)
NS13GC10
NS13GC20
NS14GC10
NS16GC10


PSEP Grain Size Distribution
GRAVEL
SAND
SILT
CLAY
100
90
80
70
60
50
40
30
20
10
0
Percent Finer
10000
1000
100
10
1
Particle Diameter (microns)
NS17GC10
NS19GC10
NS19GC20
NS20GC10

ReSplit

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. L Client Sample No. NS20GC10

Set-up Date: 4/23/09 Sample Description: Silty clay, organic fines oil/fuel smell & sheen

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	220
Tare Weight	1.5824
Wet Weight + Tare	23.9109
Dry Weight + Tare	5.41890

AR

Test Sample	Initials EG
Container No.	220
Tare Weight	49.8909
Wet Weight + Tare	75.42013
Dry Weight + Tare	51.5479

SIEVE ANALYSIS

Initials AR

Sieve Size	Weight Retained
Tare	49.8980
4	49.8980
10	49.9219
18	50.1384
35	50.2916
60	50.5340
120	51.0722
230	51.4119
PAN	0.1143

2.9

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS

Initials

Tare ID	Tare Wt	Dry Wt & Tare

RESPLIT

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. D Client Sample No. NS13GC10

Set-up Date: 4/23/09 Sample Description: Silty clay, organic fines, oil/fuel sheen

Calgon Batch # 198 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	228
Tare Weight	1.5755
Wet Weight + Tare	22.8672
Dry Weight + Tare	4.2782

Test Sample	Initials EG
Container No.	228
Tare Weight	49.8138
Wet Weight + Tare	82.1615
Dry Weight + Tare	50.5366

SIEVE ANALYSIS

Initials AR

Sieve Size	Weight Retained
Tare	49.8206
4	4
10	
18	49.9429
35	50.0480
60	50.0916
120	50.1833
230	50.3992
PAN	0.1292

3.5g

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS

Initials

Tare ID	Tare Wt	Dry Wt & Tare

Resplit

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. 6 Client Sample No NS16GC10

Set-up Date: 4/23/09 Sample Description: silty clay organic fines

Calgon Batch # 197 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	197
Tare Weight	1.5767
Wet Weight + Tare	30.3245
Dry Weight + Tare	7.1821

Test Sample	Initials EG
Container No.	197
Tare Weight	50.7384
Wet Weight + Tare	76.4289
Dry Weight + Tare	51.2837

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.7374
4	50.7374
10	50.7492
18	50.9075
35	50.9856
60	51.0277
120	51.1051
230	51.2069
PAN	0.0605

4.5

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare

Resplit

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. H Client Sample No. NS17GC10

Set-up Date: 4/23/09 Sample Description: silty clay, organic fines

Calgon Batch # 198 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	208
Tare Weight	1.5833
Wet Weight + Tare	35.9679
Dry Weight + Tare	7.9590

Test Sample	Initials EG
Container No.	208
Tare Weight	49.1732
Wet Weight + Tare	76.0115
Dry Weight + Tare	49.7836

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.1726
4	49.1726
10	49.1787
18	49.3444
35	49.4528
60	49.5099
120	49.5921
230	49.6876 AR
PAN	0.0732

AR 4.5

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare

Resplit

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. J Client Sample No. NS196C10

Set-up Date: 4/28/09 Sample Description: silty clay, organic debris, oil/fuel smell & sheen

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	216
Tare Weight	1.5304
Wet Weight + Tare	26.1849
Dry Weight + Tare	6.0884

Test Sample	Initials EG
Container No.	216
Tare Weight	49.0909
Wet Weight + Tare	76.7604
Dry Weight + Tare	49.9891

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.0924
4	49.0924
10	49.1059
18	49.2747
35	49.3754
60	49.4441
120	49.6390
230	49.8717
PAN	0.0986

4.3

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. A-1 Client Sample No. NSIIGC10

Set-up Date: 3/4/23/09 Sample Description: silty clay

Calgon Batch # 168 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	141
Tare Weight	1.5155
Wet Weight + Tare	25.9668
Dry Weight + Tare	8.1867

Test Sample	Initials EG
Container No.	141
Tare Weight	51.3366
Wet Weight + Tare	74.3097
Dry Weight + Tare	51.8096

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	51.3378
4	51.3378
10	51.3378
18	51.4877
35	51.6110
60	51.6721
120	51.7157
230	51.7683
PAN	0.0394

4/29/2009

Temp:23

Salt Correction	
Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt AR	Dry Wt & Tare	TIME
A-1-1	1.4998	1.6297	10:45:00
A-1-2	1.4748	1.6010	10:45:20
A-1-3	1.4884	1.6016	10:46:46
A-1-4	1.5007	1.5895	10:52:05
A-1-5	1.4868	1.5568	11:13:18
A-1-6	1.4826	1.5323	12:38:00
A-1-7	1.4834	1.5178	16:11:00
			9:21:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. A-2 Client Sample No. NSIIEC10

Set-up Date: 4/23/09 Sample Description: silty clay

Calgon Batch # 198 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	189
Tare Weight	1.5720
Wet Weight + Tare	24.3144
Dry Weight + Tare	7.7330

Test Sample	Initials EG
Container No.	189
Tare Weight	49.8548
Wet Weight + Tare	75.7522
Dry Weight + Tare	50.5065

SIEVE ANALYSIS
Initials AB

Sieve Size	Weight Retained
Tare	49.8567
4	49.8567
10	49.8848
18	50.1120
35	50.2805
60	50.3468
120	50.3994
230	50.4561
PAN	0.0593

4/29/2009

Temp:23

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare	TIME
A-2-1	1.4793	1.6236	10:48:00
A-2-2	1.5446	1.6851	10:48:20
A-2-3	1.5479	1.6712	10:49:46
A-2-4	1.5454	1.6476	10:55:05
A-2-5	1.5518	1.6278	11:16:18
A-2-6	1.5174	1.5701	12:41:00
A-2-7	1.5397	1.5772	16:14:00
			9:24:00

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. A-3 Client Sample No. NS11GC10

Set-up Date: 4/23/09 Sample Description: Silty clay

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	153
Tare Weight	1.5004
Wet Weight + Tare	21.5455
Dry Weight + Tare	6.9863

Test Sample	Initials EG
Container No.	153
Tare Weight	49.0848
Wet Weight + Tare	74.5697
Dry Weight + Tare	49.6329

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.0860
4	49.0860
10	49.1231
18	49.3097
35	49.4450
60	49.4978
120	49.5374
230	49.5913
PAN	0.0400

4/29/2009

Temp:23

PIPETTE ANALYSIS
Initials ____

Tare ID	Tare Wt	Dry Wt & Tare	TIME
A-3-1	1.5403	1.6845	10:51:00
A-3-2	1.5375	1.6770	10:51:20
A-3-3	1.5305	1.6555	10:52:46
A-3-4	1.5402	1.6412	10:58:05
A-3-5	1.5461	1.6219	11:19:18
A-3-6	1.5396	1.5926	12:44:00
A-3-7	1.5428	1.5799	16:17:00
			9:27:00

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. D Client Sample No. NS13EC10

Set-up Date: ~~4/28/09~~ 4/29/09 Sample Description: Silty clay, organic fines, oil/fuel sheen

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/29/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	152
Tare Weight	1.5456
Wet Weight + Tare	30.6337
Dry Weight + Tare	5.3144

Test Sample	Initials EG
Container No.	152
Tare Weight	51.1292
Wet Weight + Tare	149.8010
Dry Weight + Tare	56.4067

SIEVE ANALYSIS
Initials EG

Sieve Size	Weight Retained
Tare	51.1713
4	51.1713
10	51.1713
18	51.1929
35	51.2251
60	51.2901
120	51.7613
230	52.9825
PAN	3.4238 ~~9~~

4/29/2009 Salt Correction

Temp:23

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare	TIME
D-1	1.5100	1.7288	10:54:00
D-2	1.5233	1.7280	10:55:46
D-3	1.5184	1.6887	11:01:05
D-4	1.5157	1.6255	11:22:18
D-5	1.5078	1.5753	12:47:00
D-6	1.5491	1.5995	16:20:00
D-7	1.5395	1.5740	9:30:00

PSEP GRAIN SIZE ANALYSIS

Job No. ON26 ARI Sample No. E Client Sample No. NS136C20

Set-up Date: 4/23/09 Sample Description: 81 Hy clay

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	149
Tare Weight	1.4987
Wet Weight + Tare	26.6281
Dry Weight + Tare	9.1697

Test Sample	Initials EG
Container No.	149
Tare Weight	49.8623
Wet Weight + Tare	75.2352
Dry Weight + Tare	51.4875

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	49.8679
4	49.8679
10	49.8709
18	49.9703
35	50.0702
60	50.1677
120	50.3168
230	50.9950
PAN	0.4829

4/29/2009
Temp:23

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare	TIME
E-1	1.5506	1.6934	10:57:00
E-2	1.5521	1.6735	10:57:20
E-3	1.5548	1.6455	10:58:46
E-4	1.5476	1.6170	11:04:05
E-5	1.5479	1.5970	11:25:18
E-6	1.5515	1.5862	12:50:00
E-7	1.5499	1.5744	16:23:00
			9:33:00

PSEP GRAIN SIZE ANALYSIS

Job No. DW26 ARI Sample No. F Client Sample No. NS14GC10

Set-up Date: 4/23/09 Sample Description: Silty clay, organic fines

Calgon Batch # 198 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	217
Tare Weight	1.5038
Wet Weight + Tare	30.1875
Dry Weight + Tare	7.9124

Test Sample	Initials EG
Container No.	217
Tare Weight	50.0381
Wet Weight + Tare	75.8990
Dry Weight + Tare	50.5992

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.0376
4	50.0376
10	50.0419
18	50.2017
35	50.2960
60	50.3428
120	50.4134
230	50.5100
PAN	0.7145

PIPETTE ANALYSIS
Initials

4/29/2009
Temp:23

Tare ID	Tare Wt	Dry Wt & Tare	TIME
F-1	1.5296	1.6489	11:00:00
F-2	1.5445	1.6594	11:00:20
F-3	1.5393	1.6411	11:01:46
F-4	1.5480	1.6306	11:07:05
F-5	1.5429	1.6023	11:28:18
F-6	1.5445	1.5863	12:53:00
F-7	1.5396	1.5694	16:26:00
			9:36:00

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. G Client Sample No. NSI66C10

Set-up Date: 4/28/09 Sample Description: silty clay, organic fines

Calgon Batch # 198 Sieve Set # 2 Date Sieved: 4/29/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	109
Tare Weight	1.5454
Wet Weight + Tare	31.2230
Dry Weight + Tare	7.29883

Test Sample	Initials EG
Container No.	109
Tare Weight	51.2189
Wet Weight + Tare	112.1629
Dry Weight + Tare	53.1246

SIEVE ANALYSIS
Initials EG

Sieve Size	Weight Retained
Tare	51.2465
4	51.2465
10	51.2465
18	51.3256
35	51.3567
60	51.4439
120	51.6772
230	51.9766
PAN	0.9884

4/29/2009
Temp:23

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare	TIME
G-1	1.5433	1.7682	11:03:00
G-2	1.5181	1.7352	11:03:20
G-3	1.5040	1.6966	11:04:46
G-4	1.5186	1.6742	11:10:05
G-5	1.5200	1.6268	11:31:18
G-6	1.5320	1.6071	12:56:00
G-7	1.5438	1.5960	16:29:00
			9:39:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. H Client Sample No. NS174C10

Set-up Date: 4/28/09 Sample Description: silty clay, organic fines

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/29/09

SOLIDS CONTENT

Moisture Content	Initials EG	Redo gs
Container No.	215	
Tare Weight	1.5412 gs	1.5108
Wet Weight + Tare	33.7269	27.0238
Dry Weight + Tare	7.5047	6.2959

Test Sample	Initials EG
Container No.	215
Tare Weight	50.3002
Wet Weight + Tare	115.1008
Dry Weight + Tare	51.8423

SIEVE ANALYSIS
Initials

Sieve Size	Weight Retained
Tare	50.3395 ~~50.3493~~
4	50.3395
10	50.3567
18	50.3657
35	50.3833
60	50.4552
120	50.5952
230	50.8324
PAN	0.8405

4/29/2009
Temp:23

Salt Correction	
Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare	TIME
H-1	~~1.4661~~ 1.5218 gs	~~1.7199~~ 1.7279 gs	11:06:00
H-2	1.5219	1.7145	11:06:20
H-3	1.5248	1.6948	11:07:46
H-4	1.5443	1.6846	11:13:05
H-5	1.5406	1.6462	11:34:18
H-6	1.5409	1.6192	12:59:00
H-7	1.5228	1.5807	16:32:00
			9:42:00

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. J Client Sample No. NS199C10

Set-up Date: 4/28/09 Sample Description: Silty clay, organic debris, oil/fuel smell & shee

Calgon Batch # 197 Sieve Set # 2 Date Sieved: 4/29/09

SOLIDS CONTENT

Moisture Content	Initials eg
Container No.	114
Tare Weight	1.5462
Wet Weight + Tare	32.2616
Dry Weight + Tare	7.2300

Test Sample	Initials eg
Container No.	114
Tare Weight	49.9117
Wet Weight + Tare	110.7163
Dry Weight + Tare	52.2939

SIEVE ANALYSIS
Initials eg

Sieve Size	Weight Retained
Tare	49.9328
4	49.9328
10	49.9389
18	49.9551
35	49.9793
60	50.0549
120	50.3207
230	50.8960
PAN	0.2447

4/29/2009

Temp:23

PIPETTE ANALYSIS
Initials

Tare ID	Tare Wt	Dry Wt & Tare	TIME
J-1	1.5476	1.7557	11:09:20
J-2	1.5491	1.7427	11:10:46
J-3	1.5496	1.7166	11:16:05
J-4	1.5410	1.6730	11:37:18
J-5	1.5304	1.6214	13:02:00
J-6	1.5360	1.6018	16:35:00
J-7	1.5333	1.5795	9:45:00

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. K Client Sample No. HS19GC20

Set-up Date: 4/23/09 Sample Description: silty clay, oil/fuel smell & sheen

Calgon Batch # 198 Sieve Set # 2 Date Sieved: 4/27/09

SOLIDS CONTENT

Moisture Content	Initials EG
Container No.	184
Tare Weight	1.5790
Wet Weight + Tare	31.6434
Dry Weight + Tare	10.5244

Test Sample	Initials EG
Container No.	184
Tare Weight	50.7441
Wet Weight + Tare	74.9055
Dry Weight + Tare	51.4270

SIEVE ANALYSIS
Initials AR

Sieve Size	Weight Retained
Tare	50.7442
4	50.7442
10	50.7834
18	50.9259
35	51.0217
60	51.0517
120	51.0872
230	51.2835
PAN	0.1332

PIPETTE ANALYSIS
Initials

4/29/200
Temp:23
TIME

Tare ID	Tare Wt	Dry Wt & Tare	
K-1	1.5344	1.6804	11:12:00
K-2	1.5164	1.6504	11:12:20
K-3	1.5425	1.6615	11:13:46
K-4	1.5363	1.6324	11:19:05
K-5	1.5457	1.6182	11:40:18
AR K-6	1.5458	1.5992	13:05:00
K-7	1.5459	1.5840	16:38:00
			9:48:00

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

PSEP GRAIN SIZE ANALYSIS

Job No. OW26 ARI Sample No. L Client Sample No. NS209C10

Set-up Date: 4/28/09 Sample Description: silty clay, organic fines, oil/fuel smell & shee

Calgon Batch # 198 Sieve Set # 1 Date Sieved: 4/29/09

SOLIDS CONTENT

Moisture Content	Initials EG	R=00
Container No.	~~160~~	
Tare Weight	~~1.5625~~	1.5122
Wet Weight + Tare	~~27.9102~~	24.4282
Dry Weight + Tare	~~4.5805~~	4.8016

Test Sample	Initials EG
Container No.	160
Tare Weight	50.6583
Wet Weight + Tare	155.6858
Dry Weight + Tare	60.5597

SIEVE ANALYSIS
Initials EG

Sieve Size	Weight Retained
Tare	50.6923
4	50.6923
10	50.7311
18	50.78030
35	50.9652
60	51.7749
120	53.8266
230	55.3558
PAN	4.7028

PIPETTE ANALYSIS
Initials

4/29/2009
Temp:23

Tare ID	Tare Wt	Dry Wt & Tare	TIME
L-1	1.5345	1.7605	11:15:00
L-2	1.5493	1.7524	11:15:20
L-3	1.5491	1.7224	11:16:46
L-4	1.5438	1.6764	11:22:05
L-5	1.4979	1.5874	11:43:18
L-6	1.5210	1.5811	13:08:00
L-7	1.5053	1.5498	16:41:00
			9:51:00

Salt Correction

Tare Wt.	
Tare + Dry Sample	
Salt Correction (x 50)	

ANALYTICAL RESOURCES INCORPORATED

MOISTURE CONTENT DETERMINATION – ASTM D-2216

ARI Job No.: OW26 Tested by: GS

Set-up Date: 4/30/09

ARI Sample ID	Tare #	Wt. Tare (g)	Wt. Wet Soil + Tare (g)	Wt. Dry Soil + Tare (g)	MC %
H	H-1	1.5362	21.0902	5.1737	
H	H-2	1.4669	34.8807	7.1746	
H	H-3	1.5108	27.0238	6.2459	
L	L-1	1.5122	24.4282	4.8076	
L	L-2	1.5324	26.1425	5.8194	
L	L-3	1.5256	32.5349	6.9052	
			TARE + DRY WT		
H-1	H-1	1.4886	1.7444		
H-2	H-2	1.4666	1.7199		
L-1	L-1	1.4727	1.7544		
L-2	L-2	1.4795	1.7538		

PIPETTE

1103F
Rev. 0

Analytical Resources, Incorporated
Analytical Chemists and Consultants

June 9, 2009

Mark Longtine
Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

RE: Project: 002330.WD10
ARI Job: OW23

Dear Mark:

Please find enclosed the original chain of custody documentation and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Susan D. Dunnihoo
Director, Client Services
sue@arilabs.com
206-695-6207

cc: eFile OW23

Enclosures

Chain of Custody
Documentation

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW23

prepared
by

Analytical Resources, Inc.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: QW23	Turn-around Requested:
ARI Client Company: ECOLOGY AND ENVIRONMENT, INC.	Phone: 206-624-9537
Client Contact: MARK LONGTINE	206 794 9750
Client Project Name: 002330.WD10	
Client Project #: 002330.WD10	Samplers: DON ~~ROBERTSON~~ PETERSEN (ML)

Date: 4/21/09

Page: 1 of 1

No. of Coolers: 0 Cooler Temps: Amb

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: ATTERBERG LIMITS ASTM D 4318	CONSOLIDATION ASTM D 2435	GRAIN SIZE + HYDROMETER ASTM D 422	MOISTURE CONTENT ASTM D 2216	POROSITY CALC FROM SPECIFIC GRAVITY ASTM D 854 AND	BULK UNIT WEIGHT ASTM D 2937	UNCONSOLIDATED UNDRAINED TRIAXIAL STRENGTH ASTM D 2850	VANE SHEAR ASTM D 4648	Notes/Comments
NS05	4/20/09	1305	SEDIMENT	1 CORE 54"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	
NS06	4/20/09	1730	SEDIMENT	1 CORE 18"	0-18"	0-18"	0-18"	0-18"	0-18"	0-18"	0-18"	0-18"	
NS12	4/20/09	1505	SEDIMENT	1 CORE 53"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	
NS18	4/20/09	1620	SEDIMENT	1 CORE 56"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	0-24" 24-48"	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: MARK LONGTINE	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: ECOLOGY + ENVIRONMENT	Company: ARI	Company:	Company:
	Date & Time: 4/21/09 1015	Date & Time: 4/21/09 1015	Date & Time:	Date & Time:

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Ecology & Environment
Project Name: 002330.WD10
COC No(s): _____ (NA)
Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other: _____
Assigned ARI Job No: OW23
Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) Amb		
If cooler temperature is out of compliance fill out form 00070F	Temp Gun ID#: NA	

Cooler Accepted by: _____ Date: 4/21/09 Time: 1120

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: none			
Was sufficient ice used (if appropriate)?	NA	YES	(NO)
Were all bottles sealed in individual plastic bags?		(YES)	NO
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	(NO)
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO

Samples Logged by: JH Date: 4/21/09 Time: 1126

*** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Small Air Bubbles < 2mm	Peabubbles 2-4 mm	LARGE Air Bubbles > 4 mm
• • •	• • •	● ● ●

Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Case Narrative

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW23

prepared
by

Analytical Resources, Inc.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Ecology and Environment	**ARI Project No.:** OW23
Client Project: 002330.WD10	

Case Narrative

1. Four samples were received on April 21, 2008, in 3.85" diameter plastic core tubes and were in good condition. Three of the tubes were cut in half creating seven individual core samples total. A moisture content was taken at the division of the cores at this time. The samples were examined and then put on hold until the test parameters were obtained from the client.
2. Atterberg limits determination was measured according to ASTM D4318. NS06 0-18" was non plastic. Organic tests were run on all of the plastic samples and five of these samples were determined to be organic and given the OH symbol as seen on the report.
3. Grain size was run according to ASTM D422. The sample was prepared according to ASTM D421. A standard milkshake mixer-type device was used to homogenize the fine portion of the sample for hydrometer analysis.
4. The samples for consolidation and undrained unconsolidated triaxial shear strength testing were extruded and visually examined.
5. Specific Gravity was determined according to ASTM D854.
6. Bulk density (wet/dry density) was determined according to ASTM D2937.
7. Porosity of the sample was calculated using the density and specific gravity data.
8. Moisture Content Determination was run according to ASTM D2216. Upon arrival, three of the cores were cut in half and the moisture content sample was taken from the middle of the cores, so as to disturb the core samples as little as possible. The cores were then placed on hold for multiple weeks, and although they were sealed, the cores still lost moisture while they were stored in the refrigerator, upright, on hold. Using the initial moisture content results in three of the cores possessing the same moisture content in the report. Although the moisture content from the middle of each core would be more accurate, it is assumed that this initial measurement is more accurate, because it was taken before the samples lost moisture. A moisture content was also taken from NS06 0-18" at this time.
9. The consolidation testing was conducted using a GeoTAC Sigma-1 automated testing system and associated software. The samples were trimmed into a test ring and placed in the loading device. The loads were applied according to the test schedule, and the next load was applied after reaching 100 percent of primary consolidation, plus a delay factor based on the time to reach this point, or after 4 hours, whichever was less. For some loads the automated system had trouble calculating the end of primary consolidation. On these loads, the data was downloaded and manual

calculations were performed based on ASTM D2435, method B and USACE guidelines for consolidation testing of very soft sediments.

10. The unconsolidated undrained triaxial tests were attempted according to ASTM D2850. The samples could not stand up on their own weight at a height to diameter ratio of 2:1, indicating the samples did not possess sufficient shear strength to run the triaxial test. Upon consulting with the client, a tilt board test based on Parsons, Whipple and Simoni's paper, "Experimental Study of the Grain-Flow, Fluid-Mud Transition in Debris Flows", was adapted. Samples were extruded at the maximum height that the core could stand under it's own weight. This height averaged about three inches for each sample.
11. A tilt board test was not run for sample NS18 24-48", because the sample was consumed during the attempt to set up a triaxial shear test.
12. The data is provided in summary tables and plots.
13. There were no noted anomalies in the samples or test methods.

Approved by: Date: 6/8/07
Title: Geotechnical Division Manager

Data Summary Package

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW23

prepared
by

Analytical Resources, Inc.

GEOTECHNICAL ANALYSIS

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Moisture Content by Method ASTM D2216

Data Release Authorized: gs
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
NS05 0-24" OW23A 09-9674	04/20/09	Sediment	05/29/09 13:57	126.0
NS06 0-18" OW23B 09-9675	04/20/09	Sediment	05/29/09 13:57	38.11
NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	880.5
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	842.8
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	126.0
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	880.5
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	842.8

Reported in Percent

GEOTECHNICAL ANALYSIS DATA SHEET
Wet Density by Method ASTM D2937

ANALYTICAL RESOURCES INCORPORATED

Data Release Authorized: gs
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
NS05 0-24" OW23A 09-9674	04/20/09	Sediment	05/29/09 13:57	96.7
NS06 0-18" OW23B 09-9675	04/20/09	Sediment	05/29/09 13:57	95.7
NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	72.9
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	84.9
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	64.5
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	62.9
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	59.1

Reported in lb/ft3

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Dry Density by Method CalcDD

Data Release Authorized: gs
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
NS05 0-24" OW23A 09-9674	04/20/09	Sediment	05/29/09 13:57	42.8
NS06 0-18" OW23B 09-9675	04/20/09	Sediment	05/29/09 13:57	69.3
NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	7.4
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	9.0
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	28.5
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	6.4
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	6.3

Reported in lb/ft3

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Porosity by Method CalcPor

Data Release Authorized: gs
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
NS05 0-24" OW23A 09-9674	04/20/09	Sediment	05/29/09 13:57	0.73
NS06 0-18" OW23B 09-9675	04/20/09	Sediment	05/29/09 13:57	0.59
NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	0.95
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	0.94
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	0.75
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	0.95
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	0.95

Reported in Std Units

Ecology & Environment
002230.WD10.05

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
NS05 0-24"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.3	98.7	98.3	97.8	96.8	84.1	74.6	60.3	55.5	44.4	28.6	17.5
NS06 0-18"	100.0	100.0	100.0	100.0	100.0	99.4	97.4	94.1	89.2	77.5	63.5	43.3	24.2	12.7	11.8	10.5	9.2	9.2	5.2	2.6	1.3
NS12 0-24"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	99.3	99.0	98.5	97.0	86.5	81.7	68.1	57.7	48.1	27.2	16.0
NS18 0-24"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	96.9	95.7	94.7	93.2	90.5	85.6	79.1	67.8	58.1	46.8	29.1	18.6
NS05 24-48"	100.0	100.0	100.0	100.0	100.0	99.7	99.7	99.7	99.7	98.5	97.7	97.0	96.3	93.9	81.0	73.9	63.6	55.6	42.9	28.6	16.7
NS12 24-48"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.6	99.6	99.4	80.5	74.0	63.7	59.9	52.4	22.5	9.4
NS18 24-48"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0	84.8	83.2	82.4	81.6	79.8	71.6	67.9	56.8	51.7	46.5	16.2	10.3

Testing performed according to ASTM D421/D422

Ecology & Environment
002230.WD10.05

Percent Retained in Each Size Fraction

Description	%Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
Particle Size (microns)	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
NS05 0-24"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.5	0.4	0.5	1.0	12.7	9.5	14.3	4.8	11.1	15.9	28.6
NS06 0-18"	0.0	0.0	0.0	0.0	0.6	2.0	3.3	4.9	11.8	14.0	20.2	19.1	11.5	0.9	1.3	1.3	0.0	3.9	2.6	2.6
NS12 0-24"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.2	0.3	0.5	1.5	10.5	4.8	13.6	10.4	9.6	20.8	27.2
NS18 0-24"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.0	1.2	1.0	1.6	2.6	4.9	6.5	11.3	9.7	11.3	17.8	29.1
NS05 24-48"	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	1.2	0.8	0.7	0.7	2.4	12.9	7.1	10.3	7.9	12.7	14.3	28.6
NS12 24-48"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.2	18.9	6.6	10.3	3.7	7.5	30.0	22.5
NS18 24-48"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	5.2	1.6	0.8	0.8	1.8	8.2	3.7	11.1	5.2	5.2	30.3	16.2

Laboratory Data Package

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW23

prepared
by

Analytical Resources, Inc.

Geotechnical Analysis

prepared
for

Ecology & Environment

Project: 002330.WD10

ARI JOB NO: OW23

prepared
by

Analytical Resources, Inc.

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Moisture Content by Method ASTM D2216

Data Release Authorized: gs
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
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NS06 0-18" OW23B 09-9675	04/20/09	Sediment	05/29/09 13:57	38.11
NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	880.5
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NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	842.8

Reported in Percent

GEOTECHNICAL ANALYSIS DATA SHEET
Wet Density by Method ASTM D2937

ANALYTICAL RESOURCES INCORPORATED

Data Release Authorized: gs
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
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NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	72.9
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	84.9
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	64.5
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	62.9
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	59.1

Reported in lb/ft3

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Dry Density by Method CalcDD

Data Release Authorized: gb
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
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NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	7.4
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	9.0
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	28.5
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	6.4
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	6.3

Reported in lb/ft3

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Porosity by Method CalcPor

Data Release Authorized: gb
Reported: 06/05/09
Date Received: 04/21/09
Page 1 of 1

QC Report No: OW23-Ecology & Environment
Project: 002330.WD10
002330.WD10

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
NS05 0-24" OW23A 09-9674	04/20/09	Sediment	05/29/09 13:57	0.73
NS06 0-18" OW23B 09-9675	04/20/09	Sediment	05/29/09 13:57	0.59
NS12 0-24" OW23C 09-9676	04/20/09	Sediment	05/29/09 13:57	0.95
NS18 0-24" OW23D 09-9677	04/20/09	Sediment	05/29/09 13:57	0.94
NS05 24-48" OW23E 09-9713	04/20/09	Sediment	05/29/09 13:57	0.75
NS12 24-48" OW23F 09-9714	04/20/09	Sediment	05/29/09 13:57	0.95
NS18 24-48" OW23G 09-9715	04/20/09	Sediment	05/29/09 13:57	0.95

Reported in Std Units

Ecology & Environment
002230.WD10.05

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
NS05 0-24"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.3	98.7	98.3	97.8	96.8	84.1	74.6	60.3	55.5	44.4	28.6	17.5
NS06 0-18"	100.0	100.0	100.0	100.0	100.0	99.4	97.4	94.1	89.2	77.5	63.5	43.3	24.2	12.7	11.8	10.5	9.2	9.2	5.2	2.6	1.3
NS12 0-24"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	99.3	99.0	98.5	97.0	86.5	81.7	68.1	57.7	48.1	27.2	16.0
NS18 0-24"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	96.9	95.7	94.7	93.2	90.5	85.6	79.1	67.8	58.1	46.8	29.1	18.6
NS05 24-48"	100.0	100.0	100.0	100.0	100.0	99.7	99.7	99.7	99.7	98.5	97.7	97.0	96.3	93.9	81.0	73.9	63.6	55.6	42.9	28.6	16.7
NS12 24-48"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.6	99.6	99.4	80.5	74.0	63.7	59.9	52.4	22.5	9.4
NS18 24-48"	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0	84.8	83.2	82.4	81.6	79.8	71.6	67.9	56.8	51.7	46.5	16.2	10.3

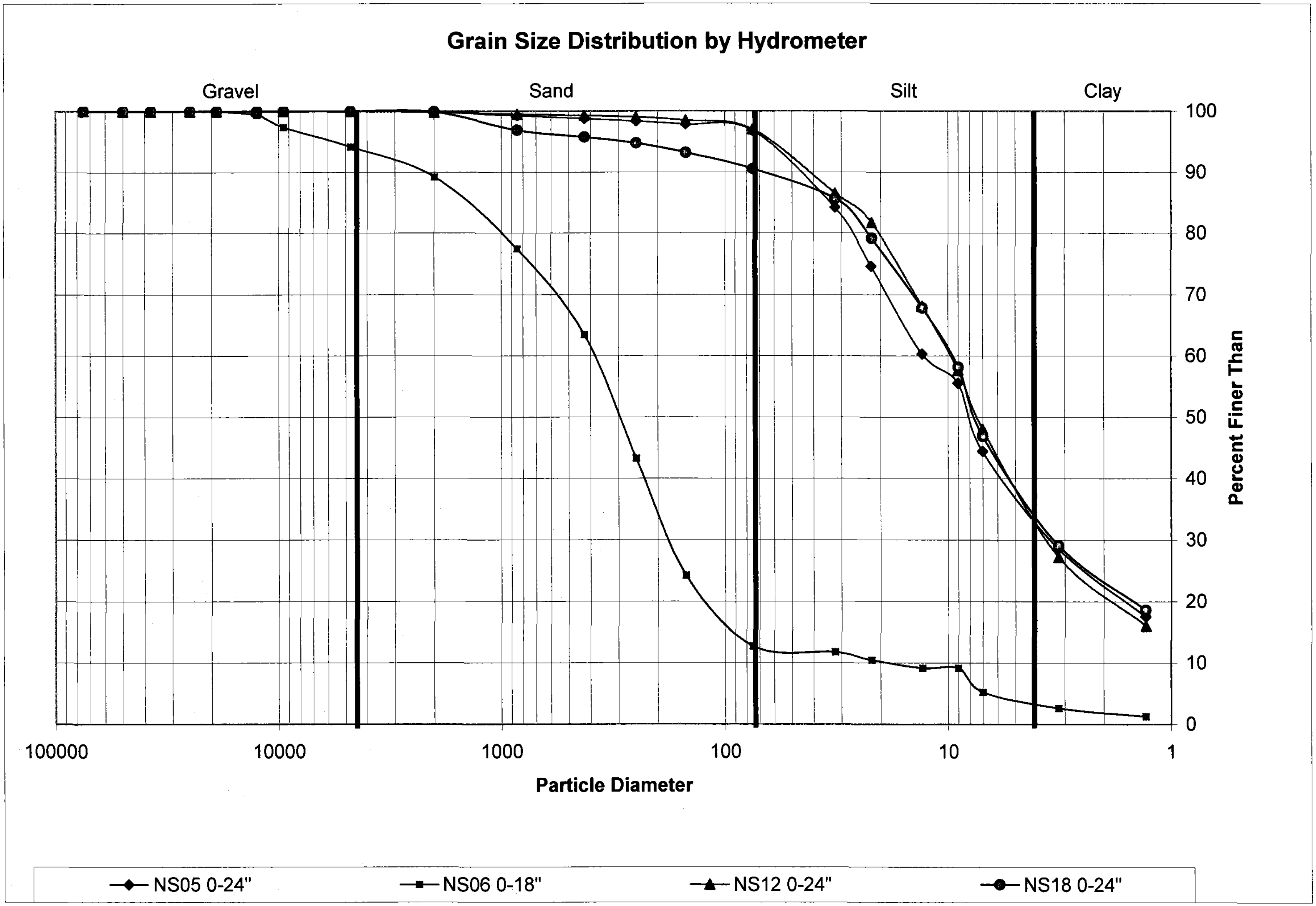
Testing performed according to ASTM D421/D422

Ecology & Environment
002230.WD10.05

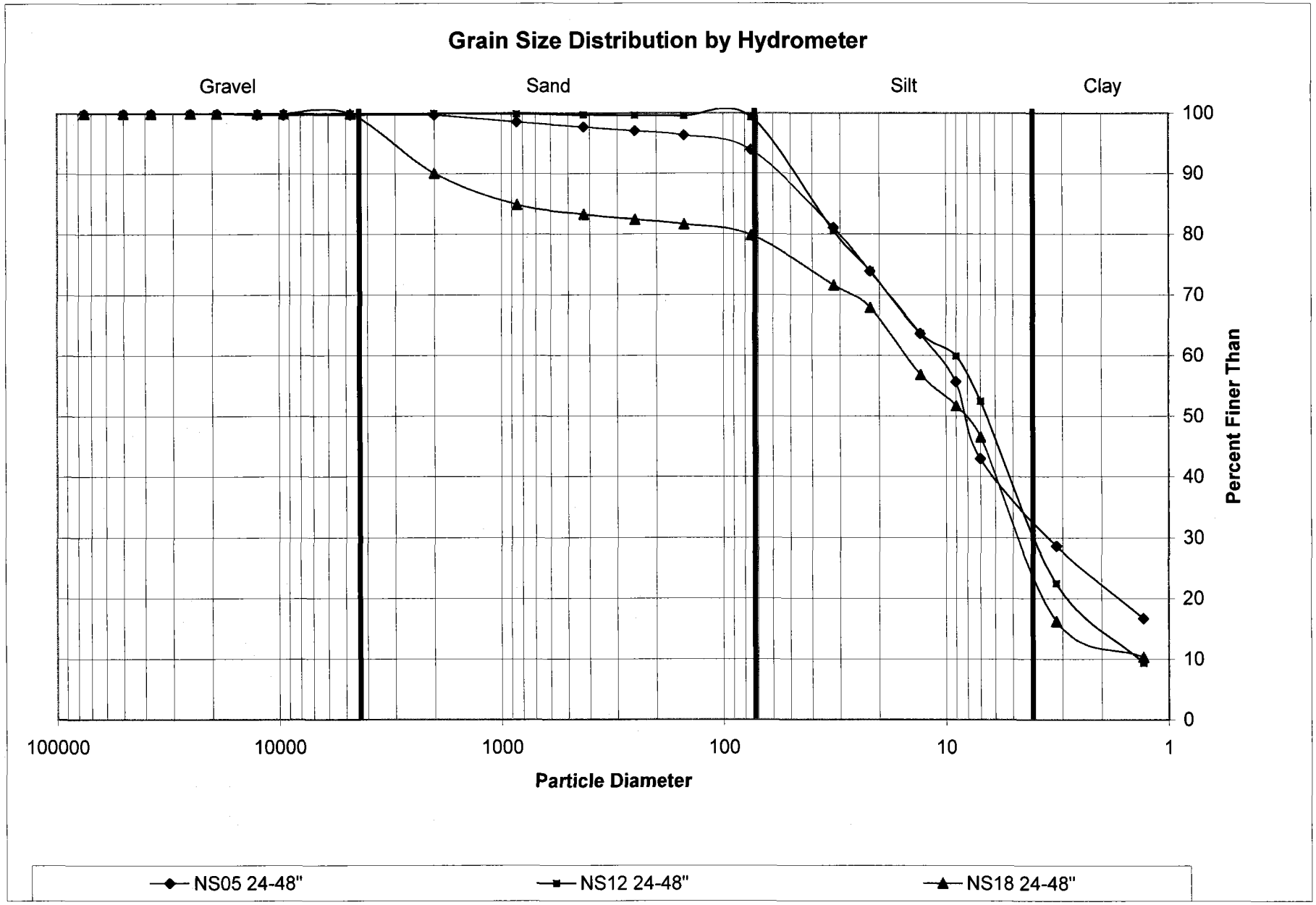
Percent Retained in Each Size Fraction

Description	%Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
Particle Size (microns)	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
NS05 0-24"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.5	0.4	0.5	1.0	12.7	9.5	14.3	4.8	11.1	15.9	28.6
NS06 0-18"	0.0	0.0	0.0	0.0	0.6	2.0	3.3	4.9	11.8	14.0	20.2	19.1	11.5	0.9	1.3	1.3	0.0	3.9	2.6	2.6
NS12 0-24"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.2	0.3	0.5	1.5	10.5	4.8	13.6	10.4	9.6	20.8	27.2
NS18 0-24"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.0	1.2	1.0	1.6	2.6	4.9	6.5	11.3	9.7	11.3	17.8	29.1
NS05 24-48"	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	1.2	0.8	0.7	0.7	2.4	12.9	7.1	10.3	7.9	12.7	14.3	28.6
NS12 24-48"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.2	18.9	6.6	10.3	3.7	7.5	30.0	22.5
NS18 24-48"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	5.2	1.6	0.8	0.8	1.8	8.2	3.7	11.1	5.2	5.2	30.3	16.2

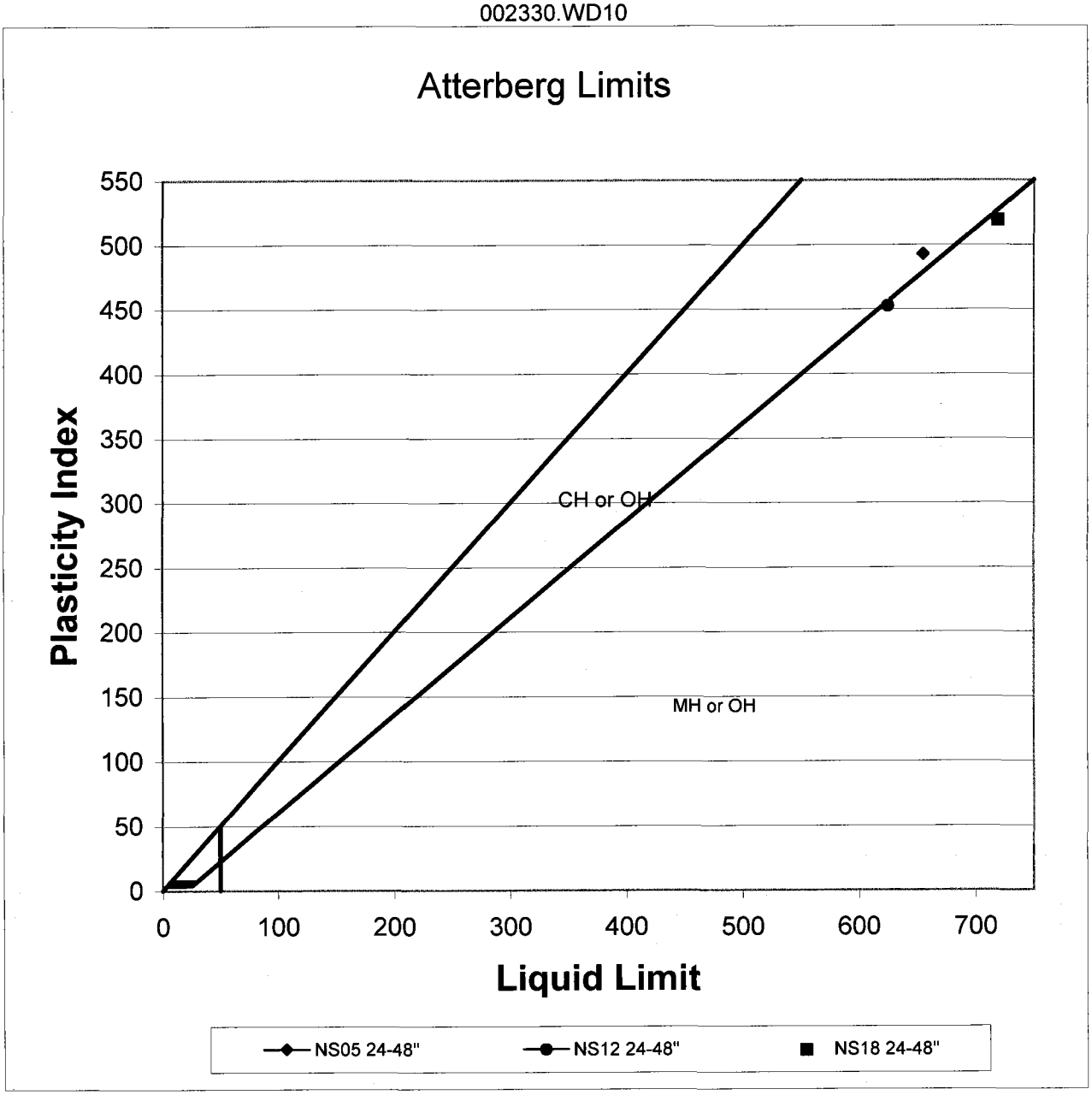
OW23



Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
100
10
1
Particle Diameter
NS05 0-24"
NS06 0-18"
NS12 0-24"
NS18 0-24"


Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
100
10
1
Particle Diameter
NS05 24-48"
NS12 24-48"
NS18 24-48"

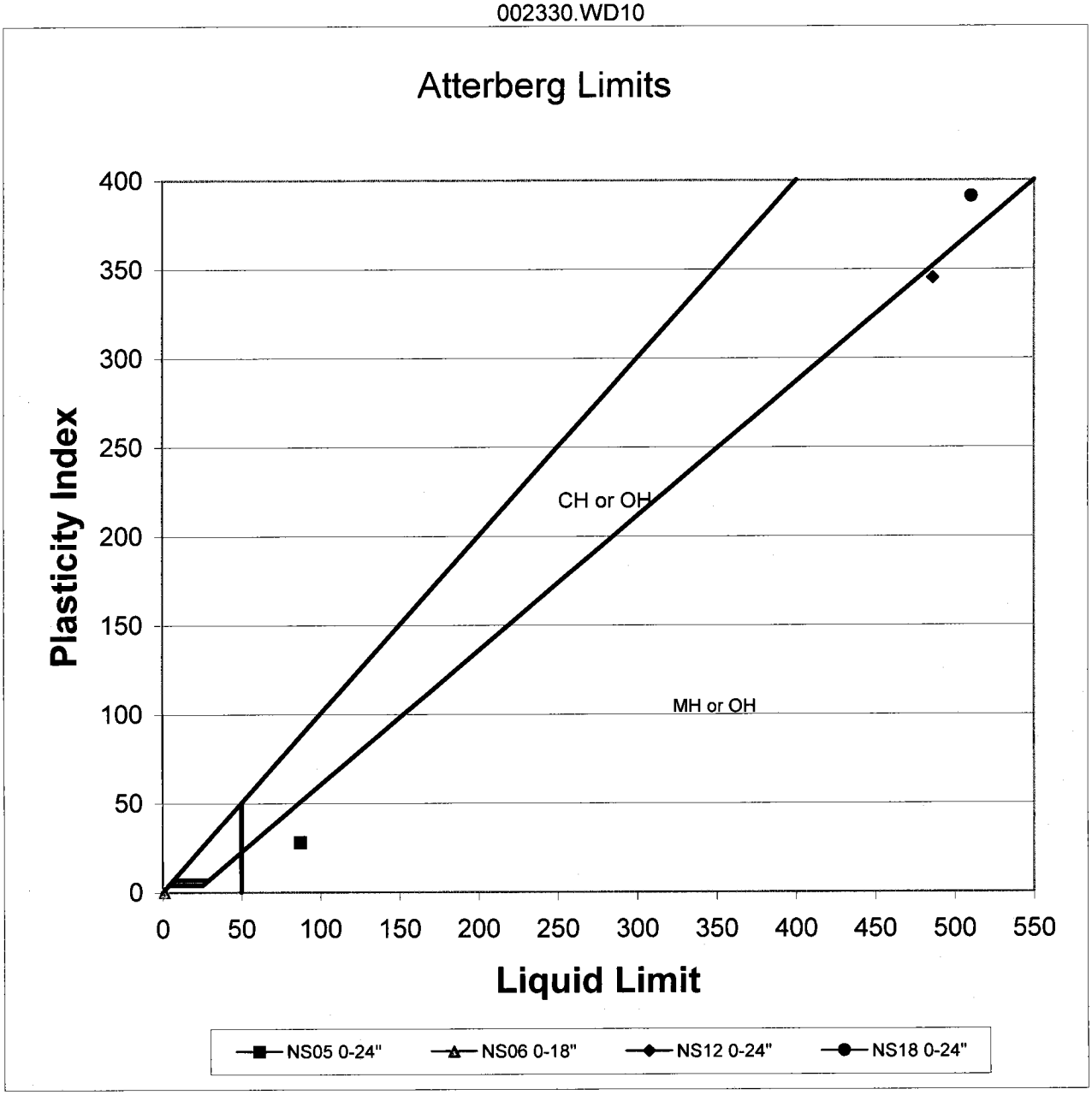
Ecology & Environment
002330.WD10



Sample Identification	As-Received Moisture Content	Plasticity Index	Liquid Limit	Plastic Limit	USCS
NS05 24-48"	125.97	492.4	654.9	162.5	OH
NS12 24-48"	880.48	452.7	624.9	172.2	OH
NS18 24-48"	842.75	519.1	718.2	199.2	OH

OW23

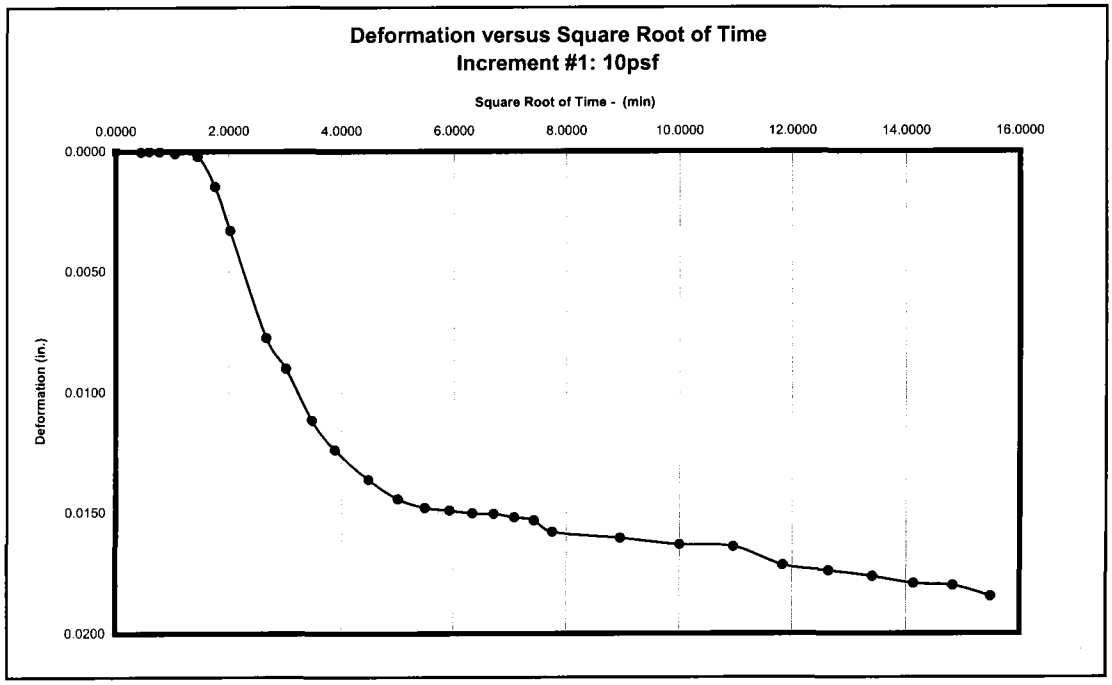
Ecology & Environment
002330.WD10



Sample Identification	As-Received Moisture Content	Plasticity Index	Liquid Limit	Plastic Limit	USCS
NS05 0-24"	125.97	28.2	87.4	59.3	MH
NS06 0-18"	38.11	NA	NA	NA	Non-Plastic
NS12 0-24"	880.48	345.0	486.0	140.9	OH
NS18 0-24"	842.75	390.7	510.4	119.7	OH

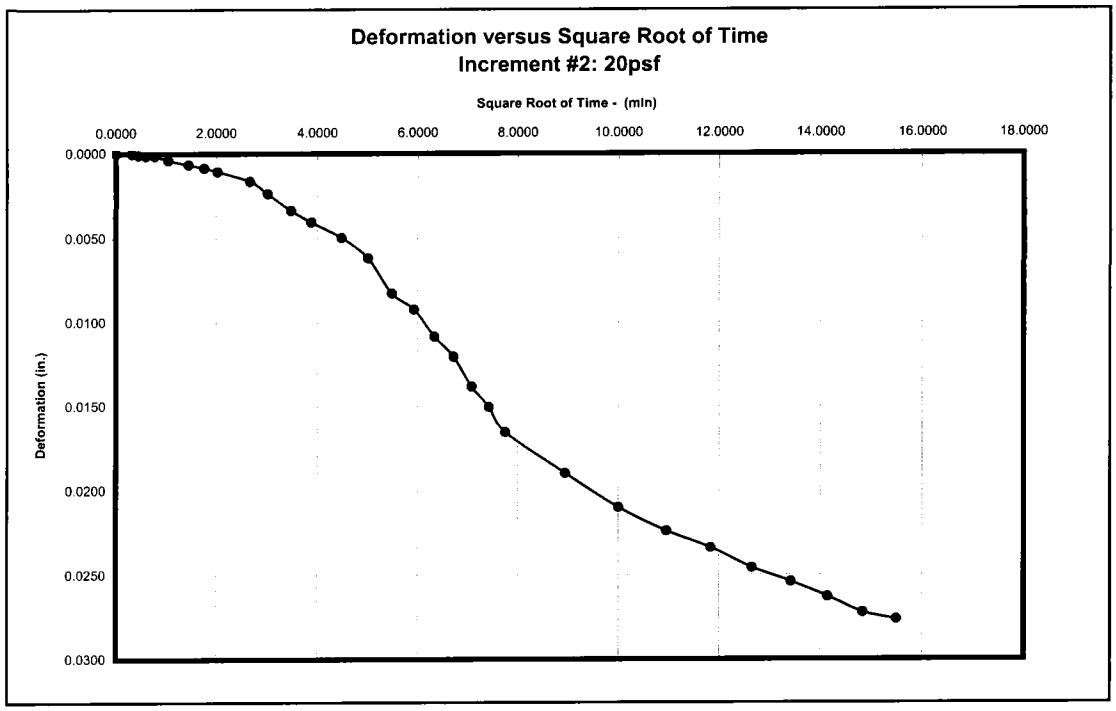
OW23

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



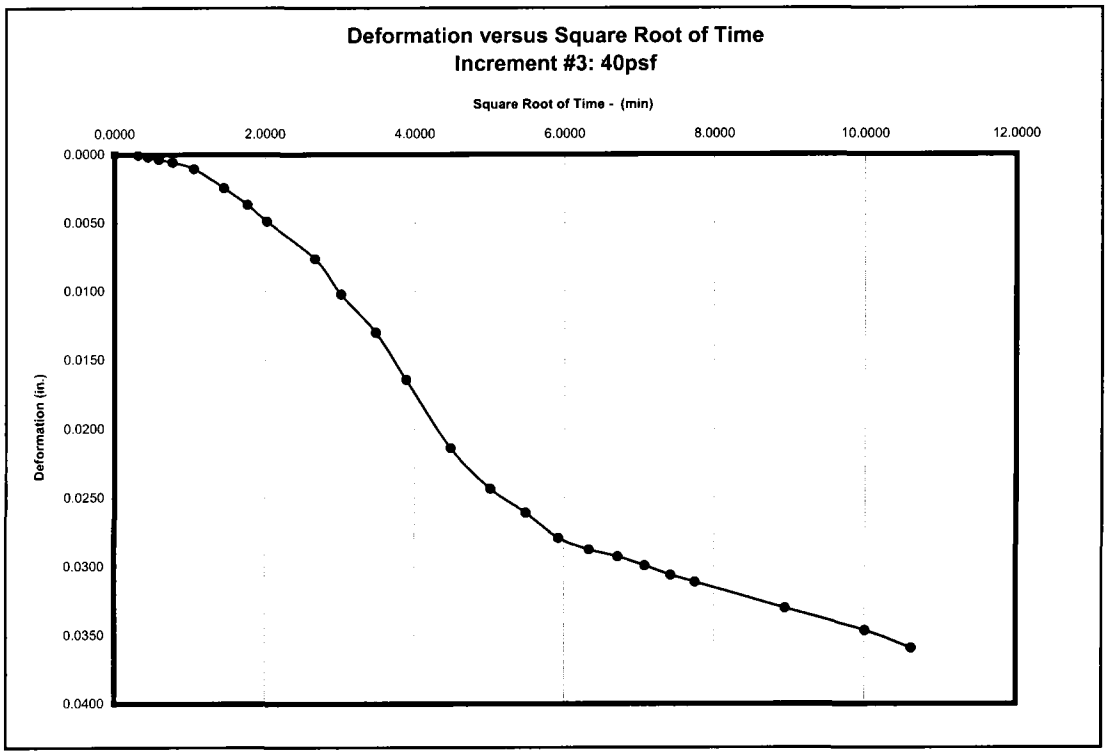
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0000	-0.0439
0.10	0.3162	0.0000	0.0000	0.0238
0.20	0.4472	0.0000	0.0000	0.0456
0.35	0.5916	0.0000	0.0000	0.0726
0.60	0.7746	0.0000	0.0000	-0.0460
1.10	1.0488	0.0001	0.0001	0.0408
2.10	1.4491	0.0002	0.0002	0.0907
3.10	1.7607	0.0015	0.0014	0.0872
4.10	2.0248	0.0033	0.0033	0.3081
7.10	2.6646	0.0077	0.0077	0.2879
9.10	3.0166	0.0090	0.0090	0.2284
12.10	3.4785	0.0111	0.0111	0.2798
15.10	3.8859	0.0124	0.0124	0.3417
20.10	4.4833	0.0136	0.0136	0.4743
25.10	5.0100	0.0144	0.0144	0.3711
30.08	5.4848	0.0148	0.0148	0.3262
35.08	5.9231	0.0149	0.0149	0.3711
40.08	6.3311	0.0150	0.0150	0.2950
45.08	6.7144	0.0151	0.0150	0.3452
50.08	7.0770	0.0152	0.0152	0.4068
55.08	7.4218	0.0153	0.0153	0.4115
60.08	7.7513	0.0158	0.0158	0.3221
80.07	8.9480	0.0161	0.0160	0.3426
100.07	10.0033	0.0163	0.0163	0.3262
120.05	10.9567	0.0164	0.0164	0.3762
140.10	11.8364	0.0172	0.0171	0.2748
160.08	12.6524	0.0174	0.0174	0.3556
180.08	13.4195	0.0177	0.0176	0.3711
200.07	14.1445	0.0179	0.0179	0.3512
220.07	14.8346	0.0180	0.0180	0.2953
240.05	15.4935	0.0185	0.0184	0.3476
240.12	15.4957	0.0185	0.0184	0.3414

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



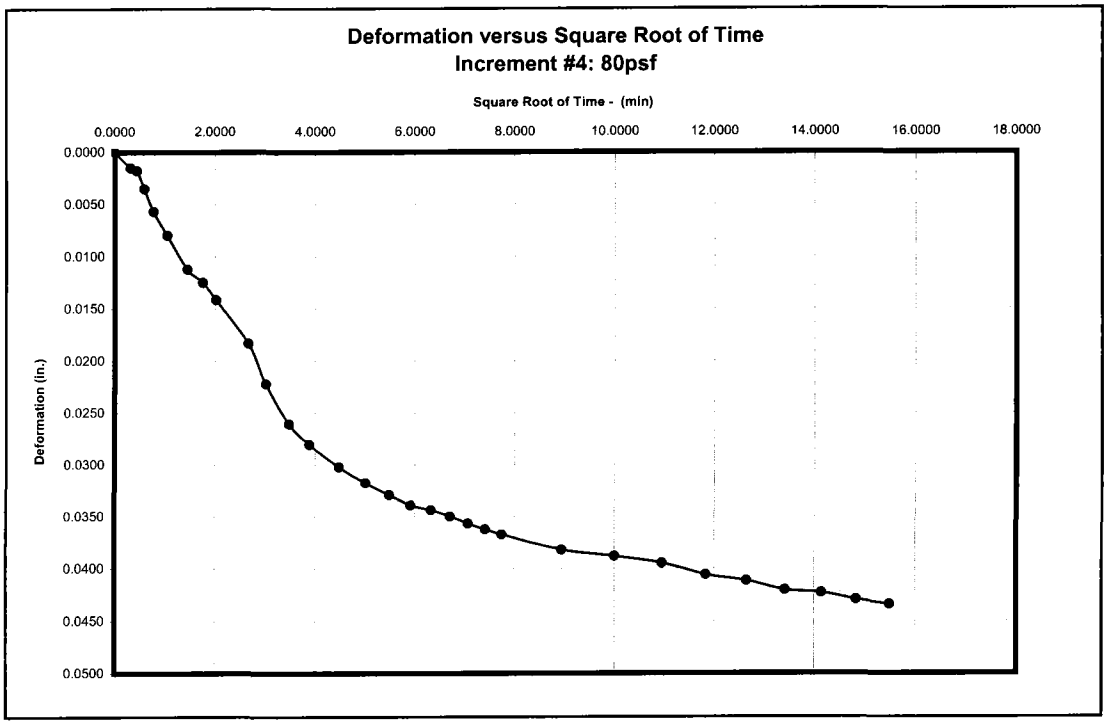
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0184	0.3441
0.10	0.3162	0.0000	0.0185	0.3869
0.20	0.4472	0.0001	0.0185	0.3842
0.35	0.5916	0.0001	0.0186	0.3533
0.60	0.7746	0.0002	0.0186	0.3283
1.10	1.0488	0.0004	0.0188	0.3949
2.10	1.4491	0.0007	0.0191	0.3726
3.10	1.7607	0.0009	0.0193	0.3628
4.10	2.0248	0.0011	0.0195	0.3782
7.10	2.6646	0.0016	0.0201	0.3595
9.10	3.0166	0.0024	0.0208	0.4011
12.10	3.4785	0.0034	0.0218	0.4761
15.10	3.8859	0.0040	0.0225	0.4939
20.17	4.4907	0.0050	0.0234	0.4535
25.17	5.0166	0.0062	0.0246	0.5623
30.15	5.4909	0.0083	0.0267	0.5712
35.15	5.9287	0.0092	0.0277	0.6116
40.15	6.3364	0.0108	0.0293	0.6259
45.15	6.7194	0.0120	0.0305	0.6735
50.15	7.0817	0.0138	0.0322	0.7413
55.15	7.4263	0.0150	0.0335	0.7133
60.13	7.7546	0.0165	0.0350	0.7433
80.13	8.9517	0.0190	0.0374	0.6637
100.12	10.0058	0.0210	0.0394	0.6530
120.12	10.9598	0.0224	0.0408	0.6544
140.17	11.8392	0.0234	0.0418	0.7243
160.17	12.6557	0.0246	0.0430	0.6675
180.17	13.4226	0.0254	0.0438	0.6211
200.17	14.1480	0.0263	0.0447	0.6794
220.17	14.8380	0.0272	0.0457	0.6434
240.15	15.4968	0.0276	0.0461	0.6066

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



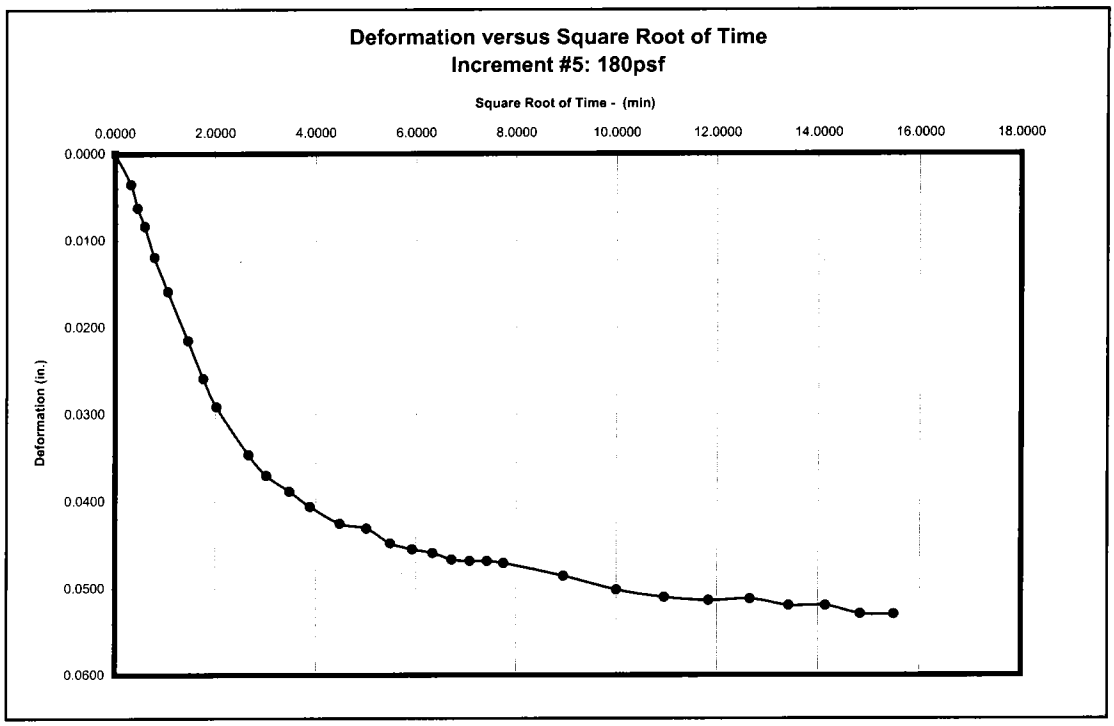
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0461	0.7008
0.10	0.3162	0.0001	0.0462	0.7326
0.20	0.4472	0.0002	0.0463	0.7731
0.35	0.5916	0.0004	0.0465	0.8218
0.60	0.7746	0.0006	0.0467	0.7163
1.12	1.0567	0.0011	0.0472	0.8816
2.12	1.4549	0.0024	0.0485	0.9515
3.12	1.7654	0.0037	0.0498	0.9824
4.12	2.0290	0.0049	0.0510	0.9952
7.12	2.6677	0.0076	0.0537	1.0299
9.12	3.0194	0.0102	0.0563	1.1385
12.12	3.4809	0.0130	0.0591	1.2514
15.12	3.8880	0.0164	0.0625	1.2794
20.12	4.4852	0.0214	0.0675	1.3430
25.12	5.0117	0.0243	0.0704	1.3287
30.12	5.4879	0.0261	0.0722	1.4179
35.12	5.9259	0.0279	0.0740	1.3977
40.12	6.3338	0.0288	0.0749	1.3180
45.12	6.7169	0.0293	0.0754	1.3772
50.12	7.0793	0.0299	0.0760	1.3276
55.12	7.4241	0.0306	0.0767	1.4129
60.12	7.7535	0.0311	0.0772	1.3820
80.12	8.9508	0.0330	0.0791	1.3832
100.12	10.0058	0.0347	0.0808	1.3157
112.78	10.6199	0.0359	0.0820	1.3739

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



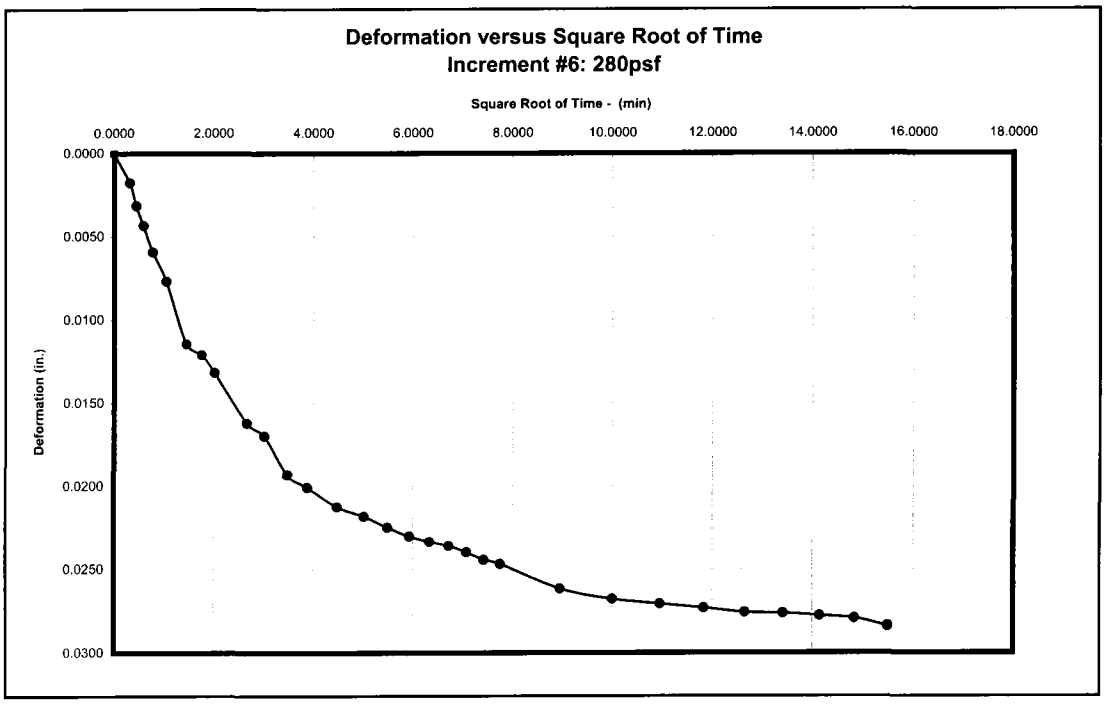
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0821	1.3763
0.10	0.3162	0.0015	0.0836	2.2382
0.20	0.4472	0.0018	0.0839	2.4297
0.35	0.5916	0.0035	0.0856	2.5855
0.60	0.7746	0.0057	0.0878	2.6452
1.10	1.0488	0.0080	0.0901	2.6500
2.10	1.4491	0.0112	0.0933	2.7710
3.10	1.7607	0.0125	0.0946	2.7897
4.10	2.0248	0.0141	0.0962	2.7511
7.10	2.6646	0.0183	0.1004	2.6782
9.10	3.0166	0.0222	0.1043	2.7380
12.10	3.4785	0.0261	0.1081	2.7142
15.10	3.8859	0.0280	0.1101	2.6714
20.10	4.4833	0.0302	0.1123	2.7309
25.12	5.0117	0.0318	0.1138	2.8209
30.12	5.4879	0.0329	0.1150	2.7011
35.12	5.9259	0.0339	0.1160	2.7225
40.12	6.3338	0.0344	0.1165	2.6937
45.12	6.7169	0.0350	0.1171	2.7600
50.12	7.0793	0.0357	0.1178	2.7737
55.12	7.4241	0.0362	0.1183	2.7413
60.12	7.7535	0.0367	0.1188	2.7401
80.12	8.9508	0.0382	0.1203	2.7582
100.13	10.0067	0.0388	0.1209	2.7520
120.13	10.9605	0.0395	0.1216	2.7273
140.13	11.8378	0.0406	0.1227	2.7332
160.10	12.6531	0.0412	0.1233	2.7202
180.10	13.4201	0.0421	0.1241	2.7309
200.08	14.1451	0.0423	0.1244	2.7389
220.08	14.8352	0.0430	0.1251	2.7285
240.05	15.4935	0.0434	0.1255	2.7056

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



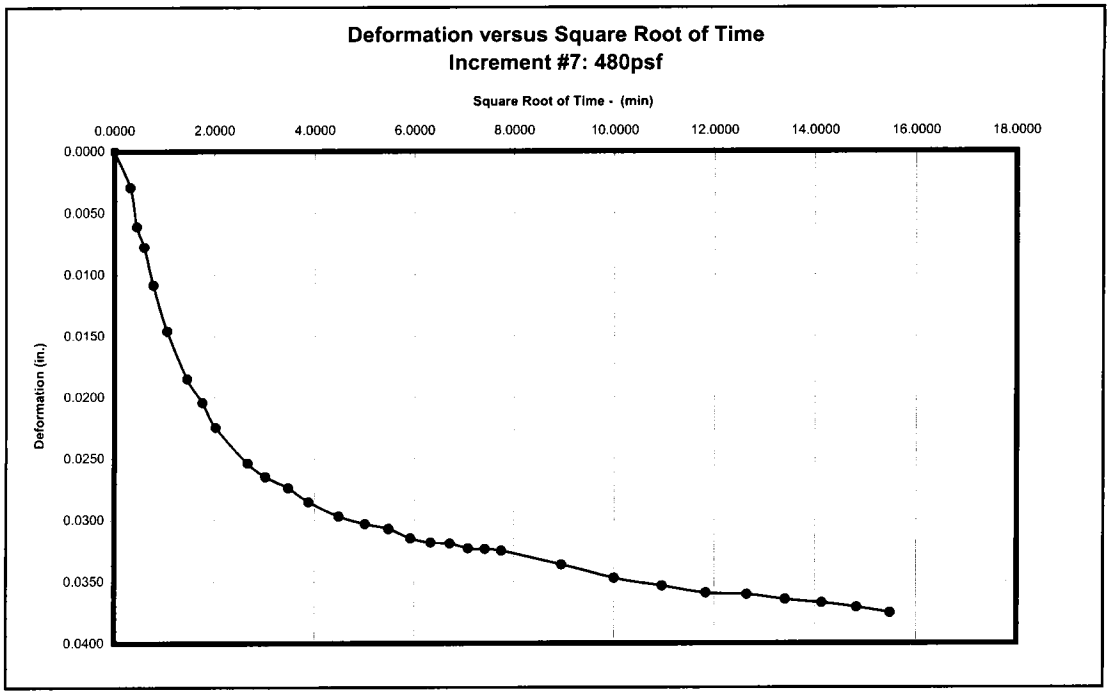
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1256	2.6877
0.10	0.3162	0.0035	0.1291	5.7230
0.20	0.4472	0.0062	0.1318	5.9156
0.35	0.5916	0.0084	0.1339	5.9394
0.62	0.7853	0.0119	0.1375	6.0914
1.12	1.0567	0.0159	0.1415	6.1071
2.12	1.4549	0.0215	0.1471	6.1571
3.10	1.7607	0.0259	0.1515	6.1535
4.10	2.0248	0.0292	0.1548	6.2150
7.10	2.6646	0.0347	0.1602	6.1951
9.10	3.0166	0.0371	0.1626	6.1160
12.10	3.4785	0.0389	0.1644	6.1749
15.10	3.8859	0.0406	0.1662	6.0735
20.10	4.4833	0.0426	0.1681	6.1392
25.17	5.0166	0.0431	0.1687	6.1583
30.17	5.4924	0.0448	0.1704	6.0774
35.17	5.9301	0.0455	0.1711	6.1113
40.17	6.3377	0.0459	0.1715	6.0890
45.15	6.7194	0.0467	0.1723	6.1178
50.15	7.0817	0.0469	0.1724	6.1568
55.15	7.4263	0.0469	0.1724	6.1511
60.15	7.7556	0.0471	0.1727	6.0952
80.15	8.9527	0.0486	0.1742	6.1119
100.13	10.0067	0.0502	0.1758	6.0949
120.12	10.9598	0.0510	0.1766	6.1282
140.12	11.8371	0.0514	0.1770	6.1065
160.17	12.6557	0.0512	0.1768	6.1603
180.15	13.4220	0.0520	0.1775	6.1306
200.15	14.1474	0.0520	0.1776	6.1544
220.13	14.8369	0.0529	0.1785	6.1817
240.07	15.4941	0.0530	0.1786	6.1583

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



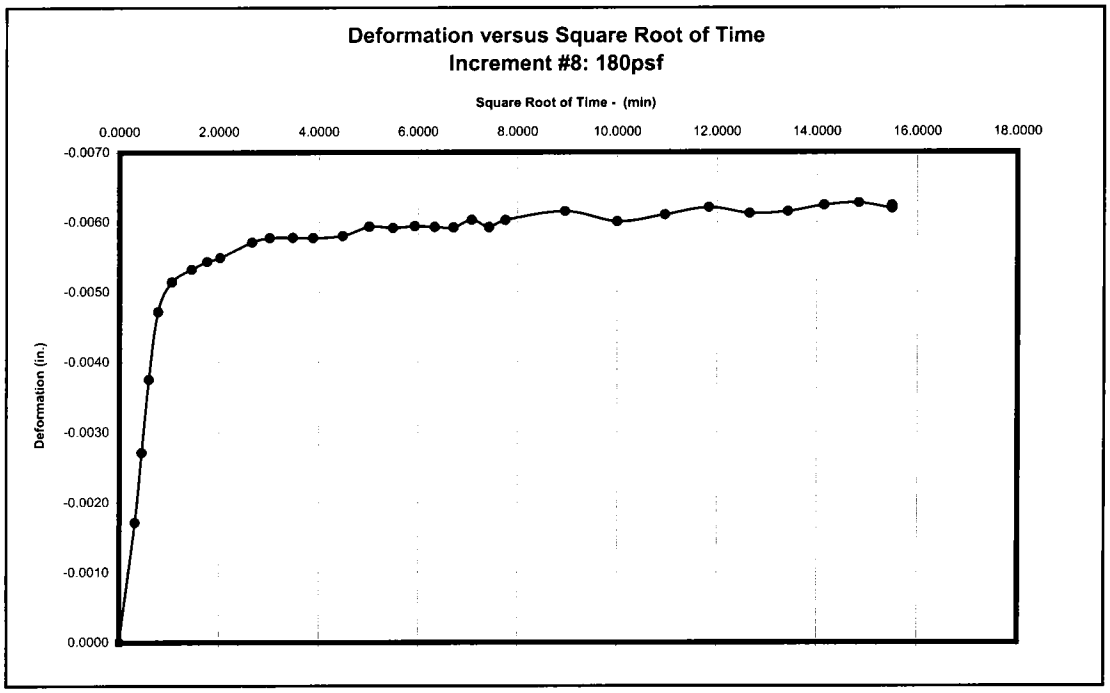
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1785	6.0890
0.10	0.3162	0.0018	0.1803	9.2003
0.20	0.4472	0.0032	0.1817	9.3918
0.35	0.5916	0.0043	0.1829	9.4248
0.60	0.7746	0.0059	0.1845	9.4417
1.10	1.0488	0.0077	0.1862	9.4747
2.10	1.4491	0.0114	0.1900	9.5036
3.10	1.7607	0.0121	0.1906	9.2464
4.10	2.0248	0.0132	0.1917	9.5211
7.10	2.6646	0.0162	0.1947	9.5886
9.10	3.0166	0.0170	0.1955	9.5500
12.10	3.4785	0.0193	0.1979	9.6011
15.10	3.8859	0.0201	0.1986	9.5446
20.08	4.4814	0.0213	0.1998	9.5892
25.15	5.0150	0.0218	0.2004	9.5535
30.17	5.4924	0.0225	0.2010	9.5440
35.17	5.9301	0.0230	0.2016	9.5690
40.17	6.3377	0.0234	0.2019	9.5532
45.17	6.7206	0.0236	0.2022	9.5161
50.17	7.0828	0.0240	0.2025	9.5666
55.17	7.4274	0.0245	0.2030	9.5544
60.17	7.7567	0.0247	0.2032	9.5211
80.17	8.9536	0.0262	0.2047	9.5057
100.17	10.0083	0.0268	0.2053	9.5306
120.17	10.9621	0.0271	0.2056	9.4902
140.17	11.8392	0.0273	0.2059	9.5390
160.17	12.6557	0.0276	0.2061	9.5226
180.17	13.4226	0.0277	0.2062	9.5072
200.17	14.1480	0.0278	0.2064	9.5321
220.17	14.8380	0.0280	0.2065	9.5461
240.17	15.4973	0.0284	0.2070	9.4938
240.20	15.4984	0.0284	0.2069	9.5116

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



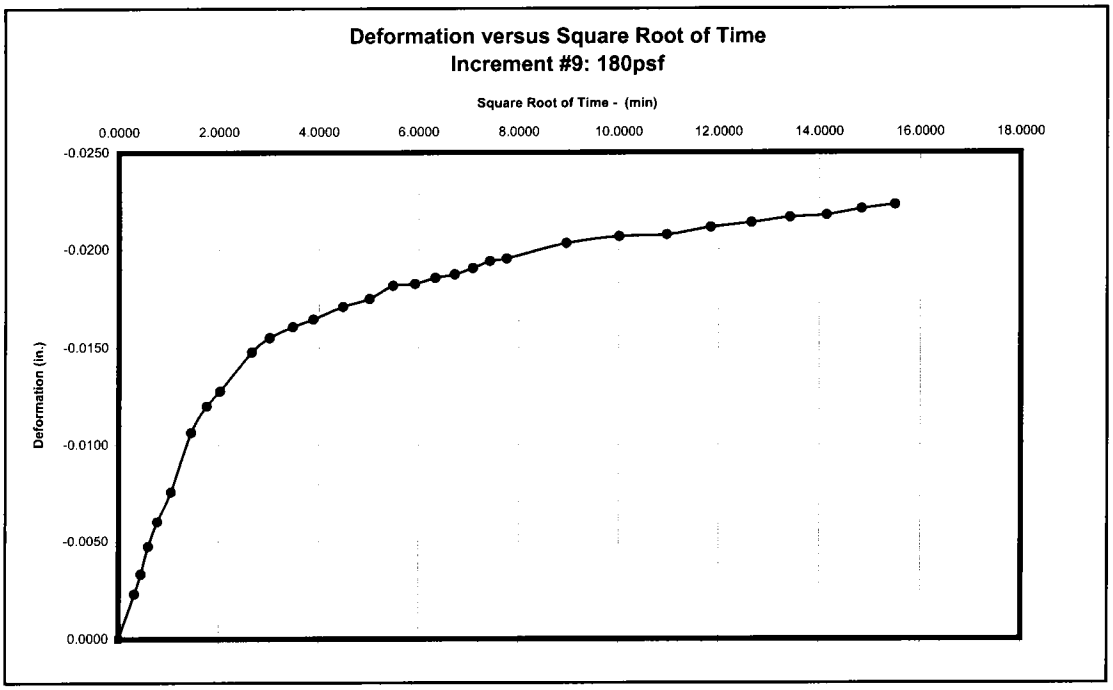
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2070	9.5345
0.10	0.3162	0.0029	0.2099	15.5970
0.20	0.4472	0.0061	0.2131	15.8491
0.35	0.5916	0.0078	0.2147	15.9537
0.60	0.7746	0.0108	0.2178	16.1883
1.10	1.0488	0.0146	0.2216	16.3096
2.10	1.4491	0.0185	0.2255	16.1776
3.10	1.7607	0.0204	0.2274	16.4452
4.10	2.0248	0.0225	0.2294	16.3819
7.10	2.6646	0.0254	0.2324	16.3807
9.10	3.0166	0.0265	0.2335	16.3926
12.10	3.4785	0.0274	0.2344	16.3869
15.10	3.8859	0.0285	0.2355	16.4104
20.10	4.4833	0.0297	0.2367	16.3417
25.10	5.0100	0.0303	0.2373	16.3346
30.10	5.4863	0.0307	0.2377	16.4256
35.10	5.9245	0.0315	0.2384	16.3465
40.12	6.3338	0.0318	0.2388	16.3676
45.12	6.7169	0.0319	0.2389	16.3833
50.12	7.0793	0.0323	0.2393	16.4163
55.12	7.4241	0.0324	0.2393	16.3798
60.12	7.7535	0.0325	0.2395	16.3700
80.12	8.9508	0.0336	0.2406	16.3720
100.13	10.0067	0.0347	0.2417	16.4223
120.13	10.9605	0.0353	0.2423	16.3961
140.13	11.8378	0.0359	0.2429	16.3774
160.10	12.6531	0.0360	0.2430	16.3382
180.10	13.4201	0.0364	0.2434	16.3346
200.08	14.1451	0.0367	0.2437	16.3750
220.07	14.8346	0.0371	0.2441	16.3664
240.05	15.4935	0.0375	0.2445	16.4238
240.05	15.4935	0.0375	0.2445	16.3771

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



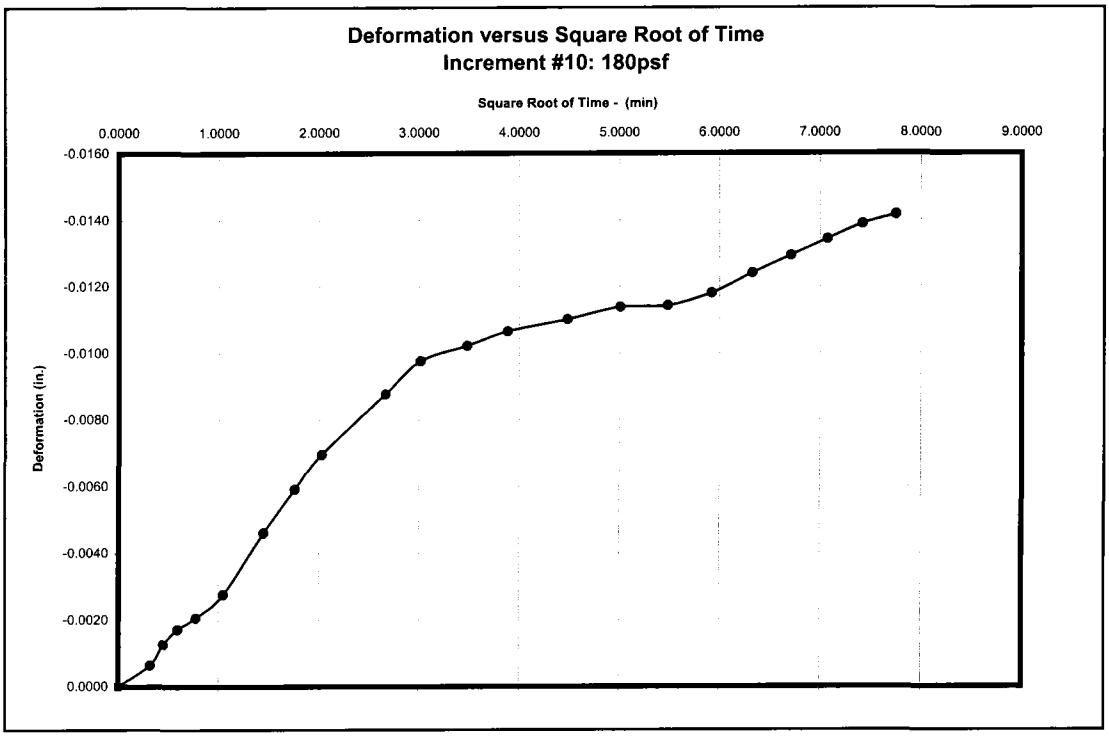
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2445	16.3917
0.10	0.3162	-0.0017	0.2428	6.6967
0.20	0.4472	-0.0027	0.2418	6.3256
0.35	0.5916	-0.0038	0.2408	6.1380
0.60	0.7746	-0.0047	0.2398	6.1758
1.10	1.0488	-0.0051	0.2394	6.2260
2.10	1.4491	-0.0053	0.2392	6.0714
3.10	1.7607	-0.0054	0.2391	6.2020
4.10	2.0248	-0.0055	0.2390	6.1080
7.10	2.6646	-0.0057	0.2388	6.1452
9.10	3.0166	-0.0058	0.2387	6.1354
12.10	3.4785	-0.0058	0.2387	6.0845
15.10	3.8859	-0.0058	0.2387	5.9974
20.08	4.4814	-0.0058	0.2387	6.0560
25.17	5.0166	-0.0059	0.2386	6.1868
30.17	5.4924	-0.0059	0.2386	6.1737
35.17	5.9301	-0.0059	0.2386	6.1154
40.15	6.3364	-0.0059	0.2386	6.0750
45.15	6.7194	-0.0059	0.2386	6.1473
50.15	7.0817	-0.0060	0.2385	6.1678
55.15	7.4263	-0.0059	0.2386	6.0964
60.15	7.7556	-0.0060	0.2385	6.2317
80.13	8.9517	-0.0062	0.2384	6.1238
100.12	10.0058	-0.0060	0.2385	6.1737
120.12	10.9598	-0.0061	0.2384	6.1208
140.10	11.8364	-0.0062	0.2383	6.2094
160.17	12.6557	-0.0061	0.2384	6.1389
180.15	13.4220	-0.0061	0.2384	6.1199
200.13	14.1468	-0.0062	0.2383	6.2082
220.13	14.8369	-0.0063	0.2382	6.1000
240.12	15.4957	-0.0062	0.2383	6.1749
240.17	15.4973	-0.0062	0.2383	6.2082

Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



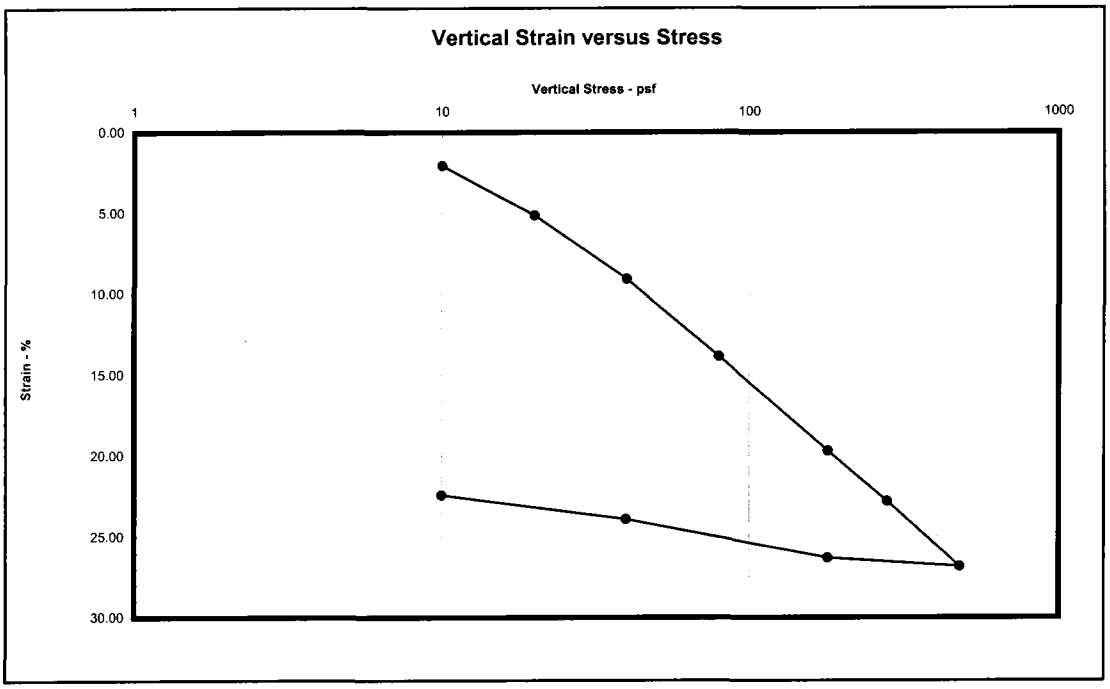
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2383	6.1972
0.10	0.3162	-0.0023	0.2360	1.7890
0.20	0.4472	-0.0033	0.2350	1.5865
0.35	0.5916	-0.0047	0.2336	1.4414
0.60	0.7746	-0.0060	0.2323	1.4521
1.10	1.0488	-0.0076	0.2307	1.3808
2.10	1.4491	-0.0106	0.2277	1.3882
3.10	1.7607	-0.0120	0.2263	1.3852
4.10	2.0248	-0.0128	0.2255	1.3882
7.10	2.6646	-0.0148	0.2235	1.2931
9.10	3.0166	-0.0155	0.2228	1.3427
12.10	3.4785	-0.0161	0.2222	1.3680
15.10	3.8859	-0.0164	0.2219	1.3371
20.10	4.4833	-0.0171	0.2212	1.3724
25.17	5.0166	-0.0175	0.2208	1.3537
30.17	5.4924	-0.0182	0.2201	1.3775
35.17	5.9301	-0.0182	0.2200	1.3930
40.17	6.3377	-0.0186	0.2197	1.3356
45.18	6.7219	-0.0187	0.2196	1.3311
50.18	7.0840	-0.0190	0.2193	1.3234
55.18	7.4285	-0.0194	0.2189	1.2544
60.18	7.7578	-0.0195	0.2188	1.3617
80.18	8.9545	-0.0203	0.2180	1.3403
100.18	10.0092	-0.0207	0.2176	1.3305
120.18	10.9628	-0.0208	0.2175	1.3989
140.18	11.8399	-0.0211	0.2172	1.3870
160.18	12.6564	-0.0214	0.2169	1.3391
180.18	13.4232	-0.0216	0.2167	1.3748
200.18	14.1486	-0.0218	0.2165	1.3335
220.18	14.8386	-0.0221	0.2162	1.3573
240.17	15.4973	-0.0223	0.2160	1.3965

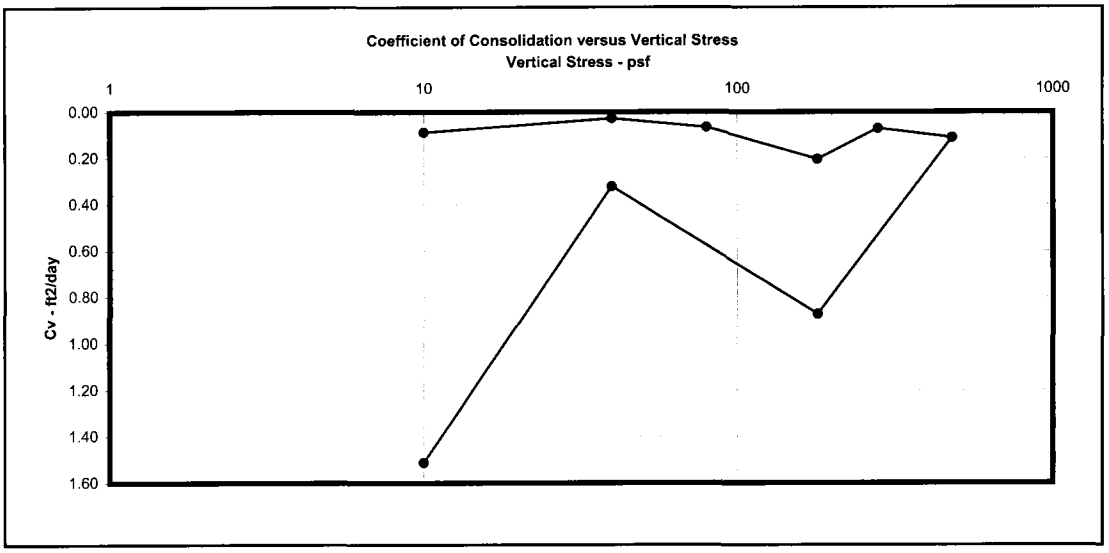
Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2160	1.3793
0.10	0.3162	-0.0006	0.2154	0.6390
0.20	0.4472	-0.0013	0.2147	0.4924
0.35	0.5916	-0.0017	0.2143	0.4594
0.60	0.7746	-0.0021	0.2139	0.4963
1.10	1.0488	-0.0028	0.2132	0.3999
2.10	1.4491	-0.0046	0.2114	0.3488
3.10	1.7607	-0.0059	0.2101	0.3577
4.10	2.0248	-0.0070	0.2090	0.3726
7.10	2.6646	-0.0088	0.2072	0.2941
9.10	3.0166	-0.0098	0.2062	0.3417
12.10	3.4785	-0.0102	0.2058	0.2379
15.10	3.8859	-0.0107	0.2053	0.2902
20.10	4.4833	-0.0110	0.2050	0.4092
25.10	5.0100	-0.0114	0.2046	0.4784
30.10	5.4863	-0.0114	0.2046	0.3072
35.10	5.9245	-0.0118	0.2042	0.3913
40.10	6.3325	-0.0124	0.2036	0.4520
45.10	6.7157	-0.0129	0.2031	0.3976
50.10	7.0781	-0.0134	0.2026	0.4059
55.10	7.4229	-0.0139	0.2021	0.4520
60.10	7.7524	-0.0142	0.2018	0.4321
60.13	7.7546	-0.0142	0.2018	0.4365

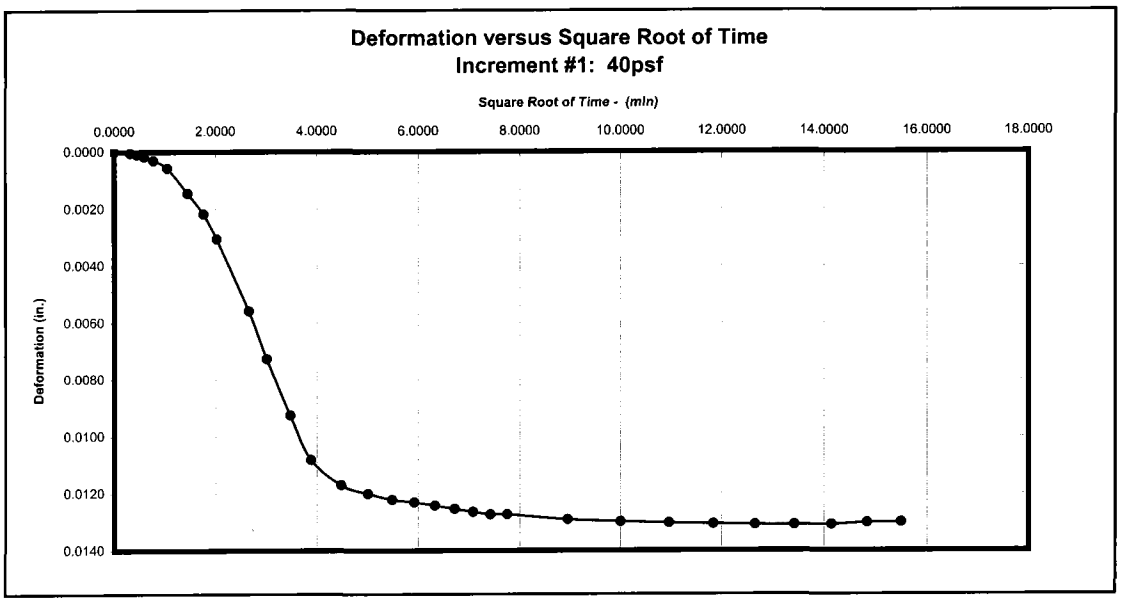
Ecology and Environment
Consolidation Data
Sample ID: NS05 0-24"





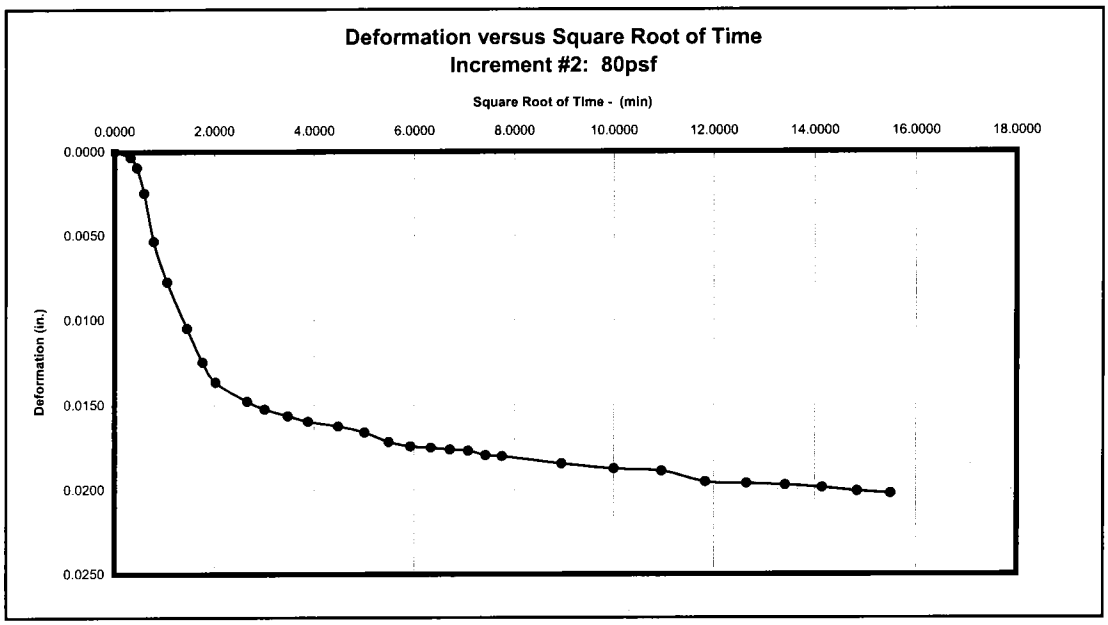
Step 0	Vertical Stress 180	Machine Deflections 0.0013432	H_0 (in) S_{100} -0.0062	0.900 H_{100} 0.6631	Vertical Strain 26.32	H_{50} (in.)	t_{50} (min.)	c_v (ft^2/day)
								#N/A
2	10	-0.0001	0.0126	0.8873	2.06	0.8936	4.42	0.09
3	20	-0.0001	0.0276	0.8538	5.13			#N/A
4	40	0.0002	0.0359	0.8182	9.09	0.8397	12.20	0.03
5	80	0.0007	0.0308	0.7878	13.87	0.8032	4.80	0.07
6	180	0.0012	0.0402	0.7354	19.71	0.7555	1.37	0.21
7	280	0.0016	0.0256	0.6975	22.81	0.7103	3.46	0.07
8	480	0.0028	0.0297	0.6661	26.85	0.6810	2.03	0.11
9	180	0.0013	-0.0062	0.6631	26.32	0.6660	0.25	0.87
10	40	0.0007	-0.0223	0.6847	23.92	0.6732	0.69	0.32
11	10	0.0001	-0.0142	0.6983	22.42	0.7011	0.16	1.51

Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



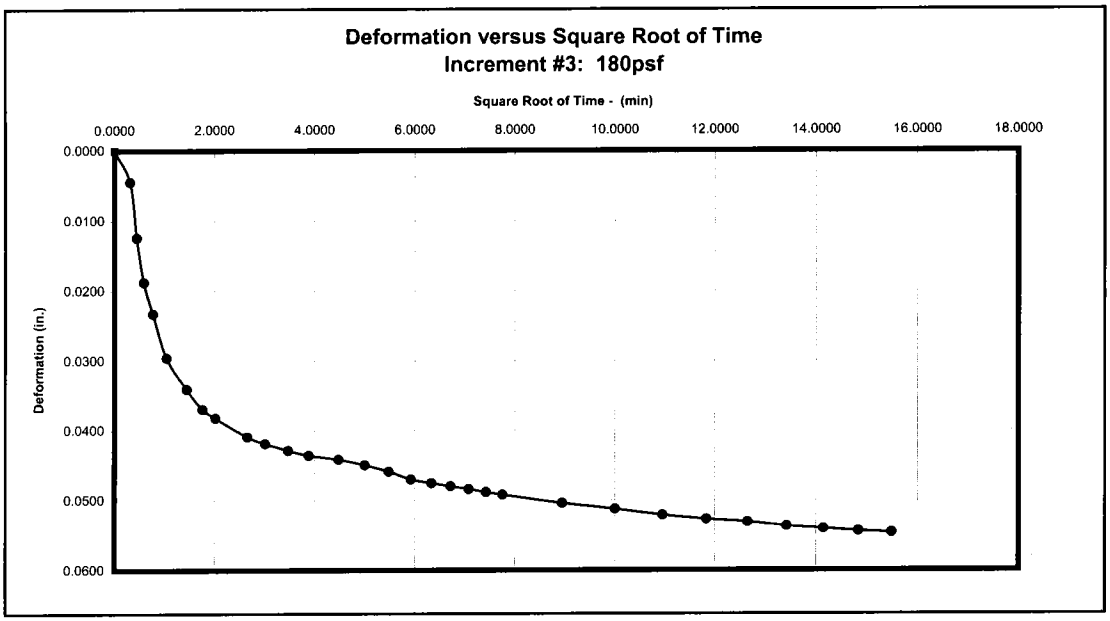
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1186	0.5697
0.10	0.3162	0.0000	0.1186	0.6087
0.20	0.4472	0.0001	0.1187	0.6574
0.35	0.5916	0.0002	0.1188	0.6114
0.60	0.7746	0.0003	0.1189	0.6289
1.10	1.0488	0.0006	0.1192	0.7407
2.10	1.4491	0.0014	0.1200	0.7981
3.10	1.7607	0.0022	0.1208	0.8311
4.10	2.0248	0.0031	0.1216	0.9631
7.12	2.6677	0.0056	0.1242	1.1165
9.12	3.0194	0.0073	0.1259	1.2821
12.12	3.4809	0.0093	0.1278	1.3808
15.12	3.8880	0.0108	0.1294	1.3558
20.12	4.4852	0.0117	0.1303	1.4554
25.12	5.0117	0.0120	0.1306	1.3317
30.12	5.4879	0.0122	0.1308	1.3853
35.12	5.9259	0.0123	0.1309	1.3793
40.12	6.3338	0.0124	0.1310	1.3023
45.12	6.7169	0.0125	0.1311	1.3190
50.12	7.0793	0.0126	0.1312	1.3056
55.12	7.4241	0.0127	0.1313	1.3963
60.12	7.7535	0.0127	0.1313	1.4272
80.12	8.9508	0.0129	0.1315	1.3508
100.12	10.0058	0.0130	0.1316	1.3603
120.12	10.9598	0.0130	0.1316	1.3142
140.12	11.8371	0.0131	0.1317	1.4117
160.12	12.6537	0.0131	0.1317	1.3677
180.12	13.4208	0.0131	0.1317	1.3594
200.12	14.1463	0.0131	0.1317	1.3424
220.12	14.8363	0.0130	0.1316	1.4248
240.12	15.4957	0.0130	0.1316	1.3365
240.20	15.4984	0.0130	0.1316	1.3948

Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



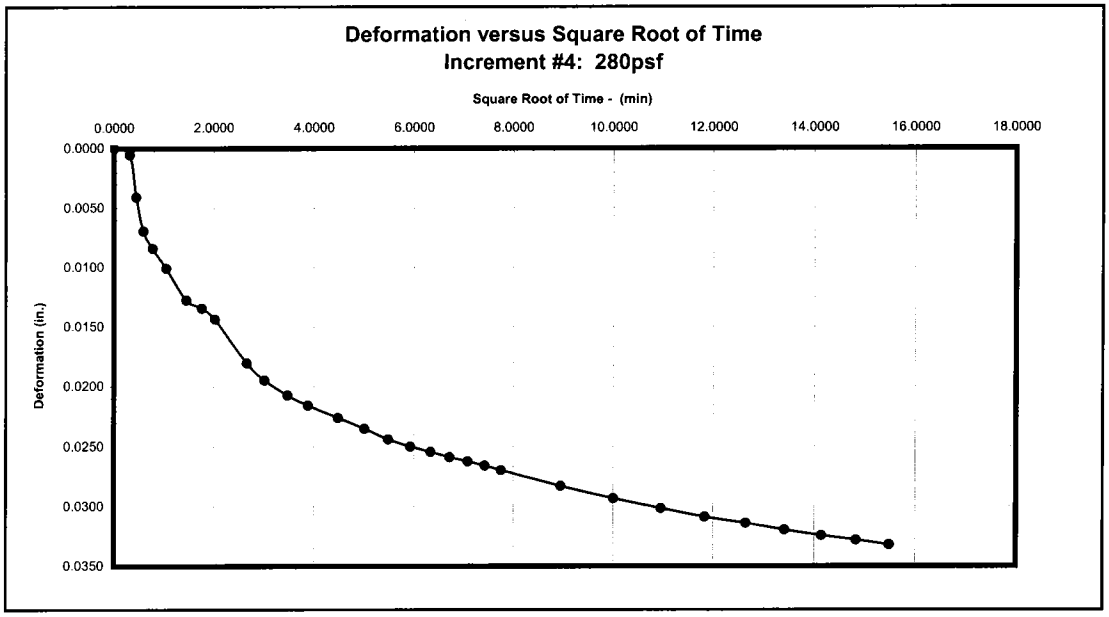
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1316	1.3639
0.10	0.3162	0.0003	0.1319	1.5378
0.20	0.4472	0.0009	0.1325	1.8086
0.35	0.5916	0.0025	0.1341	2.1372
0.62	0.7853	0.0053	0.1369	2.5427
1.12	1.0567	0.0077	0.1393	2.6723
2.12	1.4549	0.0105	0.1421	2.7235
3.12	1.7654	0.0125	0.1441	2.7044
4.12	2.0290	0.0137	0.1453	2.7223
7.12	2.6677	0.0148	0.1464	2.7068
9.12	3.0194	0.0152	0.1468	2.7330
12.12	3.4809	0.0156	0.1472	2.7196
15.12	3.8880	0.0160	0.1476	2.7243
20.12	4.4852	0.0162	0.1478	2.6848
25.12	5.0117	0.0166	0.1482	2.7006
30.12	5.4879	0.0172	0.1488	2.8397
35.13	5.9273	0.0174	0.1490	2.7933
40.13	6.3351	0.0175	0.1491	2.6604
45.13	6.7181	0.0176	0.1492	2.7065
50.13	7.0805	0.0177	0.1493	2.7065
55.13	7.4252	0.0180	0.1496	2.7353
60.13	7.7546	0.0180	0.1496	2.7232
80.12	8.9508	0.0185	0.1501	2.7089
100.12	10.0058	0.0188	0.1504	2.6842
120.12	10.9598	0.0189	0.1505	2.7359
140.12	11.8371	0.0195	0.1511	2.7603
160.12	12.6537	0.0196	0.1512	2.7270
180.10	13.4201	0.0197	0.1513	2.7160
200.15	14.1474	0.0199	0.1515	2.7006
220.15	14.8375	0.0201	0.1517	2.7306
240.17	15.4973	0.0202	0.1518	2.7199
240.22	15.4989	0.0202	0.1518	2.6899

Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



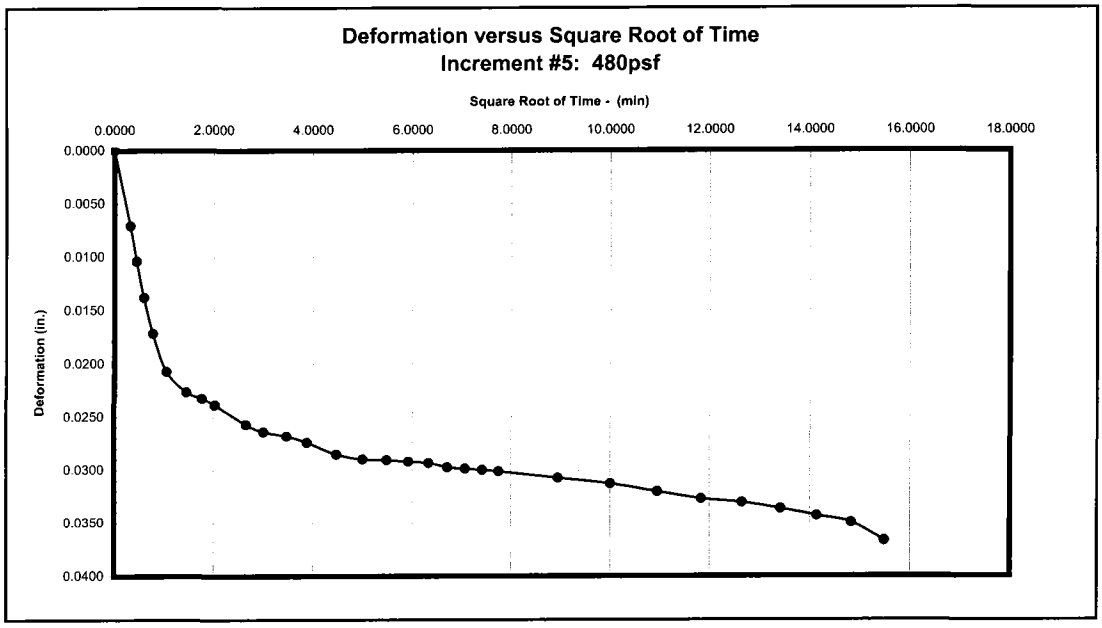
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1518	2.7627
0.10	0.3162	0.0045	0.1563	4.6578
0.20	0.4472	0.0124	0.1642	5.1635
0.35	0.5916	0.0188	0.1706	5.8354
0.60	0.7746	0.0233	0.1751	5.9433
1.10	1.0488	0.0296	0.1814	6.0807
2.10	1.4491	0.0341	0.1859	6.0295
3.10	1.7607	0.0369	0.1888	6.1137
4.10	2.0248	0.0382	0.1901	6.1280
7.10	2.6646	0.0409	0.1928	6.1925
9.12	3.0194	0.0419	0.1937	6.1743
12.12	3.4809	0.0429	0.1947	6.0819
15.12	3.8880	0.0436	0.1954	6.1636
20.12	4.4852	0.0442	0.1960	6.1175
25.12	5.0117	0.0450	0.1968	5.9772
30.12	5.4879	0.0459	0.1977	6.0985
35.13	5.9273	0.0471	0.1989	6.2603
40.13	6.3351	0.0476	0.1994	6.1045
45.13	6.7181	0.0480	0.1999	6.1137
50.13	7.0805	0.0484	0.2003	6.0997
55.13	7.4252	0.0489	0.2007	6.1553
60.15	7.7556	0.0492	0.2011	6.1841
80.08	8.9489	0.0505	0.2023	6.2017
100.10	10.0050	0.0513	0.2031	6.1282
120.10	10.9590	0.0522	0.2040	6.1360
140.12	11.8371	0.0528	0.2046	6.1755
160.13	12.6544	0.0532	0.2050	6.0652
180.15	13.4220	0.0538	0.2056	6.1161
200.08	14.1451	0.0541	0.2060	6.1199
220.10	14.8358	0.0545	0.2063	6.1434
240.10	15.4952	0.0547	0.2065	6.1244
240.13	15.4962	0.0547	0.2065	6.1752

Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



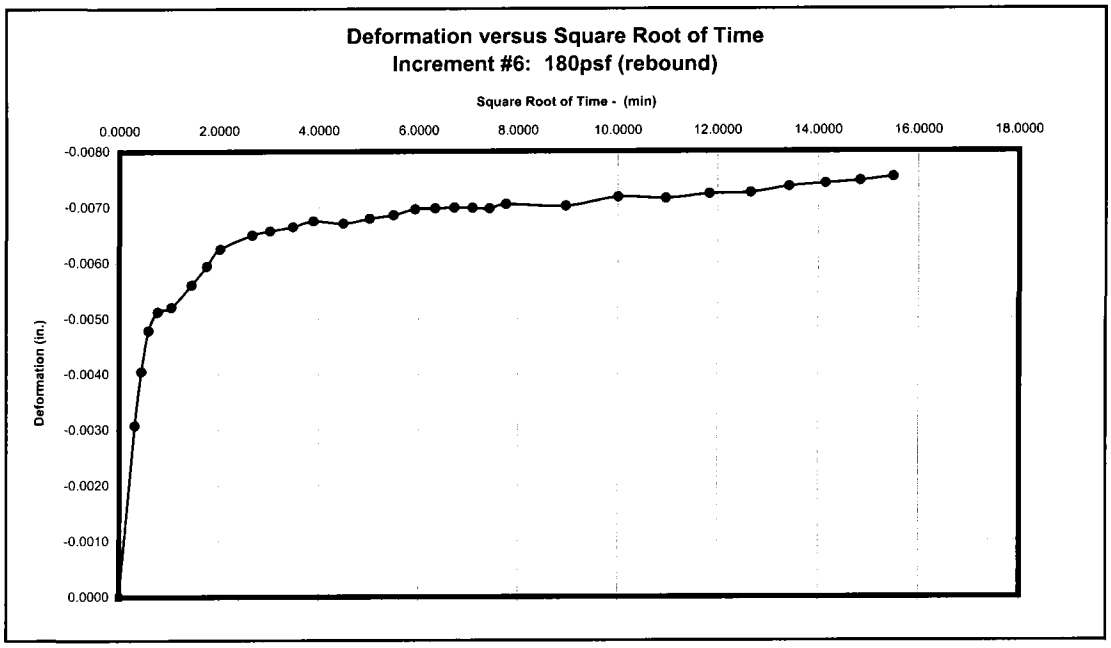
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2065	6.1330
0.10	0.3162	0.0005	0.2070	6.8370
0.20	0.4472	0.0041	0.2106	9.2322
0.35	0.5916	0.0069	0.2134	9.4733
0.60	0.7746	0.0084	0.2149	9.5289
1.10	1.0488	0.0101	0.2166	9.4091
2.10	1.4491	0.0127	0.2192	9.3056
3.10	1.7607	0.0134	0.2199	9.0749
4.10	2.0248	0.0144	0.2209	9.2024
7.10	2.6646	0.0180	0.2245	9.6422
9.10	3.0166	0.0195	0.2260	9.7162
12.10	3.4785	0.0207	0.2272	9.5470
15.12	3.8880	0.0216	0.2281	9.5711
20.12	4.4852	0.0226	0.2291	9.5378
25.12	5.0117	0.0235	0.2300	9.5423
30.12	5.4879	0.0244	0.2309	9.5128
35.13	5.9273	0.0250	0.2315	9.5458
40.13	6.3351	0.0255	0.2319	9.5446
45.13	6.7181	0.0259	0.2324	9.5518
50.13	7.0805	0.0262	0.2327	9.5601
55.15	7.4263	0.0266	0.2331	9.5672
60.15	7.7556	0.0270	0.2335	9.5684
80.07	8.9480	0.0283	0.2348	9.5913
100.07	10.0033	0.0293	0.2358	9.5637
120.07	10.9575	0.0302	0.2367	9.5723
140.07	11.8350	0.0309	0.2374	9.5330
160.07	12.6517	0.0314	0.2379	9.5435
180.07	13.4189	0.0320	0.2385	9.5518
200.07	14.1445	0.0325	0.2389	9.5399
220.07	14.8346	0.0328	0.2393	9.5735
240.07	15.4941	0.0332	0.2397	9.5304
240.12	15.4957	0.0332	0.2397	9.5256

Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



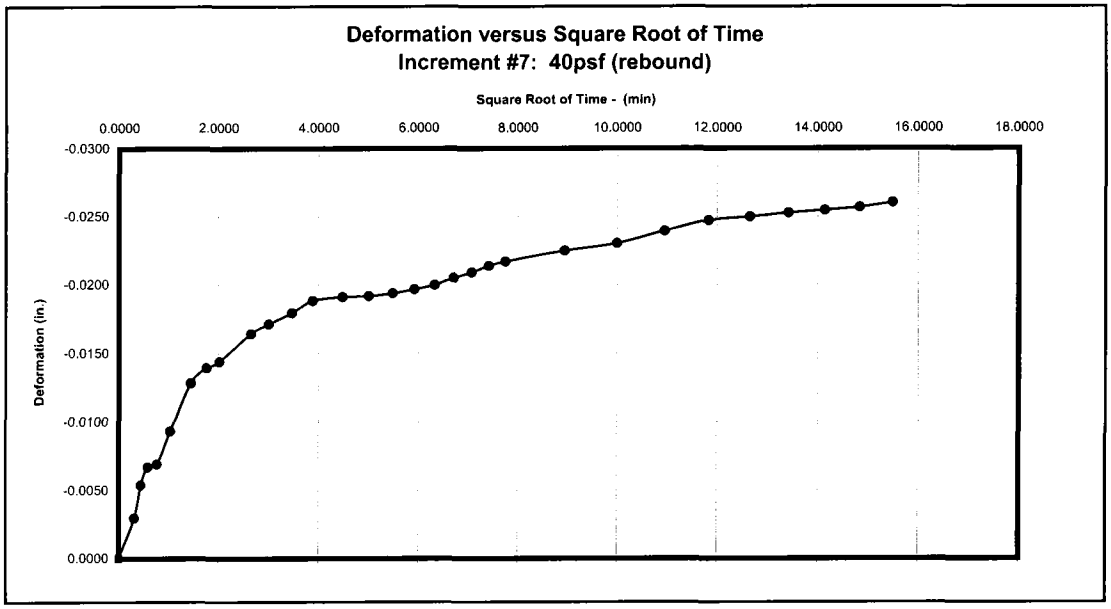
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2412	9.5390
0.10	0.3162	0.0071	0.2483	15.6110
0.20	0.4472	0.0104	0.2516	16.0275
0.35	0.5916	0.0138	0.2549	16.1366
0.60	0.7746	0.0171	0.2583	16.2499
1.10	1.0488	0.0207	0.2619	16.4259
2.10	1.4491	0.0226	0.2638	16.3581
3.10	1.7607	0.0233	0.2645	16.4054
4.10	2.0248	0.0239	0.2650	16.2891
7.10	2.6646	0.0257	0.2669	16.3447
9.10	3.0166	0.0264	0.2676	16.3887
12.10	3.4785	0.0268	0.2680	16.3519
15.10	3.8859	0.0274	0.2686	16.3926
20.10	4.4833	0.0285	0.2697	16.3575
25.10	5.0100	0.0290	0.2702	16.3447
30.12	5.4879	0.0291	0.2702	16.3890
35.12	5.9259	0.0292	0.2704	16.3197
40.12	6.3338	0.0294	0.2705	16.3640
45.12	6.7169	0.0298	0.2709	16.3138
50.12	7.0793	0.0299	0.2711	16.3522
55.12	7.4241	0.0300	0.2712	16.3926
60.12	7.7535	0.0302	0.2713	16.3412
80.10	8.9499	0.0308	0.2719	16.3792
100.10	10.0050	0.0313	0.2725	16.3409
120.08	10.9583	0.0321	0.2732	16.3875
140.08	11.8357	0.0328	0.2739	16.4006
160.08	12.6524	0.0331	0.2743	16.3046
180.12	13.4208	0.0337	0.2749	16.3281
200.10	14.1457	0.0344	0.2755	16.3792
220.10	14.8358	0.0350	0.2762	16.3807
240.08	15.4946	0.0367	0.2779	16.3367
240.10	15.4952	0.0367	0.2779	16.3855

Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



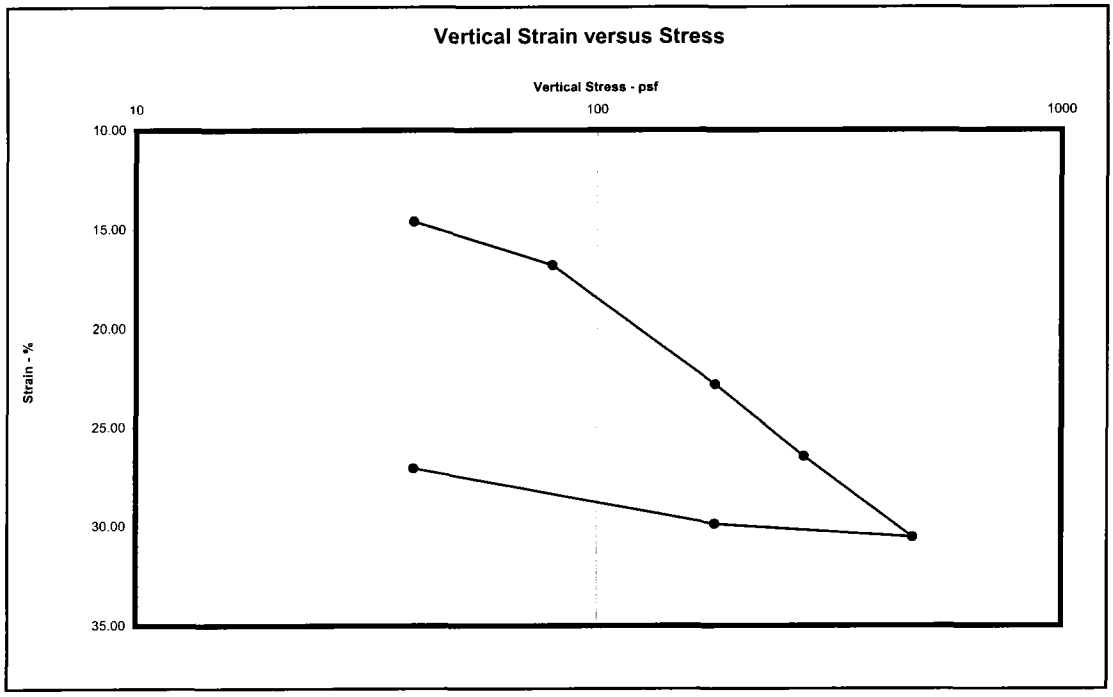
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2779	16.3257
0.10	0.3162	-0.0031	0.2748	6.5335
0.20	0.4472	-0.0041	0.2738	6.2287
0.35	0.5916	-0.0048	0.2731	6.0982
0.60	0.7746	-0.0051	0.2727	6.0685
1.10	1.0488	-0.0052	0.2727	6.1746
2.10	1.4491	-0.0056	0.2723	6.1508
3.10	1.7607	-0.0059	0.2719	6.1413
4.10	2.0248	-0.0062	0.2716	6.1711
7.10	2.6646	-0.0065	0.2714	6.1196
9.10	3.0166	-0.0066	0.2713	6.1339
12.10	3.4785	-0.0066	0.2712	6.0831
15.10	3.8859	-0.0068	0.2711	6.1220
20.10	4.4833	-0.0067	0.2712	6.1803
25.10	5.0100	-0.0068	0.2711	6.1354
30.10	5.4863	-0.0069	0.2710	6.1838
35.10	5.9245	-0.0070	0.2709	6.1351
40.10	6.3325	-0.0070	0.2709	6.1782
45.10	6.7157	-0.0070	0.2709	6.1199
50.10	7.0781	-0.0070	0.2709	6.1838
55.10	7.4229	-0.0070	0.2709	6.1092
60.10	7.7524	-0.0071	0.2708	6.1065
80.13	8.9517	-0.0070	0.2708	6.1398
100.13	10.0067	-0.0072	0.2707	6.0938
120.12	10.9598	-0.0072	0.2707	6.2053
140.12	11.8371	-0.0072	0.2706	6.1378
160.10	12.6531	-0.0073	0.2706	6.1592
180.10	13.4201	-0.0074	0.2705	6.1339
200.15	14.1474	-0.0074	0.2704	6.1390
220.15	14.8375	-0.0075	0.2704	6.1449
240.12	15.4957	-0.0075	0.2703	6.0970

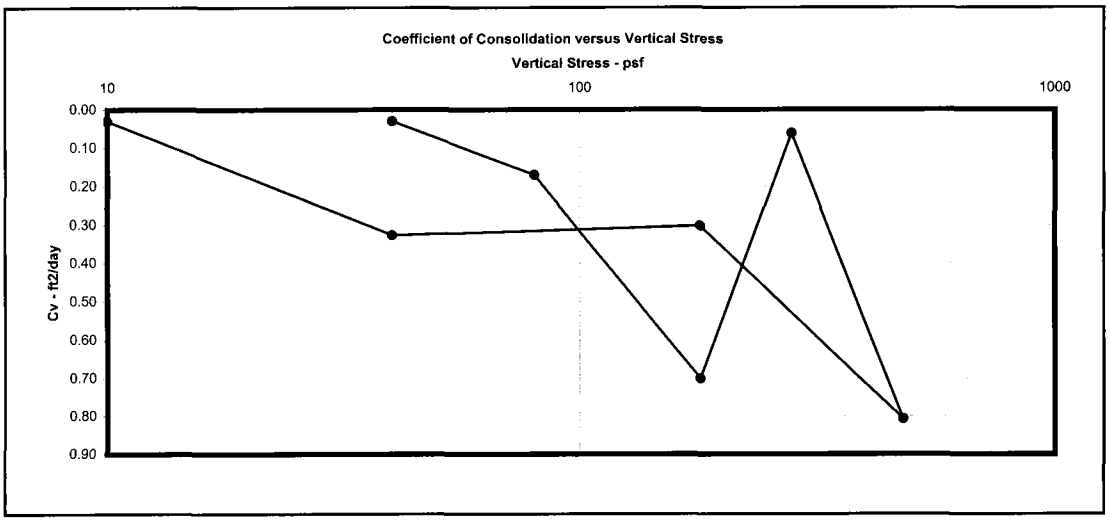
Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2704	6.0914
0.10	0.3162	-0.0030	0.2674	2.0001
0.20	0.4472	-0.0054	0.2650	1.5066
0.35	0.5916	-0.0067	0.2637	1.4423
0.60	0.7746	-0.0069	0.2635	1.4221
1.10	1.0488	-0.0093	0.2610	1.4058
2.10	1.4491	-0.0128	0.2575	1.3805
3.10	1.7607	-0.0139	0.2564	1.3282
4.10	2.0248	-0.0144	0.2560	1.3306
7.10	2.6646	-0.0164	0.2539	1.3808
9.10	3.0166	-0.0171	0.2533	1.3508
12.10	3.4785	-0.0179	0.2524	1.3998
15.10	3.8859	-0.0188	0.2516	1.3329
20.10	4.4833	-0.0191	0.2513	1.3080
25.10	5.0100	-0.0192	0.2512	1.3772
30.10	5.4863	-0.0194	0.2510	1.3983
35.10	5.9245	-0.0197	0.2507	1.3416
40.10	6.3325	-0.0200	0.2504	1.3222
45.10	6.7157	-0.0205	0.2499	1.3056
50.10	7.0781	-0.0209	0.2495	1.3558
55.10	7.4229	-0.0214	0.2490	1.3439
60.10	7.7524	-0.0217	0.2487	1.3463
80.10	8.9499	-0.0225	0.2479	1.3853
100.10	10.0050	-0.0230	0.2474	1.3600
120.10	10.9590	-0.0239	0.2465	1.3606
140.10	11.8364	-0.0247	0.2457	1.3606
160.10	12.6531	-0.0250	0.2454	1.3404
180.10	13.4201	-0.0253	0.2451	1.3856
200.10	14.1457	-0.0254	0.2449	1.3772
220.12	14.8363	-0.0257	0.2447	1.3582
240.12	15.4957	-0.0260	0.2444	1.3995
240.12	15.4957	-0.0260	0.2444	1.3749

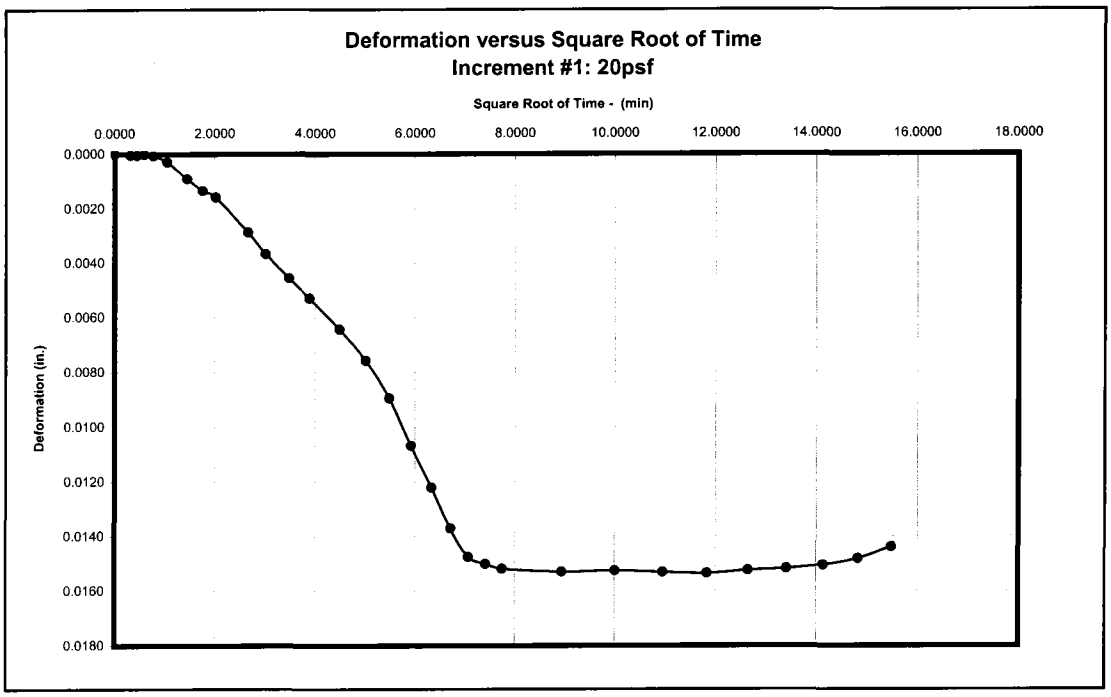
Ecology and Environment
Consolidation Data
Sample ID: NS06 0-18"





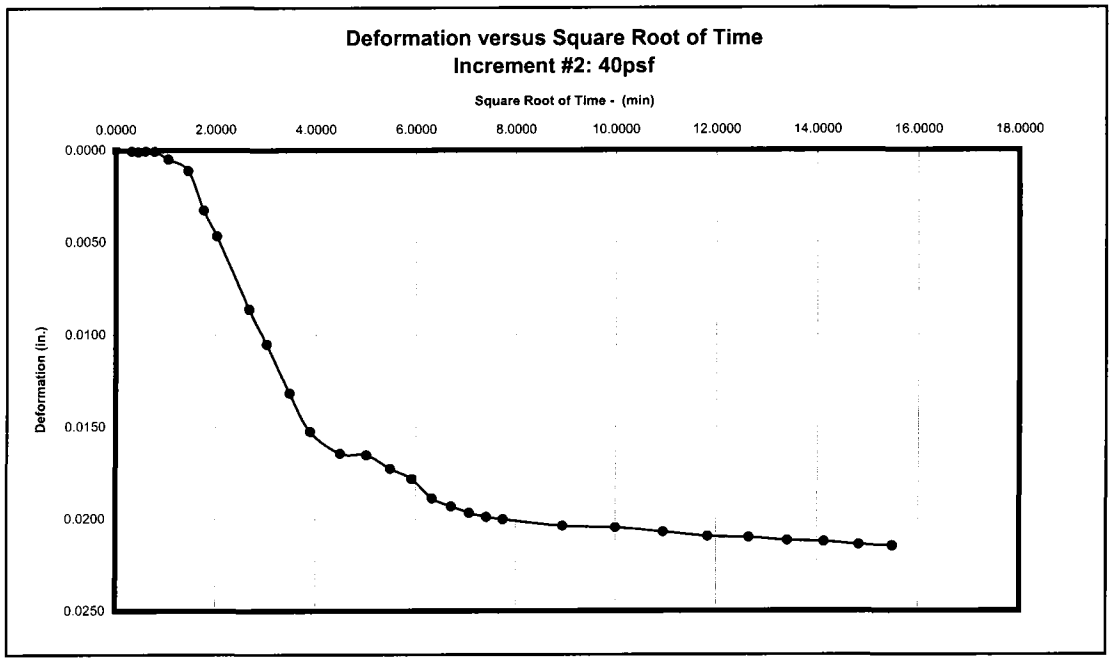
Step	Vertical Stress	Machine Deflections	H_0 (in)	0.900	Vertical Strain	H_{50}	t_{50}	c_v
0	10	9.697E-05	S_{100} -0.747	H_{100} 1.4054	-56.15	(in.)	(min.)	(ft^2/day)
1	5	0.0000						#N/A
2	40	0.0002	0.0165	0.7652	14.60	0.7734	9.63	0.03
3	80	0.0007	0.0179	0.7512	16.80	0.7601	1.67	0.17
4	180	0.0012	0.0547	0.6947	22.81	0.7158	0.36	0.70
5	280	0.0016	0.0332	0.6619	26.46	0.6757	3.61	0.06
6	480	0.0028	0.0367	0.6250	30.56	0.6403	0.25	0.81
7	180	0.0013	-0.0075	0.6310	29.89	0.6271	0.64	0.30
8	40	0.0007	-0.0260	0.6563	27.07	0.6516	0.64	0.33
9	10	0.0001	-1.2092	1.8649	-55.75	1.2604	25.50	0.03

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



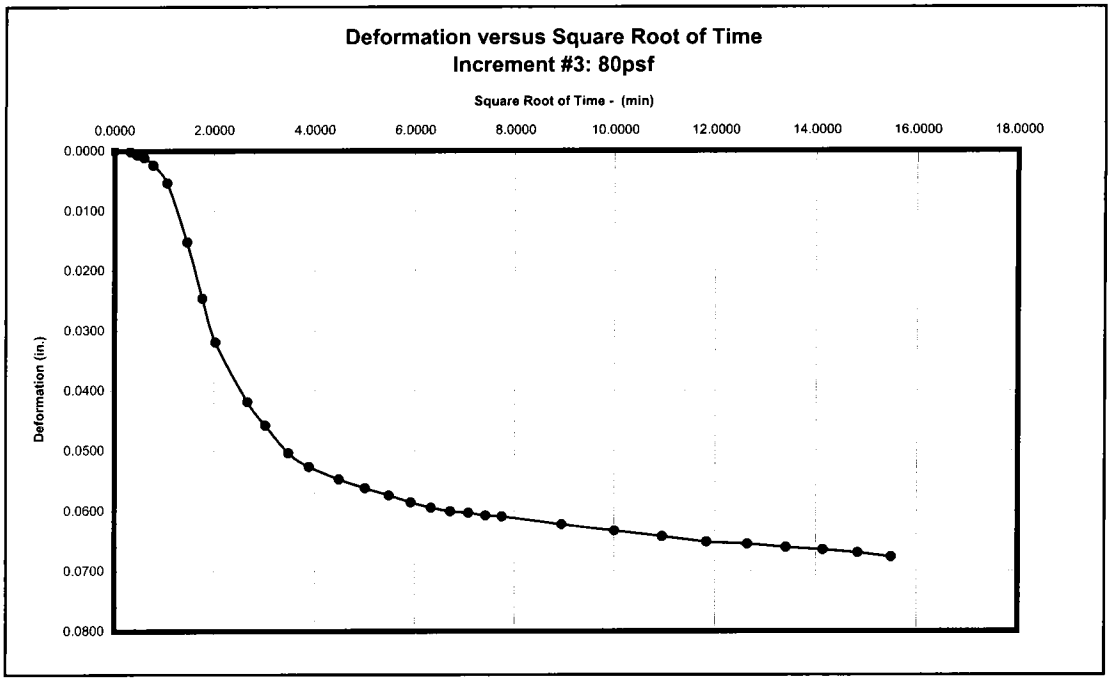
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1280	0.3126
0.10	0.3162	0.0000	0.1281	0.3491
0.20	0.4472	0.0000	0.1281	0.2876
0.35	0.5916	0.0000	0.1280	0.3708
0.60	0.7746	0.0001	0.1281	0.3209
1.10	1.0488	0.0003	0.1283	0.4469
2.10	1.4491	0.0009	0.1289	0.3979
3.10	1.7607	0.0013	0.1294	0.4339
4.10	2.0248	0.0016	0.1296	0.4802
7.10	2.6646	0.0029	0.1309	0.4217
9.10	3.0166	0.0037	0.1317	0.4716
12.10	3.4785	0.0046	0.1326	0.4767
15.10	3.8859	0.0053	0.1333	0.4493
20.10	4.4833	0.0064	0.1345	0.4648
25.10	5.0100	0.0076	0.1356	0.5171
30.10	5.4863	0.0090	0.1370	0.6681
35.10	5.9245	0.0107	0.1387	0.6408
40.08	6.3311	0.0122	0.1402	0.7000
45.08	6.7144	0.0137	0.1417	0.6479
50.08	7.0770	0.0148	0.1428	0.7107
55.08	7.4218	0.0150	0.1430	0.6872
60.08	7.7513	0.0152	0.1432	0.7460
80.08	8.9489	0.0153	0.1433	0.7130
100.15	10.0075	0.0153	0.1433	0.6598
120.15	10.9613	0.0153	0.1433	0.7023
140.15	11.8385	0.0154	0.1434	0.7237
160.15	12.6550	0.0152	0.1433	0.7095
180.15	13.4220	0.0152	0.1432	0.6919
200.15	14.1474	0.0151	0.1431	0.6723
220.15	14.8375	0.0148	0.1429	0.6521
240.12	15.4957	0.0144	0.1424	0.6738

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



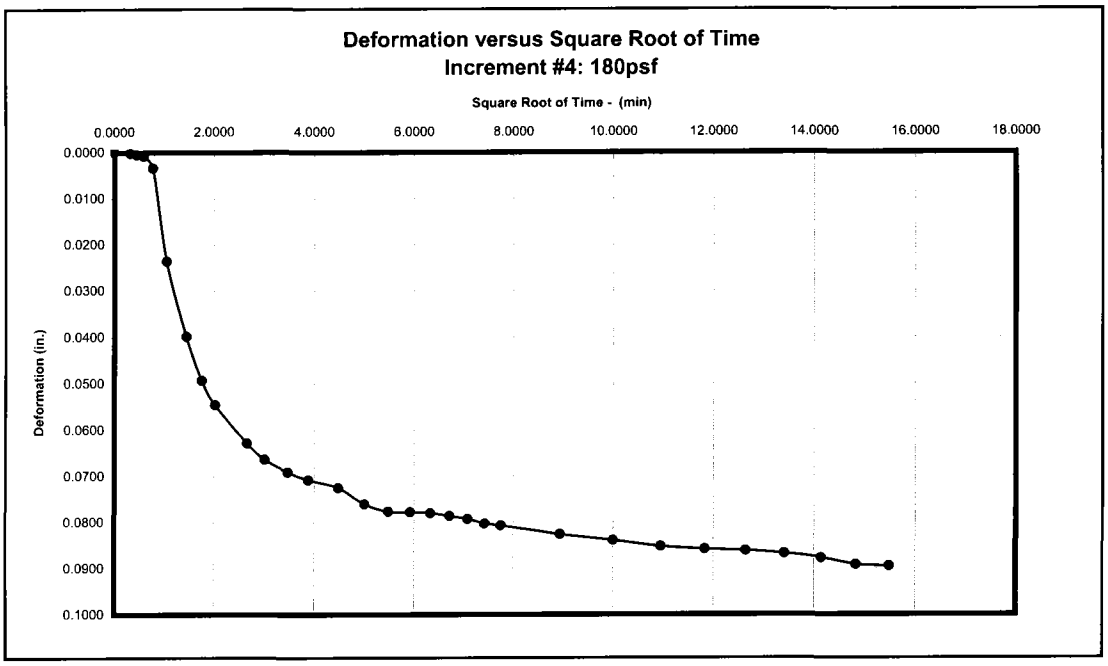
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1424	0.7368
0.10	0.3162	0.0001	0.1425	0.7142
0.20	0.4472	0.0001	0.1425	0.7273
0.35	0.5916	0.0001	0.1425	0.7392
0.60	0.7746	0.0001	0.1425	0.7618
1.10	1.0488	0.0005	0.1429	0.8329
2.10	1.4491	0.0011	0.1435	0.9521
3.10	1.7607	0.0033	0.1457	1.1343
4.10	2.0248	0.0047	0.1471	1.1831
7.10	2.6646	0.0086	0.1510	1.3650
9.10	3.0166	0.0105	0.1529	1.3766
12.10	3.4785	0.0132	0.1556	1.3644
15.10	3.8859	0.0152	0.1577	1.3306
20.10	4.4833	0.0165	0.1589	1.3793
25.10	5.0100	0.0165	0.1589	1.3627
30.10	5.4863	0.0173	0.1597	1.3615
35.10	5.9245	0.0178	0.1602	1.3847
40.10	6.3325	0.0189	0.1613	1.4004
45.10	6.7157	0.0193	0.1617	1.3647
50.10	7.0781	0.0197	0.1621	1.3395
55.10	7.4229	0.0199	0.1623	1.3552
60.10	7.7524	0.0200	0.1624	1.3341
80.12	8.9508	0.0204	0.1628	1.3543
100.12	10.0058	0.0205	0.1629	1.3591
120.12	10.9598	0.0207	0.1631	1.3766
140.12	11.8371	0.0210	0.1634	1.3698
160.12	12.6537	0.0210	0.1634	1.3662
180.13	13.4214	0.0212	0.1636	1.3650
200.13	14.1468	0.0213	0.1637	1.3671
220.13	14.8369	0.0214	0.1638	1.3353
240.10	15.4952	0.0215	0.1639	1.3912
240.17	15.4973	0.0215	0.1639	1.3686

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



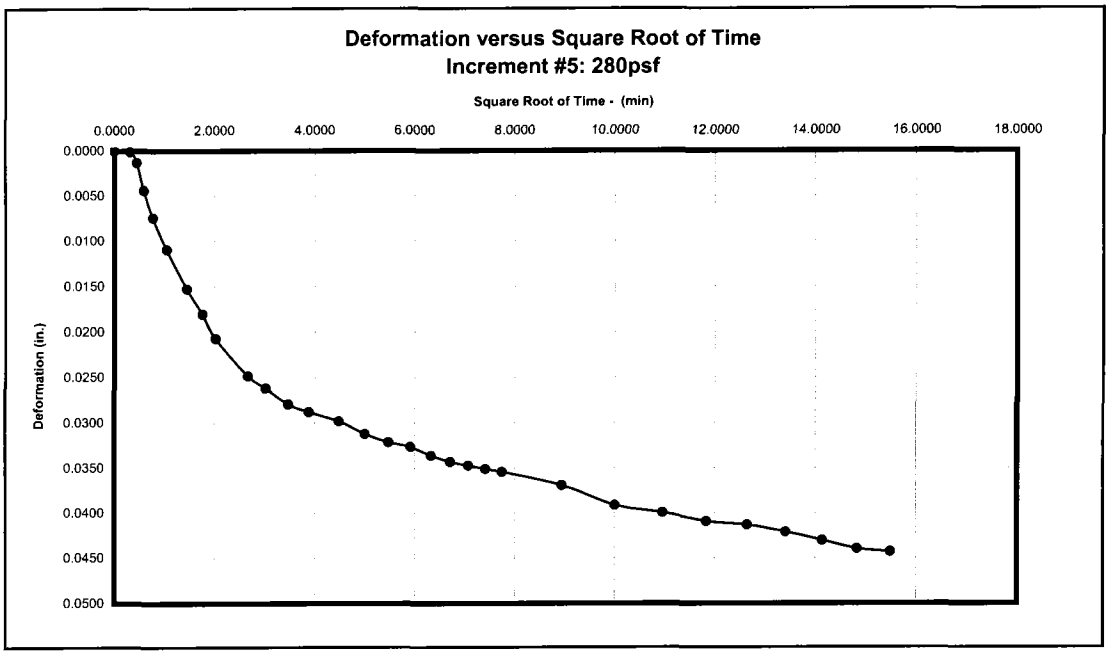
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1639	1.3933
0.10	0.3162	0.0002	0.1641	1.5312
0.20	0.4472	0.0007	0.1646	1.6457
0.35	0.5916	0.0011	0.1650	1.6692
0.60	0.7746	0.0024	0.1663	1.8618
1.12	1.0567	0.0053	0.1692	2.3569
2.12	1.4549	0.0152	0.1791	2.4413
3.12	1.7654	0.0246	0.1885	2.6670
4.12	2.0290	0.0319	0.1958	2.7217
7.12	2.6677	0.0419	0.2058	2.7110
9.12	3.0194	0.0458	0.2097	2.7050
12.12	3.4809	0.0504	0.2143	2.7933
15.12	3.8880	0.0527	0.2166	2.7680
20.10	4.4833	0.0548	0.2187	2.7493
25.10	5.0100	0.0562	0.2202	2.6922
30.10	5.4863	0.0574	0.2213	2.6967
35.10	5.9245	0.0586	0.2225	2.7909
40.10	6.3325	0.0595	0.2234	2.6824
45.10	6.7157	0.0601	0.2240	2.7362
50.10	7.0781	0.0603	0.2242	2.7811
55.10	7.4229	0.0608	0.2247	2.7288
60.10	7.7524	0.0609	0.2248	2.7514
80.08	8.9489	0.0622	0.2262	2.7243
100.15	10.0075	0.0633	0.2272	2.7669
120.13	10.9605	0.0643	0.2282	2.7006
140.12	11.8371	0.0652	0.2291	2.7422
160.10	12.6531	0.0655	0.2294	2.7446
180.10	13.4201	0.0661	0.2300	2.7517
200.08	14.1451	0.0665	0.2304	2.7205
220.15	14.8375	0.0670	0.2309	2.7918
240.13	15.4962	0.0677	0.2316	2.7359

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



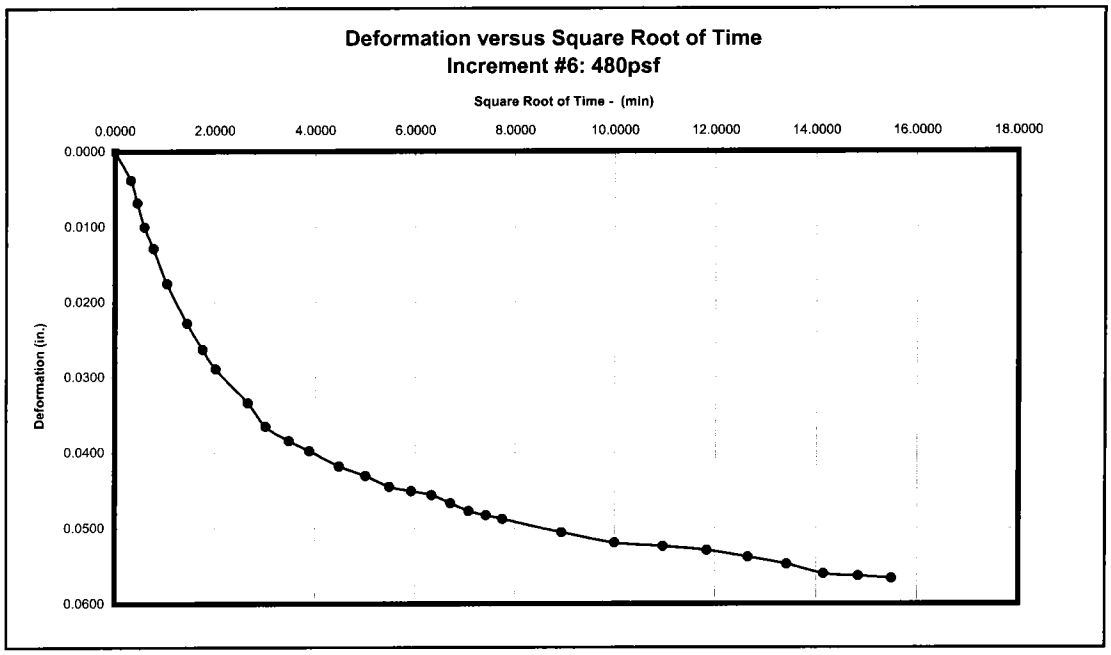
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2316	2.7083
0.10	0.3162	0.0002	0.2318	2.8370
0.20	0.4472	0.0005	0.2321	2.8278
0.35	0.5916	0.0008	0.2325	2.9265
0.60	0.7746	0.0034	0.2350	3.1867
1.10	1.0488	0.0236	0.2552	5.7486
2.10	1.4491	0.0398	0.2714	6.0857
3.10	1.7607	0.0493	0.2809	6.1684
4.10	2.0248	0.0546	0.2862	6.2302
7.10	2.6646	0.0629	0.2945	6.1443
9.10	3.0166	0.0664	0.2980	6.1645
12.10	3.4785	0.0691	0.3007	6.0447
15.10	3.8859	0.0708	0.3024	5.9228
20.10	4.4833	0.0725	0.3041	6.0768
25.08	5.0083	0.0760	0.3076	6.5439
30.08	5.4848	0.0777	0.3093	6.2588
35.08	5.9231	0.0778	0.3094	6.1196
40.08	6.3311	0.0780	0.3096	6.1479
45.08	6.7144	0.0786	0.3102	6.1256
50.08	7.0770	0.0793	0.3109	6.1158
55.08	7.4218	0.0803	0.3119	6.0682
60.08	7.7513	0.0807	0.3123	6.1054
80.07	8.9480	0.0827	0.3143	6.1288
100.13	10.0067	0.0840	0.3156	6.1375
120.13	10.9605	0.0853	0.3169	6.1645
140.13	11.8378	0.0859	0.3175	6.0756
160.13	12.6544	0.0862	0.3178	6.1288
180.13	13.4214	0.0868	0.3184	6.1491
200.13	14.1468	0.0878	0.3194	6.1601
220.13	14.8369	0.0892	0.3209	6.1431
240.13	15.4962	0.0896	0.3212	6.1859
240.17	15.4973	0.0896	0.3212	6.1360

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



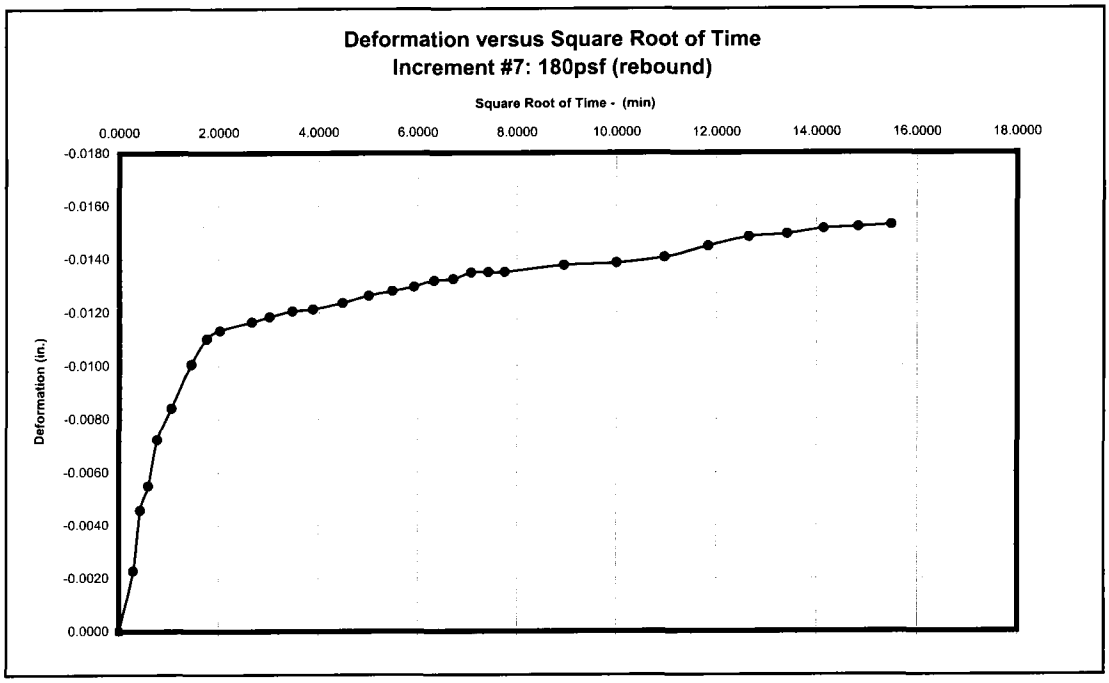
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.3212	6.1027
0.10	0.3162	0.0001	0.3213	6.5668
0.20	0.4472	0.0013	0.3225	8.5727
0.35	0.5916	0.0044	0.3256	9.3886
0.60	0.7746	0.0074	0.3286	9.4409
1.10	1.0488	0.0110	0.3321	9.5217
2.10	1.4491	0.0153	0.3364	9.5110
3.10	1.7607	0.0180	0.3392	9.5006
4.10	2.0248	0.0207	0.3419	9.5102
7.10	2.6646	0.0248	0.3460	9.6053
9.10	3.0166	0.0262	0.3474	9.6514
12.10	3.4785	0.0280	0.3492	9.5886
15.12	3.8880	0.0288	0.3500	9.5292
20.12	4.4852	0.0298	0.3510	9.4887
25.12	5.0117	0.0312	0.3524	9.6002
30.12	5.4879	0.0322	0.3534	9.5241
35.12	5.9259	0.0327	0.3539	9.4635
40.12	6.3338	0.0336	0.3548	9.5408
45.12	6.7169	0.0343	0.3555	9.5839
50.12	7.0793	0.0347	0.3559	9.5601
55.12	7.4241	0.0351	0.3563	9.6505
60.12	7.7535	0.0354	0.3566	9.5625
80.12	8.9508	0.0369	0.3581	9.5729
100.12	10.0058	0.0391	0.3603	9.5931
120.12	10.9598	0.0400	0.3612	9.5360
140.12	11.8371	0.0409	0.3621	9.5194
160.12	12.6537	0.0413	0.3625	9.5672
180.12	13.4208	0.0421	0.3633	9.5812
200.13	14.1468	0.0431	0.3643	9.5253
220.13	14.8369	0.0440	0.3652	9.5206
240.10	15.4952	0.0443	0.3655	9.5527
240.13	15.4962	0.0443	0.3655	9.5479

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



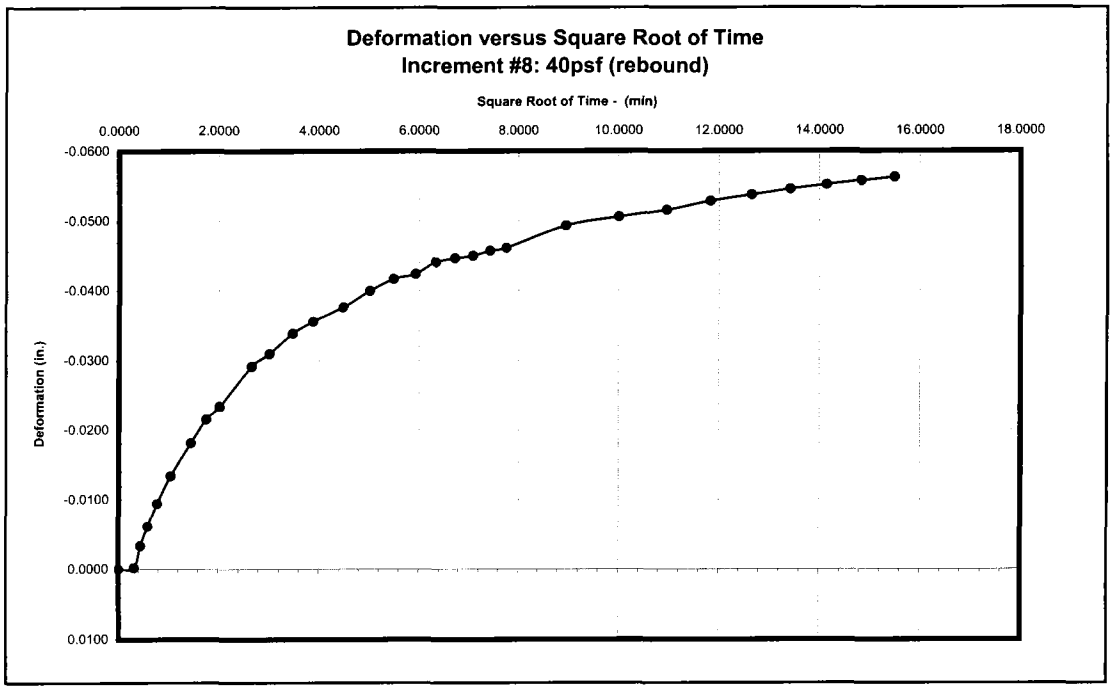
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.3655	9.5542
0.10	0.3162	0.0038	0.3693	15.0687
0.20	0.4472	0.0068	0.3723	16.0126
0.35	0.5916	0.0100	0.3755	16.1176
0.60	0.7746	0.0129	0.3784	16.3753
1.10	1.0488	0.0175	0.3831	16.3233
2.10	1.4491	0.0228	0.3883	16.1949
3.10	1.7607	0.0263	0.3918	16.3135
4.10	2.0248	0.0289	0.3944	16.3643
7.10	2.6646	0.0335	0.3990	16.3825
9.10	3.0166	0.0366	0.4021	16.4039
12.10	3.4785	0.0385	0.4040	16.4372
15.10	3.8859	0.0398	0.4053	16.3780
20.10	4.4833	0.0418	0.4074	16.3979
25.10	5.0100	0.0431	0.4086	16.2817
30.10	5.4863	0.0445	0.4100	16.4042
35.10	5.9245	0.0451	0.4106	16.3970
40.10	6.3325	0.0456	0.4111	16.3361
45.08	6.7144	0.0467	0.4122	16.3302
50.08	7.0770	0.0478	0.4133	16.3525
55.08	7.4218	0.0483	0.4138	16.3944
60.08	7.7513	0.0488	0.4143	16.3376
80.07	8.9480	0.0506	0.4161	16.3923
100.13	10.0067	0.0520	0.4175	16.3516
120.12	10.9598	0.0524	0.4179	16.4039
140.10	11.8364	0.0530	0.4185	16.4185
160.10	12.6531	0.0538	0.4194	16.3507
180.08	13.4195	0.0548	0.4203	16.3397
200.08	14.1451	0.0561	0.4216	16.3706
220.13	14.8369	0.0564	0.4219	16.4205
240.12	15.4957	0.0567	0.4222	16.4039
240.15	15.4968	0.0567	0.4222	16.4339

Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



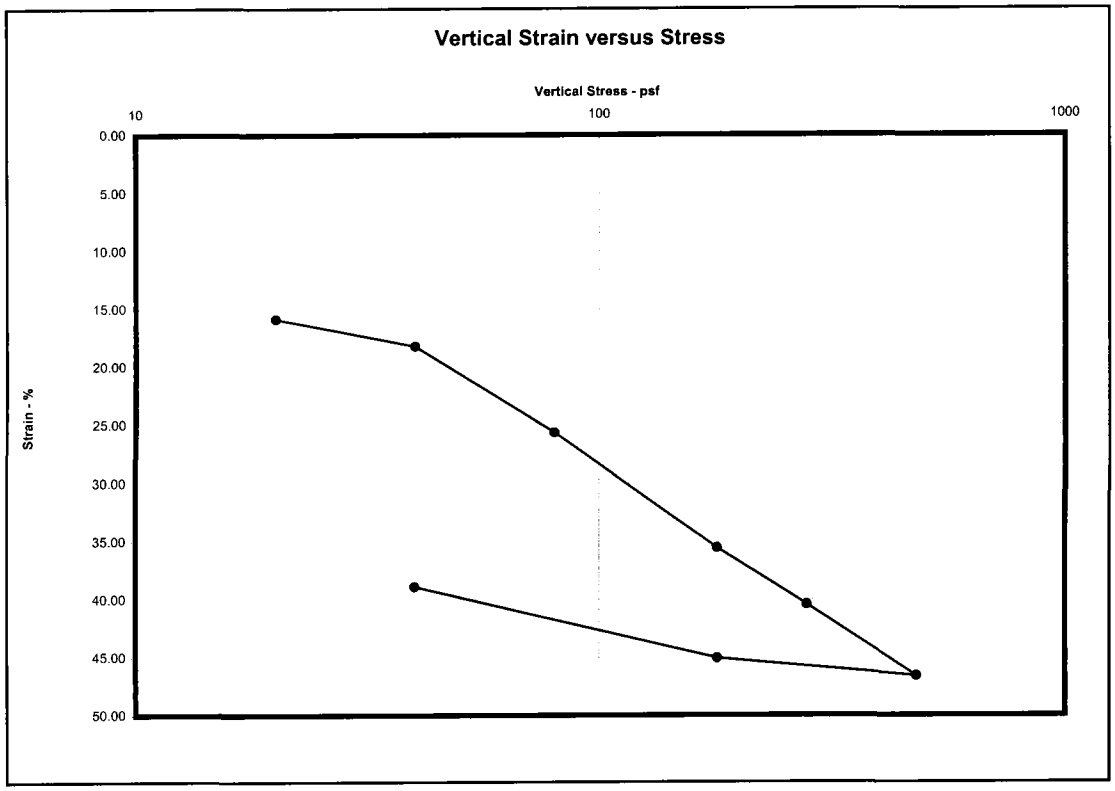
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.4222	16.4015
0.08	0.2887	-0.0023	0.4199	8.7740
0.18	0.4282	-0.0046	0.4176	6.4024
0.35	0.5916	-0.0055	0.4167	6.2240
0.60	0.7746	-0.0072	0.4150	6.1931
1.10	1.0488	-0.0084	0.4138	6.2264
2.10	1.4491	-0.0101	0.4121	6.1300
3.10	1.7607	-0.0110	0.4112	6.1812
4.10	2.0248	-0.0113	0.4109	6.1874
7.08	2.6615	-0.0116	0.4106	6.1220
9.10	3.0166	-0.0118	0.4104	6.1003
12.08	3.4761	-0.0121	0.4101	6.1003
15.08	3.8837	-0.0121	0.4101	6.1360
20.08	4.4814	-0.0124	0.4098	6.0863
25.08	5.0083	-0.0126	0.4096	6.1743
30.08	5.4848	-0.0128	0.4094	6.1030
35.08	5.9231	-0.0130	0.4092	6.1752
40.08	6.3311	-0.0132	0.4090	6.1886
45.08	6.7144	-0.0132	0.4090	6.2085
50.08	7.0770	-0.0135	0.4087	6.1232
55.08	7.4218	-0.0135	0.4087	6.2029
60.08	7.7513	-0.0135	0.4087	6.1086
80.07	8.9480	-0.0138	0.4084	6.1428
100.12	10.0058	-0.0138	0.4084	6.1705
120.12	10.9598	-0.0141	0.4081	6.1562
140.10	11.8364	-0.0145	0.4077	6.1788
160.10	12.6531	-0.0148	0.4074	6.1681
180.08	13.4195	-0.0149	0.4073	6.1743
200.08	14.1451	-0.0151	0.4071	6.0935
220.13	14.8369	-0.0152	0.4070	6.1184
240.07	15.4941	-0.0153	0.4069	6.0952

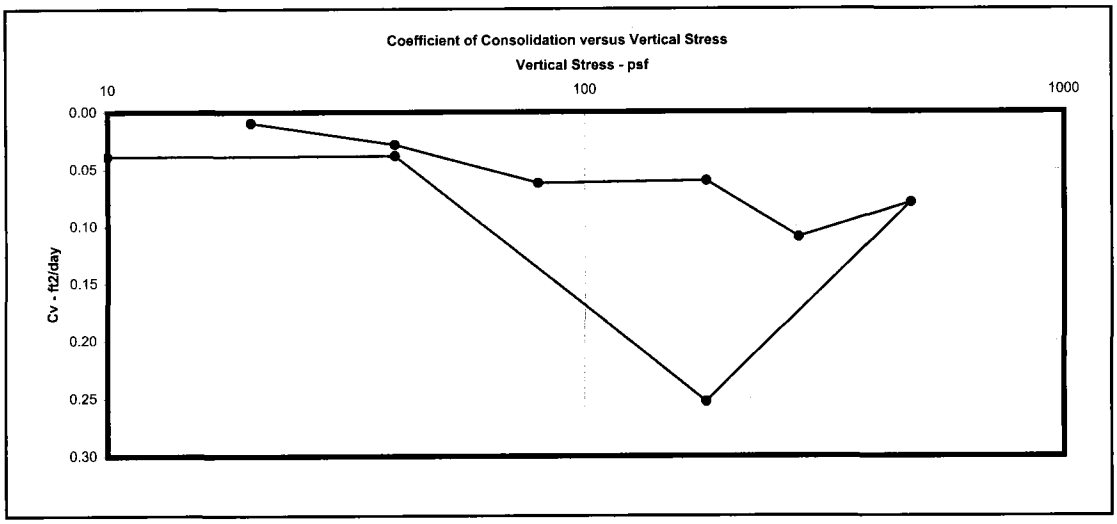
Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.4070	6.1526
0.10	0.3162	-0.0002	0.4068	5.4394
0.20	0.4472	-0.0034	0.4036	1.8074
0.35	0.5916	-0.0061	0.4008	1.6267
0.60	0.7746	-0.0094	0.3976	1.4908
1.10	1.0488	-0.0134	0.3936	1.4590
2.10	1.4491	-0.0181	0.3888	1.4649
3.10	1.7607	-0.0216	0.3854	1.3751
4.10	2.0248	-0.0233	0.3836	1.3413
7.10	2.6646	-0.0291	0.3778	1.3710
9.10	3.0166	-0.0309	0.3760	1.3234
12.10	3.4785	-0.0339	0.3731	1.3529
15.10	3.8859	-0.0356	0.3714	1.3103
20.10	4.4833	-0.0376	0.3694	1.4007
25.10	5.0100	-0.0399	0.3670	1.3769
30.10	5.4863	-0.0416	0.3653	1.3529
35.12	5.9259	-0.0424	0.3646	1.3508
40.12	6.3338	-0.0440	0.3629	1.3754
45.12	6.7169	-0.0446	0.3624	1.4087
50.12	7.0793	-0.0449	0.3620	1.4052
55.12	7.4241	-0.0457	0.3613	1.3936
60.12	7.7535	-0.0461	0.3609	1.3936
80.12	8.9508	-0.0493	0.3577	1.3743
100.12	10.0058	-0.0506	0.3564	1.3365
120.10	10.9590	-0.0515	0.3555	1.3921
140.10	11.8364	-0.0528	0.3542	1.3198
160.10	12.6531	-0.0537	0.3533	1.3389
180.10	13.4201	-0.0545	0.3525	1.3754
200.08	14.1451	-0.0551	0.3518	1.3728
220.10	14.8358	-0.0557	0.3512	1.3790
240.12	15.4957	-0.0562	0.3507	1.3710

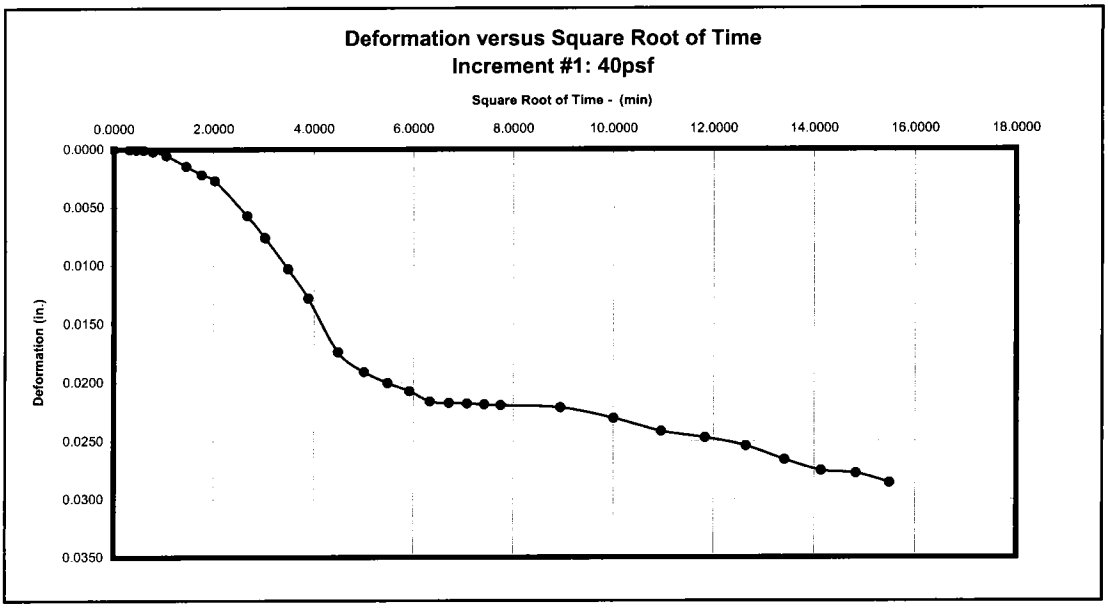
Ecology and Environment
Consolidation Data
Sample ID: NS18 0-24"





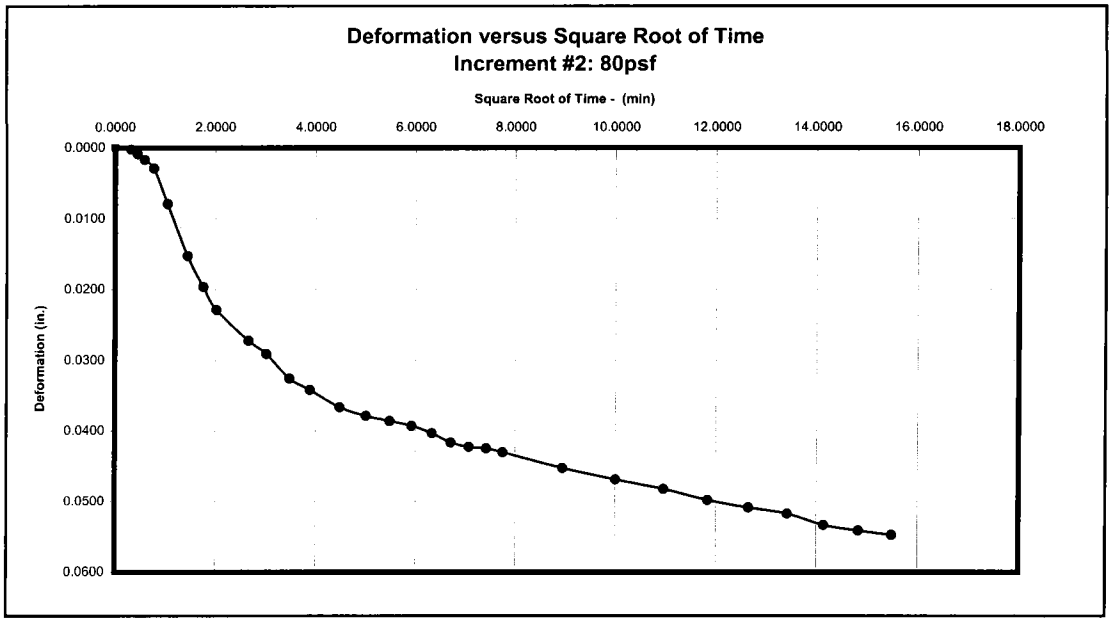
Step No.	Vertical Stress (psf)	Machine Deflections (in.)	H_0 (in) S_{100} (in.)	0.900 H_{100} (in.)	Vertical Strain (%)	H_{50} (in.)	t_{50} (min.)	c_v (ft^2/day)
								#N/A
2	20	-0.0001	0.0203	0.7515	15.84	0.7617	30.41	0.01
3	40	0.0002	0.0233	0.7345	18.19	0.7462	9.68	0.03
4	80	0.0007	0.0506	0.6862	25.66	0.7115	4.02	0.06
5	180	0.0012	0.0896	0.5800	35.56	0.6287	3.24	0.06
6	280	0.0016	0.0443	0.5361	40.43	0.5683	1.46	0.11
7	480	0.0028	0.0567	0.4806	46.60	0.5195	1.68	0.08
8	180	0.0013	-0.0153	0.4944	45.06	0.5017	0.49	0.25
9	40	0.0007	-0.0562	0.5500	38.89	0.5191	3.50	0.04
10	10	0.0001	-1.4310	1.9804	-60.89	1.2648	20.28	0.04

Ecology and Environment
Consolidation Data
NS12 0-24"



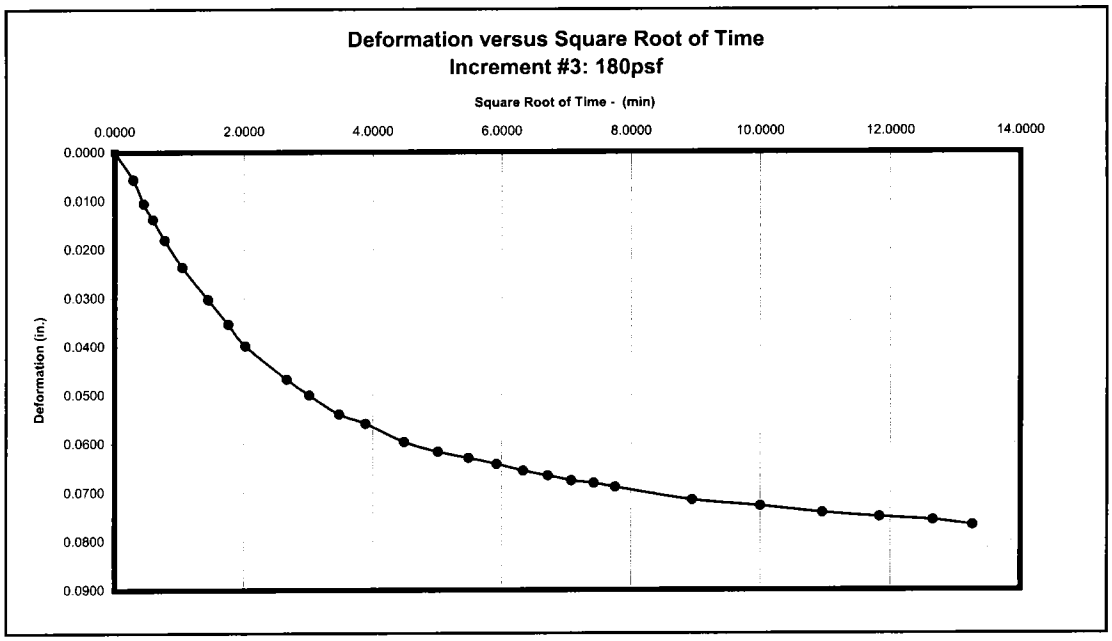
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1444	0.6667
0.10	0.3162	0.0000	0.1444	0.6712
0.20	0.4472	0.0000	0.1444	0.6688
0.35	0.5916	0.0001	0.1445	0.6310
0.60	0.7746	0.0002	0.1446	0.7009
1.10	1.0488	0.0005	0.1449	0.7345
2.10	1.4491	0.0015	0.1459	0.8543
3.10	1.7607	0.0022	0.1466	0.8733
4.10	2.0248	0.0027	0.1471	0.9376
7.10	2.6646	0.0057	0.1501	1.0925
9.10	3.0166	0.0076	0.1520	1.1234
12.10	3.4785	0.0103	0.1547	1.2706
15.10	3.8859	0.0128	0.1572	1.3395
20.10	4.4833	0.0174	0.1618	1.4822
25.10	5.0100	0.0191	0.1635	1.4977
30.10	5.4863	0.0201	0.1645	1.4219
35.10	5.9245	0.0207	0.1651	1.3886
40.10	6.3325	0.0216	0.1660	1.5051
45.10	6.7157	0.0217	0.1661	1.4394
50.10	7.0781	0.0218	0.1662	1.4882
55.12	7.4241	0.0219	0.1663	1.4058
60.12	7.7535	0.0220	0.1664	1.4858
80.12	8.9508	0.0222	0.1666	1.4873
100.12	10.0058	0.0231	0.1675	1.4397
120.12	10.9598	0.0242	0.1686	1.4133
140.10	11.8364	0.0247	0.1691	1.4255
160.10	12.6531	0.0254	0.1698	1.4382
180.10	13.4201	0.0266	0.1710	1.4112
200.10	14.1457	0.0275	0.1719	1.3838
220.08	14.8352	0.0278	0.1722	1.3740
240.13	15.4962	0.0286	0.1730	1.4457
240.17	15.4973	0.0286	0.1730	1.4442

Ecology and Environment
Consolidation Data
NS12 0-24"



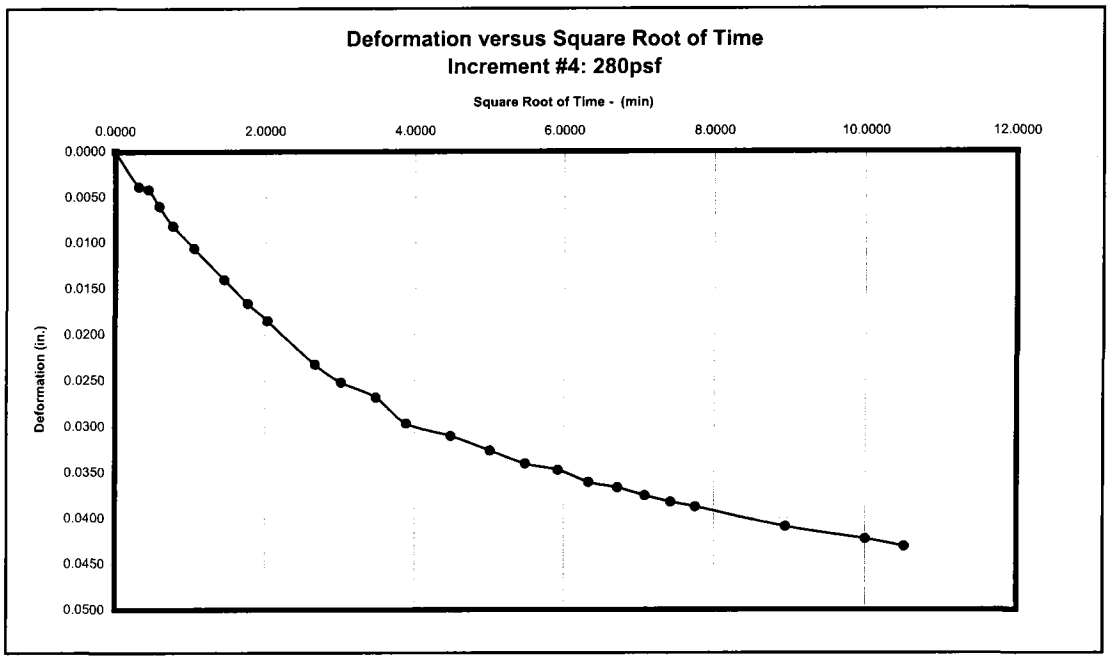
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1730	1.4156
0.10	0.3162	0.0003	0.1732	1.6249
0.20	0.4472	0.0009	0.1738	1.7168
0.35	0.5916	0.0017	0.1747	1.7775
0.60	0.7746	0.0029	0.1759	1.9591
1.10	1.0488	0.0079	0.1809	2.5362
2.10	1.4491	0.0153	0.1883	2.7336
3.10	1.7607	0.0197	0.1926	2.7336
4.10	2.0248	0.0229	0.1958	2.6881
7.10	2.6646	0.0272	0.2002	2.7107
9.10	3.0166	0.0291	0.2021	2.7687
12.12	3.4809	0.0326	0.2056	2.7871
15.12	3.8880	0.0342	0.2072	2.8368
20.12	4.4852	0.0367	0.2097	2.7764
25.12	5.0117	0.0379	0.2109	2.7904
30.12	5.4879	0.0386	0.2116	2.7797
35.13	5.9273	0.0393	0.2123	2.8157
40.13	6.3351	0.0404	0.2133	2.8071
45.13	6.7181	0.0417	0.2147	2.8002
50.13	7.0805	0.0423	0.2152	2.8023
55.15	7.4263	0.0425	0.2155	2.7467
60.15	7.7556	0.0431	0.2160	2.7955
80.17	8.9536	0.0453	0.2183	2.8026
100.10	10.0050	0.0469	0.2199	2.7940
120.12	10.9598	0.0482	0.2212	2.8014
140.13	11.8378	0.0498	0.2228	2.7515
160.13	12.6544	0.0509	0.2238	2.7503
180.15	13.4220	0.0517	0.2247	2.7788
200.17	14.1480	0.0534	0.2263	2.7812
220.10	14.8358	0.0541	0.2271	2.8285
240.12	15.4957	0.0547	0.2277	2.7678
240.13	15.4962	0.0548	0.2277	2.7880

Ecology and Environment
Consolidation Data
NS12 0-24"



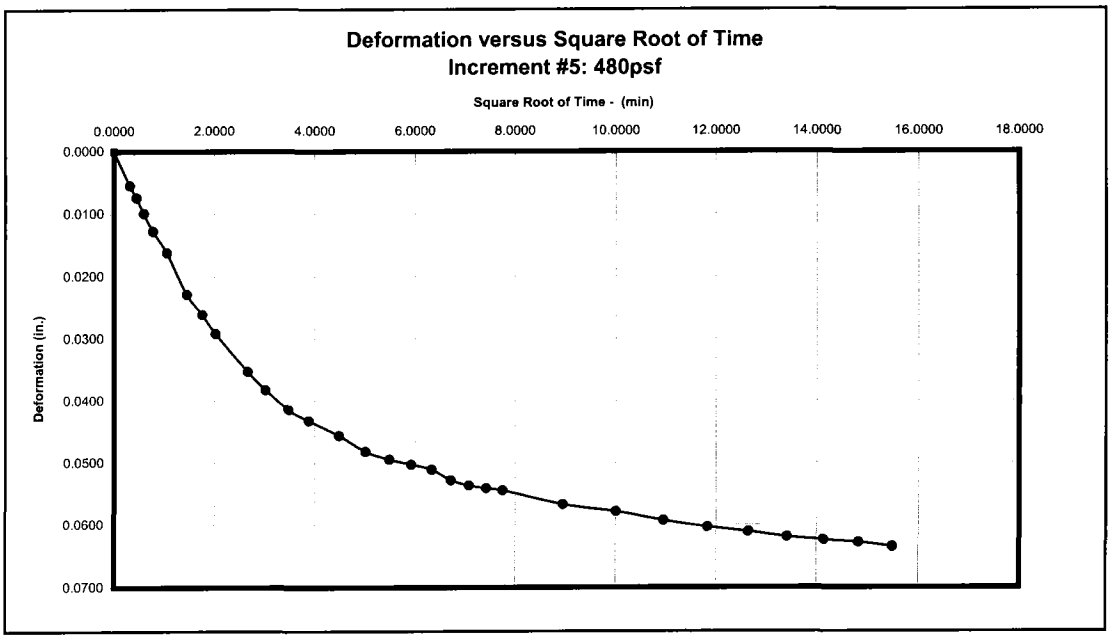
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2277	2.7845
0.08	0.2887	0.0056	0.2333	5.4626
0.20	0.4472	0.0105	0.2382	5.7787
0.35	0.5916	0.0138	0.2415	5.9645
0.60	0.7746	0.0180	0.2457	6.0549
1.10	1.0488	0.0236	0.2513	6.1774
2.10	1.4491	0.0303	0.2580	6.1812
3.10	1.7607	0.0354	0.2630	6.2594
4.10	2.0248	0.0398	0.2675	6.2178
7.10	2.6646	0.0467	0.2744	6.1381
9.10	3.0166	0.0500	0.2777	6.2205
12.10	3.4785	0.0540	0.2816	6.2035
15.12	3.8880	0.0559	0.2836	6.2098
20.12	4.4852	0.0596	0.2873	6.2297
25.12	5.0117	0.0617	0.2893	6.1247
30.12	5.4879	0.0630	0.2906	6.1738
35.12	5.9259	0.0642	0.2919	6.1586
40.13	6.3351	0.0656	0.2933	6.1655
45.13	6.7181	0.0666	0.2943	6.2252
50.13	7.0805	0.0676	0.2953	6.1357
55.13	7.4252	0.0681	0.2958	6.2312
60.15	7.7556	0.0689	0.2966	6.1586
80.15	8.9527	0.0716	0.2992	6.1786
100.08	10.0042	0.0728	0.3005	6.1789
120.10	10.9590	0.0742	0.3019	6.1417
140.10	11.8364	0.0751	0.3027	6.1904
160.10	12.6531	0.0758	0.3034	6.2133
175.90	13.2627	0.0768	0.3044	6.2145

Ecology and Environment
Consolidation Data
NS12 0-24"



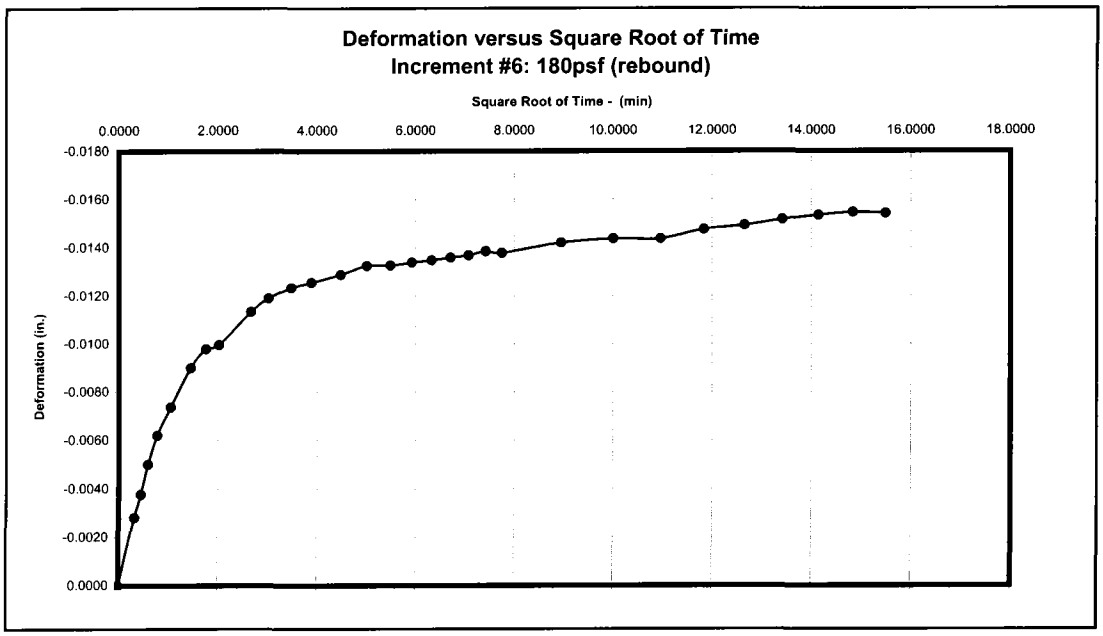
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.3044	6.2344
0.10	0.3162	0.0038	0.3082	9.3149
0.20	0.4472	0.0041	0.3085	9.4906
0.35	0.5916	0.0060	0.3104	9.5611
0.60	0.7746	0.0082	0.3126	9.5396
1.12	1.0567	0.0106	0.3150	9.6630
2.12	1.4549	0.0140	0.3184	9.6033
3.12	1.7654	0.0166	0.3210	9.6265
4.12	2.0290	0.0185	0.3229	9.7130
7.12	2.6677	0.0232	0.3276	9.6919
9.12	3.0194	0.0252	0.3296	9.6324
12.12	3.4809	0.0268	0.3312	9.5605
15.12	3.8880	0.0297	0.3341	9.6107
20.12	4.4852	0.0310	0.3354	9.6048
25.12	5.0117	0.0326	0.3370	9.5997
30.12	5.4879	0.0340	0.3384	9.5813
35.12	5.9259	0.0347	0.3391	9.5682
40.12	6.3338	0.0361	0.3405	9.5834
45.12	6.7169	0.0367	0.3411	9.5854
50.12	7.0793	0.0375	0.3419	9.5976
55.12	7.4241	0.0382	0.3426	9.6098
60.13	7.7546	0.0388	0.3432	9.5584
80.13	8.9517	0.0409	0.3453	9.5798
100.13	10.0067	0.0423	0.3467	9.6467
110.75	10.5238	0.0431	0.3475	9.6419

Ecology and Environment
Consolidation Data
NS12 0-24"



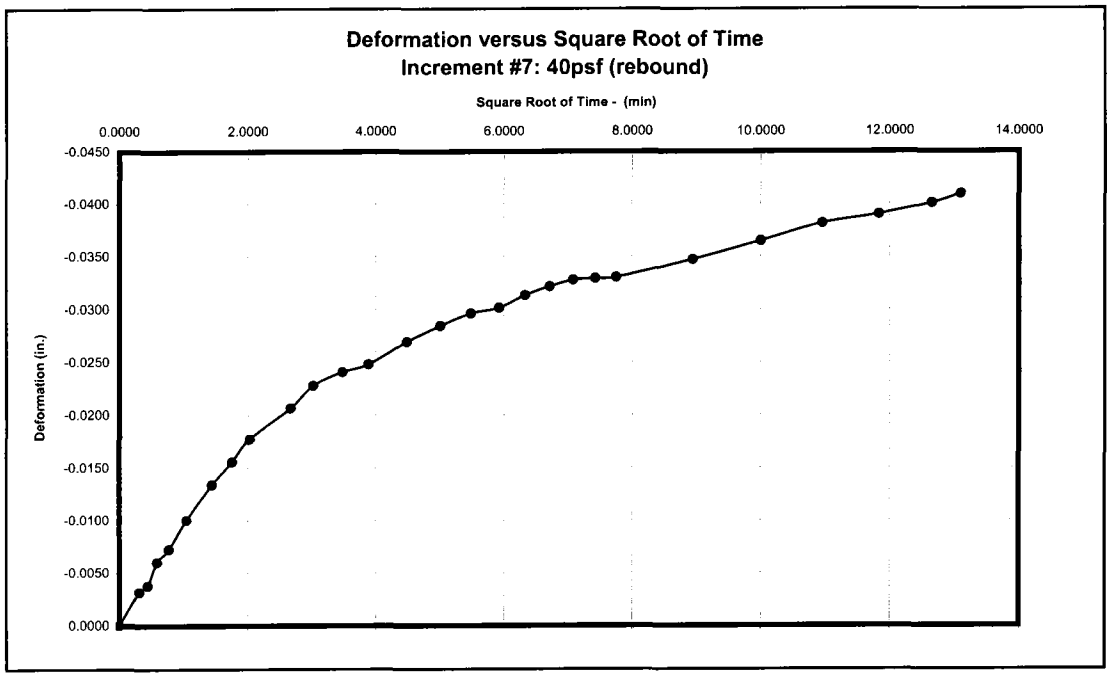
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.3474	9.6300
0.10	0.3162	0.0055	0.3528	16.0055
0.20	0.4472	0.0074	0.3548	16.1706
0.35	0.5916	0.0099	0.3573	16.2232
0.60	0.7746	0.0128	0.3602	16.3466
1.12	1.0567	0.0162	0.3636	16.2030
2.12	1.4549	0.0229	0.3702	16.4705
3.12	1.7654	0.0261	0.3735	16.5190
4.12	2.0290	0.0291	0.3765	16.3540
7.12	2.6677	0.0353	0.3827	16.4679
9.12	3.0194	0.0383	0.3856	16.4896
12.12	3.4809	0.0414	0.3888	16.4144
15.12	3.8880	0.0432	0.3906	16.5000
20.12	4.4852	0.0456	0.3930	16.3992
25.12	5.0117	0.0482	0.3956	16.4595
30.12	5.4879	0.0495	0.3969	16.3980
35.12	5.9259	0.0503	0.3977	16.4144
40.12	6.3338	0.0511	0.3985	16.4491
45.13	6.7181	0.0528	0.4002	16.4194
50.13	7.0805	0.0537	0.4010	16.4619
55.13	7.4252	0.0541	0.4015	16.4099
60.12	7.7535	0.0545	0.4018	16.3879
80.10	8.9499	0.0567	0.4041	16.4747
100.10	10.0050	0.0579	0.4053	16.4598
120.10	10.9590	0.0593	0.4067	16.4402
140.08	11.8357	0.0604	0.4078	16.3813
160.08	12.6524	0.0611	0.4085	16.4120
180.12	13.4208	0.0620	0.4094	16.4262
200.10	14.1457	0.0624	0.4098	16.4417
220.10	14.8358	0.0628	0.4102	16.4146
240.10	15.4952	0.0635	0.4109	16.4322
240.15	15.4968	0.0636	0.4109	16.4087

Ecology and Environment
Consolidation Data
NS12 0-24"



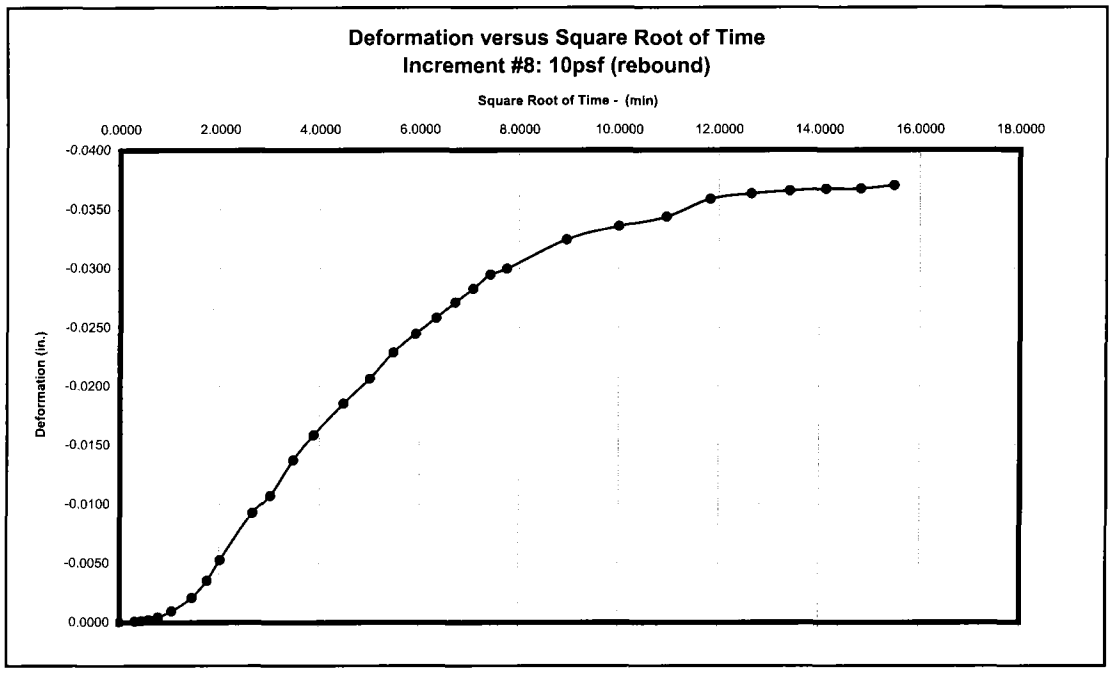
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.4108	16.4274
0.10	0.3162	-0.0028	0.4080	6.6685
0.20	0.4472	-0.0038	0.4070	6.4310
0.35	0.5916	-0.0050	0.4058	6.3117
0.60	0.7746	-0.0062	0.4046	6.1762
1.10	1.0488	-0.0074	0.4035	6.2440
2.10	1.4491	-0.0090	0.4018	6.1571
3.10	1.7607	-0.0098	0.4010	6.2169
4.10	2.0248	-0.0100	0.4009	6.2324
7.10	2.6646	-0.0113	0.3995	6.2121
9.10	3.0166	-0.0119	0.3989	6.2190
12.10	3.4785	-0.0123	0.3985	6.2202
15.10	3.8859	-0.0126	0.3983	6.2145
20.10	4.4833	-0.0129	0.3979	6.1806
25.10	5.0100	-0.0133	0.3976	6.1765
30.10	5.4863	-0.0133	0.3976	6.1702
35.10	5.9245	-0.0134	0.3974	6.2050
40.10	6.3325	-0.0135	0.3973	6.1548
45.10	6.7157	-0.0136	0.3972	6.1738
50.08	7.0770	-0.0137	0.3971	6.1916
55.13	7.4252	-0.0138	0.3970	6.2098
60.13	7.7546	-0.0138	0.3970	6.2083
80.12	8.9508	-0.0142	0.3966	6.2273
100.12	10.0058	-0.0144	0.3965	6.2285
120.12	10.9598	-0.0144	0.3965	6.1322
140.12	11.8371	-0.0147	0.3961	6.2026
160.10	12.6531	-0.0149	0.3959	6.2083
180.13	13.4214	-0.0152	0.3957	6.2805
200.13	14.1468	-0.0153	0.3955	6.1456
220.15	14.8375	-0.0155	0.3954	6.2784
240.13	15.4962	-0.0154	0.3954	6.2606

Ecology and Environment
Consolidation Data
NS12 0-24"



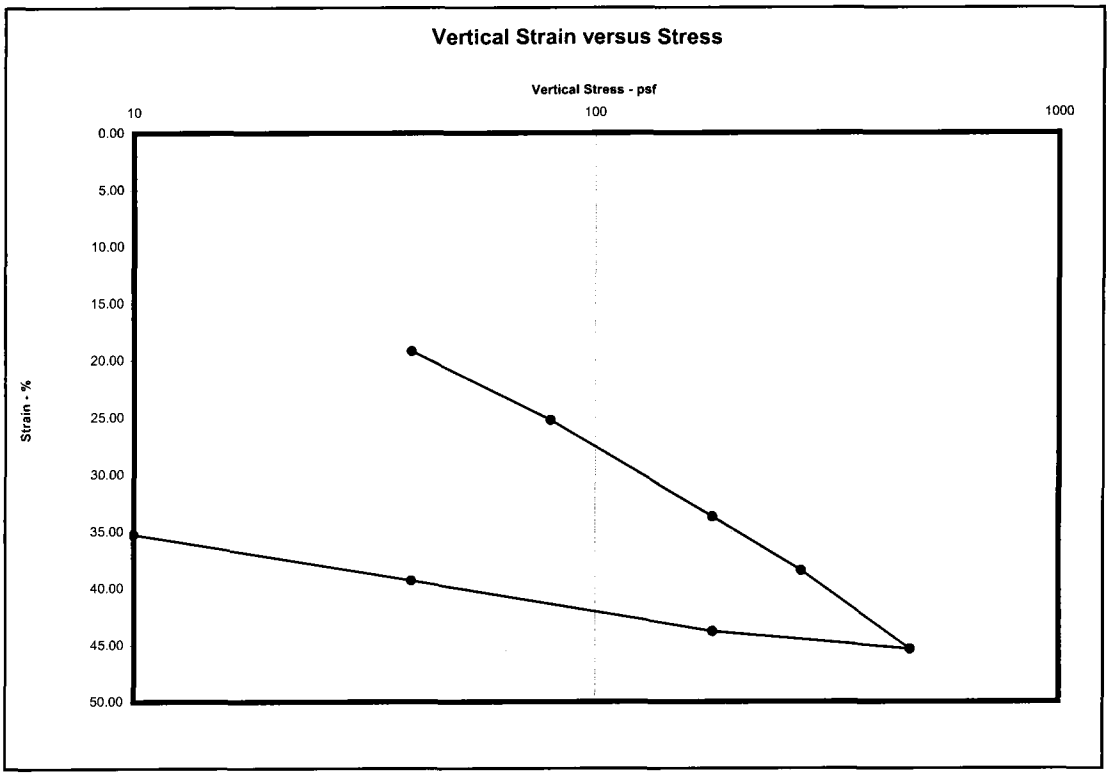
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.3953	6.2454
0.10	0.3162	-0.0032	0.3921	1.8021
0.20	0.4472	-0.0038	0.3916	1.5824
0.35	0.5916	-0.0060	0.3893	1.5702
0.60	0.7746	-0.0073	0.3881	1.4370
1.10	1.0488	-0.0100	0.3853	1.4469
2.10	1.4491	-0.0134	0.3820	1.4451
3.10	1.7607	-0.0156	0.3798	1.4243
4.12	2.0290	-0.0177	0.3776	1.5013
7.12	2.6677	-0.0206	0.3747	1.4335
9.12	3.0194	-0.0228	0.3726	1.4088
12.12	3.4809	-0.0241	0.3713	1.6348
15.12	3.8880	-0.0248	0.3705	1.4454
20.12	4.4852	-0.0269	0.3684	1.4148
25.12	5.0117	-0.0284	0.3669	1.4231
30.12	5.4879	-0.0296	0.3657	1.3600
35.12	5.9259	-0.0301	0.3652	1.4100
40.12	6.3338	-0.0313	0.3640	1.4397
45.12	6.7169	-0.0321	0.3632	1.4766
50.12	7.0793	-0.0328	0.3626	1.4076
55.12	7.4241	-0.0329	0.3624	1.4124
60.12	7.7535	-0.0330	0.3623	1.4469
80.12	8.9508	-0.0347	0.3606	1.4846
100.12	10.0058	-0.0365	0.3589	1.4278
120.12	10.9598	-0.0381	0.3572	1.3660
140.12	11.8371	-0.0390	0.3563	1.4109
160.12	12.6537	-0.0400	0.3553	1.4442
171.47	13.0945	-0.0409	0.3544	1.4133

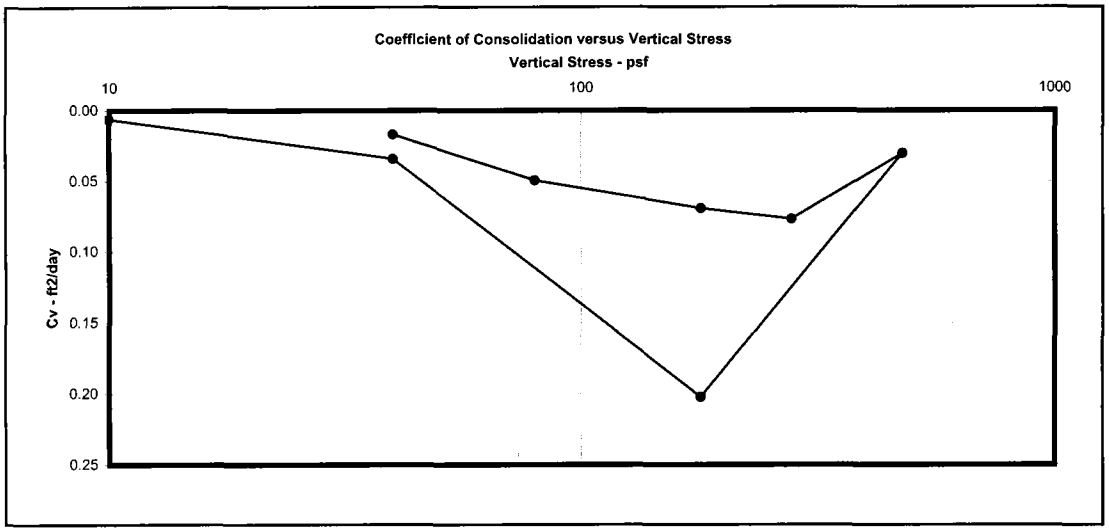
Ecology and Environment
Consolidation Data
NS12 0-24"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.3544	1.4715
0.10	0.3162	-0.0001	0.3543	1.4207
0.20	0.4472	-0.0001	0.3543	1.3743
0.35	0.5916	-0.0002	0.3542	1.2994
0.60	0.7746	-0.0004	0.3540	1.2792
1.10	1.0488	-0.0009	0.3535	1.0877
2.12	1.4549	-0.0021	0.3523	0.9506
3.12	1.7654	-0.0035	0.3509	0.7354
4.12	2.0290	-0.0053	0.3491	0.6105
7.12	2.6677	-0.0093	0.3451	0.5395
9.12	3.0194	-0.0107	0.3437	0.5047
12.12	3.4809	-0.0137	0.3407	0.4824
15.12	3.8880	-0.0158	0.3386	0.4503
20.12	4.4852	-0.0185	0.3359	0.3754
25.12	5.0117	-0.0206	0.3338	0.4318
30.12	5.4879	-0.0229	0.3315	0.3893
35.12	5.9259	-0.0244	0.3300	0.4764
40.12	6.3338	-0.0258	0.3286	0.3869
45.12	6.7169	-0.0271	0.3273	0.3358
50.13	7.0805	-0.0283	0.3261	0.4143
55.13	7.4252	-0.0295	0.3249	0.3789
60.13	7.7546	-0.0300	0.3244	0.3834
80.13	8.9517	-0.0324	0.3220	0.4868
100.13	10.0067	-0.0336	0.3208	0.4155
120.15	10.9613	-0.0344	0.3200	0.3751
140.10	11.8364	-0.0359	0.3185	0.3789
160.10	12.6531	-0.0363	0.3181	0.4119
180.08	13.4195	-0.0366	0.3178	0.4640
200.07	14.1445	-0.0367	0.3177	0.3465
220.07	14.8346	-0.0367	0.3177	0.3813
240.12	15.4957	-0.0370	0.3174	0.4146

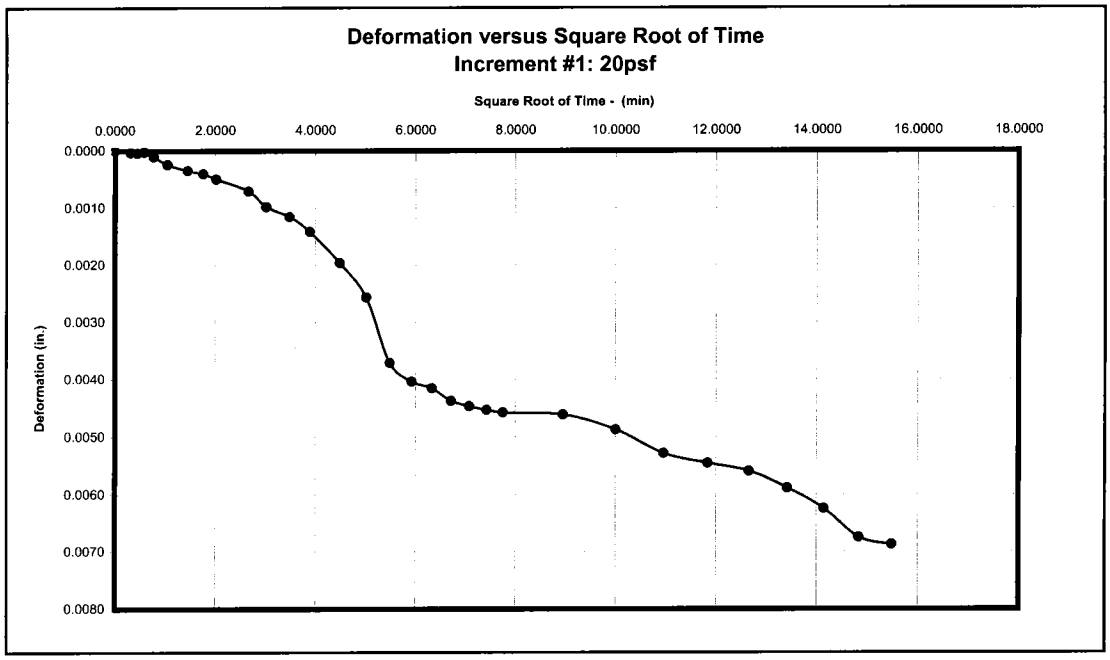
Ecology and Environment
Consolidation Data
NS12 0-24"





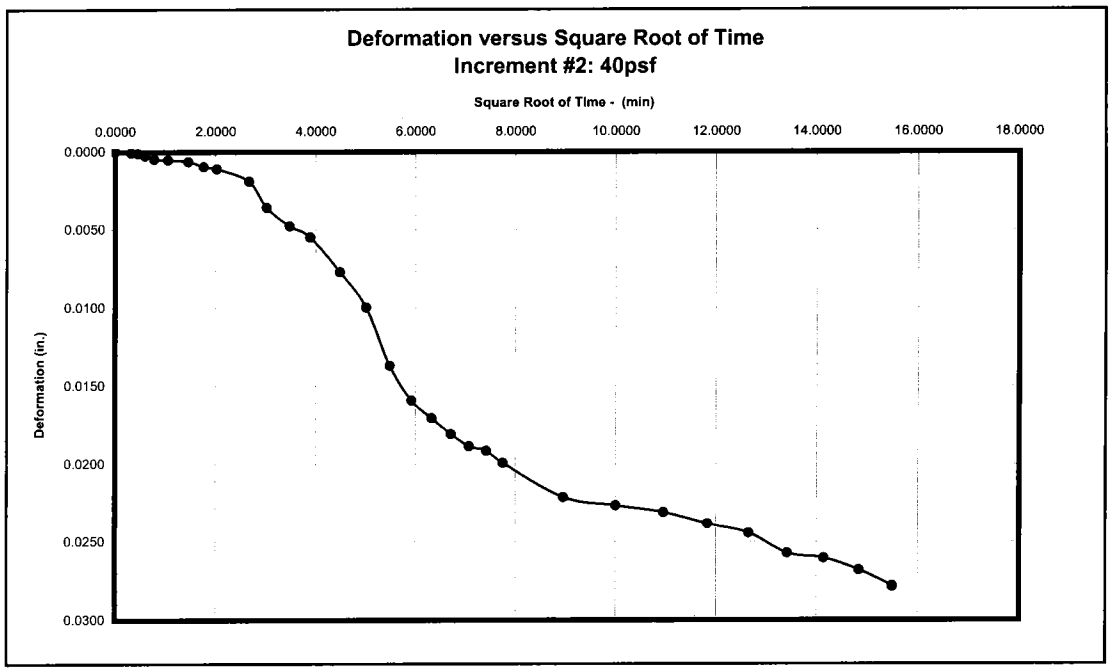
Step No.	Vertical Stress (psf)	Machine Deflections (in.)	H_0 (in) S_{100} (in.)	0.900 H_{100} (in.)	Vertical Strain (%)	H_{50} (in.)	t_{50} (min.)	c_v (ft^2/day)
1	5	0.0000						#N/A
2	40	0.0002	0.0264	0.7294	19.20	0.7426	16.02	0.02
3	80	0.0007	0.0548	0.6729	25.23	0.6968	4.84	0.05
4	180	0.0012	0.0768	0.5967	33.70	0.6435	2.94	0.07
5	280	0.0016	0.0431	0.5541	38.43	0.5821	2.17	0.08
6	480	0.0028	0.0667	0.4888	45.34	0.5221	4.43	0.03
7	180	0.0013	-0.0147	0.5053	43.78	0.4979	0.60	0.20
8	40	0.0007	-0.0319	0.5373	39.30	0.5213	3.92	0.03
9	10	0.0001	-0.0428	0.5885	35.26	0.5671	25.78	0.01

Ecology and Environment
Consolidation Data
NS05 24-48"



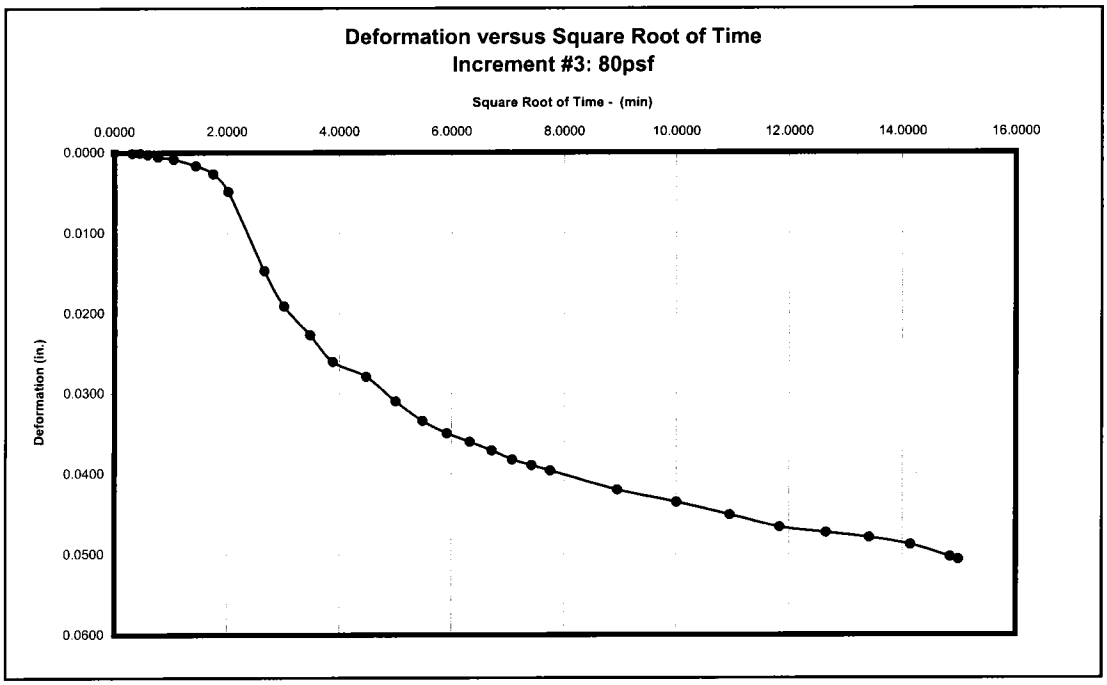
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0001	0.4844
0.10	0.3162	0.0000	0.0001	0.4404
0.20	0.4472	0.0000	0.0001	0.4699
0.35	0.5916	0.0000	0.0001	0.4440
0.60	0.7746	0.0001	0.0002	0.4580
1.10	1.0488	0.0002	0.0003	0.5415
2.10	1.4491	0.0003	0.0005	0.4615
3.10	1.7607	0.0004	0.0005	0.5273
4.10	2.0248	0.0005	0.0006	0.4868
7.10	2.6646	0.0007	0.0008	0.5142
9.10	3.0166	0.0010	0.0011	0.5082
12.10	3.4785	0.0012	0.0013	0.5258
15.12	3.8880	0.0014	0.0015	0.5603
20.12	4.4852	0.0020	0.0021	0.6197
25.12	5.0117	0.0026	0.0027	0.6723
30.12	5.4879	0.0037	0.0038	0.7244
35.12	5.9259	0.0040	0.0041	0.6248
40.12	6.3338	0.0042	0.0043	0.6474
45.12	6.7169	0.0044	0.0045	0.6982
50.12	7.0793	0.0045	0.0046	0.7092
55.12	7.4241	0.0045	0.0046	0.6854
60.12	7.7535	0.0046	0.0047	0.7101
80.12	8.9508	0.0046	0.0047	0.7056
100.13	10.0067	0.0049	0.0050	0.6848
120.13	10.9605	0.0053	0.0054	0.6676
140.13	11.8378	0.0055	0.0056	0.6474
160.13	12.6544	0.0056	0.0057	0.6902
180.12	13.4208	0.0059	0.0060	0.7044
200.10	14.1457	0.0063	0.0064	0.6890
220.10	14.8358	0.0068	0.0069	0.6735
240.08	15.4946	0.0069	0.0070	0.6521
240.10	15.4952	0.0069	0.0070	0.6447

Ecology and Environment
Consolidation Data
NS05 24-48"



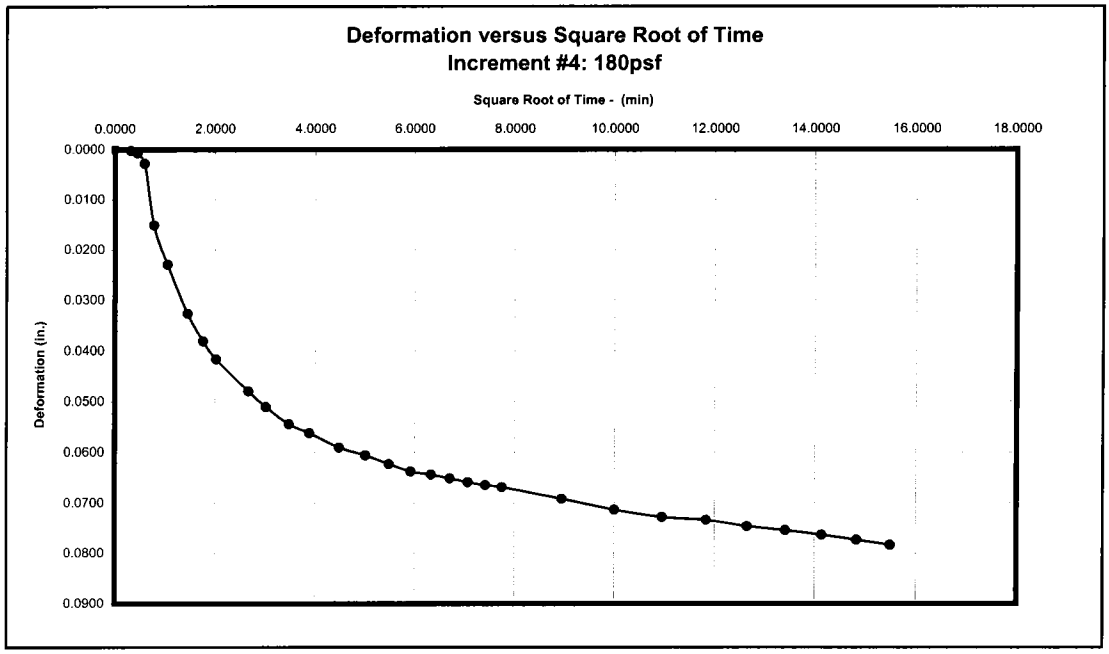
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0070	0.7104
0.10	0.3162	0.0001	0.0070	0.7294
0.20	0.4472	0.0001	0.0071	0.6914
0.35	0.5916	0.0003	0.0072	0.7140
0.60	0.7746	0.0005	0.0074	0.7104
1.10	1.0488	0.0005	0.0075	0.7294
2.10	1.4491	0.0006	0.0076	0.7529
3.10	1.7607	0.0010	0.0079	0.7782
4.10	2.0248	0.0011	0.0081	0.8139
7.10	2.6646	0.0019	0.0089	0.9340
9.10	3.0166	0.0036	0.0106	0.9685
12.10	3.4785	0.0048	0.0118	0.9696
15.10	3.8859	0.0055	0.0125	0.9860
20.08	4.4814	0.0077	0.0147	1.1370
25.08	5.0083	0.0100	0.0169	1.2084
30.08	5.4848	0.0137	0.0207	1.3698
35.08	5.9231	0.0159	0.0229	1.3999
40.08	6.3311	0.0171	0.0240	1.3915
45.15	6.7194	0.0181	0.0251	1.3309
50.15	7.0817	0.0189	0.0258	1.3597
55.15	7.4263	0.0192	0.0261	1.3133
60.15	7.7556	0.0199	0.0269	1.2824
80.13	8.9517	0.0221	0.0291	1.3252
100.12	10.0058	0.0227	0.0296	1.3906
120.10	10.9590	0.0231	0.0301	1.4082
140.10	11.8364	0.0238	0.0308	1.3939
160.08	12.6524	0.0244	0.0314	1.3585
180.15	13.4220	0.0257	0.0327	1.4046
200.13	14.1468	0.0261	0.0330	1.4192
220.12	14.8363	0.0268	0.0338	1.4676
240.12	15.4957	0.0278	0.0348	1.3752
240.15	15.4968	0.0279	0.0349	1.3704

Ecology and Environment
Consolidation Data
NS05 24-48"



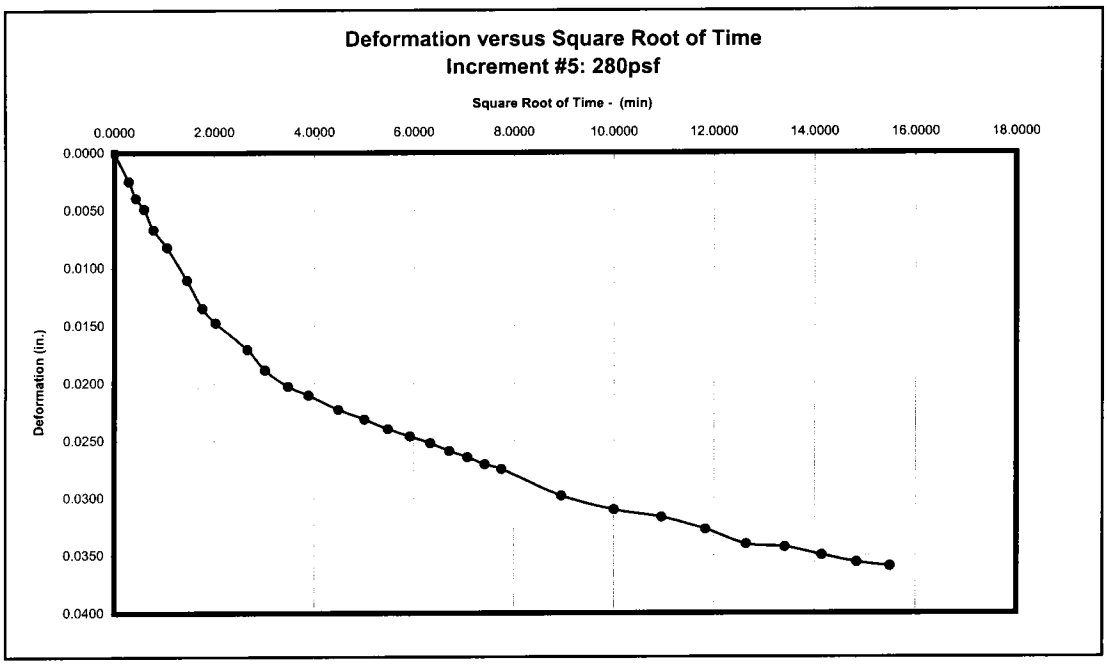
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0349	1.3261
0.10	0.3162	0.0001	0.0349	1.3960
0.20	0.4472	0.0001	0.0349	1.3942
0.35	0.5916	0.0003	0.0351	1.4629
0.60	0.7746	0.0006	0.0354	1.5295
1.10	1.0488	0.0009	0.0357	1.6365
2.10	1.4491	0.0017	0.0365	1.6737
3.10	1.7607	0.0027	0.0375	1.9005
4.10	2.0248	0.0049	0.0397	2.0400
7.10	2.6646	0.0147	0.0496	2.6700
9.10	3.0166	0.0191	0.0539	2.6447
12.08	3.4761	0.0227	0.0576	2.7214
15.08	3.8837	0.0261	0.0609	2.7366
20.08	4.4814	0.0280	0.0628	2.7152
25.08	5.0083	0.0310	0.0659	2.7211
30.08	5.4848	0.0334	0.0683	2.7226
35.08	5.9231	0.0350	0.0698	2.7749
40.08	6.3311	0.0361	0.0709	2.7119
45.15	6.7194	0.0371	0.0720	2.7702
50.15	7.0817	0.0382	0.0731	2.7865
55.15	7.4263	0.0390	0.0738	2.7428
60.15	7.7556	0.0396	0.0745	2.7378
80.15	8.9527	0.0420	0.0769	2.6816
100.15	10.0075	0.0435	0.0784	2.6976
120.15	10.9613	0.0451	0.0800	2.7615
140.15	11.8385	0.0466	0.0815	2.7059
160.15	12.6550	0.0473	0.0822	2.7339
180.15	13.4220	0.0480	0.0828	2.7131
200.15	14.1474	0.0488	0.0837	2.7247
220.15	14.8375	0.0503	0.0852	2.7595
224.65	14.9883	0.0507	0.0855	2.6997

Ecology and Environment
Consolidation Data
NS05 24-48"



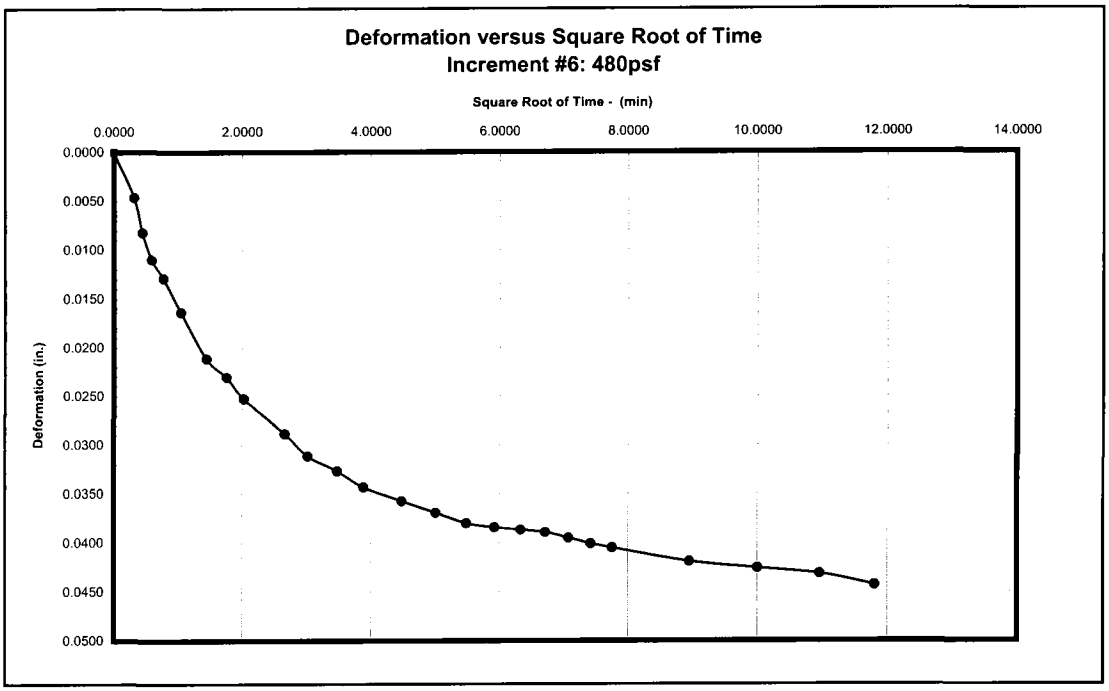
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0855	2.7488
0.10	0.3162	0.0003	0.0858	2.9259
0.20	0.4472	0.0007	0.0863	3.1543
0.35	0.5916	0.0028	0.0883	3.8390
0.60	0.7746	0.0151	0.1006	5.7016
1.10	1.0488	0.0229	0.1085	5.9689
2.10	1.4491	0.0326	0.1181	6.1720
3.10	1.7607	0.0381	0.1236	6.1544
4.10	2.0248	0.0417	0.1272	6.1140
7.12	2.6677	0.0480	0.1335	6.1211
9.12	3.0194	0.0511	0.1366	6.0204
12.12	3.4809	0.0544	0.1400	6.1794
15.12	3.8880	0.0562	0.1418	6.0311
20.12	4.4852	0.0591	0.1446	6.1901
25.12	5.0117	0.0606	0.1461	6.0890
30.12	5.4879	0.0623	0.1478	6.1235
35.12	5.9259	0.0638	0.1493	6.1512
40.12	6.3338	0.0644	0.1499	6.1057
45.12	6.7169	0.0651	0.1507	6.1631
50.12	7.0793	0.0659	0.1514	6.1342
55.12	7.4241	0.0665	0.1520	6.1604
60.12	7.7535	0.0669	0.1524	6.1761
80.12	8.9508	0.0692	0.1547	6.1925
100.13	10.0067	0.0713	0.1569	6.1758
120.13	10.9605	0.0728	0.1583	6.1866
140.13	11.8378	0.0734	0.1589	6.1476
160.15	12.6550	0.0746	0.1602	6.1452
180.15	13.4220	0.0754	0.1610	6.1580
200.12	14.1463	0.0764	0.1619	6.1143
220.10	14.8358	0.0774	0.1629	6.0858
240.08	15.4946	0.0784	0.1639	6.1321
240.13	15.4962	0.0784	0.1639	6.1095

Ecology and Environment
Consolidation Data
NS05 24-48"



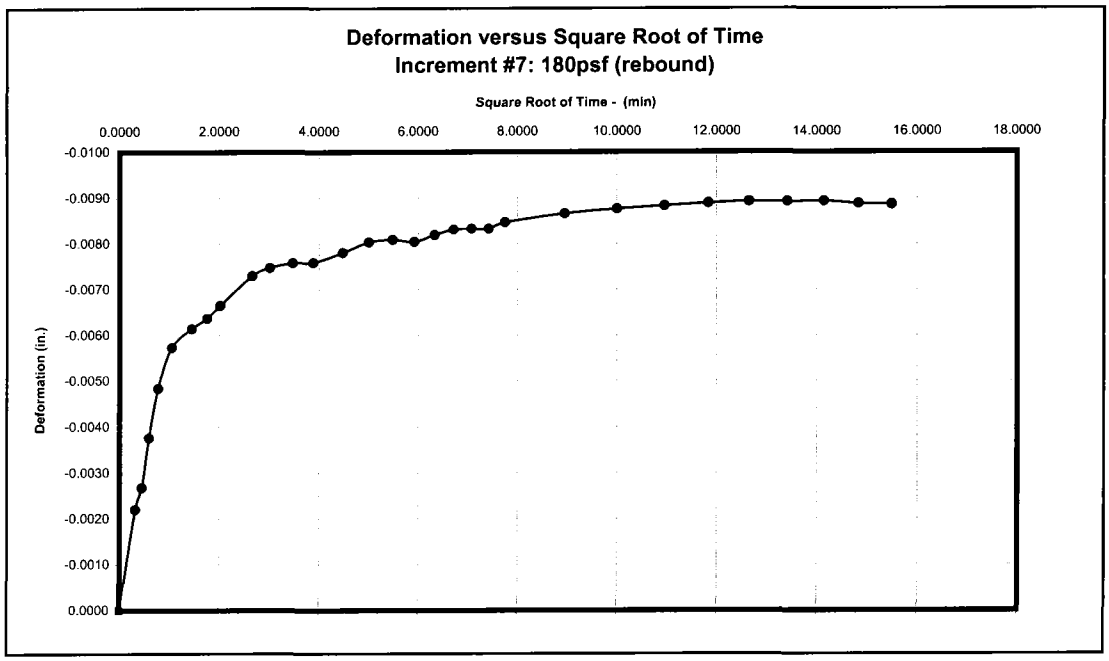
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1639	6.1449
0.08	0.2887	0.0025	0.1664	9.2786
0.18	0.4282	0.0040	0.1678	9.3511
0.35	0.5916	0.0049	0.1688	9.5048
0.60	0.7746	0.0067	0.1706	9.5905
1.10	1.0488	0.0082	0.1721	9.2991
2.10	1.4491	0.0111	0.1749	9.5402
3.10	1.7607	0.0135	0.1774	9.6404
4.10	2.0248	0.0147	0.1786	9.5925
7.08	2.6615	0.0170	0.1809	9.5310
9.08	3.0139	0.0189	0.1827	9.5616
12.08	3.4761	0.0203	0.1842	9.6021
15.08	3.8837	0.0211	0.1849	9.5331
20.08	4.4814	0.0223	0.1862	9.5334
25.08	5.0083	0.0231	0.1870	9.5708
30.08	5.4848	0.0240	0.1879	9.5402
35.08	5.9231	0.0246	0.1885	9.5676
40.08	6.3311	0.0252	0.1891	9.5952
45.08	6.7144	0.0259	0.1898	9.5640
50.07	7.0758	0.0264	0.1903	9.5108
55.07	7.4207	0.0271	0.1909	9.4474
60.15	7.7556	0.0275	0.1914	9.5441
80.13	8.9517	0.0298	0.1937	9.4379
100.12	10.0058	0.0310	0.1949	9.6493
120.12	10.9598	0.0317	0.1955	9.4379
140.10	11.8364	0.0327	0.1966	9.5961
160.08	12.6524	0.0340	0.1979	9.4831
180.15	13.4220	0.0343	0.1982	9.4959
200.13	14.1468	0.0350	0.1989	9.6128
220.12	14.8363	0.0356	0.1995	9.5592
240.10	15.4952	0.0360	0.1998	9.5355
240.13	15.4962	0.0359	0.1998	9.5473

Ecology and Environment
Consolidation Data
NS05 24-48"



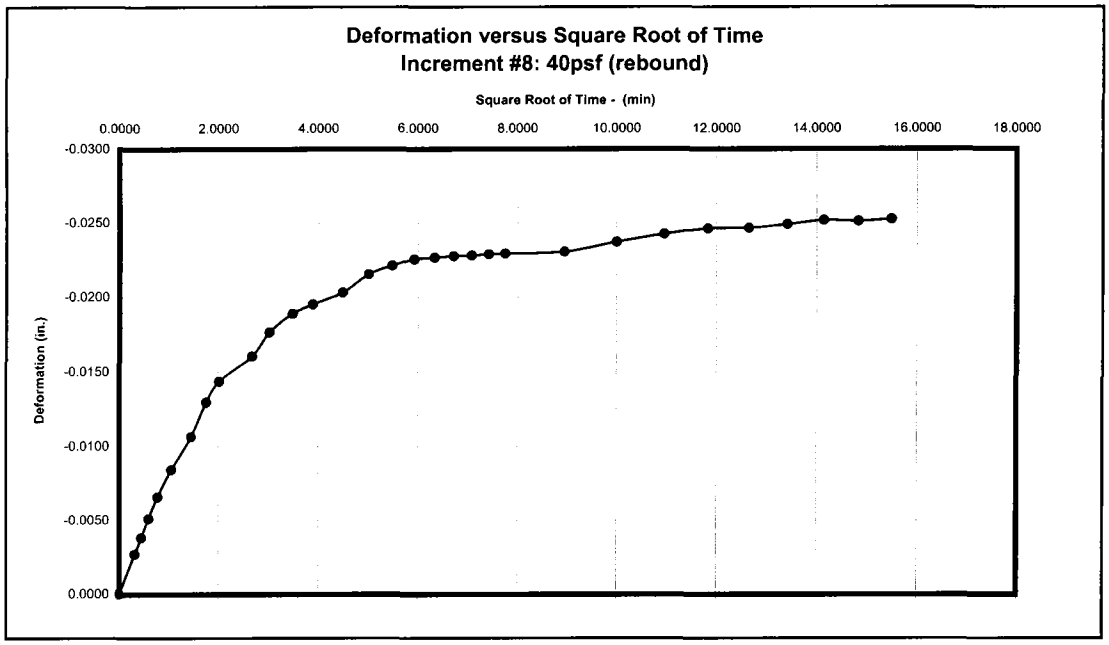
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1998	9.5426
0.10	0.3162	0.0046	0.2044	15.3306
0.20	0.4472	0.0083	0.2081	16.1619
0.35	0.5916	0.0110	0.2108	16.2098
0.60	0.7746	0.0129	0.2127	16.3498
1.10	1.0488	0.0163	0.2162	16.2669
2.10	1.4491	0.0211	0.2210	16.2190
3.10	1.7607	0.0230	0.2229	15.7400
4.10	2.0248	0.0253	0.2251	16.5273
7.10	2.6646	0.0289	0.2287	16.4509
9.10	3.0166	0.0311	0.2310	16.3783
12.10	3.4785	0.0327	0.2325	16.4619
15.10	3.8859	0.0343	0.2342	16.3620
20.10	4.4833	0.0357	0.2356	16.3653
25.10	5.0100	0.0370	0.2368	16.4203
30.10	5.4863	0.0380	0.2378	16.2764
35.08	5.9231	0.0384	0.2383	16.4762
40.08	6.3311	0.0387	0.2385	16.3962
45.08	6.7144	0.0390	0.2388	16.4250
50.08	7.0770	0.0395	0.2394	16.3486
55.08	7.4218	0.0401	0.2399	16.3144
60.15	7.7556	0.0405	0.2403	16.3676
80.17	8.9536	0.0419	0.2418	16.3772
100.17	10.0083	0.0426	0.2424	16.2835
120.17	10.9621	0.0432	0.2430	16.3082
139.38	11.8061	0.0443	0.2442	16.3236

Ecology and Environment
Consolidation Data
NS05 24-48"



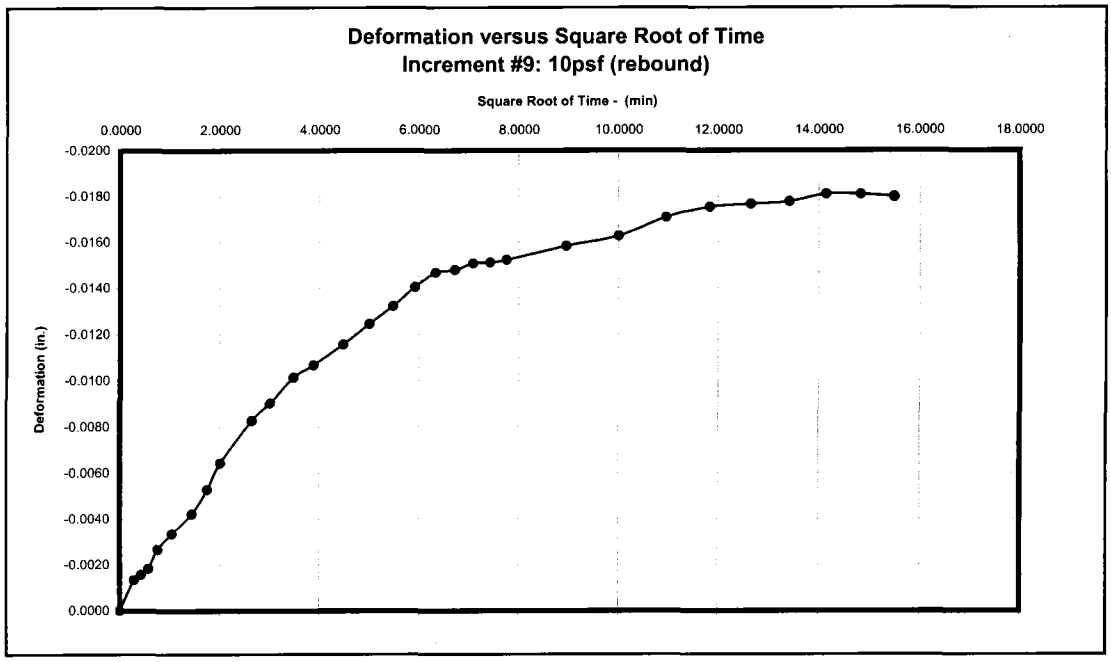
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2442	16.4310
0.10	0.3162	-0.0022	0.2420	6.9405
0.20	0.4472	-0.0027	0.2415	6.2710
0.35	0.5916	-0.0038	0.2404	6.2044
0.60	0.7746	-0.0048	0.2393	6.2448
1.10	1.0488	-0.0057	0.2384	6.1666
2.10	1.4491	-0.0061	0.2380	6.3768
3.10	1.7607	-0.0064	0.2378	6.1699
4.10	2.0248	-0.0066	0.2375	6.1152
7.10	2.6646	-0.0073	0.2369	6.1735
9.10	3.0166	-0.0075	0.2367	6.1214
12.10	3.4785	-0.0076	0.2366	6.1164
15.10	3.8859	-0.0076	0.2366	6.1152
20.10	4.4833	-0.0078	0.2364	6.1057
25.10	5.0100	-0.0080	0.2361	6.0322
30.10	5.4863	-0.0081	0.2361	6.1366
35.10	5.9245	-0.0080	0.2361	6.1036
40.10	6.3325	-0.0082	0.2360	6.1208
45.10	6.7157	-0.0083	0.2359	6.1961
50.12	7.0793	-0.0083	0.2358	6.1345
55.12	7.4241	-0.0083	0.2358	6.1345
60.12	7.7535	-0.0085	0.2357	6.1521
80.12	8.9508	-0.0087	0.2355	6.1845
100.12	10.0058	-0.0088	0.2354	6.0489
120.12	10.9598	-0.0088	0.2353	6.1961
140.12	11.8371	-0.0089	0.2353	6.1021
160.12	12.6537	-0.0089	0.2352	6.1571
180.12	13.4208	-0.0089	0.2353	6.0870
200.12	14.1463	-0.0089	0.2352	6.1750
220.13	14.8369	-0.0089	0.2353	6.1369
240.13	15.4962	-0.0089	0.2353	6.1961
240.18	15.4978	-0.0089	0.2353	6.1428

Ecology and Environment
Consolidation Data
NS05 24-48"



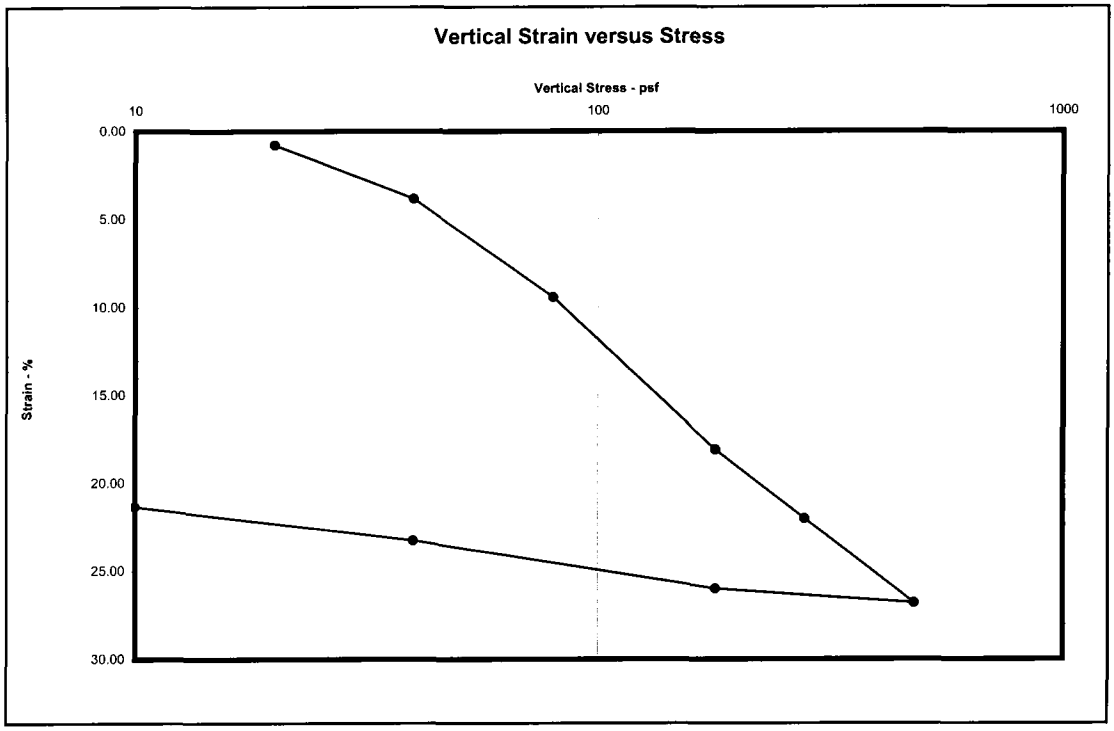
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2353	6.2035
0.10	0.3162	-0.0027	0.2326	1.7126
0.20	0.4472	-0.0038	0.2315	1.4986
0.35	0.5916	-0.0051	0.2302	1.4986
0.60	0.7746	-0.0066	0.2287	1.4236
1.10	1.0488	-0.0084	0.2269	1.4546
2.10	1.4491	-0.0107	0.2247	1.3407
3.10	1.7607	-0.0130	0.2224	1.4917
4.10	2.0248	-0.0144	0.2210	1.3570
7.10	2.6646	-0.0160	0.2193	1.3276
9.10	3.0166	-0.0177	0.2177	1.3799
12.12	3.4809	-0.0189	0.2164	1.4584
15.12	3.8880	-0.0195	0.2158	1.3547
20.12	4.4852	-0.0203	0.2150	1.3978
25.12	5.0117	-0.0215	0.2138	1.3377
30.12	5.4879	-0.0221	0.2132	1.3698
35.12	5.9259	-0.0225	0.2128	1.3472
40.12	6.3338	-0.0226	0.2127	1.3425
45.12	6.7169	-0.0228	0.2126	1.3799
50.10	7.0781	-0.0228	0.2125	1.3487
55.08	7.4218	-0.0229	0.2124	1.3559
60.08	7.7513	-0.0229	0.2124	1.3817
80.08	8.9489	-0.0230	0.2123	1.3784
100.07	10.0033	-0.0237	0.2116	1.3915
120.05	10.9567	-0.0242	0.2111	1.3502
140.03	11.8336	-0.0246	0.2107	1.3190
160.10	12.6531	-0.0246	0.2107	1.3047
180.08	13.4195	-0.0249	0.2104	1.2943
200.08	14.1451	-0.0252	0.2101	1.3618
220.07	14.8346	-0.0251	0.2102	1.3773
240.05	15.4935	-0.0253	0.2101	1.4391
240.05	15.4935	-0.0253	0.2101	1.4867

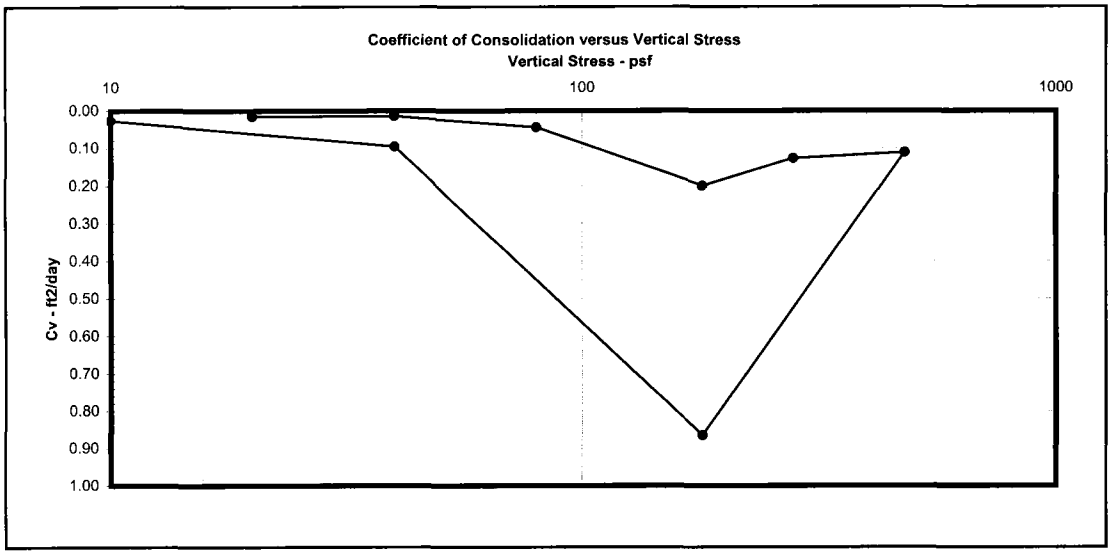
Ecology and Environment
Consolidation Data
NS05 24-48"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2101	1.3892
0.08	0.2887	-0.0013	0.2088	0.4654
0.18	0.4282	-0.0016	0.2085	0.4830
0.33	0.5774	-0.0018	0.2083	0.4452
0.58	0.7638	-0.0027	0.2074	0.3144
1.10	1.0488	-0.0034	0.2067	0.3310
2.10	1.4491	-0.0042	0.2059	0.3917
3.10	1.7607	-0.0053	0.2048	0.4464
4.10	2.0248	-0.0064	0.2037	0.3831
7.08	2.6615	-0.0083	0.2018	0.3834
9.10	3.0166	-0.0090	0.2011	0.2597
12.08	3.4761	-0.0101	0.2000	0.3334
15.08	3.8837	-0.0107	0.1994	0.3664
20.08	4.4814	-0.0116	0.1985	0.3854
25.08	5.0083	-0.0125	0.1977	0.3738
30.08	5.4848	-0.0132	0.1969	0.3667
35.08	5.9231	-0.0140	0.1961	0.3295
40.15	6.3364	-0.0147	0.1954	0.3596
45.15	6.7194	-0.0148	0.1953	0.3917
50.15	7.0817	-0.0151	0.1950	0.3724
55.15	7.4263	-0.0151	0.1950	0.3465
60.15	7.7556	-0.0152	0.1949	0.3557
80.13	8.9517	-0.0158	0.1943	0.3283
100.12	10.0058	-0.0163	0.1938	0.3441
120.10	10.9590	-0.0171	0.1930	0.3590
140.10	11.8364	-0.0175	0.1926	0.3750
160.17	12.6557	-0.0177	0.1924	0.3747
180.17	13.4226	-0.0178	0.1923	0.3286
200.17	14.1480	-0.0181	0.1920	0.3307
220.17	14.8380	-0.0181	0.1920	0.2594
240.17	15.4973	-0.0180	0.1921	0.4404
240.18	15.4978	-0.0180	0.1921	0.2882

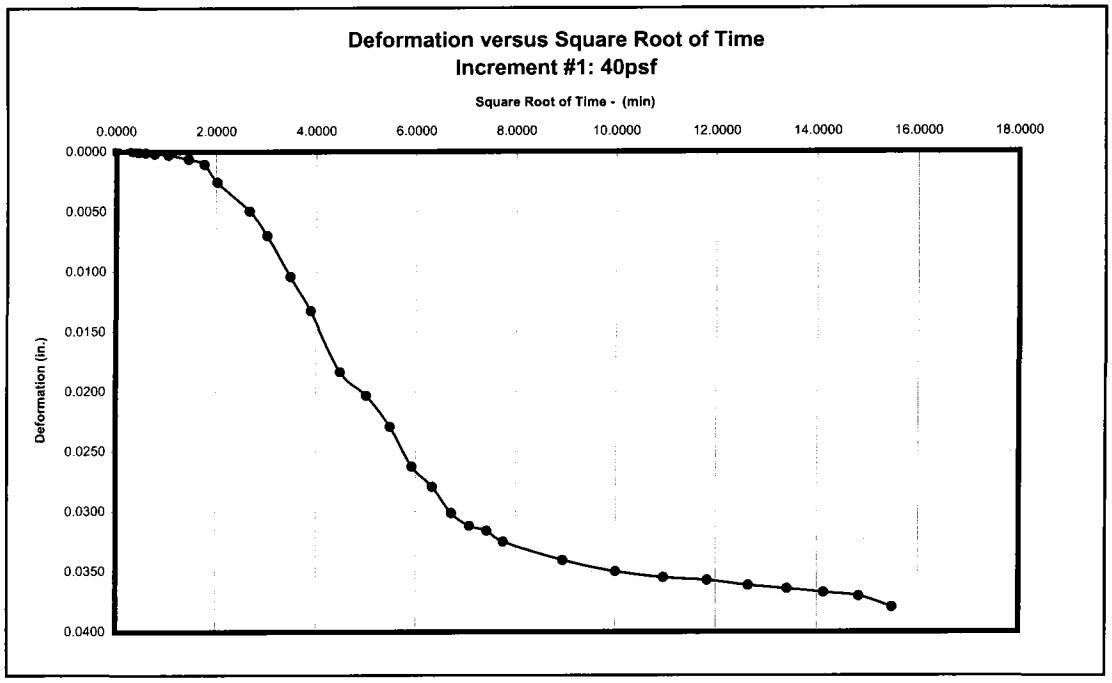
Ecology and Environment
Consolidation Data
NS05 24-48"





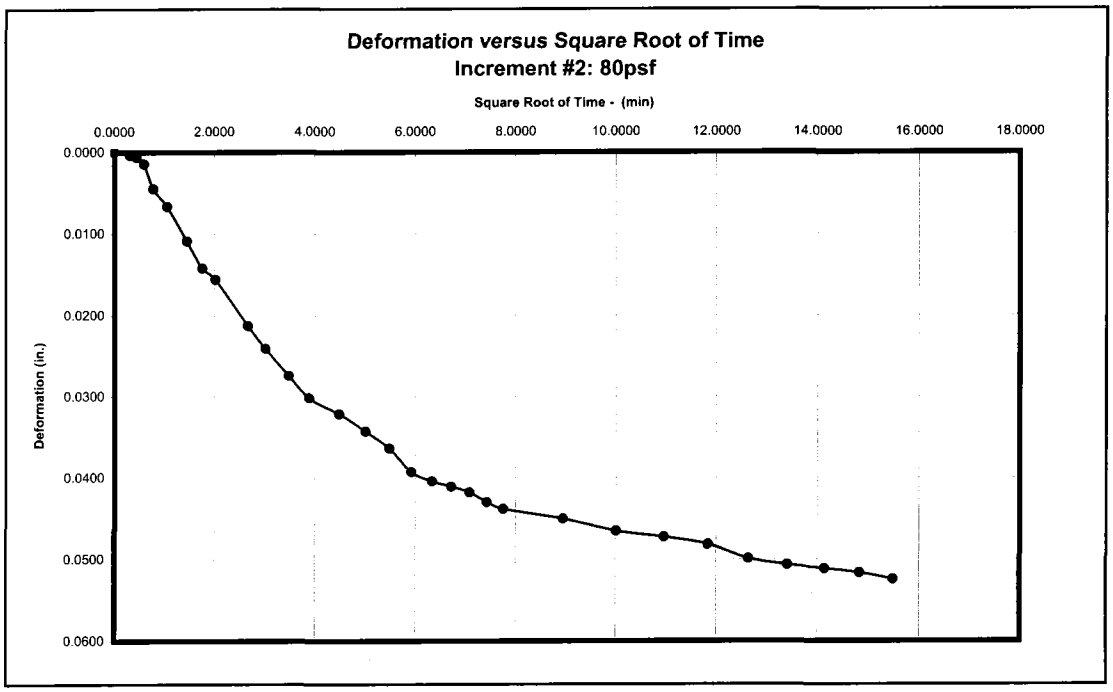
Step No.	Vertical Stress (psf)	Machine Deflections (in.)	H_0 (in) 0.900 S_{100} (in.)	H_{100} (in.)	Vertical Strain (%)	H_{50} (in.)	t_{50} (min.)	c_v (ft²/day)
								#N/A
2	20	-0.0001	0.0056	0.8941	0.79	0.8969	25.90	0.02
3	40	0.0002	0.0279	0.8653	3.85	0.8821	25.98	0.01
4	80	0.0007	0.0298	0.8361	9.43	0.8509	8.06	0.04
5	180	0.0012	0.0784	0.7373	18.08	0.7645	1.44	0.20
6	280	0.0016	0.0359	0.7018	22.02	0.7122	1.96	0.13
7	480	0.0028	0.0443	0.6587	26.82	0.6876	2.08	0.11
8	180	0.0013	-0.0089	0.6660	26.00	0.6627	0.25	0.87
9	40	0.0007	-0.0247	0.6901	23.26	0.6777	2.36	0.10
10	10	0.0001	-0.0180	0.7080	21.34	0.7020	9.10	0.03

Ecology and Environment
Consolidation Data
NS12 24-48"



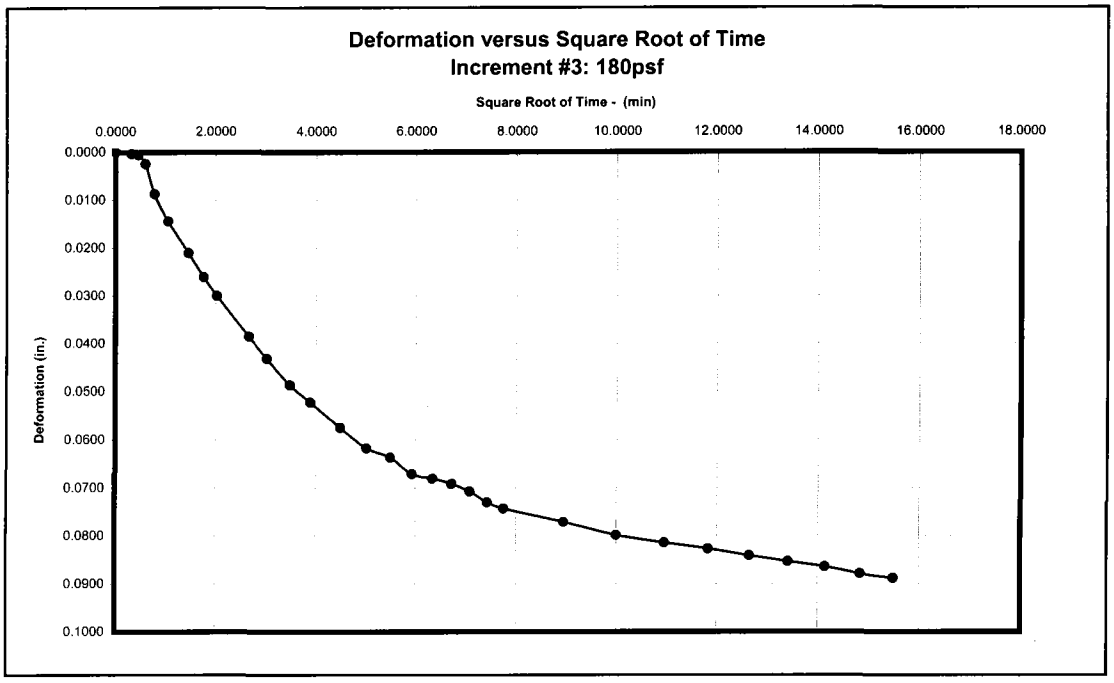
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	-0.0001	0.5171
0.10	0.3162	0.0000	-0.0001	0.5055
0.20	0.4472	0.0001	0.0000	0.5233
0.35	0.5916	0.0001	0.0000	0.5138
0.60	0.7746	0.0002	0.0001	0.5513
1.10	1.0488	0.0003	0.0002	0.5887
2.10	1.4491	0.0006	0.0006	0.5980
3.10	1.7607	0.0010	0.0010	0.5828
4.10	2.0248	0.0025	0.0025	0.7172
7.10	2.6646	0.0049	0.0049	0.8527
9.10	3.0166	0.0070	0.0069	0.9574
12.10	3.4785	0.0104	0.0103	0.9836
15.10	3.8859	0.0133	0.0132	1.1209
20.12	4.4852	0.0184	0.0183	1.2369
25.12	5.0117	0.0203	0.0203	1.1078
30.12	5.4879	0.0229	0.0229	1.2630
35.12	5.9259	0.0263	0.0262	1.3380
40.12	6.3338	0.0280	0.0279	1.4533
45.12	6.7169	0.0301	0.0301	1.4007
50.12	7.0793	0.0312	0.0311	1.3124
55.12	7.4241	0.0316	0.0316	1.3924
60.12	7.7535	0.0325	0.0325	1.3903
80.12	8.9508	0.0341	0.0340	1.2901
100.13	10.0067	0.0350	0.0349	1.4819
120.10	10.9590	0.0355	0.0354	1.3665
140.10	11.8364	0.0357	0.0357	1.3177
160.08	12.6524	0.0362	0.0361	1.3531
180.07	13.4189	0.0364	0.0364	1.4075
200.07	14.1445	0.0367	0.0367	1.3460
220.05	14.8341	0.0371	0.0370	1.3912
240.08	15.4946	0.0380	0.0379	1.3070

Ecology and Environment
Consolidation Data
NS12 24-48"



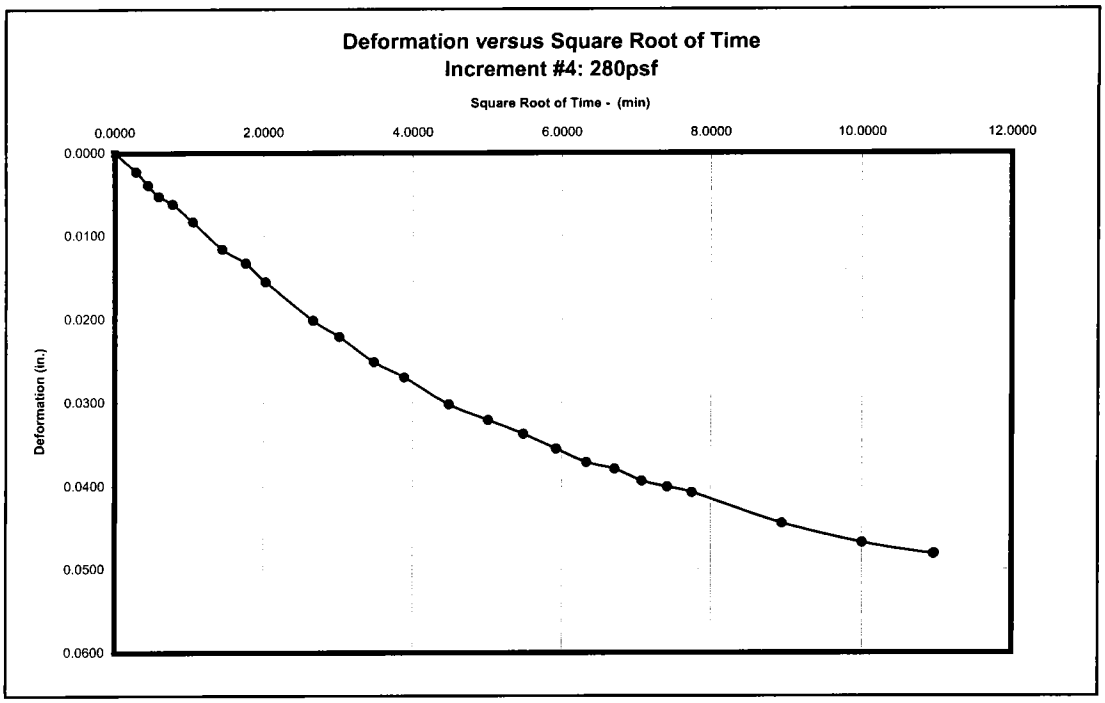
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0379	1.4066
0.10	0.3162	0.0004	0.0383	1.5505
0.20	0.4472	0.0006	0.0385	1.8157
0.35	0.5916	0.0014	0.0393	2.1657
0.60	0.7746	0.0045	0.0424	2.5673
1.10	1.0488	0.0066	0.0445	2.6506
2.10	1.4491	0.0109	0.0488	2.6497
3.10	1.7607	0.0142	0.0521	2.7148
4.10	2.0248	0.0156	0.0535	2.7472
7.10	2.6646	0.0213	0.0592	2.7246
9.10	3.0166	0.0241	0.0620	2.7127
12.10	3.4785	0.0274	0.0653	2.7766
15.10	3.8859	0.0302	0.0681	2.7207
20.10	4.4833	0.0321	0.0700	2.5486
25.10	5.0100	0.0343	0.0721	2.6764
30.10	5.4863	0.0364	0.0743	2.6660
35.08	5.9231	0.0393	0.0772	2.8896
40.08	6.3311	0.0404	0.0783	2.8245
45.08	6.7144	0.0411	0.0790	2.7258
50.08	7.0770	0.0418	0.0797	2.6411
55.08	7.4218	0.0430	0.0809	2.7957
60.08	7.7513	0.0439	0.0817	2.7448
80.07	8.9480	0.0451	0.0830	2.6898
100.07	10.0033	0.0466	0.0845	2.6747
120.12	10.9598	0.0473	0.0852	2.7362
140.12	11.8371	0.0482	0.0861	2.7424
160.10	12.6531	0.0499	0.0878	2.6794
180.08	13.4195	0.0507	0.0886	2.7853
200.08	14.1451	0.0512	0.0891	2.7579
220.07	14.8346	0.0517	0.0896	2.7282
240.10	15.4952	0.0525	0.0904	2.7484

Ecology and Environment
Consolidation Data
NS12 24-48"



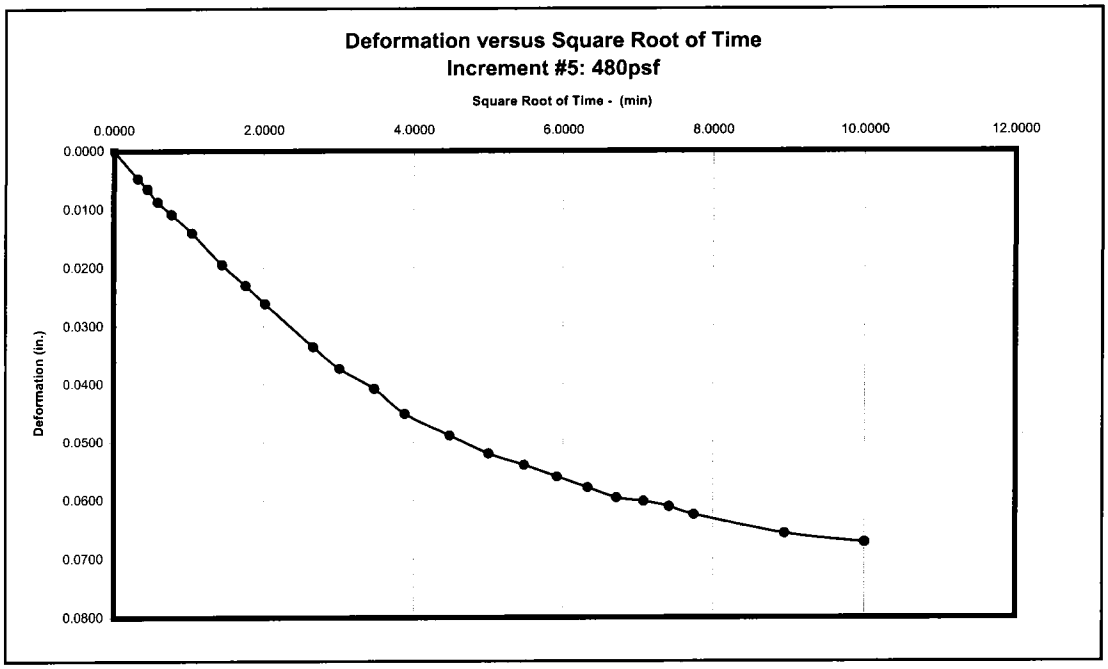
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0903	2.7210
0.10	0.3162	0.0004	0.0907	3.0338
0.20	0.4472	0.0006	0.0909	3.2550
0.35	0.5916	0.0024	0.0928	5.0303
0.60	0.7746	0.0087	0.0990	5.9534
1.10	1.0488	0.0144	0.1048	6.0777
2.12	1.4549	0.0210	0.1114	6.1449
3.12	1.7654	0.0261	0.1164	6.1805
4.12	2.0290	0.0300	0.1204	6.0494
7.12	2.6677	0.0386	0.1289	6.1377
9.12	3.0194	0.0431	0.1335	6.1315
12.12	3.4809	0.0487	0.1390	6.1318
15.12	3.8880	0.0523	0.1426	6.0280
20.12	4.4852	0.0575	0.1479	6.1996
25.12	5.0117	0.0618	0.1522	6.0866
30.12	5.4879	0.0638	0.1541	6.0872
35.12	5.9259	0.0672	0.1575	6.1645
40.12	6.3338	0.0681	0.1585	6.0854
45.12	6.7169	0.0692	0.1596	6.0283
50.12	7.0793	0.0708	0.1611	6.1044
55.12	7.4241	0.0730	0.1634	6.2421
60.12	7.7535	0.0743	0.1647	6.3018
80.12	8.9508	0.0772	0.1675	6.1591
100.12	10.0058	0.0799	0.1702	6.1603
120.12	10.9598	0.0815	0.1718	6.1800
140.12	11.8371	0.0828	0.1731	6.1065
160.12	12.6537	0.0842	0.1745	6.1125
180.12	13.4208	0.0854	0.1757	6.1743
200.12	14.1463	0.0865	0.1768	6.1541
220.12	14.8363	0.0880	0.1783	6.1877
240.10	15.4952	0.0889	0.1792	6.1556

Ecology and Environment
Consolidation Data
NS12 24-48"



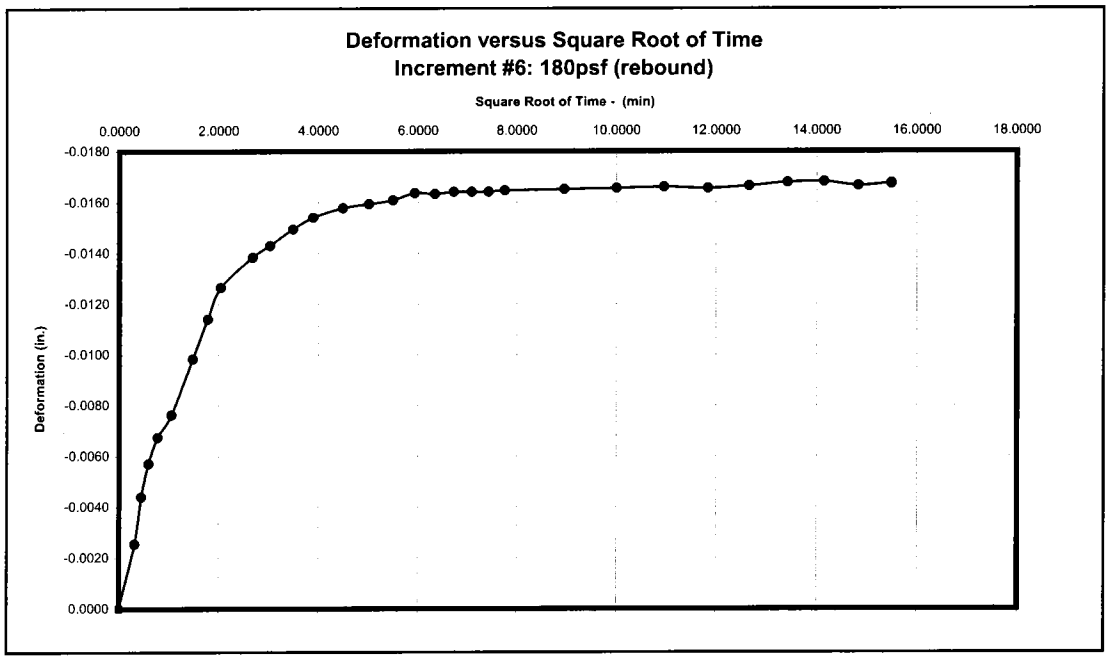
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1792	6.1068
0.08	0.2887	0.0023	0.1814	9.1739
0.20	0.4472	0.0039	0.1831	9.4055
0.35	0.5916	0.0052	0.1844	9.4403
0.60	0.7746	0.0062	0.1853	9.4269
1.10	1.0488	0.0083	0.1875	9.5461
2.10	1.4491	0.0116	0.1908	9.5223
3.10	1.7607	0.0133	0.1925	9.6683
4.10	2.0248	0.0155	0.1947	9.5520
7.10	2.6646	0.0201	0.1993	9.4771
9.10	3.0166	0.0221	0.2013	9.6151
12.10	3.4785	0.0251	0.2043	9.6088
15.10	3.8859	0.0270	0.2062	9.6484
20.10	4.4833	0.0302	0.2094	9.5723
25.10	5.0100	0.0321	0.2113	9.5497
30.10	5.4863	0.0337	0.2129	9.5232
35.12	5.9259	0.0355	0.2147	9.6207
40.12	6.3338	0.0371	0.2163	9.5743
45.12	6.7169	0.0379	0.2171	9.5176
50.12	7.0793	0.0394	0.2186	9.5223
55.12	7.4241	0.0401	0.2193	9.5732
60.12	7.7535	0.0407	0.2199	9.5696
80.12	8.9508	0.0445	0.2237	9.5327
100.12	10.0058	0.0468	0.2260	9.4652
120.10	10.9590	0.0482	0.2274	9.4281
120.27	10.9666	0.0481	0.2273	9.4884

Ecology and Environment
Consolidation Data
NS12 24-48"



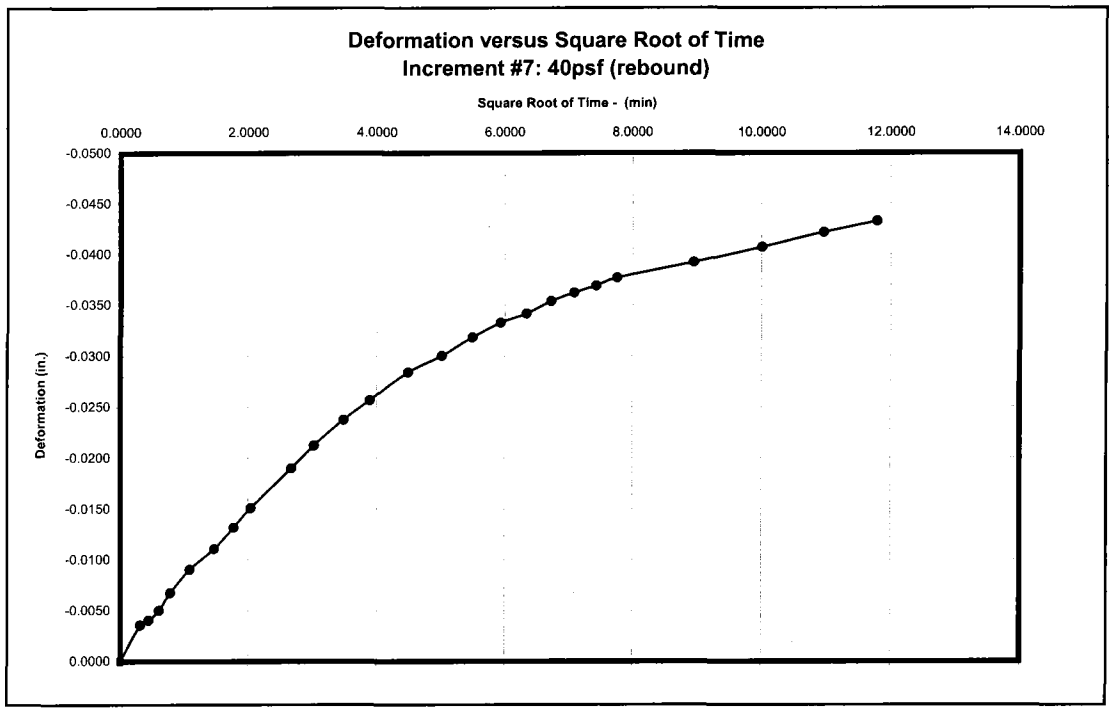
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2272	9.4736
0.10	0.3162	0.0047	0.2320	16.0072
0.20	0.4472	0.0065	0.2337	16.1009
0.35	0.5916	0.0087	0.2360	16.2213
0.60	0.7746	0.0108	0.2381	16.3316
1.10	1.0488	0.0140	0.2413	16.3602
2.10	1.4491	0.0195	0.2467	16.3057
3.10	1.7607	0.0231	0.2503	16.3480
4.10	2.0248	0.0262	0.2534	16.3973
7.10	2.6646	0.0336	0.2608	16.3771
9.10	3.0166	0.0373	0.2646	16.2879
12.10	3.4785	0.0408	0.2681	16.4125
15.10	3.8859	0.0451	0.2724	16.3961
20.10	4.4833	0.0488	0.2761	16.3890
25.08	5.0083	0.0520	0.2792	16.3390
30.08	5.4848	0.0540	0.2812	16.3376
35.08	5.9231	0.0560	0.2832	16.4710
40.08	6.3311	0.0578	0.2851	16.3509
45.08	6.7144	0.0596	0.2868	16.3652
50.08	7.0770	0.0602	0.2874	16.4030
55.08	7.4218	0.0611	0.2883	16.3700
60.08	7.7513	0.0624	0.2897	16.2903
80.07	8.9480	0.0657	0.2929	16.3581
100.05	10.0025	0.0672	0.2944	16.3034
100.18	10.0092	0.0672	0.2945	16.3200

Ecology and Environment
Consolidation Data
NS12 24-48"



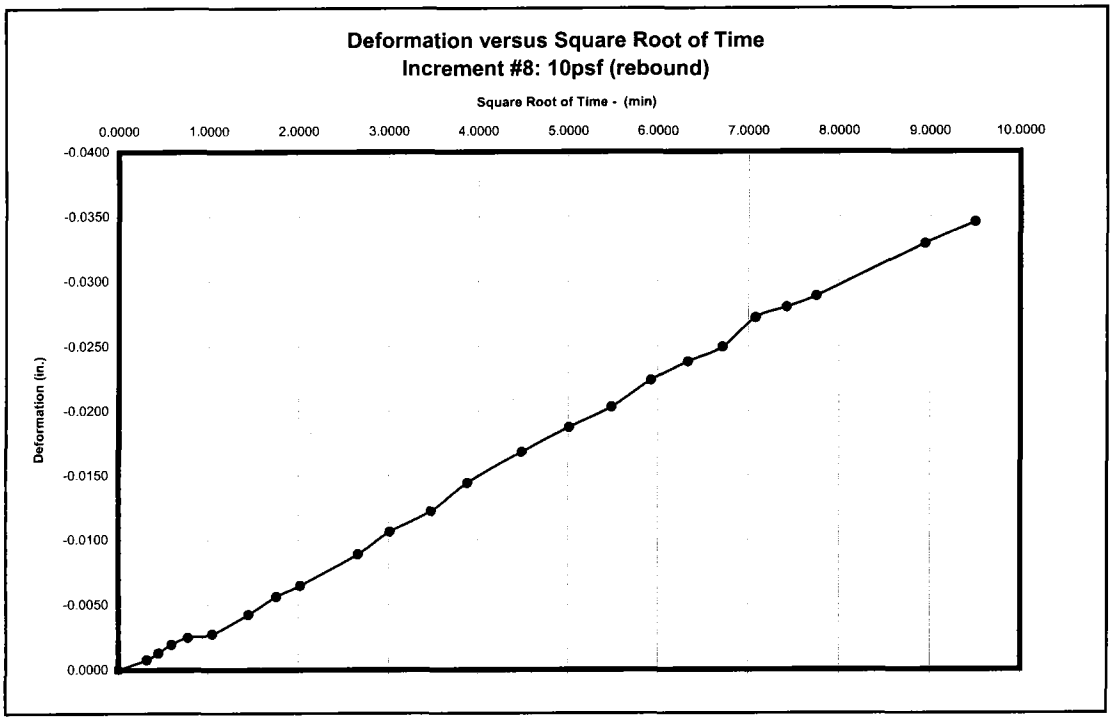
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2944	16.4104
0.10	0.3162	-0.0025	0.2919	6.8513
0.20	0.4472	-0.0044	0.2900	6.3161
0.35	0.5916	-0.0057	0.2887	6.2388
0.60	0.7746	-0.0067	0.2877	6.1853
1.10	1.0488	-0.0076	0.2868	6.1255
2.18	1.4776	-0.0098	0.2846	6.1695
3.18	1.7842	-0.0114	0.2830	6.0768
4.18	2.0453	-0.0127	0.2818	6.1032
7.18	2.6802	-0.0138	0.2806	6.1972
9.18	3.0304	-0.0143	0.2801	6.1377
12.18	3.4905	-0.0149	0.2795	6.1508
15.18	3.8966	-0.0154	0.2790	6.1921
20.18	4.4926	-0.0158	0.2787	6.1187
25.17	5.0166	-0.0159	0.2785	6.1113
30.17	5.4924	-0.0161	0.2784	6.1556
35.17	5.9301	-0.0164	0.2781	6.2028
40.17	6.3377	-0.0163	0.2781	6.1758
45.15	6.7194	-0.0164	0.2780	6.1425
50.15	7.0817	-0.0164	0.2780	6.1279
55.15	7.4263	-0.0164	0.2780	6.1151
60.15	7.7556	-0.0165	0.2780	6.1247
80.13	8.9517	-0.0165	0.2779	6.1446
100.13	10.0067	-0.0165	0.2779	6.1493
120.12	10.9598	-0.0166	0.2778	6.1139
140.18	11.8399	-0.0165	0.2779	6.1526
160.17	12.6557	-0.0166	0.2778	6.1529
180.15	13.4220	-0.0168	0.2777	6.1374
200.15	14.1474	-0.0168	0.2776	6.1303
220.13	14.8369	-0.0167	0.2778	6.1588
240.12	15.4957	-0.0168	0.2777	6.1472
240.13	15.4962	-0.0167	0.2777	6.1056

Ecology and Environment
Consolidation Data
NS12 24-48"



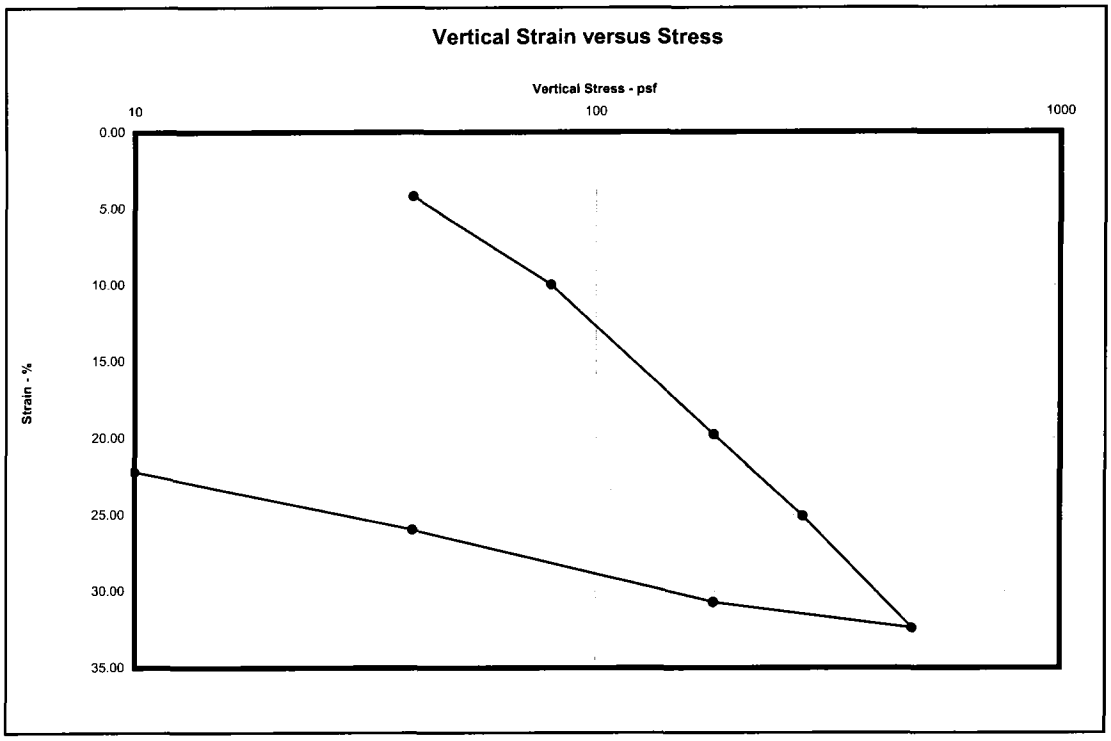
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2777	6.1859
0.10	0.3162	-0.0036	0.2741	1.6362
0.20	0.4472	-0.0041	0.2736	1.4804
0.37	0.6055	-0.0050	0.2726	1.4587
0.62	0.7853	-0.0067	0.2709	1.4173
1.18	1.0878	-0.0090	0.2686	1.3293
2.18	1.4776	-0.0111	0.2666	1.4099
3.18	1.7842	-0.0132	0.2645	1.3710
4.18	2.0453	-0.0151	0.2626	1.3341
7.18	2.6802	-0.0190	0.2587	1.3784
9.18	3.0304	-0.0212	0.2564	1.3891
12.18	3.4905	-0.0237	0.2539	1.3570
15.18	3.8966	-0.0256	0.2520	1.3412
20.18	4.4926	-0.0284	0.2493	1.3139
25.20	5.0200	-0.0300	0.2477	1.3320
30.20	5.4955	-0.0318	0.2459	1.3534
35.20	5.9330	-0.0333	0.2444	1.3487
40.20	6.3403	-0.0341	0.2435	1.3760
45.20	6.7231	-0.0353	0.2423	1.3701
50.20	7.0852	-0.0362	0.2415	1.3391
55.20	7.4297	-0.0369	0.2408	1.3710
60.20	7.7589	-0.0377	0.2400	1.4280
80.20	8.9554	-0.0392	0.2385	1.3106
100.20	10.0100	-0.0407	0.2370	1.3998
120.20	10.9636	-0.0422	0.2355	1.4269
138.92	11.7863	-0.0433	0.2344	1.3427

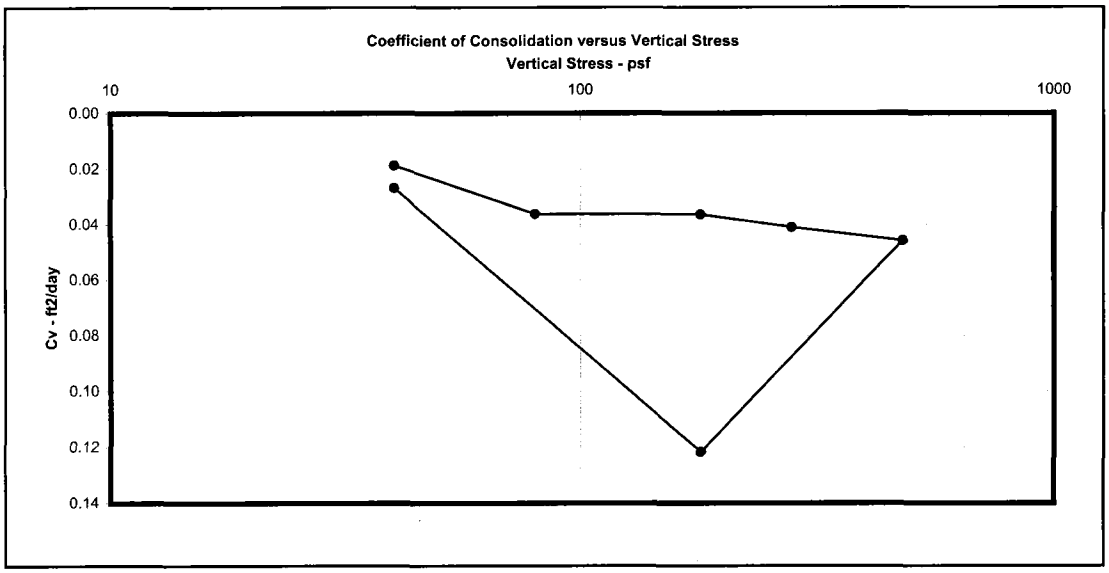
Ecology and Environment
Consolidation Data
NS12 24-48"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2343	1.3368
0.10	0.3162	-0.0008	0.2336	0.4445
0.20	0.4472	-0.0013	0.2331	0.4080
0.35	0.5916	-0.0019	0.2324	0.3720
0.60	0.7746	-0.0025	0.2318	0.3616
1.10	1.0488	-0.0028	0.2316	0.4089
2.10	1.4491	-0.0042	0.2301	0.3292
3.10	1.7607	-0.0056	0.2287	0.3506
4.10	2.0248	-0.0065	0.2279	0.3958
7.10	2.6646	-0.0089	0.2255	0.3696
9.10	3.0166	-0.0106	0.2237	0.3518
12.10	3.4785	-0.0122	0.2221	0.3958
15.10	3.8859	-0.0144	0.2199	0.3390
20.10	4.4833	-0.0168	0.2175	0.3485
25.10	5.0100	-0.0187	0.2156	0.2819
30.10	5.4863	-0.0203	0.2140	0.2914
35.12	5.9259	-0.0224	0.2120	0.2855
40.12	6.3338	-0.0238	0.2105	0.3687
45.12	6.7169	-0.0249	0.2094	0.3652
50.12	7.0793	-0.0272	0.2071	0.3604
55.12	7.4241	-0.0280	0.2063	0.3604
60.12	7.7535	-0.0288	0.2055	0.3209
80.12	8.9508	-0.0329	0.2014	0.3497
90.23	9.4991	-0.0345	0.1998	0.3720

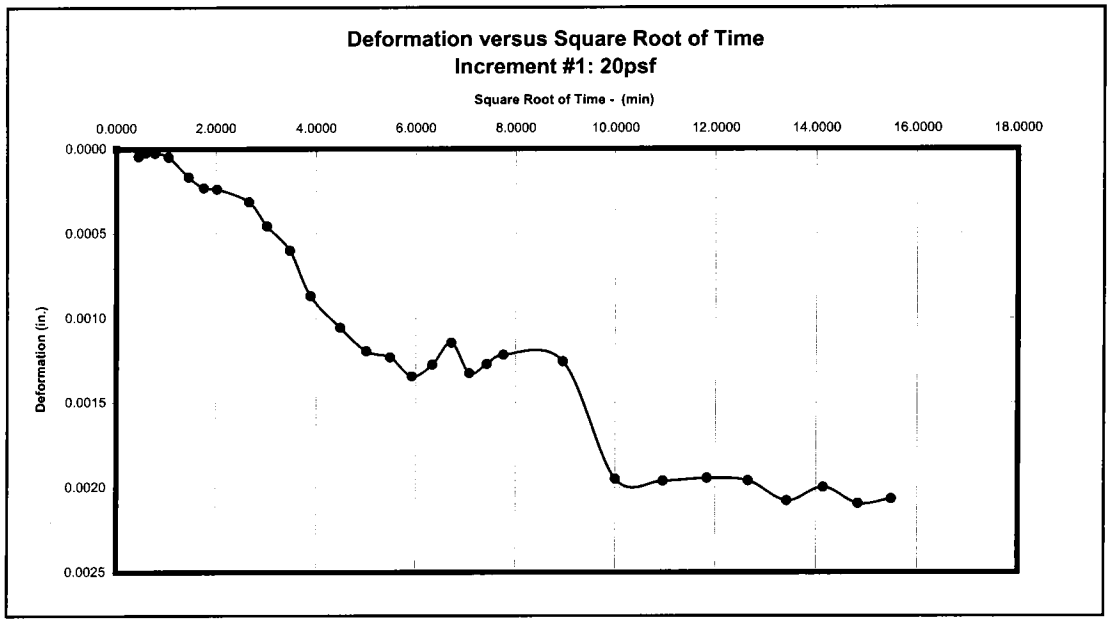
Ecology and Environment
Consolidation Data
NS12 24-48"





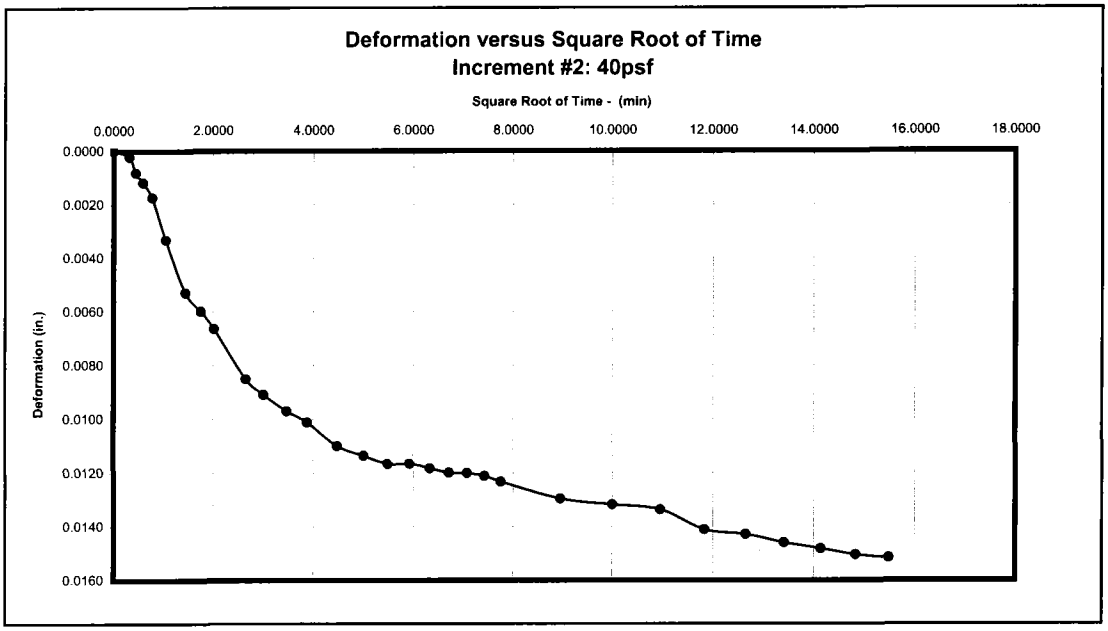
Step No.	Vertical Stress (psf)	Machine Deflections (in.)	H_0 (in) 0.900 S_{100} (in.)	H_{100} (in.)	Vertical Strain (%)	H_{50} (in.)	t_{50} (min.)	c_v (ft^2/day)
1	5	0.0000						#N/A
2	40	0.0002	0.0396	0.8607	4.19	0.8805	20.39	0.02
3	80	0.0007	0.0525	0.8103	9.97	0.8369	9.53	0.04
4	180	0.0012	0.0889	0.7220	19.78	0.7720	8.08	0.04
5	280	0.0016	0.0481	0.6743	25.08	0.6926	5.76	0.04
6	480	0.0028	0.0672	0.6084	32.40	0.6486	4.52	0.05
7	180	0.0013	-0.0177	0.6246	30.71	0.6158	1.53	0.12
8	40	0.0007	-0.0433	0.6663	25.97	0.6479	7.72	0.03
9	10	0.0001	-0.0345	0.7003	22.19			#N/A

Ecology and Environment
Consolidation Data
NS18 24-48"



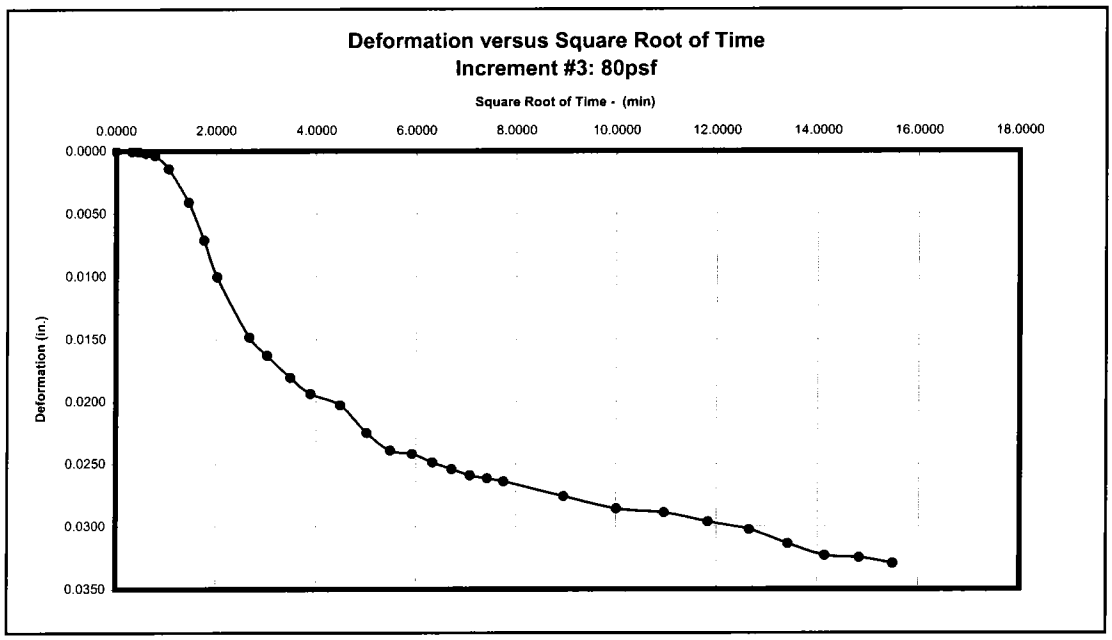
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0001	-0.5573
0.10	0.3162	0.0000	0.0001	-0.6572
0.20	0.4472	0.0000	0.0001	-0.5659
0.35	0.5916	0.0000	0.0001	-0.6599
0.60	0.7746	0.0000	0.0001	-0.6096
1.10	1.0488	0.0000	0.0001	-0.6167
2.10	1.4491	0.0002	0.0002	-0.6153
3.10	1.7607	0.0002	0.0003	-0.6786
4.10	2.0248	0.0002	0.0003	-0.6301
7.10	2.6646	0.0003	0.0004	-0.6810
9.12	3.0194	0.0005	0.0005	-0.7288
12.12	3.4809	0.0006	0.0007	-0.6940
15.12	3.8880	0.0009	0.0009	-0.7309
20.12	4.4852	0.0011	0.0011	-0.6670
25.10	5.0100	0.0012	0.0013	-0.6985
30.12	5.4879	0.0012	0.0013	-0.6884
35.12	5.9259	0.0013	0.0014	-0.7383
40.12	6.3338	0.0013	0.0013	-0.7713
45.12	6.7169	0.0011	0.0012	-0.6619
50.12	7.0793	0.0013	0.0014	-0.7859
55.12	7.4241	0.0013	0.0013	-0.7583
60.12	7.7535	0.0012	0.0013	-0.7273
80.12	8.9508	0.0013	0.0013	-0.6836
100.12	10.0058	0.0020	0.0020	-0.7618
120.13	10.9605	0.0020	0.0020	-0.7264
140.13	11.8378	0.0019	0.0020	-0.6691
160.13	12.6544	0.0020	0.0020	-0.6381
180.13	13.4214	0.0021	0.0022	-0.7273
200.12	14.1463	0.0020	0.0021	-0.6884
220.08	14.8352	0.0021	0.0022	-0.7357
240.05	15.4935	0.0021	0.0021	-0.7134

Ecology and Environment
Consolidation Data
NS18 24-48"



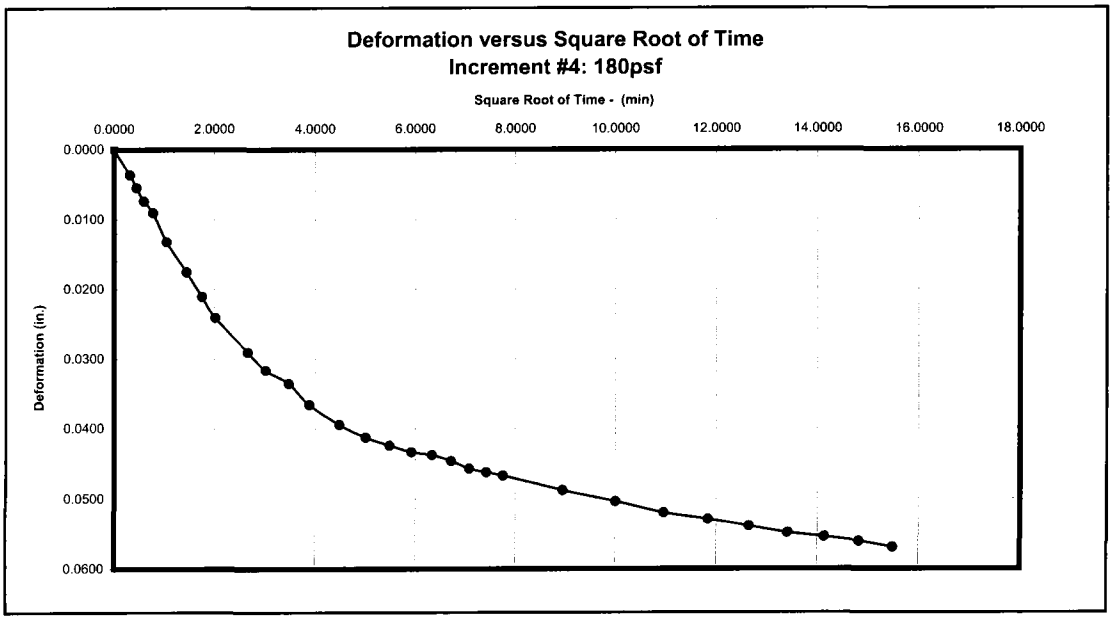
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0022	-0.7297
0.10	0.3162	0.0002	0.0024	-0.8287
0.20	0.4472	0.0008	0.0030	-1.0472
0.35	0.5916	0.0012	0.0033	-1.0951
0.60	0.7746	0.0017	0.0039	-1.1935
1.10	1.0488	0.0033	0.0055	-1.3707
2.08	1.4434	0.0053	0.0075	-1.4028
3.08	1.7559	0.0060	0.0082	-1.3853
4.08	2.0207	0.0066	0.0088	-1.4266
7.08	2.6615	0.0085	0.0107	-1.4323
9.08	3.0139	0.0091	0.0113	-1.4150
12.08	3.4761	0.0097	0.0119	-1.3793
15.08	3.8837	0.0101	0.0123	-1.3651
20.08	4.4814	0.0110	0.0132	-1.3924
25.08	5.0083	0.0114	0.0135	-1.3386
30.08	5.4848	0.0117	0.0138	-1.3838
35.08	5.9231	0.0117	0.0138	-1.4159
40.07	6.3298	0.0118	0.0140	-1.4174
45.07	6.7132	0.0120	0.0141	-1.3826
50.07	7.0758	0.0120	0.0142	-1.4400
55.15	7.4263	0.0121	0.0143	-1.3758
60.15	7.7556	0.0123	0.0145	-1.3826
80.13	8.9517	0.0130	0.0151	-1.4064
100.12	10.0058	0.0132	0.0153	-1.3591
120.12	10.9598	0.0134	0.0155	-1.3841
140.10	11.8364	0.0141	0.0163	-1.4326
160.08	12.6524	0.0143	0.0164	-1.3472
180.15	13.4220	0.0146	0.0168	-1.3374
200.13	14.1468	0.0148	0.0170	-1.3924
220.13	14.8369	0.0151	0.0172	-1.3900
240.05	15.4935	0.0152	0.0173	-1.4135

Ecology and Environment
Consolidation Data
NS18 24-48"



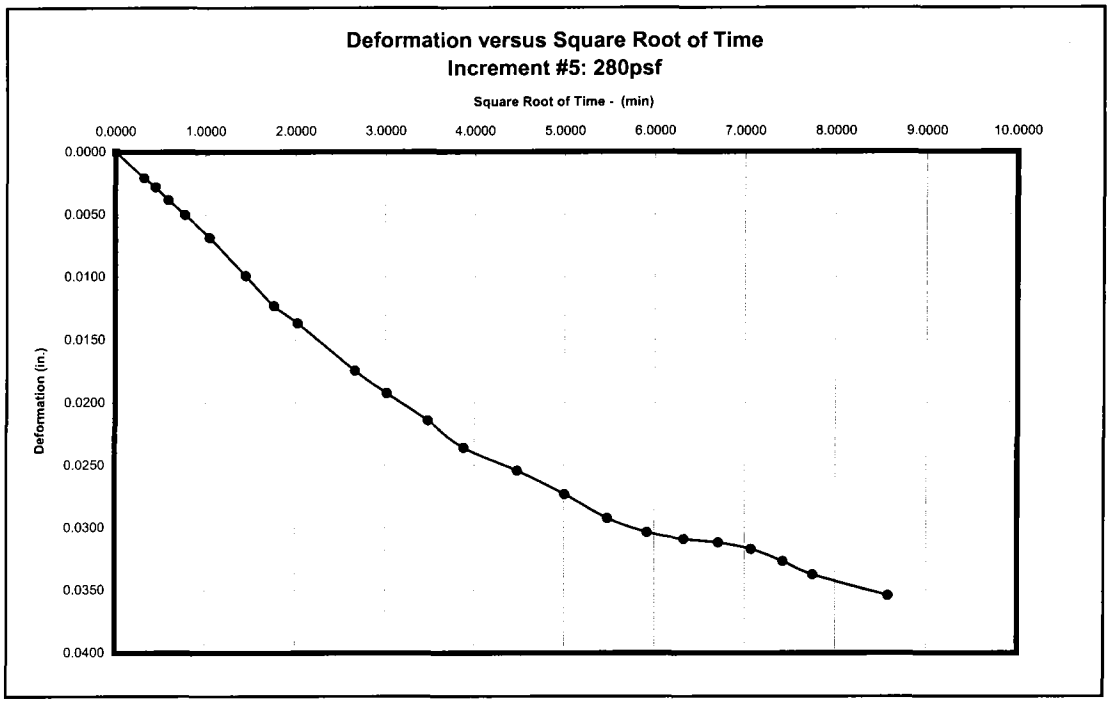
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0173	-1.4709
0.10	0.3162	0.0000	0.0174	-1.5063
0.20	0.4472	0.0001	0.0174	-1.4635
0.35	0.5916	0.0002	0.0175	-1.5898
0.60	0.7746	0.0004	0.0177	-1.6570
1.10	1.0488	0.0014	0.0187	-1.8678
2.10	1.4491	0.0041	0.0214	-2.3004
3.10	1.7607	0.0071	0.0245	-2.6625
4.10	2.0248	0.0100	0.0274	-2.7696
7.10	2.6646	0.0148	0.0322	-2.7898
9.10	3.0166	0.0163	0.0336	-2.7755
12.10	3.4785	0.0181	0.0354	-2.7779
15.10	3.8859	0.0194	0.0367	-2.6920
20.10	4.4833	0.0203	0.0376	-2.6872
25.10	5.0100	0.0225	0.0398	-2.9869
30.08	5.4848	0.0239	0.0413	-2.8061
35.08	5.9231	0.0242	0.0415	-2.7895
40.08	6.3311	0.0249	0.0422	-2.7300
45.08	6.7144	0.0254	0.0428	-2.7907
50.08	7.0770	0.0259	0.0432	-2.6932
55.15	7.4263	0.0262	0.0435	-2.7633
60.15	7.7556	0.0264	0.0437	-2.7791
80.17	8.9536	0.0276	0.0449	-2.7859
100.17	10.0083	0.0286	0.0459	-2.8382
120.17	10.9621	0.0289	0.0462	-2.7859
140.17	11.8392	0.0296	0.0470	-2.8168
160.17	12.6557	0.0303	0.0476	-2.7951
180.17	13.4226	0.0314	0.0487	-2.7705
200.17	14.1480	0.0323	0.0497	-2.7297
220.17	14.8380	0.0325	0.0498	-2.7788
240.17	15.4973	0.0329	0.0503	-2.7336
240.20	15.4984	0.0330	0.0503	-2.7693

Ecology and Environment
Consolidation Data
NS18 24-48"



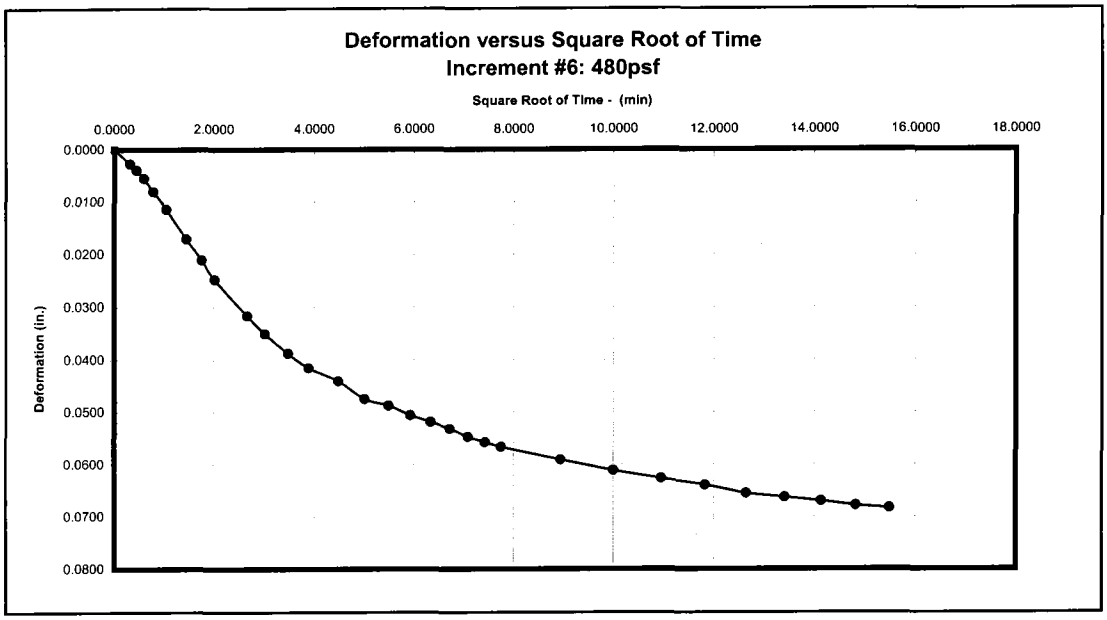
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.0503	-2.7577
0.10	0.3162	0.0036	0.0539	-5.9044
0.20	0.4472	0.0055	0.0558	-6.0195
0.35	0.5916	0.0074	0.0577	-5.9862
0.60	0.7746	0.0090	0.0593	-6.1660
1.10	1.0488	0.0132	0.0635	-6.2291
2.10	1.4491	0.0175	0.0678	-6.1363
3.10	1.7607	0.0211	0.0714	-6.1860
4.10	2.0248	0.0241	0.0744	-6.0706
7.10	2.6646	0.0290	0.0793	-6.2204
9.10	3.0166	0.0317	0.0820	-5.9365
12.10	3.4785	0.0336	0.0839	-6.2549
15.10	3.8859	0.0366	0.0869	-6.2404
20.10	4.4833	0.0394	0.0897	-6.2124
25.10	5.0100	0.0413	0.0916	-6.2419
30.10	5.4863	0.0424	0.0927	-6.1375
35.10	5.9245	0.0434	0.0937	-6.2050
40.10	6.3325	0.0438	0.0941	-6.1491
45.10	6.7157	0.0447	0.0949	-6.1839
50.10	7.0781	0.0457	0.0960	-6.1827
55.10	7.4229	0.0463	0.0966	-6.1800
60.10	7.7524	0.0467	0.0970	-6.2323
80.12	8.9508	0.0488	0.0991	-6.1125
100.12	10.0058	0.0504	0.1007	-6.1791
120.13	10.9605	0.0520	0.1023	-6.2014
140.13	11.8378	0.0529	0.1032	-6.2184
160.13	12.6544	0.0539	0.1042	-6.1669
180.13	13.4214	0.0549	0.1052	-6.2029
200.10	14.1457	0.0554	0.1057	-6.1393
220.08	14.8352	0.0561	0.1064	-6.1194
240.08	15.4946	0.0569	0.1072	-6.1530
240.08	15.4946	0.0569	0.1072	-6.2050

Ecology and Environment
Consolidation Data
NS18 24-48"



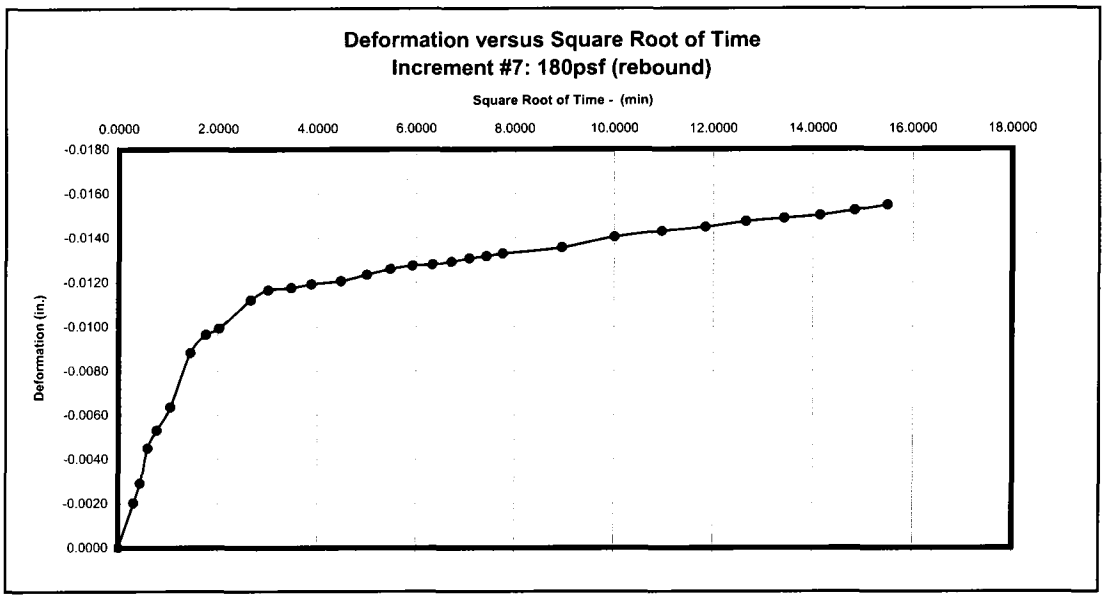
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1072	-6.1684
0.10	0.3162	0.0021	0.1093	-9.2054
0.20	0.4472	0.0028	0.1100	-9.4302
0.35	0.5916	0.0038	0.1111	-9.5527
0.60	0.7746	0.0050	0.1122	-9.4647
1.10	1.0488	0.0069	0.1141	-9.4317
2.10	1.4491	0.0099	0.1171	-9.5851
3.10	1.7607	0.0123	0.1195	-9.5384
4.10	2.0248	0.0137	0.1209	-9.5506
7.10	2.6646	0.0175	0.1247	-9.6383
9.10	3.0166	0.0193	0.1265	-9.4460
12.10	3.4785	0.0214	0.1287	-9.5566
15.10	3.8859	0.0236	0.1308	-9.7153
20.08	4.4814	0.0254	0.1327	-9.6136
25.08	5.0083	0.0273	0.1345	-9.6288
30.08	5.4848	0.0292	0.1365	-9.5848
35.08	5.9231	0.0304	0.1376	-9.5586
40.08	6.3311	0.0309	0.1381	-9.5598
45.08	6.7144	0.0312	0.1384	-9.5955
50.08	7.0770	0.0317	0.1389	-9.5111
55.15	7.4263	0.0327	0.1399	-9.5375
60.15	7.7556	0.0338	0.1410	-9.5381
73.68	8.5839	0.0355	0.1427	-9.5720

Ecology and Environment
Consolidation Data
NS18 24-48"



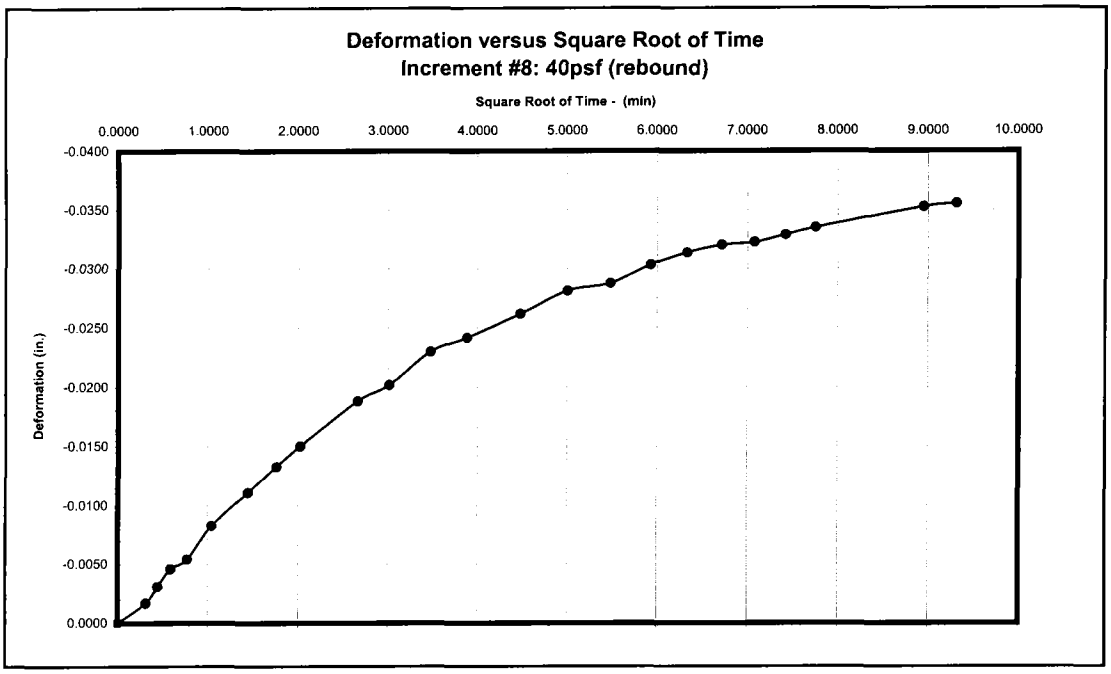
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1427	-9.6238
0.10	0.3162	0.0028	0.1455	-15.8854
0.20	0.4472	0.0040	0.1467	-16.0022
0.35	0.5916	0.0055	0.1482	-16.1164
0.60	0.7746	0.0080	0.1507	-16.2553
1.10	1.0488	0.0114	0.1541	-16.4979
2.10	1.4491	0.0171	0.1598	-16.4039
3.10	1.7607	0.0211	0.1638	-16.3513
4.10	2.0248	0.0248	0.1675	-16.2921
7.10	2.6646	0.0317	0.1744	-16.4982
9.10	3.0166	0.0351	0.1778	-16.3575
12.10	3.4785	0.0388	0.1815	-16.4170
15.10	3.8859	0.0416	0.1843	-16.3804
20.10	4.4833	0.0441	0.1868	-16.4218
25.10	5.0100	0.0475	0.1902	-16.3959
30.10	5.4863	0.0488	0.1915	-16.4539
35.08	5.9231	0.0506	0.1933	-16.5017
40.08	6.3311	0.0519	0.1946	-16.4788
45.08	6.7144	0.0532	0.1959	-16.4613
50.08	7.0770	0.0547	0.1974	-16.3754
55.08	7.4218	0.0558	0.1985	-16.4824
60.08	7.7513	0.0567	0.1994	-16.3635
80.07	8.9480	0.0592	0.2019	-16.3219
100.13	10.0067	0.0612	0.2039	-16.4360
120.12	10.9598	0.0627	0.2054	-16.4494
140.10	11.8364	0.0640	0.2067	-16.3956
160.10	12.6531	0.0655	0.2082	-16.3876
180.08	13.4195	0.0663	0.2090	-16.5157
200.07	14.1445	0.0670	0.2097	-16.2966
220.07	14.8346	0.0679	0.2106	-16.3635
240.13	15.4962	0.0684	0.2111	-16.4113

Ecology and Environment
Consolidation Data
NS18 24-48"



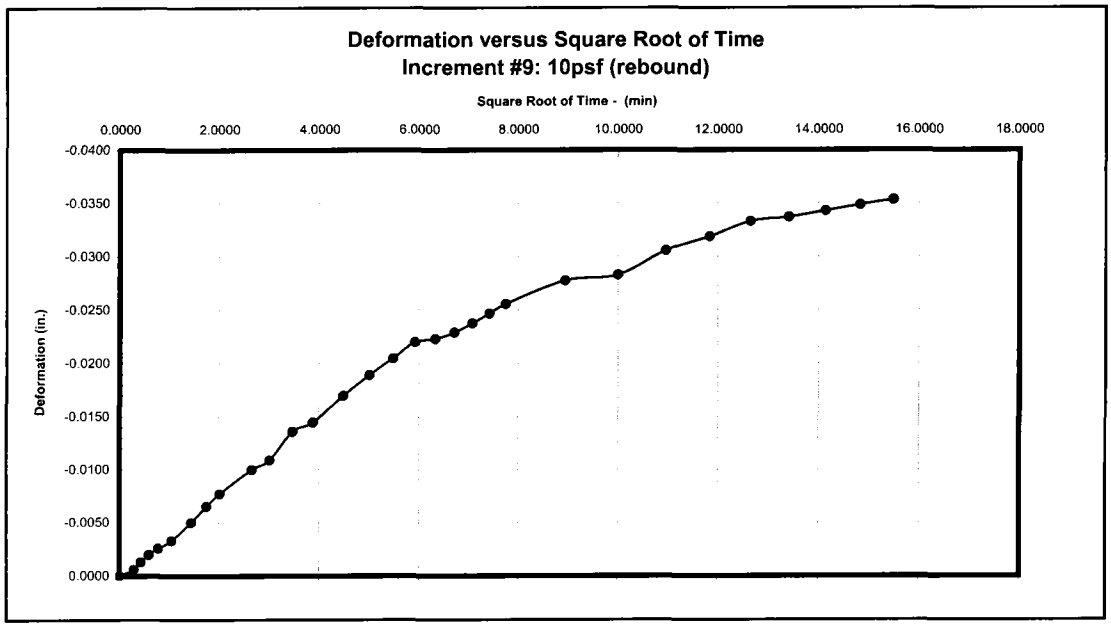
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.2111	-16.4054
0.10	0.3162	-0.0020	0.2091	-6.7773
0.20	0.4472	-0.0029	0.2082	-6.4764
0.35	0.5916	-0.0045	0.2066	-6.2612
0.60	0.7746	-0.0053	0.2058	-6.3397
1.10	1.0488	-0.0064	0.2048	-6.2861
2.12	1.4549	-0.0088	0.2023	-6.1720
3.12	1.7654	-0.0097	0.2015	-6.2273
4.12	2.0290	-0.0099	0.2012	-6.2478
7.12	2.6677	-0.0112	0.1999	-6.1324
9.12	3.0194	-0.0117	0.1995	-6.0887
12.12	3.4809	-0.0118	0.1994	-6.2088
15.12	3.8880	-0.0119	0.1992	-6.1946
20.12	4.4852	-0.0121	0.1990	-6.1871
25.12	5.0117	-0.0123	0.1988	-6.1348
30.12	5.4879	-0.0126	0.1985	-6.1396
35.12	5.9259	-0.0128	0.1984	-6.2133
40.12	6.3338	-0.0128	0.1983	-6.1934
45.12	6.7169	-0.0129	0.1982	-6.1538
50.12	7.0793	-0.0131	0.1980	-6.1387
55.12	7.4241	-0.0132	0.1979	-6.1232
60.12	7.7535	-0.0133	0.1978	-6.1779
80.12	8.9508	-0.0136	0.1975	-6.1553
100.12	10.0058	-0.0140	0.1971	-6.1726
120.12	10.9598	-0.0143	0.1968	-6.1375
140.13	11.8378	-0.0145	0.1966	-6.2457
160.13	12.6544	-0.0147	0.1964	-6.1253
180.13	13.4214	-0.0149	0.1962	-6.1205
200.13	14.1468	-0.0150	0.1961	-6.1717
220.13	14.8369	-0.0153	0.1959	-6.1396
240.13	15.4962	-0.0155	0.1956	-6.1565
240.17	15.4973	-0.0155	0.1956	-6.1506

Ecology and Environment
Consolidation Data
NS18 24-48"



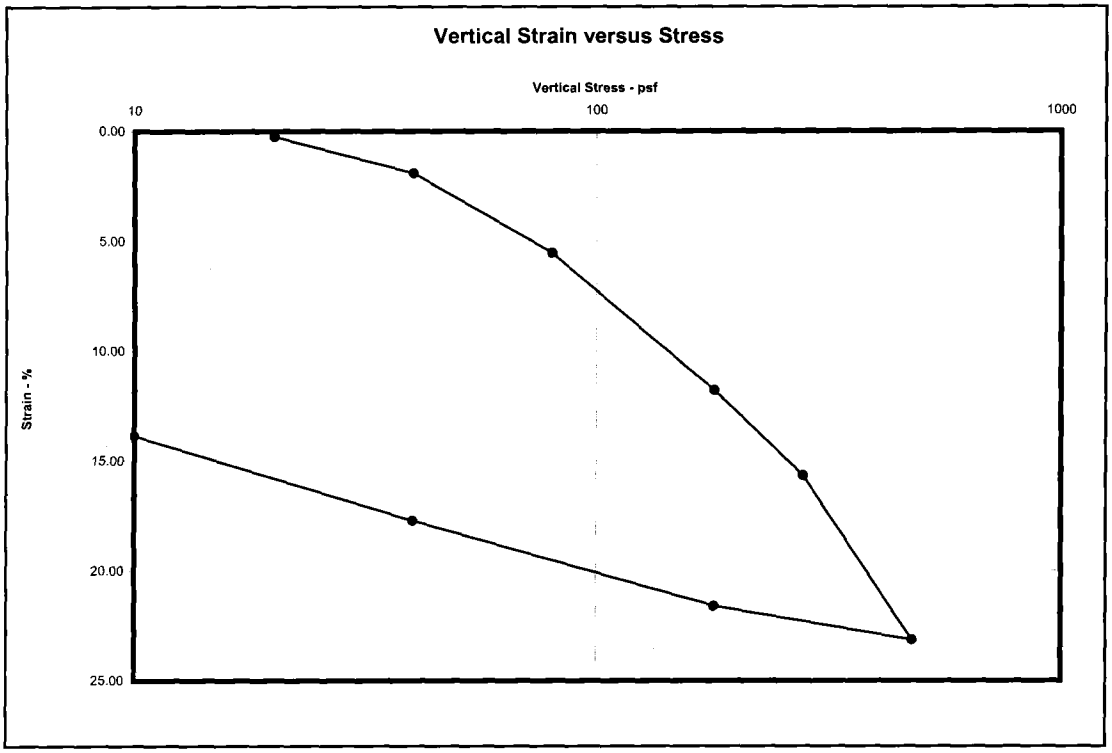
Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1956	-6.1550
0.10	0.3162	-0.0017	0.1939	-2.0703
0.20	0.4472	-0.0031	0.1925	-1.5479
0.35	0.5916	-0.0046	0.1910	-1.4769
0.60	0.7746	-0.0054	0.1902	-1.4195
1.10	1.0488	-0.0083	0.1873	-1.3362
2.10	1.4491	-0.0111	0.1845	-1.4519
3.10	1.7607	-0.0133	0.1824	-1.4587
4.10	2.0248	-0.0150	0.1806	-1.4471
7.10	2.6646	-0.0188	0.1768	-1.4364
9.10	3.0166	-0.0202	0.1754	-1.3802
12.10	3.4785	-0.0230	0.1726	-1.4115
15.10	3.8859	-0.0242	0.1715	-1.3686
20.10	4.4833	-0.0262	0.1694	-1.3793
25.10	5.0100	-0.0281	0.1675	-1.4043
30.10	5.4863	-0.0288	0.1669	-1.3434
35.10	5.9245	-0.0303	0.1653	-1.4254
40.10	6.3325	-0.0314	0.1643	-1.4528
45.10	6.7157	-0.0320	0.1636	-1.4239
50.10	7.0781	-0.0322	0.1634	-1.3270
55.10	7.4229	-0.0329	0.1628	-1.3853
60.12	7.7535	-0.0335	0.1621	-1.3731
80.12	8.9508	-0.0353	0.1604	-1.4412
86.73	9.3131	-0.0355	0.1601	-1.3865

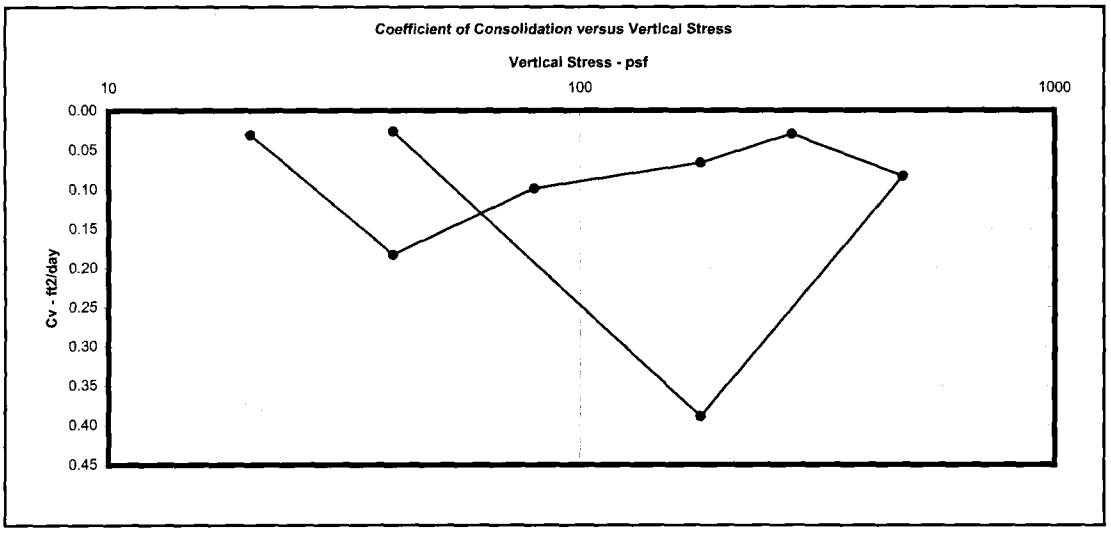
Ecology and Environment
Consolidation Data
NS18 24-48"



Time (min.)	Sq. Root Time (min.)	Inc. Disp. (in.)	Total Disp. (in.)	Load (lbs)
0.00	0.0000	0.0000	0.1601	-1.4337
0.08	0.2887	-0.0006	0.1595	-0.9319
0.18	0.4282	-0.0013	0.1588	-0.6789
0.35	0.5916	-0.0020	0.1581	-0.5338
0.60	0.7746	-0.0026	0.1575	-0.4553
1.10	1.0488	-0.0033	0.1568	-0.4265
2.10	1.4491	-0.0050	0.1551	-0.4054
3.10	1.7607	-0.0065	0.1536	-0.3729
4.10	2.0248	-0.0077	0.1524	-0.3718
7.10	2.6646	-0.0100	0.1501	-0.4583
9.10	3.0166	-0.0109	0.1492	-0.4265
12.10	3.4785	-0.0136	0.1465	-0.4169
15.10	3.8859	-0.0144	0.1457	-0.3896
20.10	4.4833	-0.0169	0.1432	-0.3673
25.10	5.0100	-0.0189	0.1412	-0.4717
30.10	5.4863	-0.0204	0.1396	-0.3744
35.10	5.9245	-0.0220	0.1381	-0.4134
40.10	6.3325	-0.0223	0.1378	-0.3634
45.10	6.7157	-0.0229	0.1372	-0.3911
50.10	7.0781	-0.0237	0.1364	-0.4208
55.10	7.4229	-0.0246	0.1355	-0.4351
60.10	7.7524	-0.0255	0.1345	-0.3281
80.10	8.9499	-0.0277	0.1324	-0.3896
100.10	10.0050	-0.0283	0.1318	-0.4054
120.12	10.9598	-0.0305	0.1296	-0.3670
140.12	11.8371	-0.0318	0.1283	-0.3352
160.10	12.6531	-0.0333	0.1268	-0.3444
180.10	13.4201	-0.0337	0.1264	-0.3566
200.10	14.1457	-0.0343	0.1258	-0.3863
220.10	14.8358	-0.0348	0.1253	-0.5052
240.10	15.4952	-0.0353	0.1248	-0.3159
240.13	15.4962	-0.0353	0.1248	-0.3634

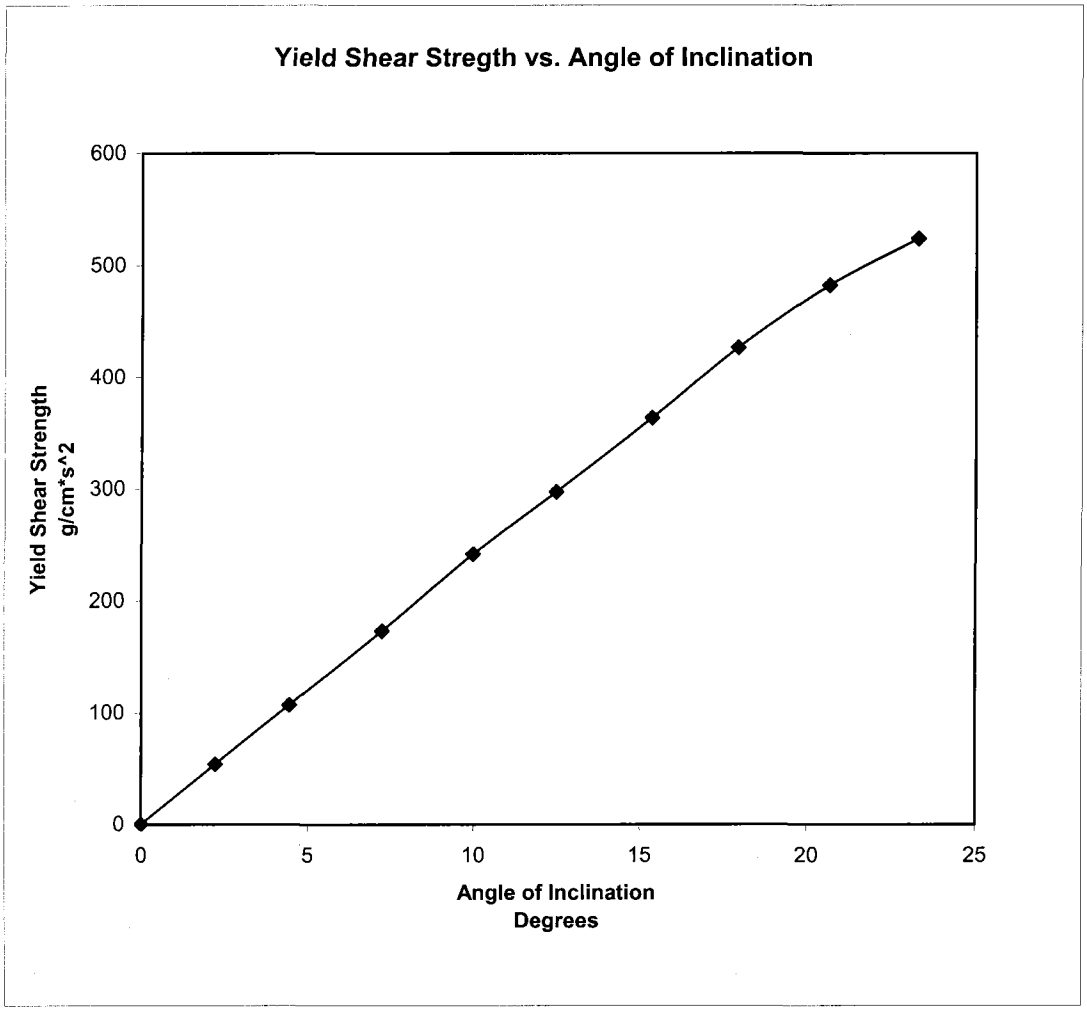
Ecology and Environment
Consolidation Data
NS18 24-48"





Step No.	Vertical Stress (psf)	Machine Deflections (in.)	H_0 (in) 0.900 S_{100} (in.)	H_{100} (in.)	Vertical Strain (%)	H_{50} (in.)	t_{50} (min.)	c_v (ft²/day)
1	5	0.0000						#N/A
2	20	-0.0001	0.0013	0.8985	0.25	0.8991	12.91	0.03
3	40	0.0002	0.0119	0.8861	1.90	0.8921	2.14	0.18
4	80	0.0007	0.0330	0.8504	5.52	0.8773	3.85	0.10
5	180	0.0012	0.0487	0.8022	11.79	0.8265	5.05	0.07
6	280	0.0016	0.0392	0.7552	15.67	0.7748	9.94	0.03
7	480	0.0028	0.0490	0.7112	23.14	0.7356	3.19	0.08
8	180	0.0013	-0.0155	0.7057	21.59	0.7111	0.64	0.39
9	40	0.0007	-0.0412	0.7463	17.71	0.7257	9.95	0.03
10	10	0.0001	-0.0353	0.7753	13.86			#N/A

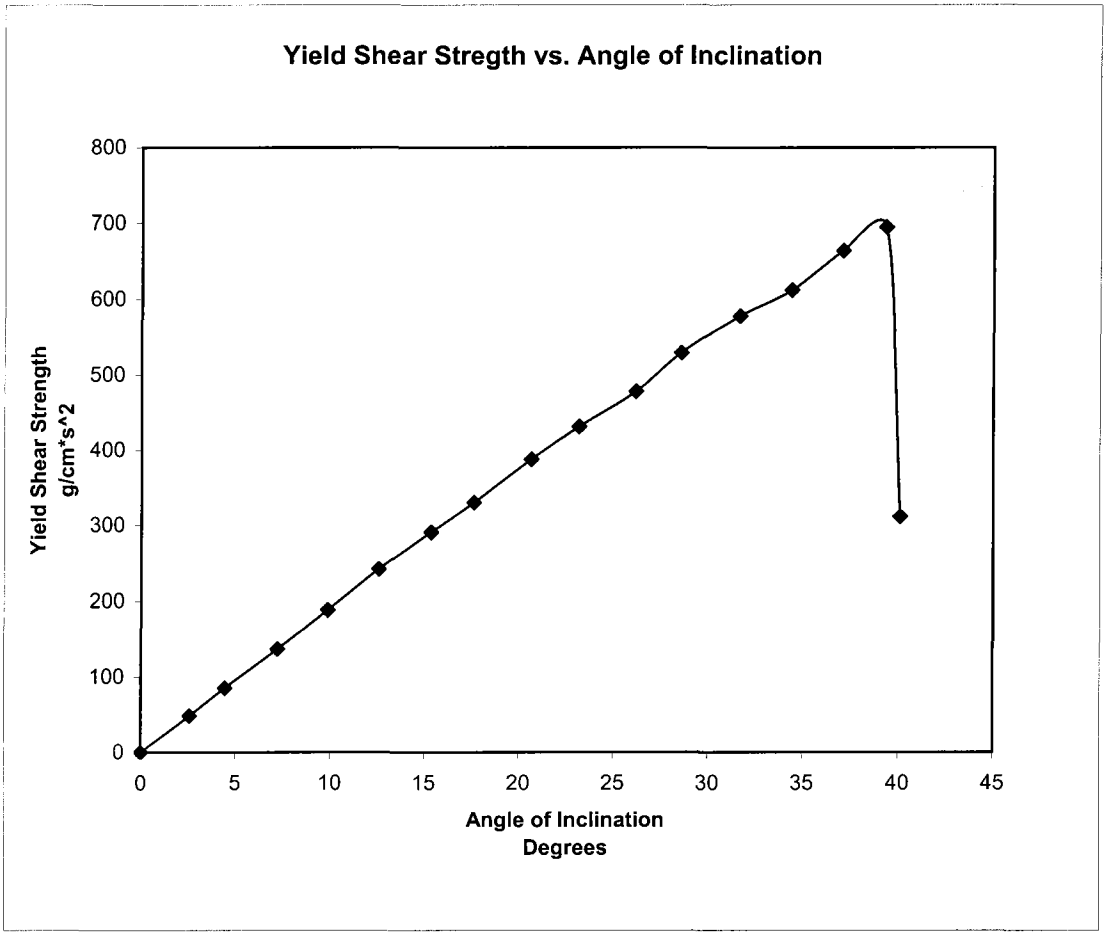
Ecology and Environment
Tilt Board Data
NS05 0-24"



Sample ID #	Weight g	Density, ρ g/cm^3	Moisture Content %
NS05 0-24"	849.52	1.55	119.62

Increment	Average Thickness cm	Calculated Angle, θ Rad.	Deg.	Yield Shear Strength, τ Pa
Initial	8.437	0.000	0.00	0
1	9.114	0.039	2.23	53.90
2	9.065	0.078	4.45	106.98
3	9.031	0.126	7.24	173.04
4	9.151	0.174	9.99	241.42
5	9.045	0.218	12.48	297.11
6	9.031	0.268	15.35	363.50
7	9.107	0.313	17.94	426.42
8	8.989	0.361	20.66	482.10
9	8.715	0.406	23.28	523.66

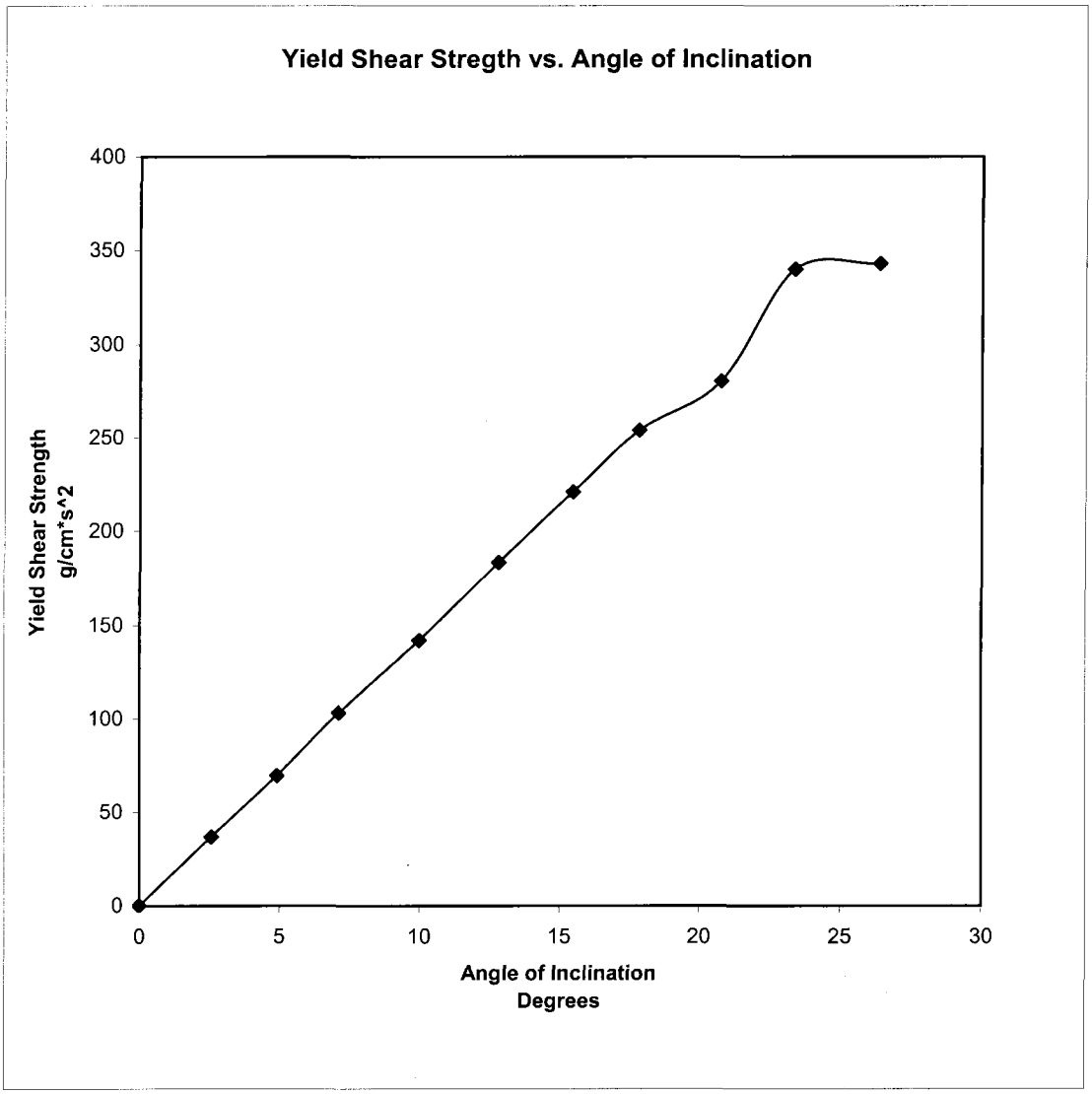
Ecology and Environment
Tilt Board Data
NS06 0-18"



Sample ID #	Weight g	Density, ρ (g/cm3):	Moisture Content %
NS06 0-18"	746.64	1.53	42.56

Increment	Average Thickness cm	Calculated Angle, θ Rad.	Deg.	Yield Shear Strength, τ Pa
Initial	7.493	0.000	0.00	0.0
1	7.111	0.045	2.58	48.2
2	7.275	0.078	4.45	85.0
3	7.216	0.126	7.24	136.9
4	7.291	0.172	9.88	188.3
5	7.379	0.220	12.59	242.1
6	7.293	0.268	15.35	290.6
7	7.247	0.308	17.62	330.1
8	7.300	0.361	20.66	387.6
9	7.275	0.405	23.18	431.1
10	7.189	0.457	26.19	477.5
11	7.344	0.499	28.59	529.0
12	7.311	0.553	31.67	577.6
13	7.195	0.600	34.39	611.6
14	7.309	0.647	37.09	663.4
15	7.279	0.687	39.34	694.4
16	3.214	0.700	40.12	311.7

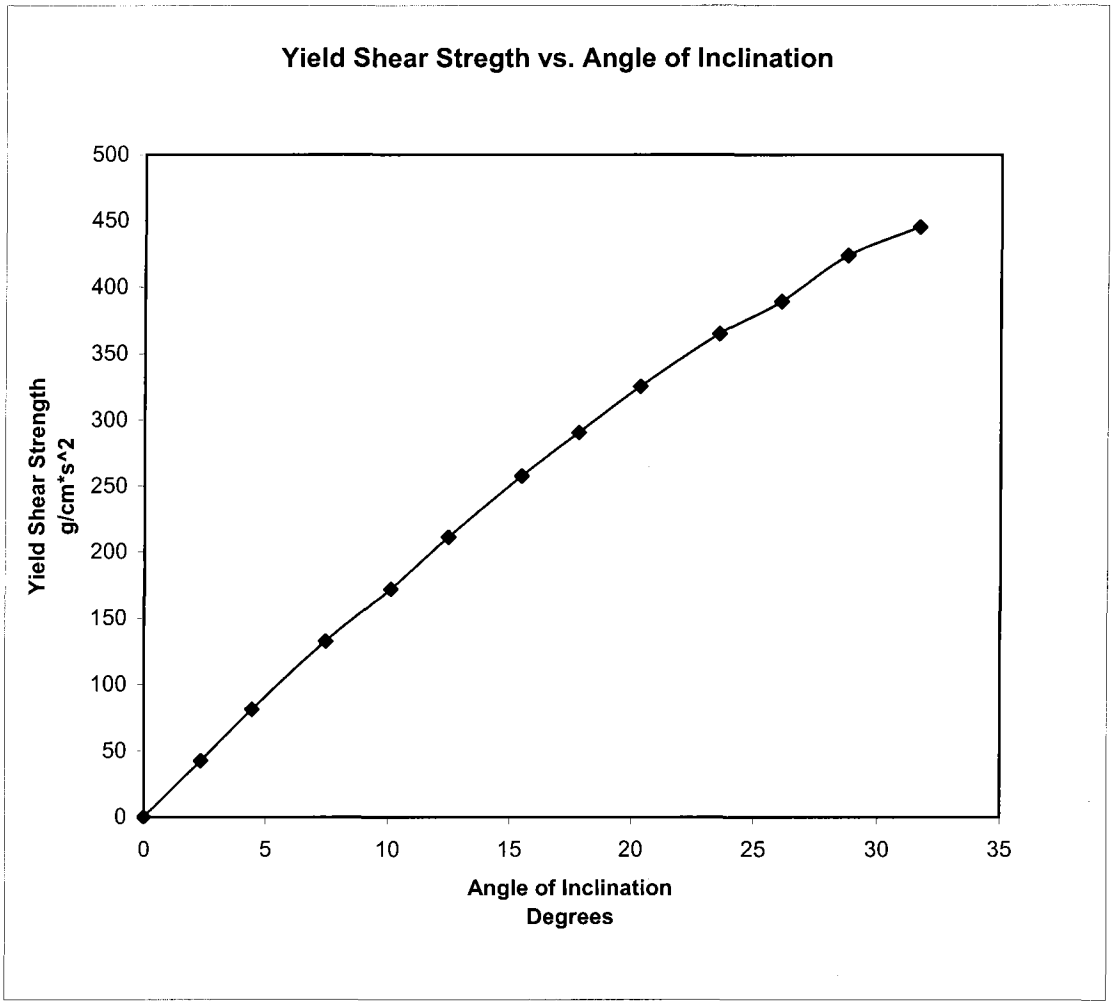
Ecology and Environment
Tilt Board Data
NS12 0-24"



Sample ID #	Weight g	Density, ρ (g/cm3):	Moisture Content %
NS12 0-24"	531.15	1.17	252.49

Increment	Average Thickness cm	Calculated Angle, θ Rad.	Deg.	Yield Shear Strength, τ Pa
Initial	7.162	0.000	0.00	0
1	7.122	0.045	2.58	36.7
2	7.099	0.086	4.92	69.7
3	7.256	0.124	7.13	103.1
4	7.146	0.174	9.99	142.0
5	7.216	0.224	12.81	183.3
6	7.233	0.270	15.46	220.8
7	7.238	0.311	17.83	253.8
8	6.901	0.362	20.76	280.1
9	7.479	0.408	23.38	339.9
10	6.739	0.460	26.38	342.8

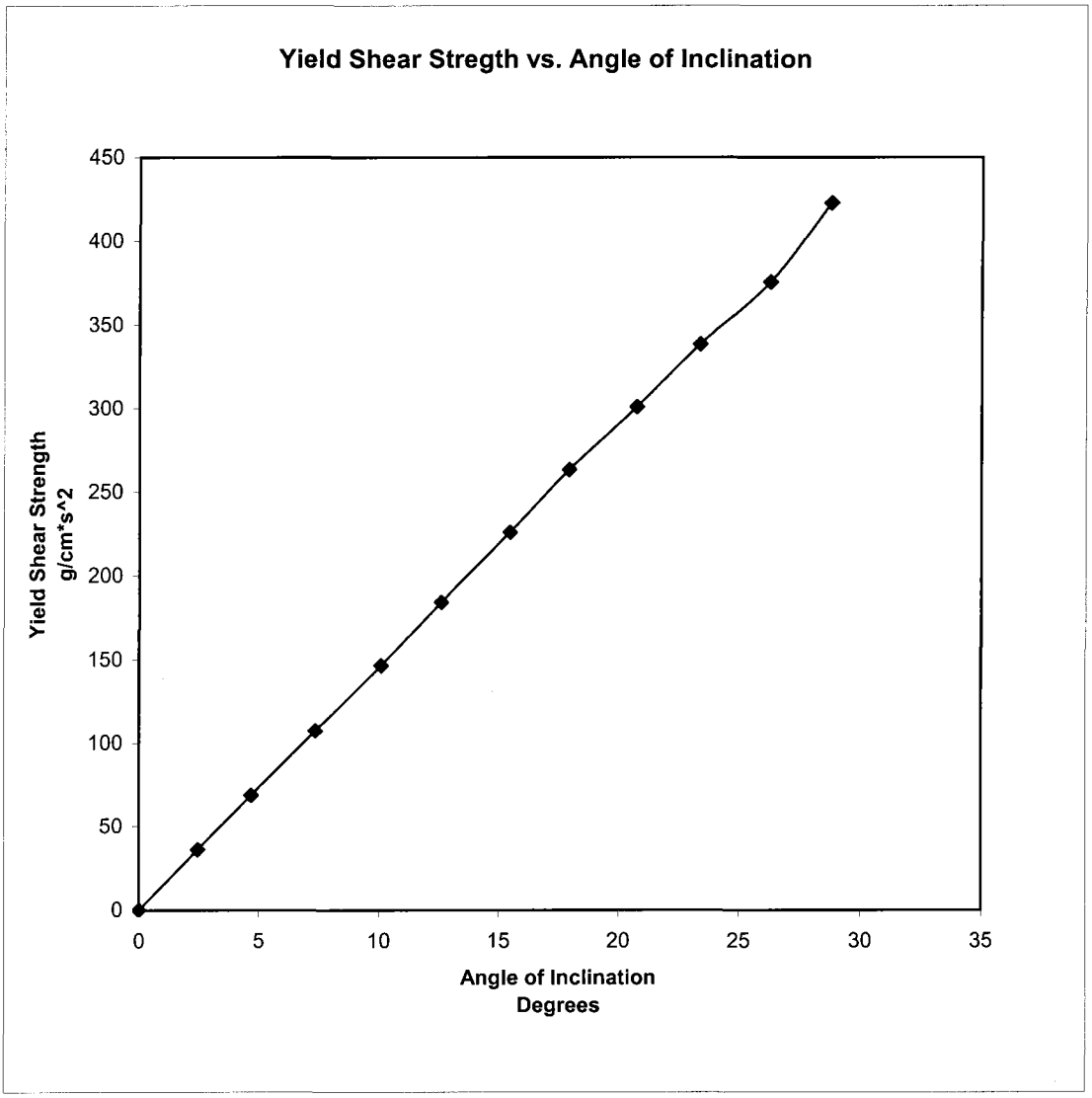
Ecology and Environment
Tilt Board Data
NS18 0-24"



Sample ID #	Weight g	Density, ρ (g/cm3):	Moisture Content %
NS18 0-24"	629.4	1.36	163.05

Increment	Average Thickness cm	Calculated Angle, θ Rad.	Deg.	Yield Shear Strength, τ Pa
Initial	7.828	0.000	0.00	0.0
1	7.786	0.041	2.35	42.5
2	7.837	0.078	4.45	81.1
3	7.641	0.130	7.47	132.5
4	7.336	0.176	10.11	171.7
5	7.324	0.218	12.48	211.1
6	7.240	0.270	15.46	257.4
7	7.120	0.311	17.81	290.5
8	7.011	0.355	20.35	325.2
9	6.837	0.412	23.58	364.8
10	6.634	0.455	26.09	389.2
11	6.600	0.502	28.77	423.7
12	6.359	0.553	31.67	445.2
13	7.472	0.597	34.23	560.5

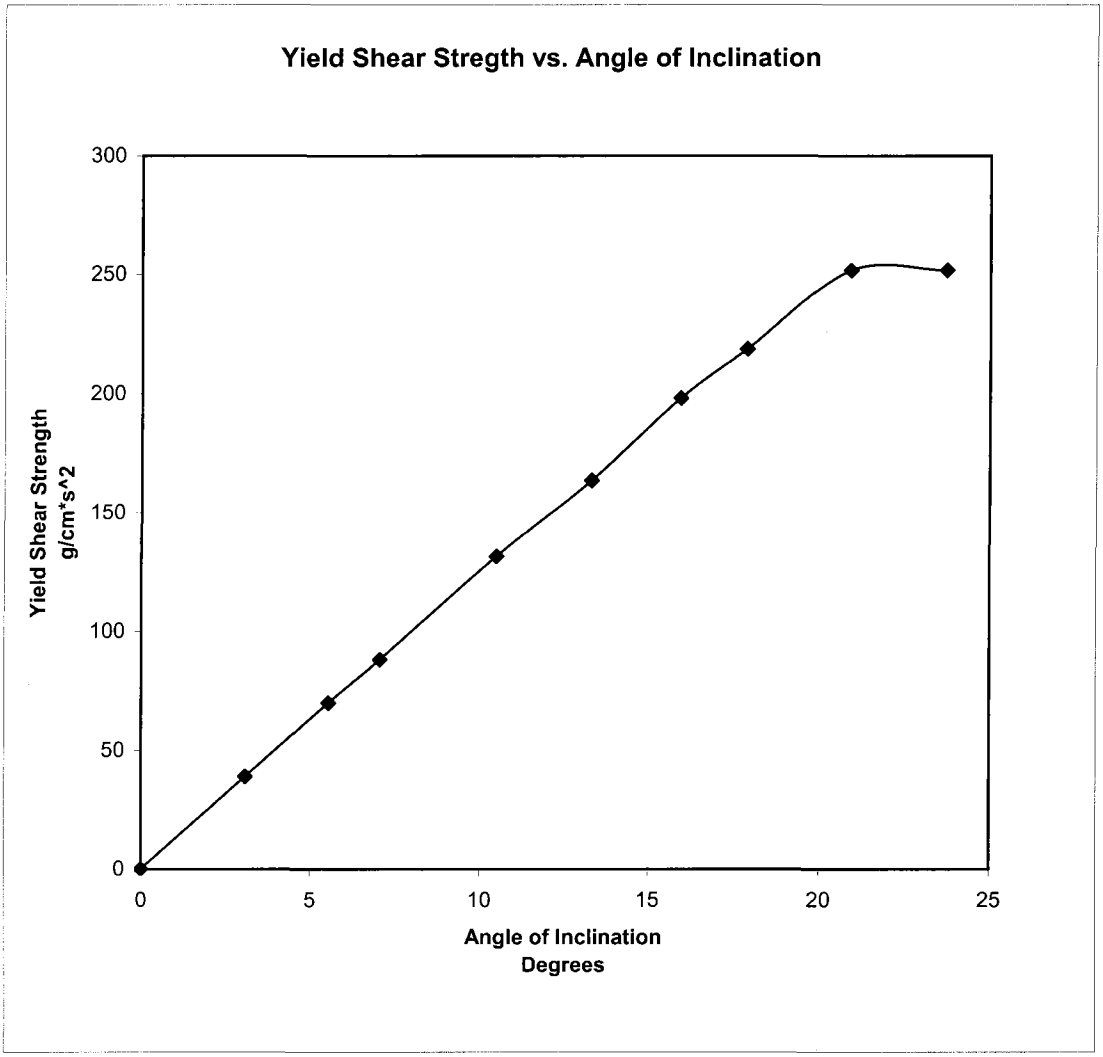
Ecology and Environment
Tilt Board Data
NS05 24-48"



Sample ID #	Weight g	Density, ρ (g/cm3):	Moisture Content %
NS05 24-48"	550.58	1.03	683.69

Increment	Average Thickness cm	Calculated Angle, θ Rad.	Deg.	Yield Shear Strength, τ Pa
Initial	8.159	0.000	0.00	0.0
1	8.280	0.043	2.46	36.1
2	8.302	0.082	4.69	68.7
3	8.268	0.128	7.36	107.2
4	8.238	0.176	10.11	146.5
5	8.339	0.220	12.59	184.2
6	8.364	0.270	15.46	225.9
7	8.433	0.313	17.94	263.2
8	8.376	0.362	20.76	300.8
9	8.419	0.408	23.38	338.5
10	8.372	0.459	26.28	375.6
11	8.670	0.502	28.77	422.8

Ecology and Environment
Tilt Board Data
NS12 24-48"



Sample ID #	Weight g	Density, ρ (g/cm3):	Moisture Content %
NS12 24-48"	514.33	1.01	870.36

Increment	Average Thickness cm	Calculated Angle, θ Rad.	Deg.	Yield Shear Strength, τ Pa
Initial	8.133	0.000	0.00	0.0
1	7.291	0.054	3.10	39.0
2	7.310	0.097	5.55	69.9
3	7.259	0.123	7.06	88.2
4	7.305	0.183	10.50	131.5
5	7.190	0.232	13.31	163.6
6	7.295	0.278	15.95	198.1
7	7.209	0.312	17.88	218.7
8	7.135	0.365	20.91	251.6
9	6.331	0.414	23.72	251.7

Moisture Content of Cores When Divided in Half (1)

Core ID	Moisture Content %	Date
NS05	126.0	4/23/2009
NS06	38.11	4/24/2009
NS12	880.5	4/23/2009
NS18	842.8	4/24/2009

1. Moisture contents taken from the center of core when divided into two sample, except for NS06. The moisture content was taken from the bottom of the NS06 core in an effort not to disturb the sample.

Moisture Content of Tilt Board Sample

Sample ID	Moisture Content %	Date
NS05 0-24"	119.62	5/21/2009
NS06 0-18"	42.56	5/28/2009
NS12 0-24"	252.49	5/19/2009
NS18 0-24"	163.05	5/14/2009
NS05 24-48"	683.69	5/27/2009
NS12 24-48"	870.36	5/14/2009

OW23

Ecology & Environment
002330.WD10

Torvane Test Readings (kg/cm^2)

Sample	Torvane Shear Reading			Average
NS05 0-24"	0.00	0.00	0.00	0.00
NS06 0-18"	0.00	0.00	0.00	0.00
NS12 0-24"	0.16	0.24	0.18	0.19
NS18 0-24"	0.00	0.00	0.00	0.00
NS05 24-48"	0.00	0.00	0.00	0.00
NS12 24-48"	0.00	0.00	0.00	0.00
NS18 24-48"	0.00	0.00	0.00	0.00

Reported precision: 0.01 kg/cm^2

OW23

ANALYTICAL RESOURCES INCORPORATED

Tilt-Board Test

ARI Job No.: OW23
Sample ID: A
Boring Number: NS05 0-24"
Depth: 24"
Test type: Tilt Board

Set-up Date: 5/21/09
Tested By: FI

Sample Weight:	1311.02
wood + Tare Weight:	461.50

Sample Lengths	Sample Diameters
3.708	3.558
3.154	3.631
3.103	3.554

Moisture Content	
Tare Number:	MC
Weight of Tare:	9.78
Wet Weight:	228.70
Dry Weight:	109.46

					Measurement Distance
					15.25
Increment	Sample Thickness			Estimated Angle of Inclination	Board Height
Initial	3.708	3.154	3.103	0	5.5
1	3.539	3.607	3.619	2.5	6 3/32
2	3.502	3.555	3.650	5	6 22/32
3	3.501	3.552	3.614	7.5	7 14/32
4	3.469	3.620	3.719	10	8 6/32
5	3.378	3.598	3.707	12.5	8 29/32
6	3.354	3.591	3.721	15	9 24/32
7	3.276	3.600	3.880	17.5	10 14/32
8	3.121	3.572	3.924	20	11 8/32
9	3.072	3.790	↓	22.5	12 2/32
10					
11					
12					
13					
14					
15					
16					
17					
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19					
20					
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22					
23					
24					

Notes:

ANALYTICAL RESOURCES INCORPORATED

Tilt-Board Test

ARI Job No.: OW23
Sample ID: B
Boring Number: NS06 0-18"
Depth:
Test type: Tilt Board

Set-up Date: FI ~~10/28~~ 5/28/09
Tested By: FI

Sample Weight:	793.39
Tare Weight:	FI ~~46.75~~ 47.57

Sample Lengths	Sample Diameters
3.085	3.606
3.111	3.536
26.654 FI	3.599

Moisture Content	
Tare Number:	B
Weight of Tare:	10.38
Wet Weight:	444.76
Dry Weight:	315.07

Increment	Sample Thickness			Estimated Angle of Inclination	Measurement Distance 15.25 Board Height
Initial	3.085	3.111	2.654	0°	5.5
1	2.822	2.894	2.683	2.5°	6 6/32
2	2.961	2.950	2.681	5°	6 22/32
3	2.944	2.946	2.633	7.5°	FI ~~6~~ 7 14/32
4	2.936	2.980	2.695	10°	8 5/32
5	2.967	2.972	2.776	12.5°	8 29/32
6	2.876	2.955	2.783	15°	9 22/32
7	2.959	2.926	2.674	17.5°	10 11/32
8	2.951	2.995	2.676	20°	11 8/32
9	2.905	3.012	2.676	22.5°	12 1/32
10	2.834	3.013	2.644	25°	13.0
11	2.986	3.002	2.686	27.5°	13 26/32
12	2.949	3.035	2.651	30°	14 29/32
13	2.897	2.974	2.627	32.5°	15 3/32
14	2.935	3.004	2.694	35°	17 1/32
15	2.903	3.020	2.674	37.5	18
16	0	1.265	2.531	40°	
17					
18					
19					
20					
21					
22					
23					
24					

Notes:

ANALYTICAL RESOURCES INCORPORATED

Tilt-Board Test

ARI Job No.: OW23
Sample ID: C
Boring Number: NS12 0-24"
Depth:
Test type: Tilt Board

Set-up Date: 5/19/2009
Tested By: FI

Sample Weight:	573.22
Tare Weight:	72.07

Sample Lengths	Sample Diameters
2.821	3.577
2.805	3.472
2.833	3.574

Moisture Content	
Tare Number:	C
Weight of Tare:	9.73
Wet Weight:	239.06
Dry Weight:	74.79

					Measurement Distance
					15.25
Increment	Sample Thickness			Estimated Angle of Inclination	Board Height
Initial	2.821	2.805	2.833	0	5.5
1	2.754	2.846	2.812	2.5	6 6/32
2	2.792	2.799	2.794	5	6 24/32
3	2.770	2.770	2.830	7.5	7 13/32
4	2.805	2.775	2.860	10	8 6/32
5	2.843	2.770	2.910	12.5	8 31/32
6	2.816	2.770	2.957	15	9 23/32
7	2.821	2.765	2.963	17.5	10 11/32
8	2.746	2.801	3.604	20	11 9/32
9	2.738	2.929	3.166	22.5	12 3/32
10	2.653				13 2/32
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24					

Notes:

ANALYTICAL RESOURCES INCORPORATED

Tilt-Board Test

ARI Job No.: OW23
Sample ID: D
Boring Number: N318 0-24"
Depth: 13.5"
Test type: Tilt Board

Set-up Date: 5/14/09
Tested By: FI/GS

Initial Wt + Tube: 705.80
Wt Tube 76.40

Moisture Content	
Tare Number:	OW23 D TILT BOARD MC
Weight of Tare:	10.29
Wet Weight:	603.13
Dry Weight:	285.66

Sample Lengths	Sample Diameters
3.088	3.530
3.171	3.4397 (FI)
2.987	3.322

Increment	Sample Thickness			Estimated Angle of Inclination	Measurement Distance 15-25 Board Height
Initial	3.088	3.171	2.987	0	5.5
1	3.015	3.177	3.004	2.5°	6 1/8
2	3.062	3.172	3.022	5°	6 22/32
3	2.965	3.086	2.974	7.5°	7.5
4	2.885	2.961	2.819	10°	8 7/32
5	2.839	2.934	2.877	12.5°	8 28/32
6	2.888	2.843	2.820	15°	9 23/32
7	2.841	2.859	2.710	17.5°	10.4
8	2.879	2.782	2.620	20°	11 5/32
9	2.919	2.680	2.476	22.5°	12 5/32
10	2.936	2.624	2.276	25°	12 31/32
11	2.965	2.741	2.089	27.5°	13 28/32
12	2.977	2.673	1.861	30°	14 29/32
13	3.020	2.705	3.100	32.5°	15 28/32
14					
15					
16					
17					
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20					
21					
22					
23					
24					

Notes:

ANALYTICAL RESOURCES INCORPORATED

Tilt-Board Test

ARI Job No.: OW23
Sample ID: E
Boring Number: NSOS 24-48"
Depth:
Test type: Tilt Board

Set-up Date: 5/27/09
Tested By: FI

Sample Weight:	597.33
Tare Weight:	46.75

Sample Lengths	Sample Diameters
2.934	3.575
3.409	3.598
3.294	3.600

Moisture Content	
Tare Number:	E
Weight of Tare:	10.13
Wet Weight:	302.84
Dry Weight:	47.48

					Measurement Distance
					15.25
Increment	Sample Thickness			Estimated Angle of Inclination	Board Height
Initial	2.934	3.409	3.294	0°	5.5
1	2.981	3.395	3.404	2.5	6 5/32
2	3.025	3.387	3.393	5	6 24/32
3	2.958	3.403	3.404	7.5	7 15/32
4	3.006	3.356	3.368	10	8 7/32
5	3.050	3.425	3.374	12.5	8 29/32
6	3.015	3.393	3.471	15	9 23/32
7	3.040	3.438	3.482	17.5	10 14/32
8	2.971	3.390	3.532	20	11 9/32
9	2.991	3.435	3.518	22.5	12 3/32
10	2.900	3.394	3.534	25	13 1/32
11	2.944	3.672	3.624	27.5	13 28/32
12				30	
13					
14					
15					
16					
17					
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20					
21					
22					
23					
24					

Notes:

ANALYTICAL RESOURCES INCORPORATED

Tilt-Board Test

ARI Job No.: OW23
Sample ID: F
Boring Number: ~~NS-12~~ NS12 24-48"
Depth: 26.5'
Test type: Tilt Board

Set-up Date: 5/14/09
Tested By: GR, FI

Initial Wet Wt + tube 560.19
Wt. Tube 45.86

Moisture Content	
Tare Number:	F
Weight of Tare:	10.07
Wet Weight:	450.42
Dry Weight:	55.45

Sample Lengths	Sample Diameters
3.498	3.485
3.129	3.535
2.984	3.537

					Measurement Distance
					15.25
Increment	Sample Thickness			Angle of Inclination	Board Height
Initial	3.498	3.129	2.984	0	5.33
1	2.846	2.940	2.825	2 1/2	6. 5/32
2	2.894	2.906	2.834	5	6 26/32
3	2.839	2.923	2.812	7 1/2	7 13/32
4	2.809	2.996	2.823	10	8 5/32
5	2.749	2.964	2.779	12 1/2	8 30/32
6	2.8858	2.988	2.740	15	9 22/32
7	2.725	2.970	2.820	17 1/2	10 1/4
8	2.680	2.959	2.788	20	11 5/32
9	2.613	2.435	2.430	22 1/2	12 1/32
10					
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23					
24					

Notes:

Analytical Resources, Inc.

VISUAL CORE LOG

ARI Job No.: OW23
Sample ID: B
Client: E & E
Core No.: NS06 0-18"
Depth of Sample: 0-18"
Sample Recovery: 0-18"

Date: 5/26/2009
Sample Extruded by: FI
Sample Logged by: FI
Type: 3.9 in plastic
Diameter of Sample: 3.9

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
		Atterberg, Grain size for None, SG		Top of Recovery Organic silty clay with some rocks, peat. Fuel smell.
			5"	
			10"	
		CONSOL.		
		TILT BOARD, DENSITY	15"	
		MOISTURE CONTENT	18"	

OW23:00106

Analytical Resources, Inc.

VISUAL CORE LOG

ARI Job No.: OW23
Sample ID: F
Client: E & E
Core No.: NS12 24-48"
Depth of Sample: 24-48"
Sample Recovery: 24-48"

Date: 5.14.09
Sample Extruded by: FI
Sample Logged by: FI, RR
Type: 3.9" in plastic
Diameter of Sample: 3.9

Specimen Saved	Water Content (%)	Test Type (Torr Vane, Tilt Bowl	Depth (ft)	Classification and Description
		Tilt Bowl		Top of Recovery
		After grain size, density, moisture content	5"	Organic fines, peat, brown.
			10"	
			15"	
			20"	
			22"	
		CONSOL.		
			25"	

OW23:00167

Analytical Resources, Inc.

VISUAL CORE LOG

Client: E&E
Project: 002330.WD10
Core No.: OW23 D
Core No.: NS18 0-24"
Depth of Sample: FI ~~20"~~ 0-24"
Sample Recovery:

Date: 4/29/09
Sample Extruded by: FI
Sample Logged by: FI
Type: 3.9 in plastic
Diameter of Sample: 3.9

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			0"	Top of Recovery
				Organic fines, peat, clay, brown in color.
		CONSOL.	11"	
		TILT BOARD		
			14"	
		Atterberg, Specific Gravity, Grainsize, Density.		
	842.75	MOIST. CONT.		
			24"	

OW23 : 00108

Analytical Resources, Inc.

VISUAL CORE LOG

Client: E & E
Project: 002330.WD10
Core No.: OW23 G
Core No.: NS18 24-48"
Depth of Sample: 24 – 48"
Sample Recovery:

Date: 4/28/09
Sample Extruded by: gs/FI
Sample Logged by: gs/FI
Type: 3.9 in Plastic
Diameter of Sample: 3.9

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
2 gallon bag	842.75	Torr Vane Shear, Moisture Content.	24"	Top of Recovery
poly-vinyl wrap		CONSOL ~~CONSOL~~	34"	Mostly organic fines, peat, clay, brown in ~~color~~ color.
		Atterberg Limit, Specific Gravity, Grain Size.	36"	
			48"	

OW23:00105

Analytical Resources, Inc.

VISUAL CORE LOG

ARI Job No.: OW23
Sample ID: C
Client: E:E
Core No.: NS,2
Depth of Sample: 24"
Sample Recovery:

Date: 5-18-09
Sample Extruded by: CR FI
Sample Logged by:
Type:
Diameter of Sample:

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
		Torr-Vane Shear		Top of Recovery
				Organic fines and peat
		CONSOL.		
		Atterberg, Grain size, Spg.		
		TILT-BOARD, DENSITY		
		MOISTURE CONTENT		

OW23:00110

Analytical Resources, Inc.

VISUAL CORE LOG

ARI Job No.: OW23
Sample ID: A
Client: E & E
Core No.: NS05 0-24"
Depth of Sample: 0-24"
Sample Recovery: 0-24"

Date: 5/25/09
Sample Extruded by: FI
Sample Logged by: FI
Type: 3.9 in plastic
Diameter of Sample: 3.9

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			Top of Recovery	
			5"	fines in water, in suspension.
			10"	organic fines and peat. several pieces of what looks like charcoal found near bottom (about 5 pieces). fuel odor.
			15"	
		Grain size,		
		CONSOL - (SCOOPED)	20"	
		TILT BOARD, DENSITY		
		MOIST. CONT.	24"	

OW23:00111

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ANALYST NOTES - GeoTech

ARI Job No: OW23 Client Name: E&E

Parameter: _____ Client Project: _____

☐ Job OK, no corrective action required

SpG: OW23B - large chunks of wood (3/8" - 2 1/2") excluded
metal spike (~2 1/2" long) excluded
included chunks of wood, aluminum foil, glass,
black vitreous material

Analyst: _____ Date Completed: _____

ANALYTICAL RESOURCES INCORPORATED

MOISTURE CONTENT DETERMINATION – ASTM D-2216

ARI Job No.: OC023 Tested by: CR
Set-up Date:

ARI Sample ID	Tare #	Wt. Tare (g)	Wt. Wet Soil + Tare (g)	Wt. Dry Soil + Tare (g)	MC %
D & G	MC	10.41	128.82	22.97	842.75
B	MC	10.06	232.48	171.10	
C & F	MC	10.20	170.41	26.54	
A & E	MC	9.71	196.77	92.49	

OC023 : 00113

1103F
Rev. 0

ANALYTICAL RESOURCES INCORPORATED

SPECIFIC GRAVITY DETERMINATION ASTM D 854

ARI Job No.: CW23 Tested by: AS

Set-Up Date: 05/18/09

Method A (moist) X Method B (oven-dried) X

set-up date	05/18/09	05/18/09	05/20/09	06/03/09	06/03/09	06/03/09	06/03/09	
Sample ID	D	G	F	A	B	C	E	
Beaker ID	—	—	—	—	—	—	—	
Flask No.	23	26	25	23	19	31	26	
Flask Wt. (g)	180.45	197.20 (as)	192.92	180.46	181.82	198.00	197.22	
Soil Wt. (g)	57.26	~~40.19~~ 50.00	47.53	50.88	100.55	51.80	53.80	
Vacuum: Start Time	1245	1245	1035	1155	1155	1155	1155	
End Time	1445	1445	1235	1355	1355	1355	1355	
Insulated Cooler: Date In	5/18/09	5/18/09	05/20/09	06/03/09	06/03/09	06/03/09	06/03/09	
Date Out	05/20/09	05/20/09	05/21/09	06/04/09	06/04/09	06/04/09	06/04/09	
Flask, Soil, Water Wt. (g)	714.03	706.27	712.89	709.22	742.93	724.53	718.50	
Temperature (° C)	19.9	19.5	19.3	21.6	21.8	22.5	22.0	
Tare No.	71	76	44	66	48	70	44	
Tare Wt. (g)	160.07	111.24	103.36 (as)	178.57	105.08	111.95	103.61	
Tare + Dry Soil Wt. (g)	219.98	136.01	151.41	228.56	203.96	162.08	154.27	
Initials	as	as	gs	gs	gs	gs	gs	
Specific Gravity	~~2.68~~ 2.419	1.95 3.27g sand	1.946 3.16g sand	2.56	2.724	2.298	1.830	

Recommended Dry Mass for Test Specimen: 500 mL Pycnometer

Poorly Graded Sand-Silty Sand	100 ± 10 g
Silty or Clayey Sand	75 ± 10 g
Silt or Clay	50 ± 10 g

1106F
Rev. 1, 09/03

Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: A
Description: organic fines, peat
Method of size reduction: Quartering [ ] Sample Splitter [ ] Whole Sample [ ]

Moisture Content	
Tare Number	A
Tare Weight	1.53
Wet Soil + Tare (g)	31.35
Dry Soil + Tare (g)	30.27

Tare Number	A
Tare Weight (g)	9.72
Weight Total Sample (g) (Air-dried, not sieved)	264.73
Weight Hydro Test Sample (g)	65.35
Tare + Oven Dry Plus #10 (g)	10.38
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	12.49

Date Set Up 5/26/09
Technician: GS
Hydro Beaker: OW23 A
Hydro #:
Calgon Batch #: 200

6/3/2009

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)	
10:30:00	START				
10:31:00	1	61	5	23.5	F
10:32:00	2	58	5	23.5	F
10:35:00	5	52	5	23.5	F
10:45:00	15	43	5	23.5	F
11:00:00	30	40	5	23.5	F
11:30:00	60	33	5	23.5	
14:40:00	250	24	6	24.5	
10:30:00	1440	17	6	23	

Place D

Sieve Analysis
Date Sieved: 6/5/09 Technician: AR Sieve Set # 3

Sieve Size	Cumulative Weight
Empty Tare	9.82
2"	
1"	
3/4	
1/2	
3/8	
#4	9.87
#10	10.30
#20	10.65
#40	10.97
#60	11.24
#100	11.55
#200	12.21
Pan	12.50

OW23 : 00115

Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: B
Description: organic fines and peat, organic silt and rocks.
Method of size reduction: Quartering [✓] Sample Splitter [ ] Whole Sample [ ]

Moisture Content	
Tare Number	B
Tare Weight	1.50
Wet Soil + Tare (g)	36.29
Dry Soil + Tare (g)	35.47

Tare Number	B
Tare Weight (g)	10.15
Weight Total Sample (g) (Air-dried, not sieved)	458.36 ~~307.78~~
Weight Hydro Test Sample (g)	69.88
Tare + Oven Dry Plus #10 (g)	57.81
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	111.91

Date Set Up 6/2/09
Technician: EG
Hydro Beaker: AX1
Hydro #:
Calgon Batch #: 200

Place D

6/3/2009 Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
10:39:00	START			
10:40:00	1	15	5	23.5
10:41:00	2	14	5	23.5
10:44:00	5	13	5	23.5
10:54:00	15	12	5	23.5
11:09:00	30	12	5	23.5
11:39:00	60	9	5	23.5
14:49:00	250	8	6	24.5
10:39:00	1440	7	6	23

Sieve Analysis
Date Sieved: 6/5/09 Technician: AR Sieve Set # 4

Sieve Size	Cumulative Weight
Empty Tare	10.32
2"	
1"	
3/4	
1/2	12.76
3/8	20.44
#4	33.18
#10	52.35
#20	61.35
#40	72.05
#60	87.49
#100	102.06
#200	110.86
Pan	112.32

Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: C
Description: organic clay and peat
Method of size reduction: Quartering [4] Sample Splitter [ ] Whole Sample [ ]

Moisture Content	
Tare Number	C
Tare Weight	1.48
Wet Soil + Tare (g)	26.59
Dry Soil + Tare (g)	25.58

Tare Number	C
Tare Weight (g)	10.25
Weight Total Sample (g) (Air-dried, not sieved)	180.03 ~~29.86~~
Weight Hydro Test Sample (g)	65.04
Tare + Oven Dry Plus #10 (g)	10.35
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	12.48

5/26/09
Date Set Up ~~5/20/9~~
Technician: ~~EG~~ GS
Hydro Beaker: ~~*~~OW23C
Hydro #:
Calgon Batch #: 200

6/3/2009

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)	
10:48:00	START				
10:49:00	1	63	5	23.5	F
10:50:00	2	59	5	23.5	F
10:53:00	5	56	5	23.5	F
11:03:00	15	47.5	5	23.5	F
11:18:00	30	41	5	23.5	
11:48:00	60	35	5	23.5	
14:58:00	250	23	6	24.5	
10:48:00	1440	16	6	23	

Place D

Sieve Analysis
Date Sieved: 6/5/09 Technician: ~~*~~KAR Sieve Set # 4

Sieve Size	Cumulative Weight
Empty Tare	10.33
2"	
1"	
3/4	
1/2	
3/8	
#4	
#10	10.55
#20	10.78
#40	10.91
#60	11.09
#100	11.42
#200	12.34
Pan	12.51

35
35
35
35

Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: D
Description: peat and clay, organic
Method of size reduction: Quartering [✓] Sample Splitter [ ] Whole Sample [ ]

Moisture Content		
Tare Number	D MC	D
Tare Weight	1.54	1.55
Wet Soil + Tare (g)	34.88	26.78
Dry Soil + Tare (g)	~~4.99~~	25.46
	5.00 eq	

Tare Number	D
Tare Weight (g)	10.75
Weight Total Sample (g) (Air-dried, not sieved)	108.69
Weight Hydro Test Sample (g)	105.37
Tare + Oven Dry Plus #10 (g)	20.77
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	17.57

5/20/9
Date Set Up 4/29/09
Technician: ~~EB~~ EG
Hydro Beaker: P1
Hydro #: 199344
Calgon Batch #: 200

Place D

5/26/2009 Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)	
12:45:00	START				
12:46:00	1	61	56	23	F
12:47:00	2	59	56	23	F
12:50:00	5	55	56	23	F
13:00:00	15	48	56	23	F
13:15:00	30	42	56	23	F
13:45:00	60	35	56	23	F
16:55:00	250	23	5	24	
12:45:00	1440	18	6.5	23	

Sieve Analysis
Date Sieved: 6/5/09 Technician: AR Sieve Set # 3

Sieve Size	Cumulative Weight
Empty Tare	10.79
2"	
1"	
3/4	
1/2	
3/8	
#4	
#10	10.88
#20	12.76
#40	13.48
#60	14.09
#100	15.06
#200	16.70
Pan	17.53

OW23:0011B

Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: E

Description: organic fines and peat

Method of size reduction: Quartering [✓] Sample Splitter [ ] Whole Sample [ ]

Moisture Content	
Tare Number	E
Tare Weight	1.~~4~~150
Wet Soil + Tare (g)	44.44
Dry Soil + Tare (g)	42.87

Tare Number	E
Tare Weight (g)	10.06
Weight Total Sample (g) (Air-dried, not sieved)	248.76
Weight Hydro Test Sample (g)	65.23
Tare + Oven Dry Plus #10 (g)	10.89
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	15.24

Date Set Up 6/2/09

Technician: cg

Hydro Beaker: P1

Hydro #:

Calgon Batch #: 200

Place D	Time (6/3/2009)	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
	10:57:00	START			
	10:58:00	1	60	5	23.5 F
	10:59:00	2	56	5	23.5 F
	11:02:00	5	51.5	5	23.5 F
	11:12:00	15	45	5	23.5 F
	11:27:00	30	40	5	23.5 F
	11:57:00	60	32	5	23.5
	15:07:00	250	24	6	24.5
	10:57:00	1440	16.5	6	23

Sieve Analysis

Date Sieved: 6/5/09 Technician: AR Sieve Set # 3

Sieve Size	Cumulative Weight
Empty Tare	10.17
2"	
1"	
3/4	AR
1/2	10.~~85~~ 79
3/8	
#4	
#10	10.84
#20	11.58
#40	12.11
#60	12.52
#100	12.97
#200	14.48
Pan	15.23

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Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: F
Description: clay and peat, organic
Method of size reduction: Quartering [ ] Sample Splitter [ ] Whole Sample [ ]

Moisture Content	
Tare Number	F
Tare Weight	1.49
Wet Soil + Tare (g)	16.58
Dry Soil + Tare (g)	~~9.89~~ 13.87

(9.89)

Tare Number	F
Tare Weight (g)	9.89
Weight Total Sample (g) (Air-dried, not sieved)	142.66
Weight Hydro Test Sample (g)	65.19
Tare + Oven Dry Plus #10 (g)	9.89
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	10.27

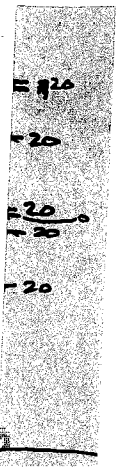
Date Set Up 5/26/09
Technician: GS
Hydro Beaker: OW23 F
Hydro #:
Calgon Batch #: 200

Place D

6/3/2009 Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)	
11:06:00	START				
11:07:00	1	49	5	23.5	F
11:08:00	2	48	5	23.5	F
11:11:00	5	44.5	5	23.5	F
11:21:00	15	39	5	23.5	F
11:36:00	30	37	5	23.5	F
12:06:00	60	33	5	23.5	F
15:16:00	250	18	6	24.5	F
11:06:00	1440	11	6	23	F

Sieve Analysis
Date Sieved: 6/05/09 Technician: AR Sieve Set # 4

Sieve Size	Cumulative Weight
Empty Tare	9.90
2"	
1"	
3/4	
1/2	
3/8	
#4	
#10	
#20	9.95
#40	10.04
#60	10.09
#100	10.13
#200	10.24
Pan	10.27



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Hydrometer Analysis - ASTM D421/422

ARI Job No.: OW23 ARI Sample ID.: G
Description: Mostly organic fines, peat, clay
Method of size reduction: Quartering [ ] Sample Splitter [ ] Whole Sample [ ]

hygroscopic moisture content

Moisture Content		
Tare Number	G	G
Tare Weight	1.53	1.57
Wet Soil + Tare (g)	30.63	13.39
Dry Soil + Tare (g)	5.00	12.61

use w/ hydro

Tare Number	G
Tare Weight (g)	10.52
Weight Total Sample (g) (Air-dried, not sieved)	88.36
Weight Hydro Test Sample (g)	65.40
Tare + Oven Dry Plus #10 (g)	10.58
Tare + Oven Dry After # 200 Wash (g) (Plus #10 Included)	26.32

Date Set Up 4/28/09
Technician: EG
Hydro Beaker: AX1
Hydro #: 199344
Calgon Batch #: 199

Place D	5/26/2009 Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)	
	12:54:00	START				
	12:55:00	1	55	65	23	F
	12:56:00	2	53.5	65	23	F
	12:59:00	5	51	65	23	F
	13:09:00	15	43.5	65	23	F
	13:24:00	30	40	65	23	F
	13:54:00	60	36.5	65	23	F
	17:04:00	250	16	5	24	
	12:54:00	1440	13	6.5	23	

Sieve Analysis
Date Sieved: 5/28/09 Technician: AR Sieve Set # 4

Sieve Size	Cumulative Weight
Empty Tare	10.60
2"	
1"	
3/4	
1/2	
3/8	
#4	10.63
#10	17.89
#20	21.43
#40	22.53
#60	23.09
#100	23.63
#200	24.83
Pan	26.33

AR

Sample is hard as a brick

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Sieve/Hydrometer Calculation page

A

Sample Number:	NS05 0-24"	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.98	99.80	99.25	98.74	98.32	97.82	96.78	84.10	74.58	60.30	55.54	44.43	28.56	17.46
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	24.1	16.3	10.3	7.4	5.6	2.9	1.26
Test Temperature	23.5	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Wet Wt & Tare	31.35
Dry Wt & Tare	30.27
Wt Moisture	1.08
Wt Tare	1.53
Dry Soil	28.74
Moisture Content	0.03757829
Air Dry Total Sample	255.01
Oven Dry Total Samp	245.79161
Air Dry Hydro Sample	65.35
Oven Dry Wt Hydro	62.9831992
Amount Plus #10	0.48
W (14.2) =	63.1064381

Sieve Analysis Portion						Hydrometer Analysis Portion							
Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
5"	9.82	0.00		0.00	100.00								
3"	9.82	0.00		0.00	100.00								
2"	9.82	0.00		0.00	100.00								
1.5"	9.82	0.00		0.00	100.00	1	61	5.0	88.86	6.3	32.77318	0.013057	1.001385
1	9.82	0.00		0.00	100.00	2	58	5.0	84.10	6.8	24.06148	0.013057	1.001385
3/4	9.82	0.00		0.00	100.00	5	52	5.0	74.58	7.8	16.2823	0.013057	1.001385
1/2	9.82	0.00		0.00	100.00	15	43	5.0	60.30	9.3	10.25362	0.013057	1.001385
3/8	9.82	0.00		0.00	100.00	30	40	5.0	55.54	9.7	7.440606	0.013057	1.001385
4	9.87	0.05		0.02	99.98	60	33	5.0	44.43	10.9	5.56249	0.013057	1.001385
10	10.3	0.48		0.20	99.80	250	24	6.0	28.56	12.4	2.903765	0.013057	1.001385
20	10.65	0.35	0.55	0.75	99.25	1440	17	6.0	17.46	13.5	1.264791	0.013057	1.001385
40	10.97	0.67	1.06	1.26	98.74								
60	11.24	0.94	1.49	1.68	98.32								
100	11.55	1.25	1.98	2.18	97.82								
200	12.21	1.91	3.03	3.22	96.78								

Sample Number:	NS06 0-18"	100.00	100.00	100.00	100.00	100.00	100.00	99.37	97.40	94.14	89.22	77.45	63.46	43.27	24.22	12.71	11.78	10.47	9.17	9.17	5.24	2.62	1.31
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	34.5	22.0	12.8	9.0	6.5	3.2	1.34
Test Temperature	23.5	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Wet Wt & Tare	36.29
Dry Wt & Tare	35.47
Wt Moisture	0.82
Wt Tare	1.5
Dry Soil	33.97
Moisture Content	0.024138946
Air Dry Total Sample	398.21
Oven Dry Total Samp	389.8148405
Air Dry Hydro Sample	69.88
Oven Dry Wt Hydro	68.232929
Amount Plus #10	42.03
W (14.2) =	76.47891811

Sieve Analysis Portion

Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing
5"	10.32	0.00		0.00	100.00
3"	10.32	0.00		0.00	100.00
2"	10.32	0.00		0.00	100.00
1.5"	10.32	0.00		0.00	100.00
1	10.32	0.00		0.00	100.00
3/4	10.32	0.00		0.00	100.00
1/2	12.76	2.44		0.63	99.37
3/8	20.44	10.12		2.60	97.40
4	33.18	22.86		5.86	94.14
10	52.35	42.03		10.78	89.22
20	61.35	9.00	11.77	22.55	77.45
40	72.05	19.70	25.76	36.54	63.46
60	87.49	35.14	45.95	56.73	43.27
100	102.06	49.71	65.00	75.78	24.22
200	110.86	58.51	76.50	87.29	12.71

Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
1	15	5	13.09	13.8	48.57413	0.013057	1.001385
2	14	5	11.78	14.0	34.54989	0.013057	1.001385
5	13	5	10.47	14.2	21.97877	0.013057	1.001385
15	12	5	9.17	14.3	12.76264	0.013057	1.001385
30	12	5	9.17	14.3	9.024549	0.013057	1.001385
60	9	5	5.24	14.8	6.489868	0.013057	1.001385
250	8	6	2.62	15.0	3.196902	0.013057	1.001385
1440	7	6	1.31	15.2	1.339306	0.013057	1.001385

Sample Number:	NS12 0-24"	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.86	99.50	99.29	99.00	98.47	97.00	86.51	81.70	68.09	57.67	48.06	27.23	16.02
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	23.8	15.6	9.8	7.4	5.5	2.9	1.27
Test Temperature	23.5	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Wet Wt & Tare	26.59
Dry Wt & Tare	25.58
Wt Moisture	1.01
Wt Tare	1.48
Dry Soil	24.1
Moisture Content	0.041908714
Air Dry Total Sample	169.78
Oven Dry Total Samp	162.9597849
Air Dry Hydro Sample	65.04
Oven Dry Wt Hydro	62.42389486
Amount Plus #10	0.22
W (14.2) =	62.50828269

Sieve Analysis Portion

Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing
5"	10.33	0.00		0.00	100.00
3"	10.33	0.00		0.00	100.00
2"	10.33	0.00		0.00	100.00
1 1/2"	10.33	0.00		0.00	100.00
1	10.33	0.00		0.00	100.00
3/4	10.33	0.00		0.00	100.00
1/2	10.33	0.00		0.00	100.00
3/8	10.33	0.00		0.00	100.00
4	10.33	0.00		0.00	100.00
10	10.55	0.22		0.14	99.86
20	10.78	0.23	0.37	0.50	99.50
40	10.91	0.36	0.58	0.71	99.29
60	11.09	0.54	0.86	1.00	99.00
100	11.42	0.87	1.39	1.53	98.47
200	12.34	1.79	2.86	3.00	97.00

Hydrometer Analysis Portion

Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
1	63	5	92.92	6.0	31.90918	0.013057	1.001385
2	59	5	86.51	6.6	23.76938	0.013057	1.001385
5	56	5	81.70	7.1	15.58073	0.013057	1.001385
15	47.5	5	68.09	8.5	9.836355	0.013057	1.001385
30	41	5	57.67	9.6	7.37775	0.013057	1.001385
60	35	5	48.06	10.6	5.478126	0.013057	1.001385
250	23	6	27.23	12.5	2.922947	0.013057	1.001385
1440	16	6	16.02	13.7	1.272439	0.013057	1.001385

Sample Number:	NS18 0-24"		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.90	96.87	95.71	94.73	93.16	90.52	85.59	79.13	67.82	58.14	46.83	29.07	18.57
			125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	23.9	15.8	9.8	7.4	5.5	2.9	1.26
Test Temperature		23	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity		2.65																						

Wet Wt & Tare	26.78
Dry Wt & Tare	25.46
Wt Moisture	1.32
Wt Tare	1.55
Dry Soil	23.91
Moisture Content	0.055207026
Air Dry Total Sample	97.94
Oven Dry Total Samp	92.82061831
Air Dry Hydro Sample	65.37
Oven Dry Wt Hydro	61.94992866
Amount Plus #10	0.09
W (14.2) =	62.01005436

Sieve Analysis Portion

Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing
5"	10.79	0.00		0.00	100.00
3"	10.79	0.00		0.00	100.00
2"	10.79	0.00		0.00	100.00
1.5"	10.79	0.00		0.00	100.00
1	10.79	0.00		0.00	100.00
3/4	10.79	0.00		0.00	100.00
1/2	10.79	0.00		0.00	100.00
3/8	10.79	0.00		0.00	100.00
4	10.79	0.00		0.00	100.00
10	10.88	0.09		0.10	99.90
20	12.76	1.88	3.03	3.13	96.87
40	13.48	2.60	4.19	4.29	95.71
60	14.09	3.21	5.18	5.27	94.73
100	15.06	4.18	6.74	6.84	93.16
200	16.7	5.82	9.39	9.48	90.52

Hydrometer Analysis Portion

Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
1	61	6	88.82	6.3	32.95943	0.013131	1.001385
2	59	6	85.59	6.6	23.90446	0.013131	1.001385
5	55	6	79.13	7.3	15.8486	0.013131	1.001385
15	48	6	67.82	8.4	9.844524	0.013131	1.001385
30	42	6	58.14	9.4	7.355921	0.013131	1.001385
60	35	6	46.83	10.6	5.509258	0.013131	1.001385
250	23	5	29.07	12.5	2.939558	0.013131	1.001385
1440	18	6.5	18.57	13.3	1.26424	0.013131	1.001385

Sample Number:	NS05 24-48"	100.00	100.00	100.00	100.00	100.00	100.00	99.73	99.73	99.73	99.71	98.53	97.69	97.04	96.33	93.93	81.03	73.88	63.55	55.61	42.90	28.60	16.68
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	24.6	16.4	10.1	7.4	5.6	2.9	1.27
Test Temperature	23.5	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Wet Wt & Tare	44.44
Dry Wt & Tare	42.87
Wt Moisture	1.57
Wt Tare	1.5
Dry Soil	41.37
Moisture Content	0.037950205
Air Dry Total Sample	238.7
Oven Dry Total Samp	229.9969935
Air Dry Hydro Sample	65.23
Oven Dry Wt Hydro	62.84501863
Amount Plus #10	0.67
W (14.2) =	63.02862616

Sieve Analysis Portion

Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing
5"	10.17	0.00		0.00	100.00
3"	10.17	0.00		0.00	100.00
2"	10.17	0.00		0.00	100.00
1.5"	10.17	0.00		0.00	100.00
1	10.17	0.00		0.00	100.00
3/4	10.17	0.00		0.00	100.00
1/2	10.79	0.62		0.27	99.73
3/8	10.79	0.62		0.27	99.73
4	10.79	0.62		0.27	99.73
10	10.84	0.67		0.29	99.71
20	11.58	0.74	1.17	1.47	98.53
40	12.11	1.27	2.01	2.31	97.69
60	12.52	1.68	2.67	2.96	97.04
100	12.97	2.13	3.38	3.67	96.33
200	14.48	3.64	5.78	6.07	93.93

Hydrometer Analysis Portion

Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
1	60	5	87.38	6.5	33.19675	0.013057	1.001385
2	56	5	81.03	7.1	24.63529	0.013057	1.001385
5	51.5	5	73.88	7.9	16.36788	0.013057	1.001385
15	45	5	63.55	8.9	10.0703	0.013057	1.001385
30	40	5	55.61	9.7	7.440606	0.013057	1.001385
60	32	5	42.90	11.1	5.604195	0.013057	1.001385
250	24	6	28.60	12.4	2.903765	0.013057	1.001385
1440	16.5	6	16.68	13.6	1.26862	0.013057	1.001385

Sample Number:	NS12 24-48"	100	100	100	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.91	99.74	99.64	99.57	99.36	80.51	73.96	63.66	59.92	52.43	22.47	9.36
		########	75000.00	50000.00	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	26.8	17.5	10.6	7.6	5.6	3.0	1.31
Test Temperature	23.5	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Wet Wt & Tare	16.58
Dry Wt & Tare	13.87
Wt Moisture	2.71
Wt Tare	1.49
Dry Soil	12.38
Moisture Content	0.218901454
Air Dry Total Sample	132.77
Oven Dry Total Samp	108.925951
Air Dry Hydro Sample	65.19
Oven Dry Wt Hydro	53.48258449
Amount Plus #10	0.00
W (14.2) =	53.48258449

Sieve Analysis Portion					
Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing
5"	9.9	0.00		0.00	100.00
3"	9.9	0.00		0.00	100.00
2"	9.9	0.00		0.00	100.00
1.5"	9.9	0.00		0.00	100.00
1	9.9	0.00		0.00	100.00
3/4	9.9	0.00		0.00	100.00
1/2	9.9	0.00		0.00	100.00
3/8	9.9	0.00		0.00	100.00
4	9.9	0.00		0.00	100.00
10	9.9	0.00		0.00	100.00
20	9.95	0.05	0.09	0.09	99.91
40	10.04	0.14	0.26	0.26	99.74
60	10.09	0.19	0.36	0.36	99.64
100	10.13	0.23	0.43	0.43	99.57
200	10.24	0.34	0.64	0.64	99.36

Hydrometer Analysis Portion							
Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
1	49	5	82.38	8.3	37.5419	0.013057	1.001385
2	48	5	80.51	8.4	26.80799	0.013057	1.001385
5	44.5	5	73.96	9.0	17.52219	0.013057	1.001385
15	39	5	63.66	9.9	10.61075	0.013057	1.001385
30	37	5	59.92	10.2	7.626066	0.013057	1.001385
60	33	5	52.43	10.9	5.56249	0.013057	1.001385
250	18	6	22.47	13.3	3.017031	0.013057	1.001385
1440	11	6	9.36	14.5	1.310009	0.013057	1.001385

Sample Number:	NS18 24-48"	100	100	100	100.00	100.00	100.00	100.00	100.00	99.96	90.04	84.82	83.20	82.37	81.58	79.81	71.59	67.90	56.83	51.66	46.50	16.24	10.33
		########	75000.00	50000.00	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	25.5	16.5	10.3	7.5	5.4	3.1	1.30
Test Temperature	23	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Wet Wt & Tare	13.39
Dry Wt & Tare	12.61
Wt Moisture	0.78
Wt Tare	1.57
Dry Soil	11.04
Moisture Content	0.070652174
Air Dry Total Sample	77.84
Oven Dry Total Samp	73.18441624
Air Dry Hydro Sample	65.4
Oven Dry Wt Hydro	61.08426396
Amount Plus #10	7.29
W (14.2) =	67.84210946

Sieve Analysis Portion					
Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing
5	10.6	0.00		0.00	100.00
3	10.6	0.00		0.00	100.00
2	10.6	0.00		0.00	100.00
1.5	10.6	0.00		0.00	100.00
1	10.6	0.00		0.00	100.00
3/4	10.6	0.00		0.00	100.00
1/2	10.6	0.00		0.00	100.00
3/8	10.6	0.00		0.00	100.00
4	10.63	0.03		0.04	99.96
10	17.89	7.29		9.96	90.04
20	21.43	3.54	5.22	15.18	84.82
40	22.53	4.64	6.84	16.80	83.20
60	23.09	5.20	7.66	17.63	82.37
100	23.63	5.74	8.46	18.42	81.58
200	24.83	6.94	10.23	20.19	79.81

Hydrometer Analysis Portion							
Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
1	55	5	73.80	7.3	35.43856	0.013131	1.001385
2	53.5	5	71.59	7.5	25.47826	0.013131	1.001385
5	51	5	67.90	7.9	16.54652	0.013131	1.001385
15	43.5	5	56.83	9.2	10.26611	0.013131	1.001385
30	40	5	51.66	9.7	7.482891	0.013131	1.001385
60	36.5	5	46.50	10.3	5.444759	0.013131	1.001385
250	16	5	16.24	13.7	3.071208	0.013131	1.001385
1440	13	6	10.33	14.2	1.302472	0.013131	1.001385

Analytical Resources, Inc.

Consolidation Data

ASTM D-2435

ARI Job No.	OW23	Boring No.	NS12 0-24
Date	5/20/2009	Sample No.	C
Technician	FI	Depth	7'

Initial	
Wt. of ring + soil	325.06
Weight of ring	247.49

Final	
Wt. of ring + soil	~~467~~ FI 313.24

Initial Dial Reading	
Dial Reading after Seating Load	
Indent?	

Final Moisture	
Tare #	Conso Ring MC
Tare Weight	1.57
Wet Weight	67.22
Dry Weight	21.58

Load	d_0	d_{90}	d_{100}	df	t_{90}	H	c_v
1/32							
1/16							
1/8							
1/4							
1/2							
1							
2							
4							
8							
16							
32							
64							
16							
4							
1							
1/4							
1/16							
1/32							

Analytical Resources, Inc.

Consolidation Data

ASTM D-2435

ARI Job No.	OW23	Boring No.	NS05 0-24"
Date	5/22/09	Sample No.	A
Technician	FB	Depth	20"

Initial	
Wt. of ring + soil	330.40
Weight of ring	247.49

Initial Dial Reading	
Dial Reading after Seating Load	

Final	
Wt. of ring + soil	309.10

Indent?	

Final Moisture	
Tare #	consol # MC
Tare Weight	1.56
Wet Weight	62.91
Dry Weight	27.14

Load	d_0	d_{90}	d_{100}	df	t_{90}	H	c_v
1/32							
1/16							
1/8							
1/4							
1/2							
1							
2							
4							
8							
16							
32							
64							
16							
4							
1							
1/4							
1/16							
1/32							

NOTE: sample scooped into container for consolidation.

Consolidation Data

ASTM D-2435

ARI Job No.	OW23	Boring No.	~~NB~~ NS18 24-48"
Date	5/18/09	Sample No.	G
Technician	FI	Depth	34"

Initial	
cap + Wt. of ring + soil	~~30~~.36
cap + Weight of ring	247.49

Initial Dial Reading	
Dial Reading after Seating Load	

Final	
capt Wt. of ring + soil	304.88

Indent?	

Final Moisture	
Tare #	Consol MC
Tare Weight	1.57
Wet Weight	58.81
Dry Weight	~~40.39~~ 9.83

Load	d_0	d_{90}	d_{100}	df	t_{90}	H	c_v
1/32							
1/16							
1/8							
1/4							
1/2							
1							
2							
4							
8							
16							
32							
64							
16							
4							
1							
1/4							
1/16							
1/32							

Analytical Resources, Inc.

Consolidation Data

ASTM D-2435

ARI Job No.	OW23	Boring No.	NS05 24-48"
Date	5/26/09	Sample No.	E
Technician	FI	Depth	27"

Initial	
cup+ Wt. of ring + soil	325.30
cup+ Weight of ring	247.49

Initial Dial Reading	
Dial Reading after Seating Load	

Final	
cup+ Wt. of ring + soil	~~285~~ 316.12 FI

Indent?	

Final Moisture	
Tare #	CONSOL MC
Tare Weight	1.53
Wet Weight	69.90
Dry Weight	28.99

Load	d_0	d_{90}	d_{100}	df	t_{90}	H	c_v
1/32							
1/16							
1/8							
1/4							
1/2							
1							
2							
4							
8							
16							
32							
64							
16							
4							
1							
1/4							
1/16							
1/32							

Analytical Resources, Inc.

Consolidation Data

ASTM D-2435

ARI Job No.	OW23	Boring No.	NS12 24-48
Date	5/15/09	Sample No.	F
Technician	FI	Depth	24"

Initial	
Wt. of ring + soil	319.69
Weight of ring	247.49

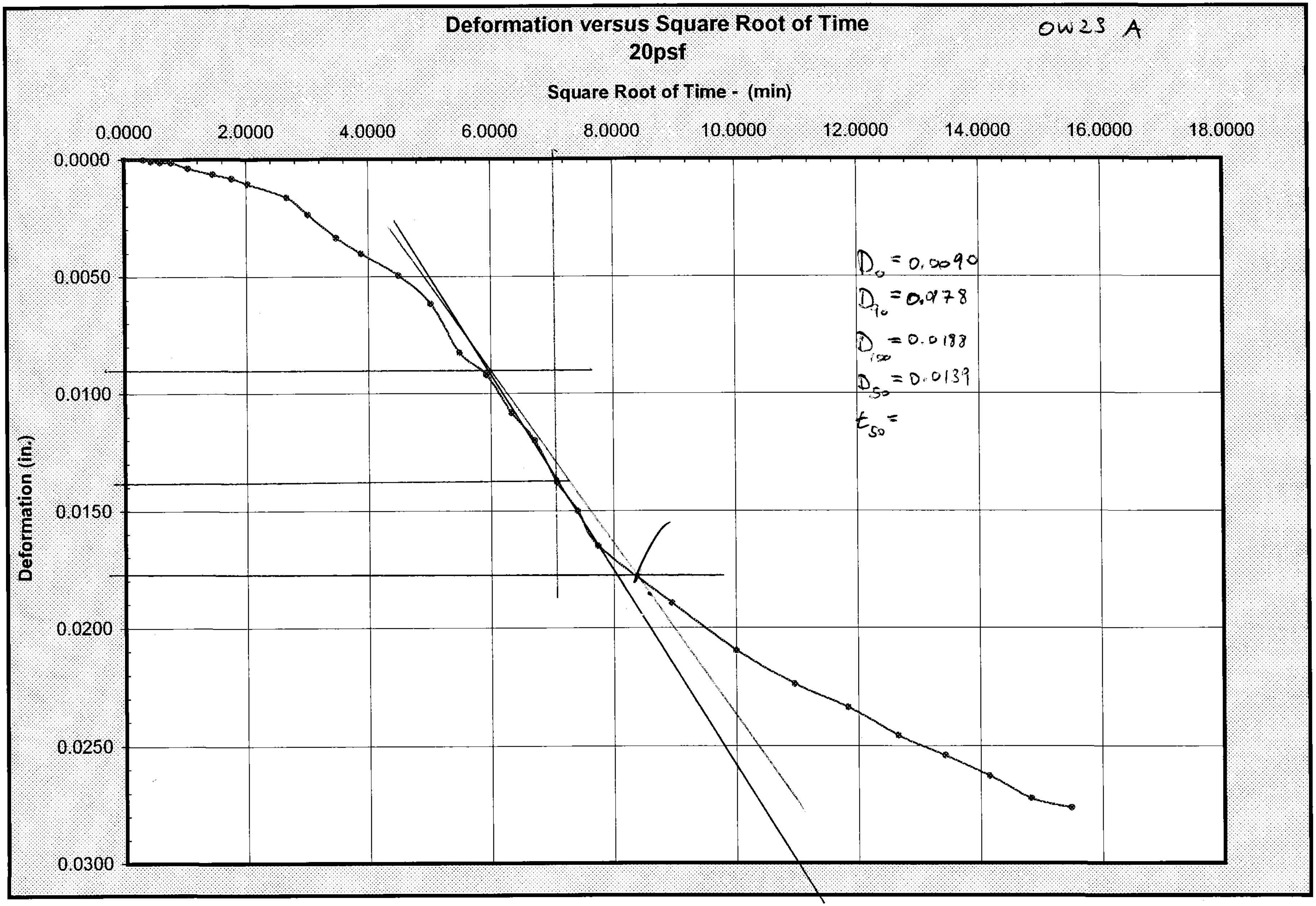
Initial Dial Reading	
Dial Reading after Seating Load	

Final	
Wt. of ring + soil	278.33

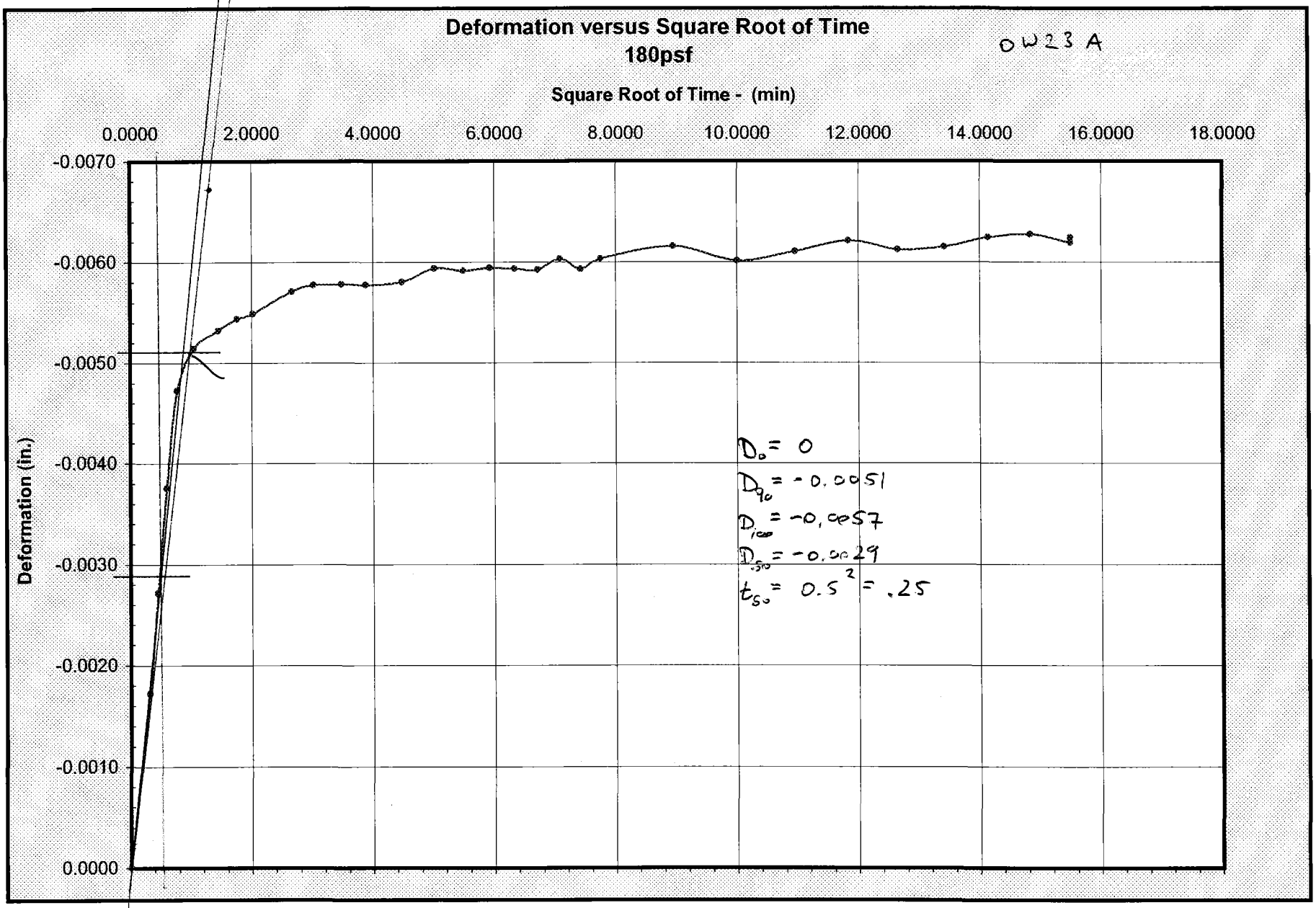
Indent?	

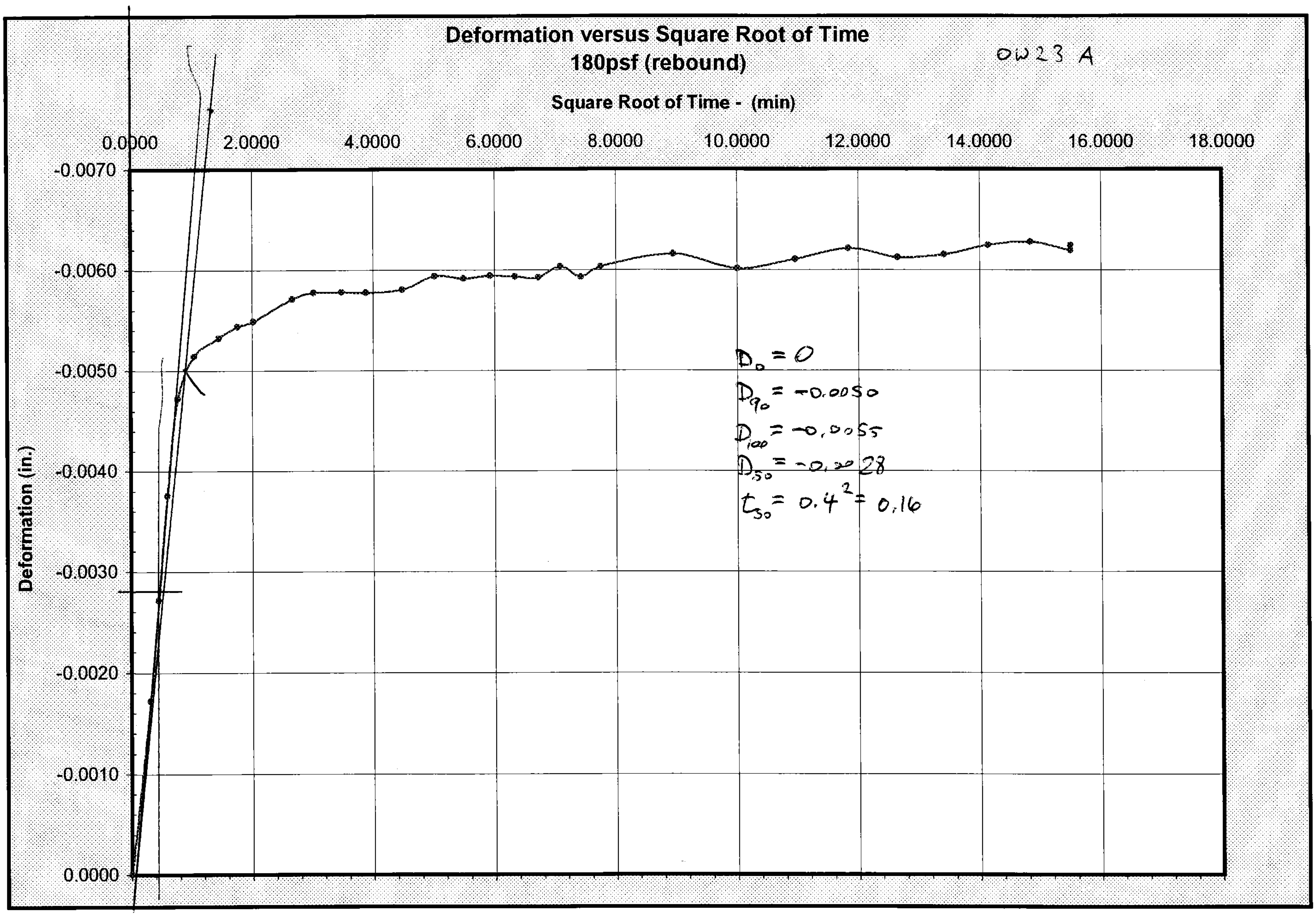
Final Moisture	
Tare #	Consol MC
Tare Weight	1.54
Wet Weight	62.20
Dry Weight	10.39

Load	d_0	d_{90}	d_{100}	df	t_{90}	H	c_v
1/32							
1/16							
1/8							
1/4							
1/2							
1							
2							
4							
8							
16							
32							
64							
16							
4							
1							
1/4							
1/16							
1/32							



Deformation versus Square Root of Time
20psf
OW23 A
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
D_0 = 0.0090
D_{90} = 0.978
D_{100} = 0.0188
D_{50} = 0.0139
t_{50} =


Deformation versus Square Root of Time
180psf
OW23 A
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
-0.0070
-0.0060
-0.0050
-0.0040
-0.0030
-0.0020
-0.0010
0.0000
D_o = 0
D_{90} = -0.0051
D_{100} = -0.0057
D_{50} = -0.0029
t_{50} = 0.5² = .25


Deformation versus Square Root of Time
180psf (rebound)
OW23 A
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
-0.0070
-0.0060
-0.0050
-0.0040
-0.0030
-0.0020
-0.0010
0.0000
D0 = 0
D90 = -0.0050
D100 = -0.0055
D50 = -0.0028
t50 = 0.4² = 0.16

ANALYTICAL RESOURCES INCORPORATED

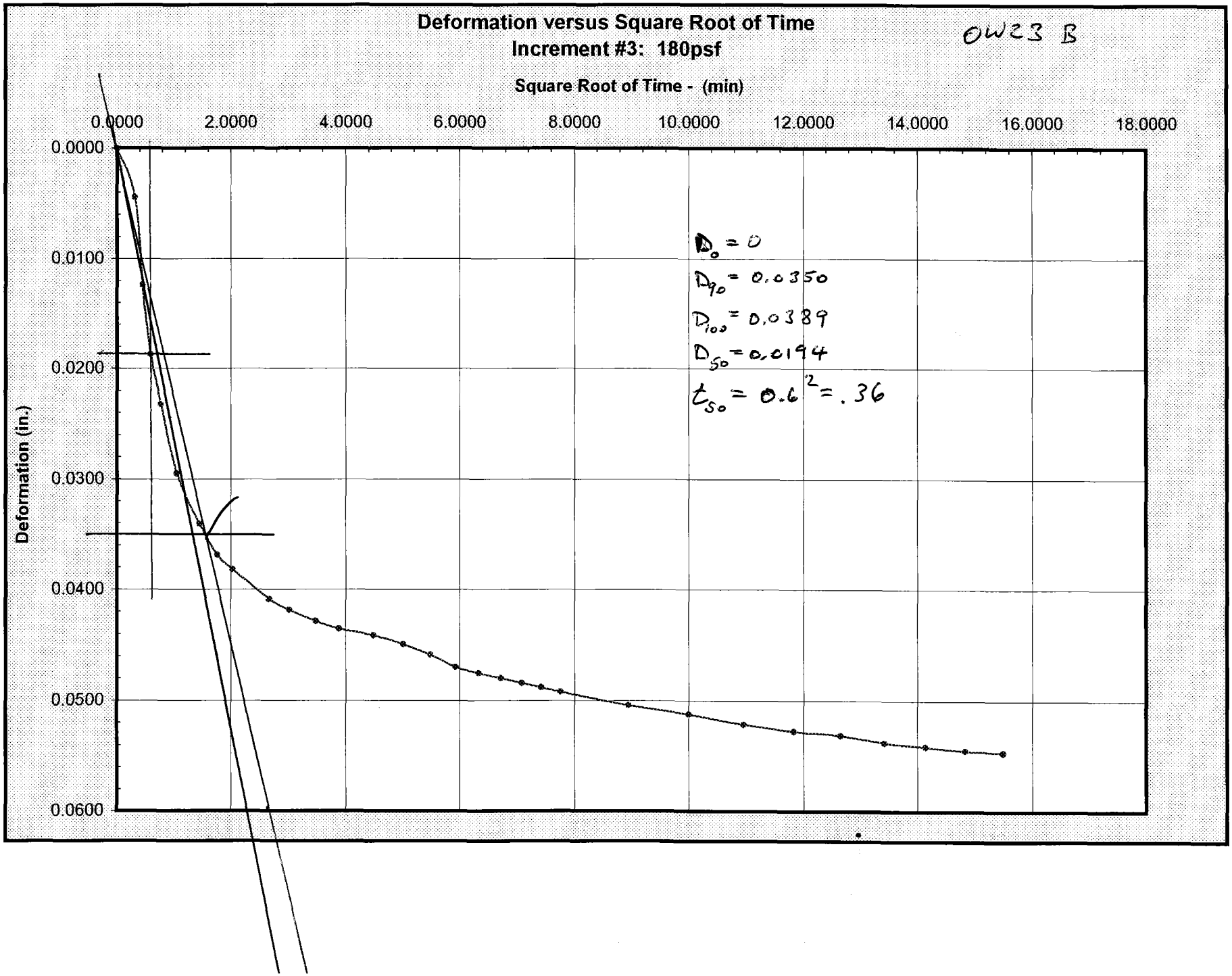
Density, Moisture Content, and Porosity

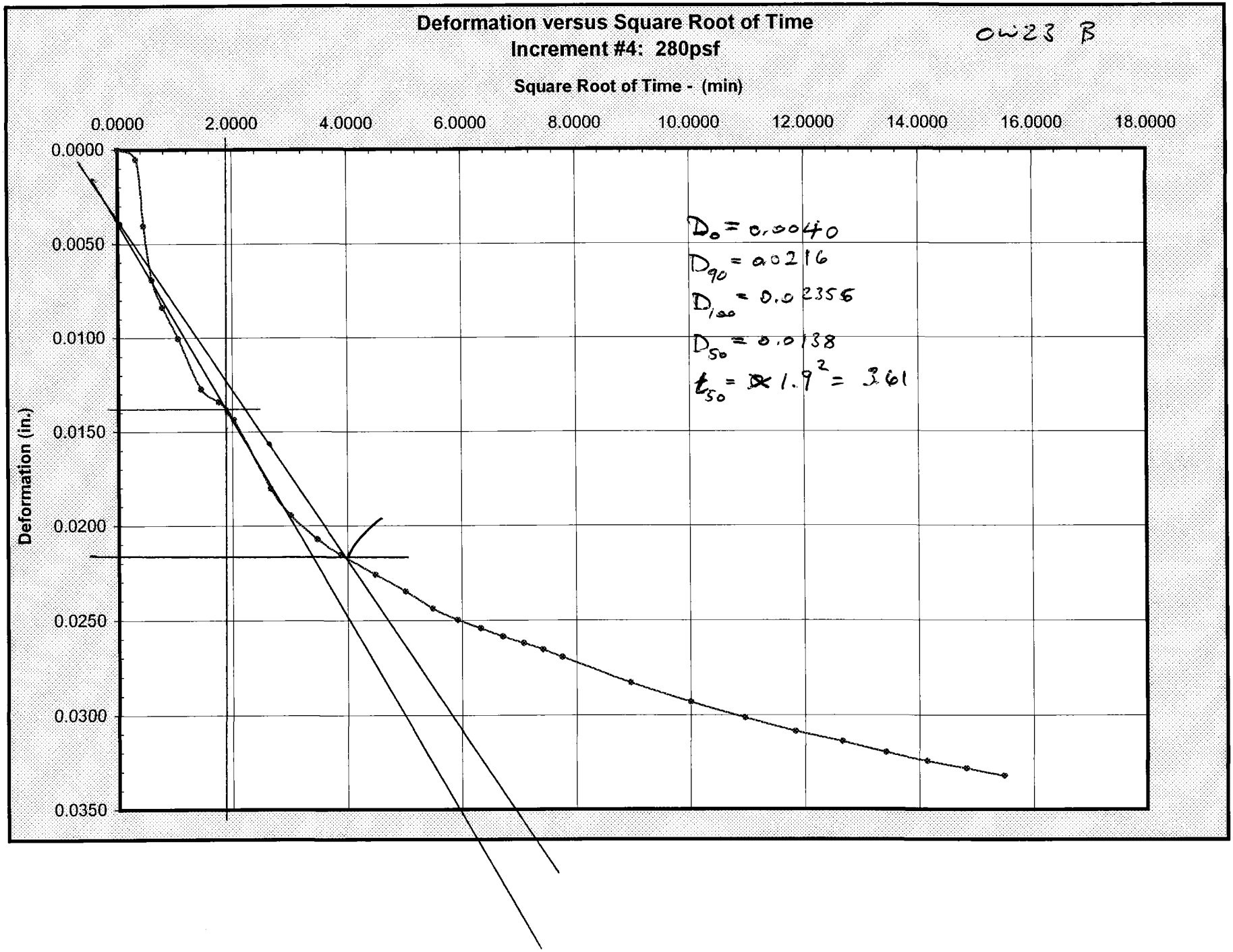
ARI Job No.: 0W23
Date:

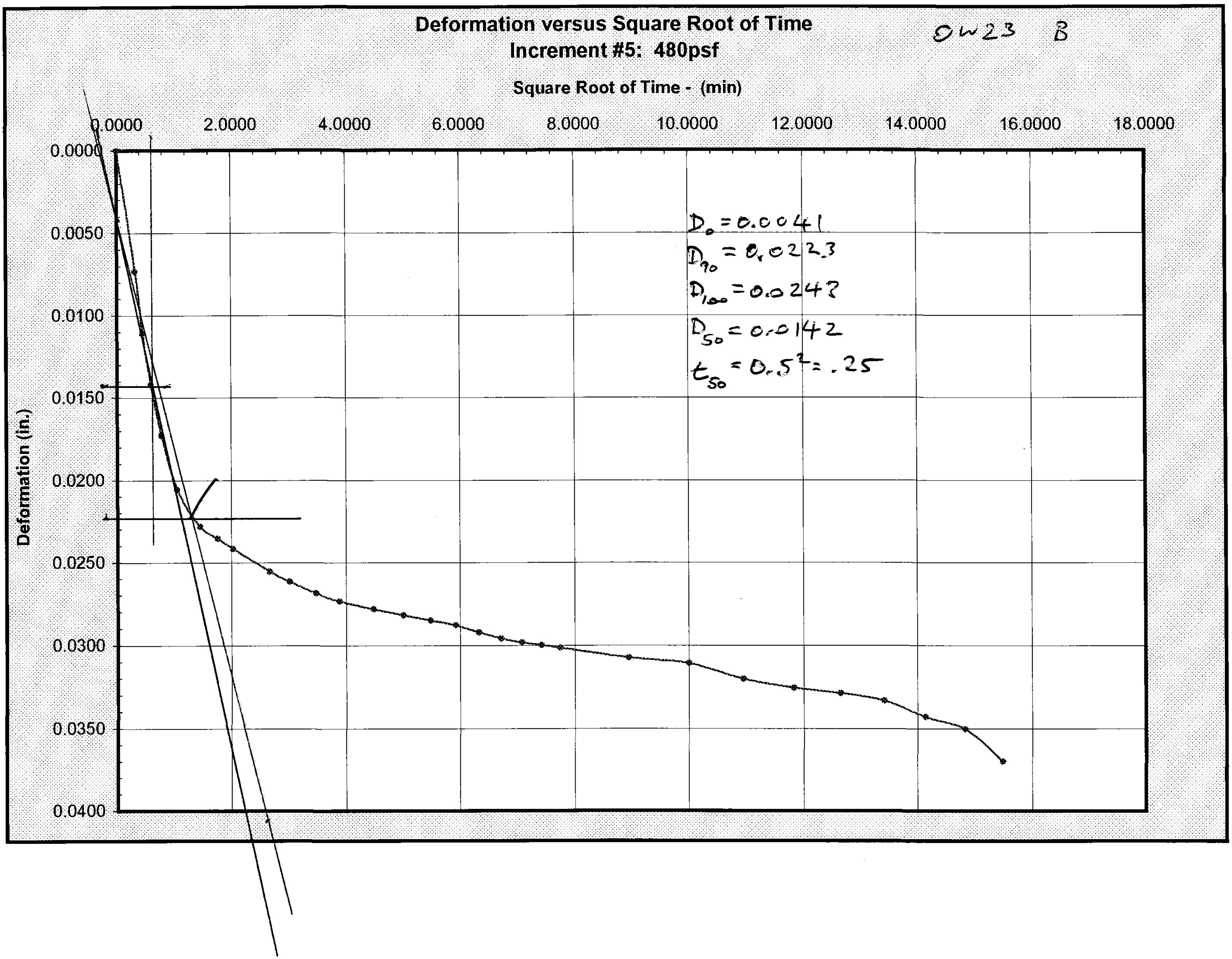
Tested By: FI, AS, EG

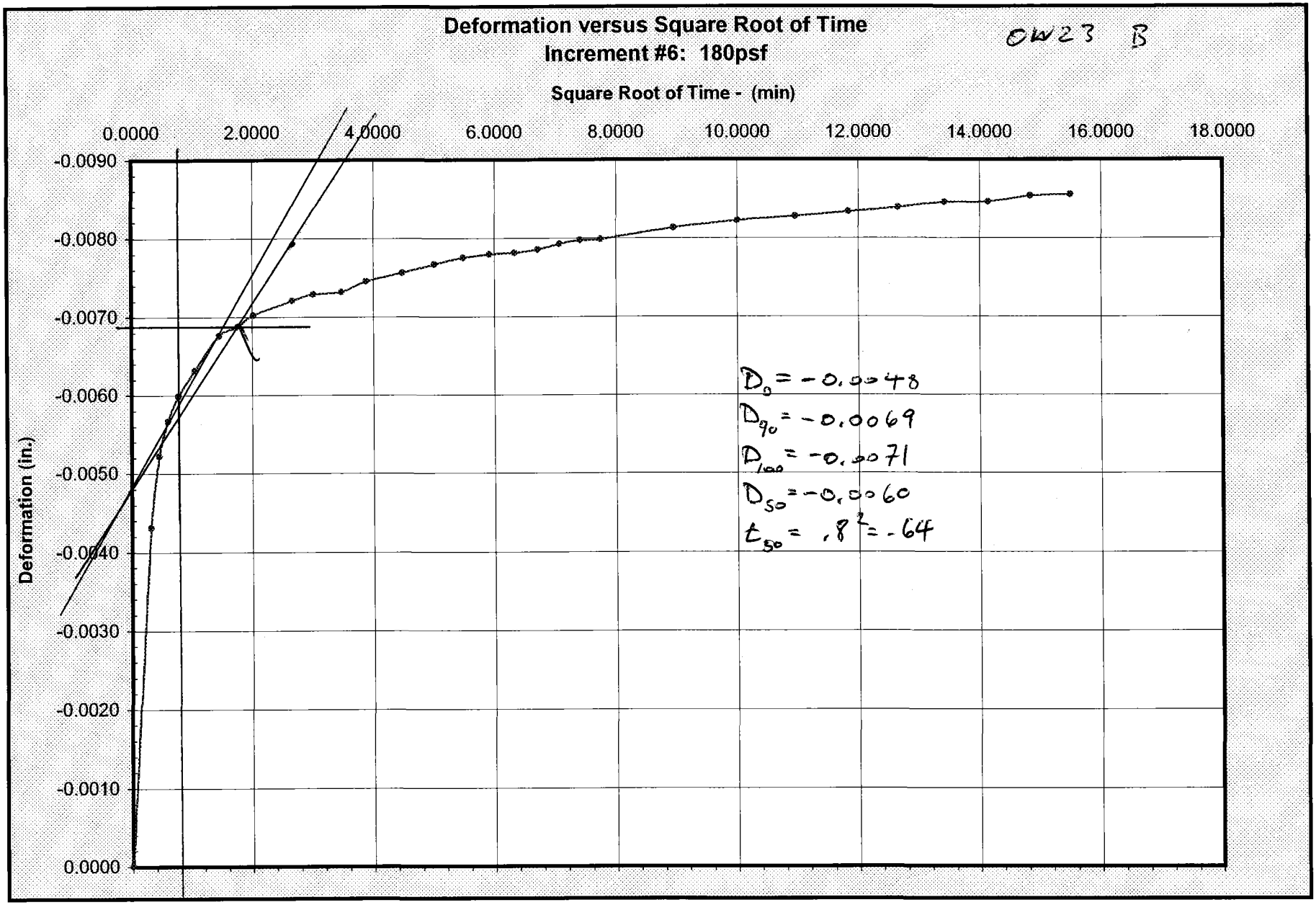
	1	2	3	4	5	6	7	8	9	10
Sample ID	A	B	C	D	E	F	G			
Wet wt. soil & tube	1311.02	793.39	573.22	705.80	597.33	560.19	1695.50			
Length 1	3.708	3.085	2.821	3.088	2.934	3.498	7.905			
Length 2	3.154	3.111	2.805	3.171	3.409	3.129	7.992			
Length 3	3.103	2.654	2.833	2.987	3.214	2.984	7.876			
Diameter 1	3.558	3.606	3.577	3.530	3.575	3.485	3.835			
Diameter 2	3.633	3.536	3.472	3.397	3.598	3.535	3.886			
Diameter 3	3.554	3.599	3.574	3.322	3.600	3.537	3.938			
Weight tube	461.50	47.57	42.07	76.40	46.75	45.86	237.14			
Tare No	A	B	C	D	E	F	G			
Tare Weight	9.71	10.06	10.20	10.41	9.71	10.20	10.41			
Wet Weight	196.77	232.48	170.41	128.82	196.77	170.41	128.82			
Dry Weight	92.49	171.10	26.54	22.97	92.49	26.54	22.97			
Moisture Content %										
Specific Gravity	2.56	2.724	2.298	2.419	1.830	1.946	1.95			

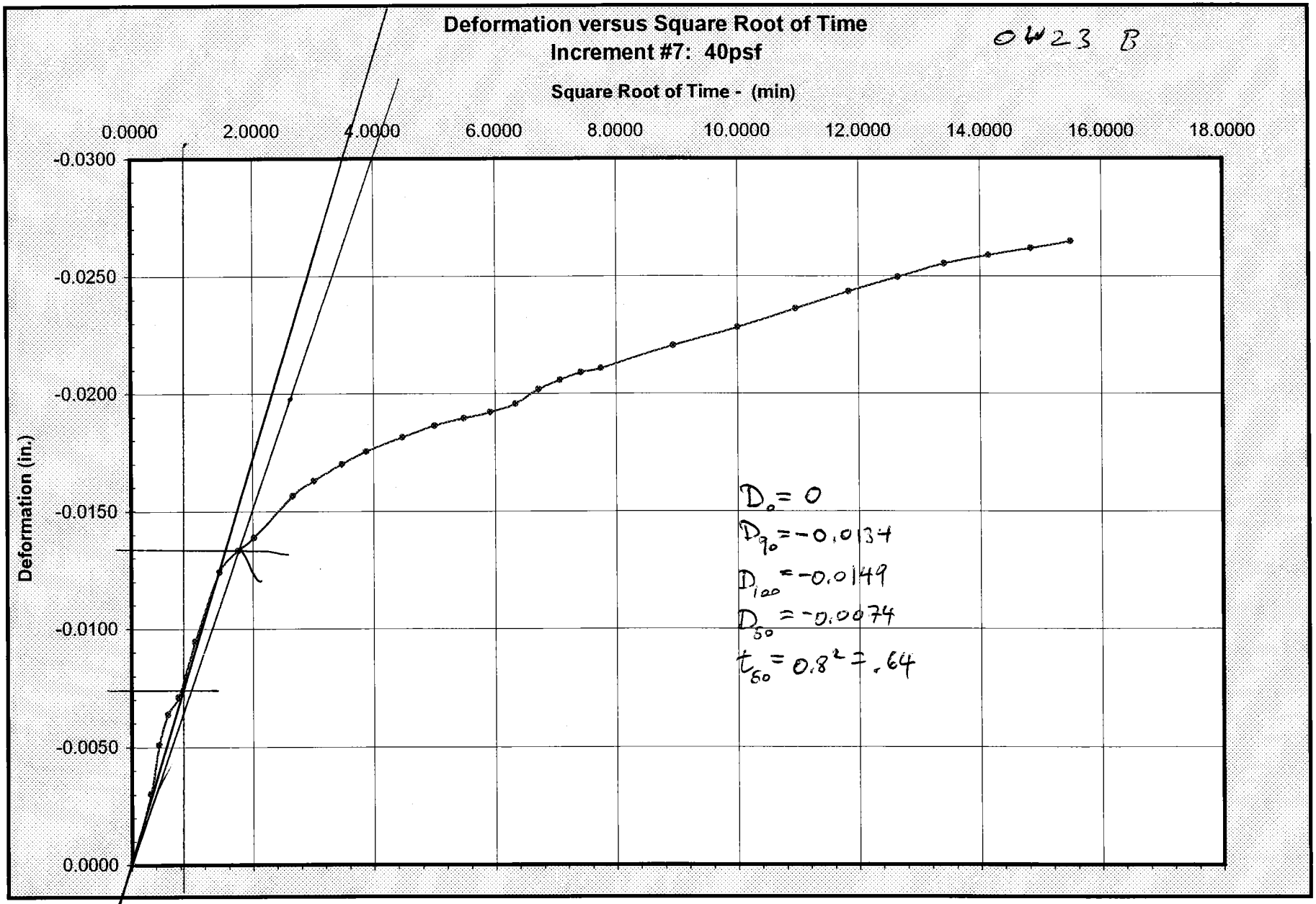
0W23 : 00137


Deformation versus Square Root of Time
Increment #3: 180psf
OW23 B
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0100
0.0200
0.0300
0.0400
0.0500
0.0600
$D_0 = 0$
$D_{90} = 0.0350$
$D_{100} = 0.0389$
$D_{50} = 0.0194$
$t_{50} = 0.6^2 = .36$


Deformation versus Square Root of Time
Increment #4: 280psf
OW23 B
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
0.0350
$D_0 = 0.0040$
$D_{90} = 0.0216$
$D_{100} = 0.02356$
$D_{50} = 0.0138$
$t_{50} = 1.9^2 = 3.61$


Deformation versus Square Root of Time
Increment #5: 480psf
OW23 B
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
0.0350
0.0400
D0 = 0.0041
D90 = 0.0223
D100 = 0.0243
D50 = 0.0142
t50 = 0.5² = .25


Deformation versus Square Root of Time
Increment #6: 180psf
OW23 B
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
-0.0090
-0.0080
-0.0070
-0.0060
-0.0050
-0.0040
-0.0030
-0.0020
-0.0010
0.0000
Deformation (in.)
$D_0 = -0.0048$
$D_{90} = -0.0069$
$D_{100} = -0.0071$
$D_{50} = -0.0060$
$t_{50} = .8^2 = .64$


Deformation versus Square Root of Time
Increment #7: 40psf
0W23 B
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
-0.0300
-0.0250
-0.0200
-0.0150
-0.0100
-0.0050
0.0000
Deformation (in.)
$D_o = 0$
$D_{90} = -0.0134$
$D_{100} = -0.0149$
$D_{50} = -0.0074$
$t_{50} = 0.8^2 = .64$

ANALYTICAL RESOURCES INCORPORATED

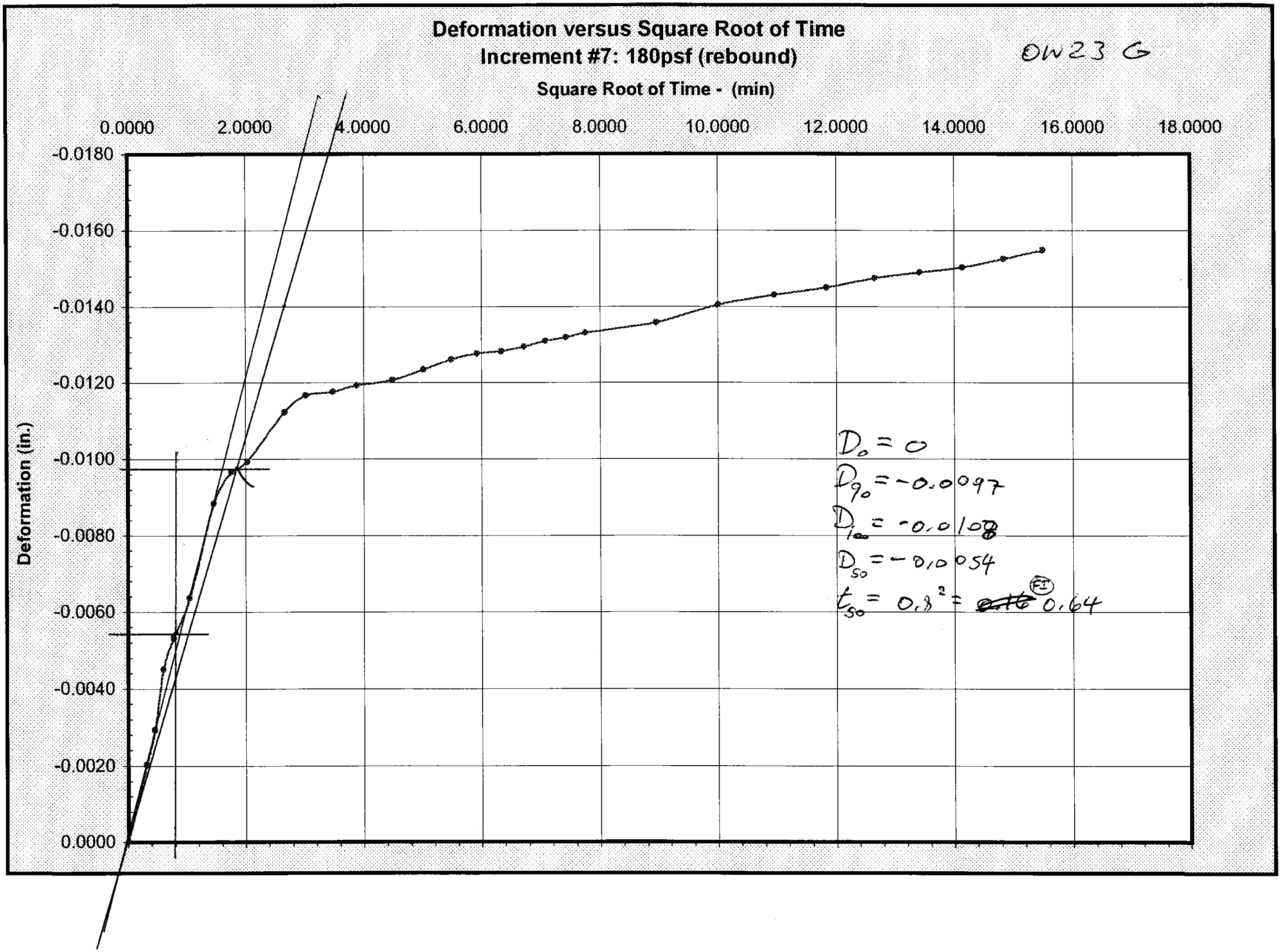
Density, Moisture Content, and Porosity

ARI Job No.: OW23 Tested By: gs/FI

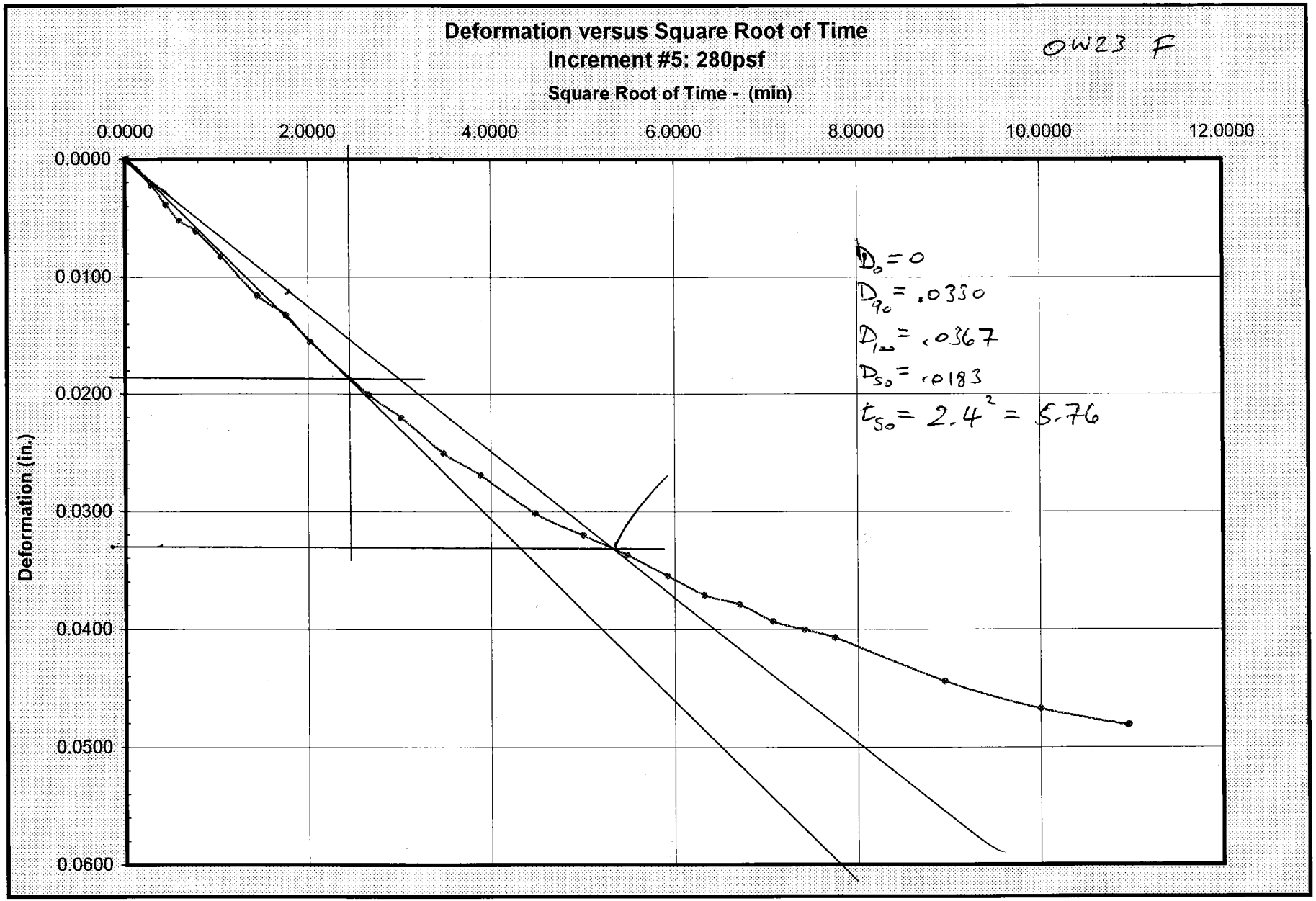
Date: 4/28/09

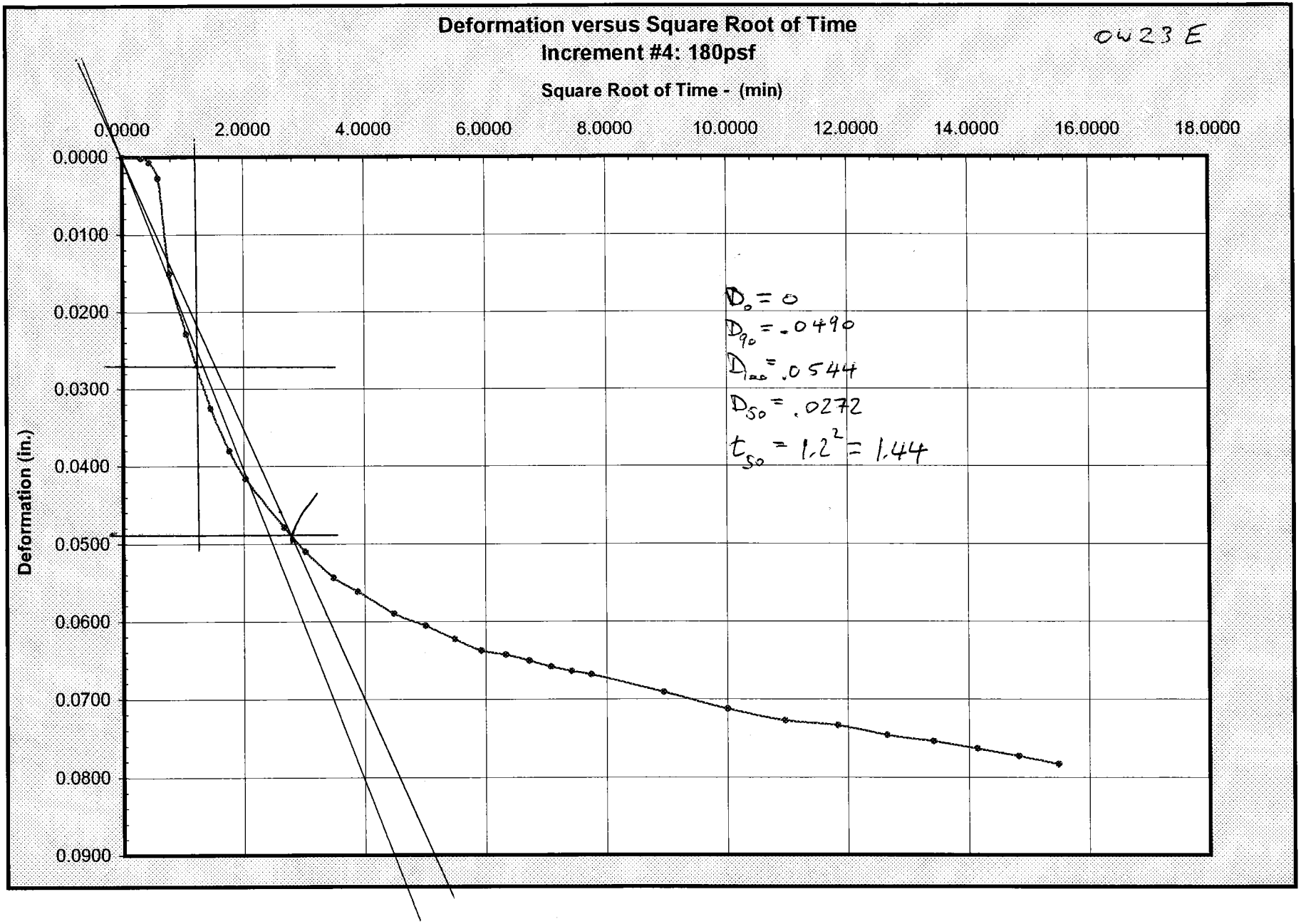
	1	2	3	4	5	6	7	8	9	10
Sample ID	G whole tube	G-UU	D	D-UU	F	E	A	C	D	F
Wet wt. soil & tube g	4870	1695.50	1900.30	1511.51	1867.64	835.00	1511.02	573.22	705.80	560.19
Length 1 cm	70.1	7.905 in.	26.8	8.05 in.	27.2	10.9	3.708 in.	2.821 in.	3.088 in.	3.498 in.
Length 2 cm	68.8	7.992 in.	25.5	7.90 in.	26.4	10.1	3.154 in.	2.805 in.	3.171 in.	3.129 in.
Length 3 cm	70.7	7.876 in.	25.0	8.00 in.	24.6	8.8	3.103 in.	2.833 in.	2.987 in.	2.984 in.
Diameter 1 cm	9.10	3.835 in.	9.30	3.720 in.	9.9	9.3	3.558 in.	3.577 in.	3.530 in.	3.485 in.
Diameter 2 cm	9.40	3.886 in.	9.00	4.160 in.	9.4	8.8	3.633 in.	3.472 in.	3.397 in.	3.535 in.
Diameter 3 cm	9.00	3.938 in.	9.10	3.857 in.	9.5	8.9	3.554 in.	3.574 in.	3.322 in.	3.537 in.
Weight tube g	339.43	237.14	FI 259.12	228.97	155.81	60.79	461.50	42.07	76.40	45.86
Tare No										
Tare Weight										
Wet Weight										
Dry Weight										
Moisture Content %										
Specific Gravity										

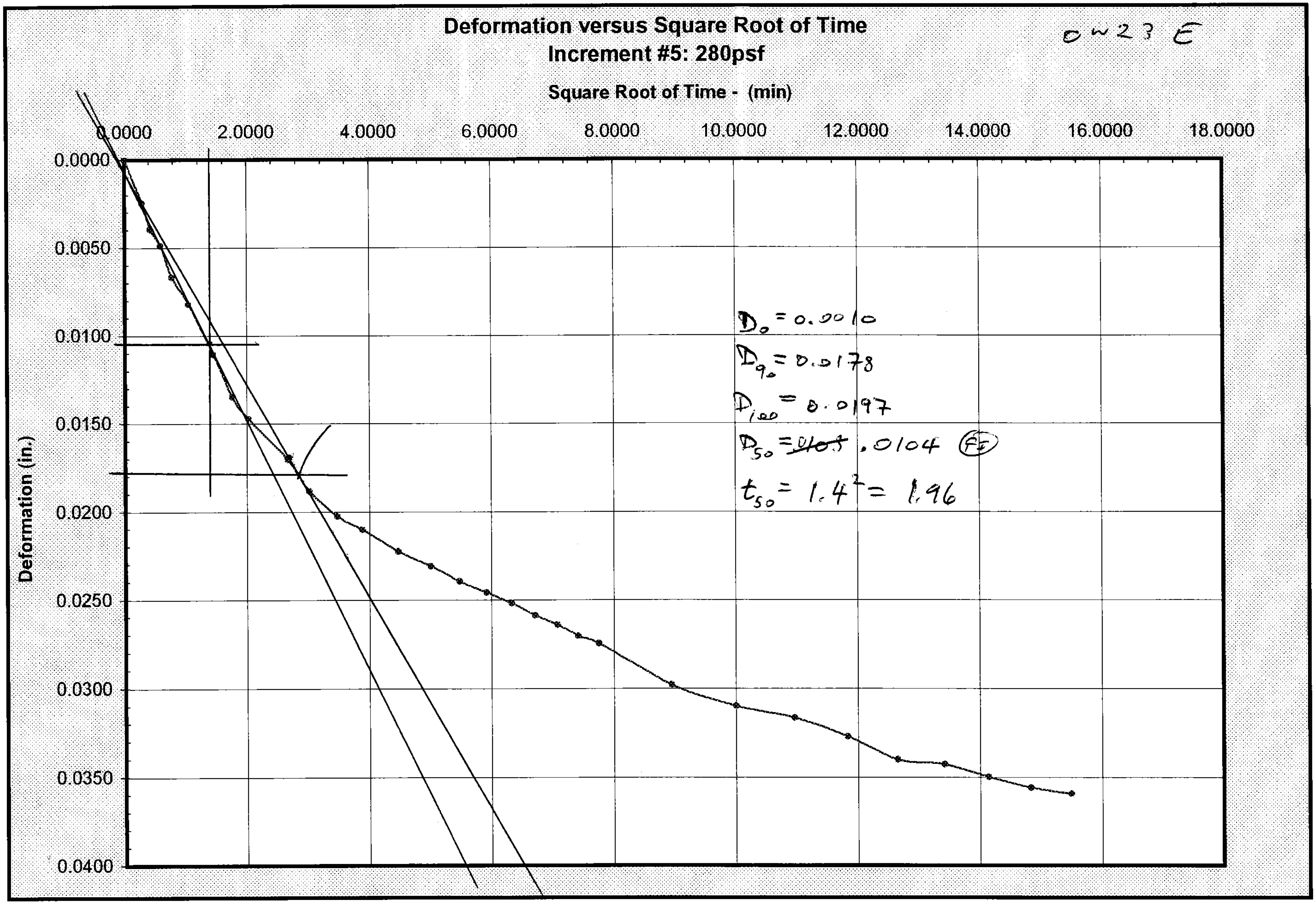
OW23 : 00113


Deformation versus Square Root of Time
Increment #7: 180psf (rebound)
Square Root of Time - (min)
Deformation (in.)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
-0.0180
-0.0160
-0.0140
-0.0120
-0.0100
-0.0080
-0.0060
-0.0040
-0.0020
0.0000
OW23 G
D0 = 0
D90 = -0.0097
D100 = -0.0108
D50 = -0.0054
t50 = 0.8² = 0.64

OW23 : 0014

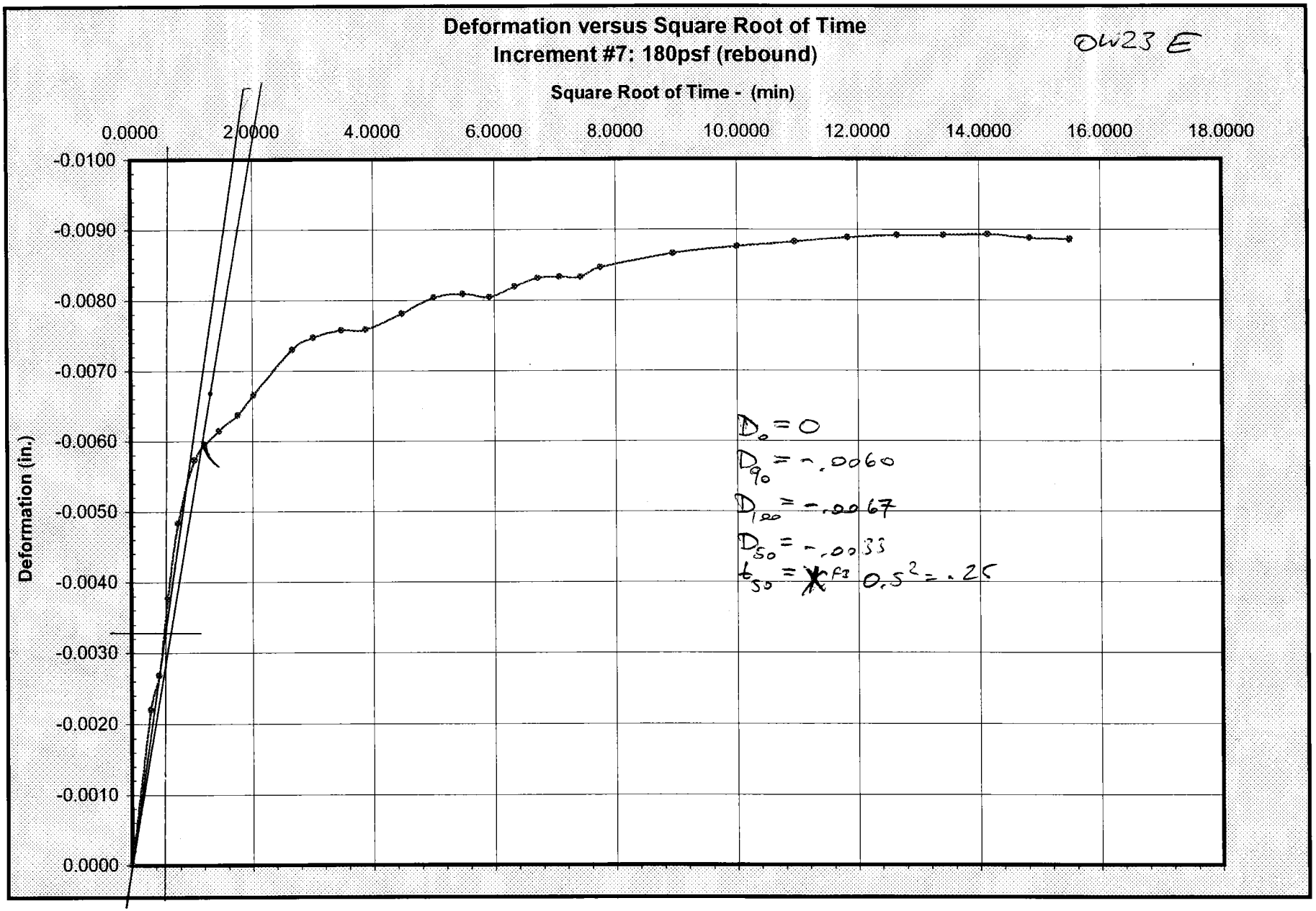

Deformation versus Square Root of Time
Increment #5: 280psf
OW23 F
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
Deformation (in.)
0.0000
0.0100
0.0200
0.0300
0.0400
0.0500
0.0600
$D_o = 0$
$D_{90} = .0330$
$D_{100} = .0367$
$D_{50} = .0183$
$t_{50} = 2.4^2 = 5.76$

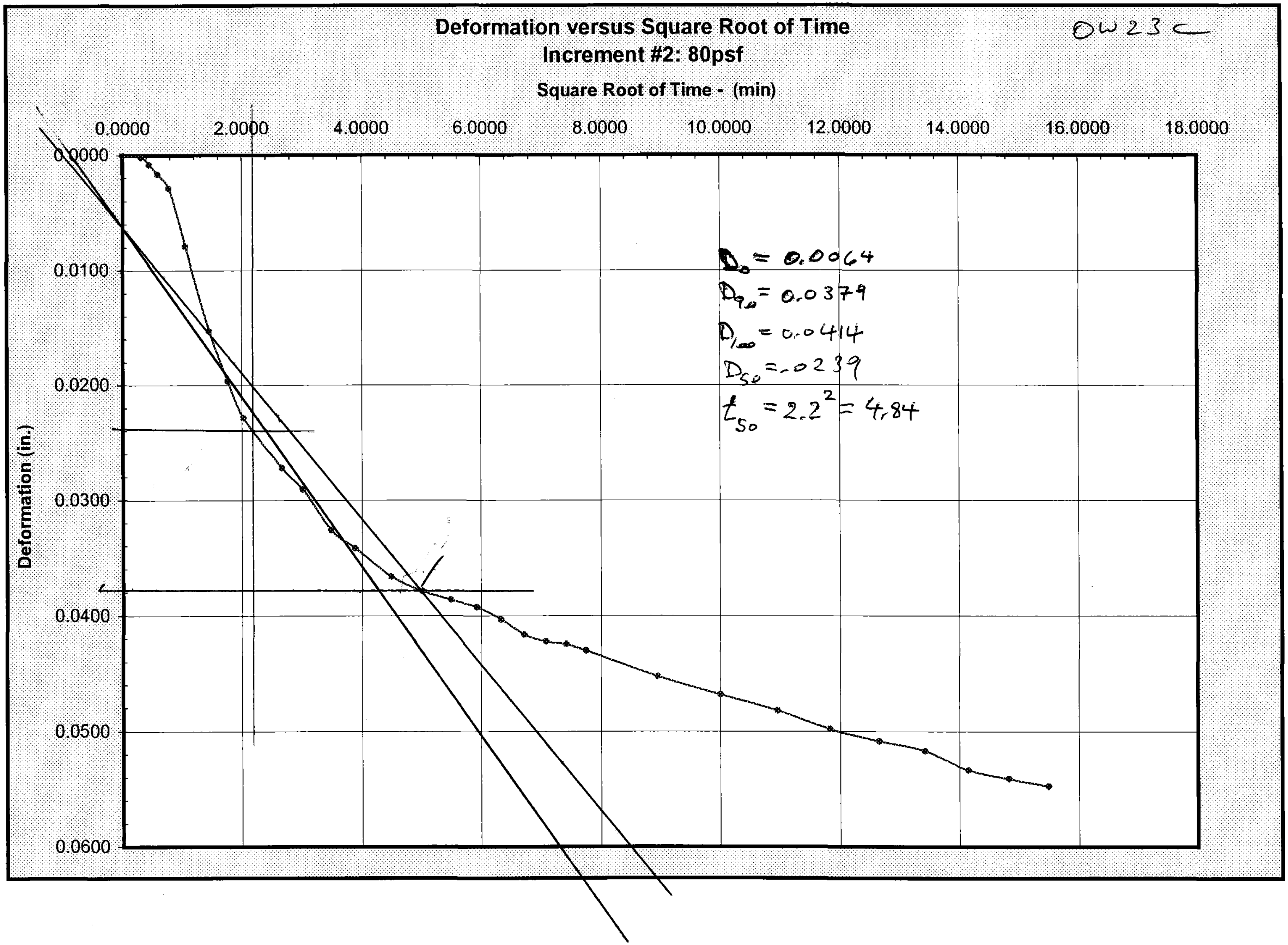

Deformation versus Square Root of Time
Increment #4: 180psf
0W23E
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0100
0.0200
0.0300
0.0400
0.0500
0.0600
0.0700
0.0800
0.0900
$D_o = 0$
$D_{90} = .0490$
$D_{100} = .0544$
$D_{50} = .0272$
$t_{50} = 1.2^2 = 1.44$



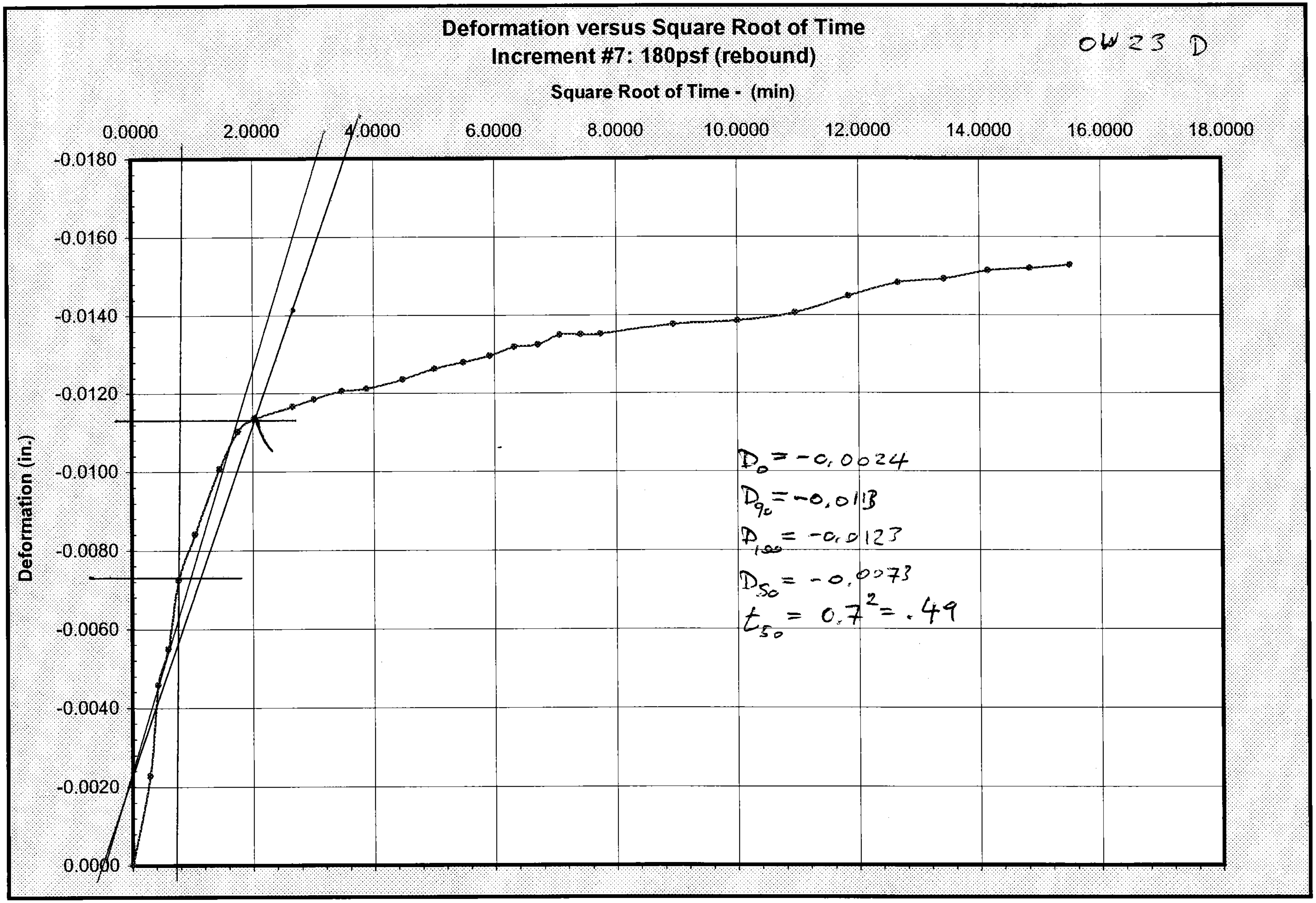
Deformation versus Square Root of Time
Increment #5: 280psf
OW23 E
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
0.0350
0.0400
D0 = 0.0010
D90 = 0.0178
D100 = 0.0197
D50 = .0104
t50 = 1.4² = 1.96

OW23 : 00147

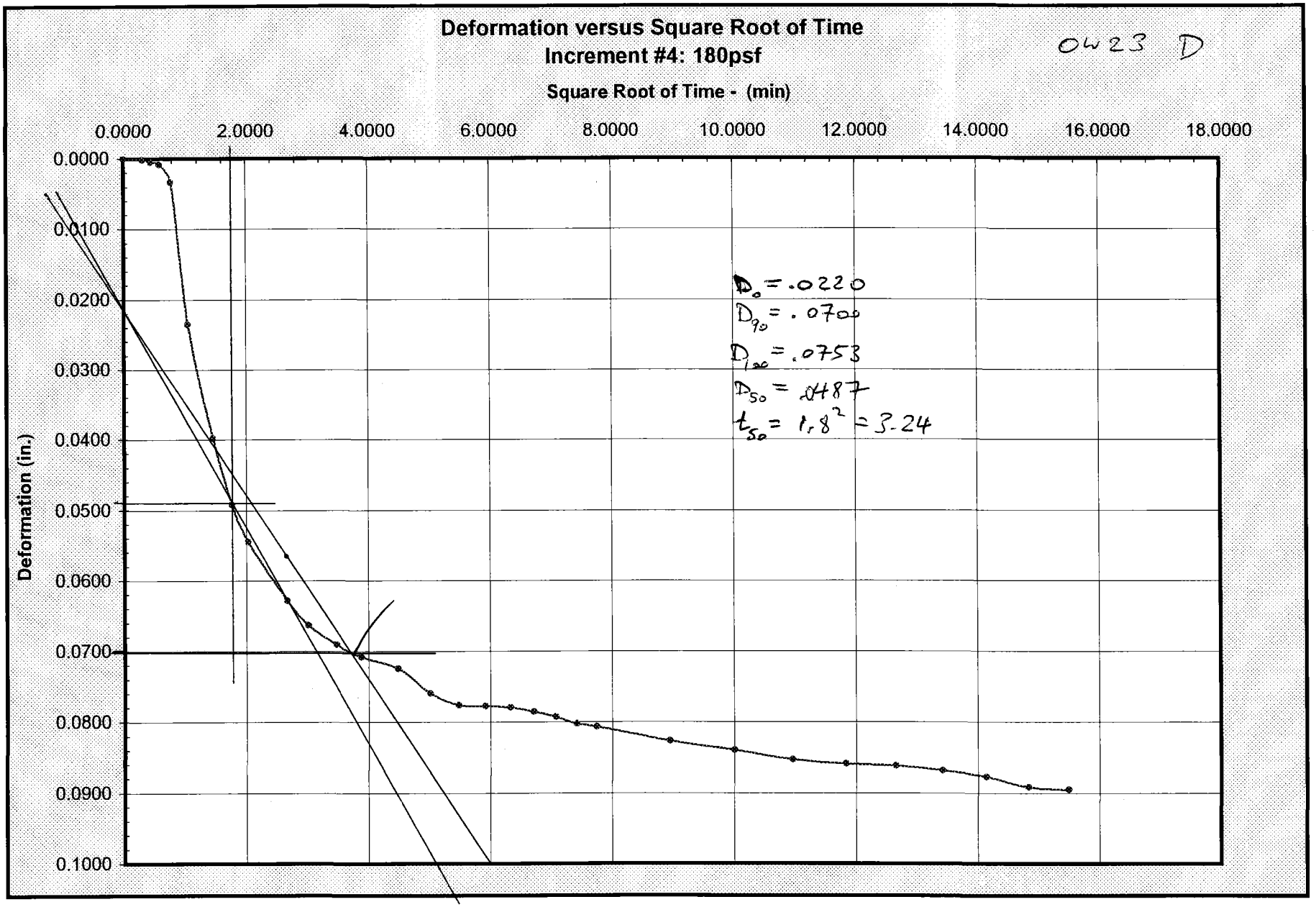

Deformation versus Square Root of Time
Increment #7: 180psf (rebound)
OW23 E
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
-0.0100
-0.0090
-0.0080
-0.0070
-0.0060
-0.0050
-0.0040
-0.0030
-0.0020
-0.0010
0.0000
$D_0 = 0$
$D_{90} = -.0060$
$D_{100} = -.0067$
$D_{50} = -.0033$
$t_{50} = 0.5^2 = .25$


Deformation versus Square Root of Time
Increment #2: 80psf
Square Root of Time - (min)
Deformation (in.)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
0.0000
0.0100
0.0200
0.0300
0.0400
0.0500
0.0600
OW23C
D0 = 0.0064
D90 = 0.0379
D100 = 0.0414
D50 = .0239
t50 = 2.2^2 = 4.84

OW23 : 00145



Deformation versus Square Root of Time
Increment #7: 180psf (rebound)
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
-0.0180
-0.0160
-0.0140
-0.0120
-0.0100
-0.0080
-0.0060
-0.0040
-0.0020
0.0000
OW23 D
D0 = -0.0024
D90 = -0.0113
D100 = -0.0123
D50 = -0.0073
t50 = 0.7² = .49


Deformation versus Square Root of Time
Increment #4: 180psf
OW23 D
Square Root of Time - (min)
0.0000
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
Deformation (in.)
0.0000
0.0100
0.0200
0.0300
0.0400
0.0500
0.0600
0.0700
0.0800
0.0900
0.1000
$D_o = .0220$
$D_{90} = .0700$
$D_{100} = .0753$
$D_{50} = .0487$
$t_{50} = 1.8^2 = 3.24$

ANALYTICAL RESOURCES INCORPORATED

ATTERBERG LIMIT DETERMINATION ASTM D 4318

ARI Job No.: OW23 Set-Up Date: 4/28/09

Tested By: EG

	Sample ID: E			Sample ID: F			Sample ID: G			Sample ID:		
	Description:			Description: brown clay + peat, organic			Description: brown clay and peat, organic			Description:		
LIQUID LIMIT	Through #40: yes/no (no)			Through #40: yes/no (no)			Through #40: yes/no (no)			Through #40: yes/no		
	Crucible #: V			Crucible #: D			Crucible #: 13			Crucible #:		
No. Blows	27	29	21	F-1	F-2	F-3	25	20	~~20~~			
Tare #	E-1	E-2	E-3	1.52	1.49	1.51	~~G~~ G-1	G-2	~~G-3~~			
Tare Wt.	1.55	1.56	1.53	32	29	26	1.51	1.51	~~1.55~~			
Wt. Wet Soil + Tare	6.84	6.91	7.84	7.75	6.01	6.26	8.75	7.31	~~6.69~~			
Wt. Dry Soil + Tare	2.25	2.27	2.37	2.39	2.13	2.17	2.39	2.21	2.16			

PLASTIC LIMIT			Natural Moisture Content			Natural Moisture Content			Natural Moisture Content			Natural Moisture Content
Tare # / MC %	E-4	E-5		F-4	F-5		G-4	G-5				
Tare Wt.	1.55	1.55		1.450	1.53		1.52	1.54				
Wt. Wet Soil + Tare	3.65	5.44		4.78	4.95		3.39	4.02				
Wt. Dry Soil + Tare	2.38	2.98		2.65	2.85		2.16	2.35				

NOTES:

	ORG.		ORG.	ORG
No. Blows	33		20	25
Tare#	~~FO~~	EO	FO	GO
Tare Wt.	~~1.54~~	1.61	1.50	1.53
Wt. Wet Soil+Tare	7.59		7.66	7.92
Wt. Dry Soil+Tare	3.08		3.23	3.56

NP = Non-plastic

0W23 : 00152

1105F
Rev. 0

ANALYTICAL RESOURCES INCORPORATED

ATTERBERG LIMIT DETERMINATION ASTM D 4318

ARI Job No.: CW23 Set-Up Date: 4/29/09

Tested By: eg

	Sample ID: A			Sample ID: B			Sample ID: C			Sample ID: D		
	Description: organic fines w/fine roots, black			Description:			Description: brown clay, organics, peat			Description: Organic clay peat		
	Through #40: yes/no			Through #40: yes/no			Through #40: yes/no			Through #40: yes/no		
LIQUID LIMIT	Crucible #: ~~32~~ AL			Crucible #: 6			Crucible #: A			Crucible #: 6		
No. Blows	22	33	26				30	28	25	31	23	24
Tare #	A-1	A-2	A-3				C-1	C-2	C-3	D-1	D-2	D-3
Tare Wt.	1.58	1.55	1.57	NON-PLASTIC			1.51	1.51	1.52	1.46	1.47	1.54
Wt. Wet Soil + Tare	8.16	7.27	~~7.47~~				7.33	6.85	7.13	8.98	11.32	8.48
Wt. Dry Soil + Tare	5.06	4.62	4.76				2.51	2.47	2.48	2.68	3.09	2.67

PLASTIC LIMIT	[redacted]		Natural Moisture Content	[redacted]		Natural Moisture Content	[redacted]		Natural Moisture Content	[redacted]		Natural Moisture Content
Tare # / MC %	A-4	A-5					C-4	C-5		D-4	D-5	
Tare Wt.	1.57	~~1.48~~					1.53	1.52		1.53	1.54	
Wt. Wet Soil + Tare	6.19	5.05					6.44	5.68		3.19	3.59	
Wt. Dry Soil + Tare	4.46	3.73					3.53	3.28		2.28	2.48	

	ORG	ORG	ORG
NOTES: No. Blows	30		30
NP = Non-plastic Tare #	A0		C0
Tare Wt.	1.54		1.55
Wt. Wet + Soil + Tare	9.86		9.15
Wt. Dry Soil + Tare	6.33		4.50

LL Recheck2 ORG

~~21~~ 21	25	28
D-6	D-7	D0
1.50	1.54	1.61
9.84	7.85	7.52
2.85	2.57	3.88

CW23 : 05/13/09

1105F
Rev. 0

ANALYTICAL RESOURCES INCORPORATED

ANALYST NOTES - GeoTech

ARI Job No: OW23 G Client Name: E & E

Parameter: ~~TORK~~ VANE SHEAR (FT) Client Project: OW 2330. WD10

☐ Job OK, no corrective action required

TORK (FT) VANE SHEAR: (kg/cm^2)

A- 0, 0, 0

B- ~~1.8~~ (0.8, 1.2, 0.9) 0.2 = 0.16, 0.24, 0.18 kg/cm^2

C- 0.0, 0.0, 0.0

D- 0.0, 0.0, 0.0

E- 0.0, 0.0, 0.0

F- 0.0, 0.0, 0.0

G- 0.0, 0.0, 0.0

Analyst: FI Date Completed: 5/29/09

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Silver

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Silver
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**6.61**		0.10	0.004	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1.18**		0.10	0.004	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	0.10	U	0.10	0.004	04/13/09	05/11/09	B09E001
0904048-04	**NS03GC10**	**2.36**		1.00	0.04	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**5.73**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	1.00	U	1.00	0.04	04/15/09	05/11/09	B09E001
0904048-07	**NS05GC10**	**3.75**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**4.26**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**2.52**		1.00	0.04	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**1.91**		1.00	0.04	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**0.44**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-12	NS07GC30	0.10	U	0.10	0.004	04/14/09	05/11/09	B09E001
0904048-13	**NS08GC10**	**0.53**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-14	**NS09GC10**	**0.61**		0.10	0.004	04/20/09	05/11/09	B09E001
0904048-15	**NS10GC10**	**0.40**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-16	**NS11GC10**	**0.54**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-17	**NS12GC10**	**3.42**		1.00	0.04	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**0.40**		0.10	0.004	04/14/09	05/11/09	B09E001
0904048-19	**NS13GC10**	**3.25**		1.00	0.04	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**0.66**		0.10	0.004	04/15/09	05/11/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/11/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	20.5	20			103	85-115		
B09E001-MS1	Matrix Spike	20.3	20	0904048-10	1.91	92	75-125		
B09E001-MSD1	Matrix Spike Dup	20.1	20	0904048-10	1.91	91	75-125	1	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Silver

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Silver
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**1.93**		1.00	0.04	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**1.97**		1.00	0.04	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**2.68**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**2.64**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**1.77**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**0.38**		0.10	0.004	04/16/09	05/11/09	B09E003
0904048-27	**NS20GC10**	**2.84**		1.00	0.04	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**1.91**		1.00	0.04	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**1.36**		1.00	0.04	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.0	20			100	85-115		
B09E003-MS1	Matrix Spike	18.0	20	0904061-01	0.739	86	75-125		
B09E003-MSD1	Matrix Spike Dup	17.8	20	0904061-01	0.739	85	75-125	1	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Arsenic

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Arsenic
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**2680**		10.0	1.63	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**398**		1.00	0.16	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**17.6**		1.00	0.16	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**1180**		1.00	0.16	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**4070**		10.0	1.63	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**151**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**1830**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**838**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**1030**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**284**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**34.3**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**12.5**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**19.0**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**41.2**		1.00	0.16	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**20.5**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**83.1**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**180**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**18.9**		1.00	0.16	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**422**		1.00	0.16	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**33.0**		1.00	0.16	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	20.4	20			102	85-115		
B09E001-MS1	Matrix Spike	312	20	0904048-10	284	144	75-125		
B09E001-MSD1	Matrix Spike Dup	270	20	0904048-10	284	-70	75-125	15	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Arsenic

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Arsenic
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**99.3**		1.00	0.16	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**65.2**		1.00	0.16	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**49.1**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**71.6**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**66.8**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**14.8**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**98.2**		1.00	0.16	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**33.1**		1.00	0.16	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**27.0**		1.00	0.16	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.2	20			101	85-115		
B09E003-MS1	Matrix Spike	36.9	20	0904061-01	17.6	97	75-125		
B09E003-MSD1	Matrix Spike Dup	36.3	20	0904061-01	17.6	94	75-125	2	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Barium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Barium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**269**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**219**		1.00	0.12	04/13/09	05/08/09	B09E001
0904048-03	**NS02GC20**	**38.0**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**186**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**406**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**143**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**276**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**210**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**178**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**153**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**150**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**74.5**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**167**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**147**		1.00	0.12	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**159**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**155**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**121**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**120**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**145**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**86.2**		1.00	0.12	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.5	20			97	85-115		
B09E001-MS1	Matrix Spike	173	20	0904048-10	153	103	75-125		
B09E001-MSD1	Matrix Spike Dup	200	20	0904048-10	153	236	75-125	14	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Barium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Barium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**109**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**105**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**109**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**90.3**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**115**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**161**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**129**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**122**		1.00	0.12	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**130**		1.00	0.12	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.9	20			100	85-115		
B09E003-MS1	Matrix Spike	116	20	0904061-01	156	-198	75-125		
B09E003-MSD1	Matrix Spike Dup	126	20	0904061-01	156	-150	75-125	8	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Cadmium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Cadmium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**7.96**		0.10	0.006	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1.75**		0.10	0.006	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	0.10	U	0.10	0.006	04/13/09	05/11/09	B09E001
0904048-04	**NS03GC10**	**3.75**		1.00	0.06	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**6.88**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	1.00	U	1.00	0.06	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**5.38**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**4.12**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**3.87**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**2.73**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**0.40**		0.10	0.006	04/14/09	05/11/09	B09E001
0904048-12	**NS07GC30**	**0.12**		0.10	0.006	04/14/09	05/11/09	B09E001
0904048-13	**NS08GC10**	**1.71**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**1.20**		1.00	0.06	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**0.44**		0.10	0.006	04/14/09	05/11/09	B09E001
0904048-16	NS11GC10	1.00	U	1.00	0.06	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**2.89**		1.00	0.06	04/14/09	05/07/09	B09E001
0904048-18	NS12GC20	1.00	U	1.00	0.06	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**4.07**		1.00	0.06	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**1.25**		1.00	0.06	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	20.3	20			101	85-115		
B09E001-MS1	Matrix Spike	21.7	20	0904048-10	2.73	95	75-125		
B09E001-MSD1	Matrix Spike Dup	21.4	20	0904048-10	2.73	93	75-125	1	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Cadmium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Cadmium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**2.05**		1.00	0.06	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**2.21**		1.00	0.06	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**2.39**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**2.49**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**2.11**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**0.42**		0.10	0.006	04/16/09	05/11/09	B09E003
0904048-27	**NS20GC10**	**2.46**		1.00	0.06	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**1.70**		1.00	0.06	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**1.42**		1.00	0.06	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.8	20			99	85-115		
B09E003-MS1	Matrix Spike	20.6	20	0904061-01	1.18	97	75-125		
B09E003-MSD1	Matrix Spike Dup	20.1	20	0904061-01	1.18	94	75-125	3	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Chromium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Chromium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**77.1**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**64.1**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**28.9**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**98.8**		5.00	0.11	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**96.4**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**53.2**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**170**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**178**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**86.8**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**67.7**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**53.4**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**32.4**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**59.9**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**65.4**		5.00	0.11	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**63.2**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**64.5**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**79.0**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**55.2**		5.00	0.11	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**95.5**		5.00	0.11	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**43.6**		5.00	0.11	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.3	20			96	85-115		
B09E001-MS1	Matrix Spike	98.9	20	0904048-10	67.7	156	75-125		
B09E001-MSD1	Matrix Spike Dup	95.0	20	0904048-10	67.7	136	75-125	4	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Chromium

Project Name: Northlake Shipyard

Work Order: 0904048

Project Officer: Keeling, John

Analyte: Chromium

Method: EPA200.8

Matrix: Sediment/Soil

Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**66.6**		5.00	0.11	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**64.0**		5.00	0.11	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**66.6**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**70.3**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**61.2**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**63.1**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**68.8**		5.00	0.11	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**63.1**		5.00	0.11	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**64.5**		5.00	0.11	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.1	20			101	85-115		
B09E003-MS1	Matrix Spike	86.1	20	0904061-01	65.9	101	75-125		
B09E003-MSD1	Matrix Spike Dup	86.2	20	0904061-01	65.9	101	75-125	0.06	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Copper

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Copper
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**2600**		10.0	1.16	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**605**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**42.2**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**1070**		1.00	0.12	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**2240**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**157**		1.00	0.12	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**3580**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**2110**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**1850**		10.0	1.16	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**647**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**91.0**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**24.8**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**67.4**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**124**		1.00	0.12	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**61.3**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**142**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**627**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**96.3**		1.00	0.12	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**1610**		10.0	1.16	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**141**		1.00	0.12	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.9	20			99	85-115		
B09E001-MS1	Matrix Spike	607	20	0904048-10	647	-200	75-125		
B09E001-MSD1	Matrix Spike Dup	650	20	0904048-10	647	18	75-125	7	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Copper

Project Name: Northlake Shipyard

Work Order: 0904048

Project Officer: Keeling, John

Analyte: Copper

Method: EPA200.8

Matrix: Sediment/Soil

Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**344**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**234**		1.00	0.12	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**1020**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**323**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**328**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**55.9**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**612**		1.00	0.12	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**222**		1.00	0.12	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**141**		1.00	0.12	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.9	20			99	85-115		
B09E003-MS1	Matrix Spike	390	20	0904061-01	579	-941	75-125		
B09E003-MSD1	Matrix Spike Dup	330	20	0904061-01	579	-1240	75-125	17	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Mercury

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Mercury
Method: EPA245.5
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**0.583**		0.0073	0.0020	04/13/09	05/07/09	B09E011
0904048-02	**NS02GC10**	**1.33**		0.0130	0.0036	04/13/09	05/07/09	B09E011
0904048-03	**NS02GC20**	**0.0340**		0.0074	0.0020	04/13/09	05/07/09	B09E011
0904048-04	**NS03GC10**	**1.40**		0.0143	0.0039	04/13/09	05/07/09	B09E011
0904048-05	**NS04GC10**	**1.02**		0.0094	0.0026	04/15/09	05/07/09	B09E011
0904048-06	**NS04GC20**	**0.796**		0.0121	0.0033	04/15/09	05/07/09	B09E011
0904048-07	**NS05GC10**	**1.73**		0.0285	0.0078	04/15/09	05/07/09	B09E011
0904048-08	**NS05GC20**	**5.82**		0.0208	0.0057	04/15/09	05/07/09	B09E011
0904048-09	**NS06GC10**	**12.1**		0.0119	0.0033	04/14/09	05/07/09	B09E011
0904048-10	**NS06GC20**	**1.71**		0.0125	0.0034	04/14/09	05/07/09	B09E011
0904048-11	**NS07GC10**	**0.346**		0.0219	0.0060	04/14/09	05/07/09	B09E011
0904048-12	**NS07GC30**	**0.0665**		0.0378	0.0104	04/14/09	05/07/09	B09E011
0904048-13	**NS08GC10**	**0.441**		0.0183	0.0050	04/14/09	05/07/09	B09E011
0904048-14	**NS09GC10**	**0.991**		0.0196	0.0054	04/20/09	05/07/09	B09E011
0904048-15	**NS10GC10**	**0.507**		0.0184	0.0050	04/14/09	05/07/09	B09E011
0904048-16	**NS11GC10**	**0.633**		0.0179	0.0049	04/14/09	05/07/09	B09E011
0904048-17	**NS12GC10**	**2.00**		0.0304	0.0083	04/14/09	05/07/09	B09E011
0904048-18	**NS12GC20**	**0.761**		0.0149	0.0041	04/14/09	05/07/09	B09E011
0904048-19	**NS13GC10**	**1.83**		0.0353	0.0097	04/15/09	05/07/09	B09E011
0904048-20	**NS13GC20**	**0.985**		0.0149	0.0041	04/15/09	05/07/09	B09E011

QC Results for Batch ID: B09E011

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E011-BLK1	Blank	0.0050	U	0.0050	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E011-BS1	LCS	0.104	0.1			104	85-115		
B09E011-MS1	Matrix Spike	2.87	0.7	0904048-19	1.83	149	75-125		
B09E011-MSD1	Matrix Spike Dup	2.73	0.691	0904048-19	1.83	131	75-125	5	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Mercury

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Mercury
Method: EPA245.5
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**1.49**		0.0222	0.0061	04/15/09	05/12/09	B09E019
0904048-22	**NS16GC10**	**1.82**		0.0244	0.0067	04/15/09	05/12/09	B09E019
0904048-23	**NS17GC10**	**3.30**		0.0270	0.0074	04/16/09	05/12/09	B09E019
0904048-24	**NS18GC10**	**1.58**		0.0311	0.0085	04/16/09	05/12/09	B09E019
0904048-25	**NS19GC10**	**1.69**		0.0263	0.0072	04/16/09	05/12/09	B09E019
0904048-26	**NS19GC20**	**0.518**		0.0168	0.0046	04/16/09	05/12/09	B09E019
0904048-27	**NS20GC10**	**1.68**		0.0272	0.0074	04/16/09	05/12/09	B09E019
0904048-28	**NS23GC10**	**1.45**		0.0237	0.0065	04/17/09	05/12/09	B09E019
0904048-29	**NS24GC10**	**1.16**		0.0211	0.0058	04/17/09	05/12/09	B09E019

QC Results for Batch ID: B09E019

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E019-BLK1	Blank	0.0050	U	0.0050	05/12/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E019-BS1	LCS	0.103	0.1			103	85-115		
B09E019-DUP1	Duplicate	21.8		0904002-01	21.4			2	20
B09E019-MS1	Matrix Spike	1.32	0.566	0904061-05	0.683	113	75-125		
B09E019-MSD1	Matrix Spike Dup	1.18	0.569	0904061-05	0.683	88	75-125	11	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Lead

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Lead
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	NS01GC10	2440		10.0	0.66	04/13/09	05/07/09	B09E001
0904048-02	NS02GC10	417		1.00	0.07	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	15.3		1.00	0.07	04/13/09	05/07/09	B09E001
0904048-04	NS03GC10	1210		10.0	0.66	04/13/09	05/07/09	B09E001
0904048-05	NS04GC10	3400		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	205		1.00	0.07	04/15/09	05/07/09	B09E001
0904048-07	NS05GC10	2360		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-08	NS05GC20	1580		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-09	NS06GC10	1200		10.0	0.66	04/14/09	05/07/09	B09E001
0904048-10	NS06GC20	702	J	10.0	0.66	04/14/09	05/07/09	B09E001
0904048-11	NS07GC10	66.5		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-12	NS07GC30	3.27		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-13	NS08GC10	126		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-14	NS09GC10	194		1.00	0.07	04/20/09	05/07/09	B09E001
0904048-15	NS10GC10	59.1		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-16	NS11GC10	134		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-17	NS12GC10	653		10.0	0.66	04/14/09	05/07/09	B09E001
0904048-18	NS12GC20	121		1.00	0.07	04/14/09	05/07/09	B09E001
0904048-19	NS13GC10	1010		10.0	0.66	04/15/09	05/07/09	B09E001
0904048-20	NS13GC20	164		1.00	0.07	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	19.3	20			97	85-115		
B09E001-MS1	Matrix Spike	931	20	0904048-10	702	1150	75-125		
B09E001-MSD1	Matrix Spike Dup	1310	20	0904048-10	702	3040	75-125	34	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Lead

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Lead
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**312**		1.00	0.07	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**312**		1.00	0.07	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**327**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**427**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**344**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**59.6**		1.00	0.07	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**601**		10.0	0.66	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**266**		1.00	0.07	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**299**		1.00	0.07	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.10	U	0.10	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	19.6	20			98	85-115		
B09E003-MS1	Matrix Spike	159	20	0904061-01	144	72	75-125		
B09E003-MSD1	Matrix Spike Dup	168	20	0904061-01	144	118	75-125	6	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Percent Solids

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Solids
Method: SM2540G
Matrix: Sediment/Soil
Units: %

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	NS01GC10	68.3				04/13/09	04/22/09	B09D218
0904048-02	NS02GC10	37.1				04/13/09	04/22/09	B09D218
0904048-03	NS02GC20	61.7				04/13/09	04/22/09	B09D218
0904048-04	NS03GC10	33.9				04/13/09	04/22/09	B09D218
0904048-05	NS04GC10	50.7				04/15/09	04/22/09	B09D218
0904048-06	NS04GC20	40.2				04/15/09	04/22/09	B09D218
0904048-07	NS05GC10	17.4				04/15/09	04/22/09	B09D218
0904048-08	NS05GC20	22.7				04/15/09	04/22/09	B09D218
0904048-09	NS06GC10	42.2				04/14/09	04/22/09	B09D218
0904048-10	NS06GC20	38.9				04/14/09	04/22/09	B09D218
0904048-11	NS07GC10	21.7				04/14/09	04/22/09	B09D218
0904048-12	NS07GC30	12.3				04/14/09	04/22/09	B09D218
0904048-13	NS08GC10	25.2				04/14/09	04/22/09	B09D218
0904048-14	NS09GC10	25.0				04/20/09	04/22/09	B09D218
0904048-15	NS10GC10	25.9				04/14/09	04/22/09	B09D218
0904048-16	NS11GC10	27.2				04/14/09	04/22/09	B09D218
0904048-17	NS12GC10	16.4				04/14/09	04/22/09	B09D218
0904048-18	NS12GC20	32.2				04/14/09	04/22/09	B09D218
0904048-19	NS13GC10	13.2				04/15/09	04/22/09	B09D218
0904048-20	NS13GC20	30.7				04/15/09	04/22/09	B09D218
0904048-21	NS14GC10	22.2				04/15/09	04/22/09	B09D218
0904048-22	NS16GC10	19.3				04/15/09	04/22/09	B09D218
0904048-23	NS17GC10	18.4				04/16/09	04/22/09	B09D218
0904048-24	NS18GC10	15.3				04/16/09	04/22/09	B09D218
0904048-25	NS19GC10	18.5				04/16/09	04/22/09	B09D218
0904048-26	NS19GC20	29.5				04/16/09	04/22/09	B09D218
0904048-27	NS20GC10	17.5				04/16/09	04/22/09	B09D218
0904048-28	NS23GC10	19.7				04/17/09	04/22/09	B09D218
0904048-29	NS24GC10	22.1				04/17/09	04/22/09	B09D218

QC Results for Batch ID: B09D218

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09D218-BLK1	Blank	-0.04	U		04/22/09
B09D218-BLK2	Blank	0.2			04/22/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09D218-DUP1	Duplicate	68.1		0904048-01	68.3			0.2	20
B09D218-DUP2	Duplicate	22.5		0904048-21	22.2			1	20
B09D218-DUP3	Duplicate	19.7		0904048-28	19.7			0.5	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Selenium

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Selenium
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**4.39**		0.50	0.30	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1.22**		0.50	0.30	04/13/09	05/07/09	B09E001
0904048-03	NS02GC20	5.00	U	5.00	3.03	04/13/09	05/07/09	B09E001
0904048-04	NS03GC10	5.00	U	5.00	3.03	04/13/09	05/07/09	B09E001
0904048-05	NS04GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-06	NS04GC20	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-07	NS05GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-08	NS05GC20	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-09	NS06GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-10	NS06GC20	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-11	NS07GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-12	NS07GC30	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-13	NS08GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-14	NS09GC10	5.00	U	5.00	3.03	04/20/09	05/07/09	B09E001
0904048-15	NS10GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-16	NS11GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-17	NS12GC10	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-18	NS12GC20	5.00	U	5.00	3.03	04/14/09	05/07/09	B09E001
0904048-19	NS13GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001
0904048-20	NS13GC20	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result		%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	21.7	20				109	85-115		
B09E001-MS1	Matrix Spike	18.5	20	0904048-10	5.00	U	93	75-125		
B09E001-MSD1	Matrix Spike Dup	19.2	20	0904048-10	5.00	U	96	75-125	3	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Selenium

Project Name: Northlake Shipyard

Work Order: 0904048

Project Officer: Keeling, John

Analyte: Selenium

Method: EPA200.8

Matrix: Sediment/Soil

Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	NS14GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E003
0904048-22	NS16GC10	5.00	U	5.00	3.03	04/15/09	05/07/09	B09E003
0904048-23	NS17GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-24	NS18GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-25	NS19GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-26	NS19GC20	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-27	NS20GC10	5.00	U	5.00	3.03	04/16/09	05/07/09	B09E003
0904048-28	NS23GC10	5.00	U	5.00	3.03	04/17/09	05/07/09	B09E003
0904048-29	NS24GC10	5.00	U	5.00	3.03	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	0.50	U	0.50	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.7	20			104	85-115		
B09E003-MS1	Matrix Spike	21.6	20	0904061-01	0.802	104	75-125		
B09E003-MSD1	Matrix Spike Dup	20.8	20	0904061-01	0.802	100	75-125	4	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Zinc

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Zinc
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-01	**NS01GC10**	**7050**		500	21.8	04/13/09	05/07/09	B09E001
0904048-02	**NS02GC10**	**1330**		50.0	2.2	04/13/09	05/07/09	B09E001
0904048-03	**NS02GC20**	**69.4**		50.0	2.2	04/13/09	05/07/09	B09E001
0904048-04	**NS03GC10**	**3680**		500	21.8	04/13/09	05/07/09	B09E001
0904048-05	**NS04GC10**	**10600**		500	21.8	04/15/09	05/07/09	B09E001
0904048-06	**NS04GC20**	**582**		50.0	2.2	04/15/09	05/07/09	B09E001
0904048-07	**NS05GC10**	**6040**		500	21.8	04/15/09	05/07/09	B09E001
0904048-08	**NS05GC20**	**3420**		500	21.8	04/15/09	05/07/09	B09E001
0904048-09	**NS06GC10**	**3650**		500	21.8	04/14/09	05/07/09	B09E001
0904048-10	**NS06GC20**	**1500**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-11	**NS07GC10**	**223**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-12	**NS07GC30**	**60.2**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-13	**NS08GC10**	**800**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-14	**NS09GC10**	**309**		50.0	2.2	04/20/09	05/07/09	B09E001
0904048-15	**NS10GC10**	**164**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-16	**NS11GC10**	**333**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-17	**NS12GC10**	**1010**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-18	**NS12GC20**	**226**		50.0	2.2	04/14/09	05/07/09	B09E001
0904048-19	**NS13GC10**	**2130**		50.0	2.2	04/15/09	05/07/09	B09E001
0904048-20	**NS13GC20**	**300**		50.0	2.2	04/15/09	05/07/09	B09E001

QC Results for Batch ID: B09E001

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E001-BLK1	Blank	5.0	U	5.0	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E001-BS1	LCS	21.7	20			109	85-115		
B09E001-MS1	Matrix Spike	1470	20	0904048-10	1500	-108	75-125		
B09E001-MSD1	Matrix Spike Dup	1600	20	0904048-10	1500	525	75-125	8	20

Authorized by: _____ **Release Date:** _____

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Analysis Report for
Zinc

Project Name: Northlake Shipyard
Work Order: 0904048
Project Officer: Keeling, John

Analyte: Zinc
Method: EPA200.8
Matrix: Sediment/Soil
Units: mg/kg dw

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
0904048-21	**NS14GC10**	**530**		50.0	2.2	04/15/09	05/07/09	B09E003
0904048-22	**NS16GC10**	**491**		50.0	2.2	04/15/09	05/07/09	B09E003
0904048-23	**NS17GC10**	**554**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-24	**NS18GC10**	**580**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-25	**NS19GC10**	**579**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-26	**NS19GC20**	**144**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-27	**NS20GC10**	**1360**		50.0	2.2	04/16/09	05/07/09	B09E003
0904048-28	**NS23GC10**	**387**		50.0	2.2	04/17/09	05/07/09	B09E003
0904048-29	**NS24GC10**	**311**		50.0	2.2	04/17/09	05/07/09	B09E003

QC Results for Batch ID: B09E003

Method Blank	Sample ID	Result	Qualifer	RL	Analyzed
B09E003-BLK1	Blank	5.0	U	5.0	05/07/09

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B09E003-BS1	LCS	20.9	20			104	85-115		
B09E003-MS1	Matrix Spike	454	20	0904061-01	453	5	75-125		
B09E003-MSD1	Matrix Spike Dup	458	20	0904061-01	453	22	75-125	0.8	20

Authorized by: _____ **Release Date:** _____

Appendix F

Geotechnical Sampling and Analysis Memorandum and Results

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Herrera Environmental Consultants, Inc.

Memorandum

To	Mark Longtine, L.G., Ecology & Environment, Inc.
cc	Alexander Whitman, P.E., Ecology and Environment, Inc.
From	Chris Brummer, Ph.D., P.E., L.E.G. and Rob Zisette, Herrera Environmental Consultants
Date	July 2, 2009
Subject	Northlake Shipyard Geotechnical Sampling and Analysis

Introduction and Purpose

This memorandum presents the results of the geotechnical laboratory testing of lake sediments collected from Lake Union, Seattle, Washington, within the vicinity of the Northlake Shipyard. Collection and analysis of the geotechnical cores were conducted in accordance with the revised final Northlake Shipyard Sandblast Grit Study Sampling and Analysis Plan (SAP; Ecology and Environment, Inc. 2009). The geotechnical samples were collected in coordination with sandblast grit identification and characterization activities. The geotechnical cores were collected on April 20, 2009, from locations that appeared to be representative of conditions across an area potentially subject to grit removal pending determination by Ecology. Laboratory analyses occurred through May 29, 2009. The purpose of the geotechnical sampling and analysis was to provide information required to develop a dredge plan for the sandblast grit area associated with the Northlake Shipyard.

Sample Locations

A total of four sediment cores were collected from the project area and submitted to Analytical Resources, Inc. (ARI) for geotechnical analyses. A fifth geotechnical core was attempted at station NS01-G, but the core was rejected due to insufficient recovery. Three of the cores were split into 24-inch intervals, for a total of seven analytical samples. Core collection information is summarized in the Northlake Shipyard Sandblast Grit Study Report. Geotechnical samples are summarized as follows:

- Sample NS06-G was collected from the sloping shoreline at an approximate depth of 30 feet below the water surface.
- Sample NS05-G was collected at a depth of approximate depth of 39 feet within the transition zone between the toe of the sloping shoreline and the flat lake bottom. The core was split into two samples (intervals 0 – 24 inches and 24 – 48 inches).
- Samples NS12-G and NS18-G were collected at depths of 40 feet and 39 feet, respectively, within the flat lake bottom at the distal limits of the project area. Both cores were split into two samples each (intervals 0 – 24 inches and 24 – 48 inches).

Sample locations are shown in Figures 3-1 and 3-2 of the Northlake Shipyard Sandblast Grit Study Report.

Sampling Methods

Geotechnical sediment cores were collected using the same methods and equipment as the sandblast grit characterization sediment cores, as described in the Northlake Shipyard Sandblast Grit Study Report. Geotechnical sediment core locations were selected based on field screening results and methods described in the SAP (Ecology and Environment, Inc. 2009).

In most instances, the divers were able to advance the cores beyond 30 inches below the sediment surface, with percent recovery ranging from 38.5 to 94.1 percent. Poor penetration and recovery depths occurred at Station NS01-G, due to large amounts of debris and sandblast grit at the sediment surface. Because of these limitations and poor sediment recovery, the core from Station NS01-G was rejected and station NS06-G was selected as a replacement.

Laboratory Testing

The core samples were submitted to ARI on April 21, 2009 for the following analyses:

- Grain size, sieve, and hydrometer (ASTM D 422)
- Moisture content (ASTM D 2216)
- Porosity calculated from specific gravity (ASTM D 854) and bulk unit weight (ASTM D 2937)
- Atterberg limits (ASTM D 4318)
- Consolidation (ASTM D 2435)
- Vane shear (ASTM D 4648)
- Unconsolidated, undrained triaxial strength tests (ASTM D 2850)

All testing was performed in accordance with the SAP, except the samples were not analyzed for unconsolidated, undrained triaxial strength tests (ASTM D 2850) because the extruded sediments were not able to stand undeformed under their own weight at a height-to-diameter ratio of 2:1. As a result, it was decided, in consultation with the E & E project manager and the Ecology project manager, to substitute the the unconsolidated, undrained triaxial strength test with a tilting table test. The tilting table test was performed in accordance with *Parsons, J. D., Whipple, K. X., and Simoni, A., 2001, Experimental study of the grain-flow, fluid-mud transition in debris flows, Journal of Geology 109(4), pages 427-447*. In general, the tilting table test consisted of extruding a 7-mm to 9-mm core on a roughened piece of plywood, slowly tilting the board, and noting the angle at which the sample failed. The yield strength of the sample was calculated from the product of the sample unit weight, sample height, and sine of the titling board angle at failure.

Quality Assurance/ Quality Control

Laboratory testing was conducted in accordance with ARI's laboratory QA/QC Plan. Herrera provided quality assurance review of the laboratory results and procedures that generally consisted of cross-checking laboratory results with field descriptions of sample cores, checking laboratory results for internal consistency, and maintaining regular communications with ARI during testing and reporting of results. The laboratory results are considered to be acceptable and generally meet the measurement objectives specified in the SAP (Ecology and Environment 2009).

Analytical Results

The following sections describe the analytical laboratory results of the geotechnical testing. A summary of geotechnical results is presented in Table 1; the complete laboratory report is included in the Northlake Shipyard Sandblast Grit Study Report.

Subsurface conditions

Detailed lithologic information on the materials encountered in the geotechnical cores is inferred based on the descriptions for the grit identification and characterization cores presented in Section 7 of the Northlake Shipyard Sandblast Grit Study Report.

Grain size analysis, sieve, and hydrometer (ASTM D 422)

Most of the samples contained less than 10 percent sand and gravel. Exceptions include sample NS06-G (0-18), which contained approximately 88 percent sand and gravel, and sample NS18-G (24-48), which contained approximately 20 percent sand and gravel.

Atterberg limits (ASTM D 4318)

All samples except NS05-G (0-24) and NS06-G (0-18) were classified as high-plasticity, organic clays (OH) with liquid limits greater than 50. Sample NS05-G (0-24) was classified as a high-plasticity silt (MH) due the high silt content. Sample NS06-G (0-18) was determined to be non-plastic due to high sand and gravel content.

Bulk unit weight (ASTM D 2937)

The bulk unit weight is reported as both wet and dry density. Wet density is calculated from the known volume and weight of an undisturbed sample; dry density is calculated from the same volume as wet density without water. Wet densities ranged from 59.1 to 96.7 lbs/ft^3; dry densities ranged from 6.3 to 69.3 lbs/ft^3, with the highest value measured in the sandy gravelly sample (NS06-G).

Moisture content (ASTM D 2216)

The moisture content was measured from the center of each of the four cores upon receipt of the samples and again from tilting table samples. The moisture content of samples ranged from 38.1 to 881 percent. The lowest values were measured in cores NS05-G and NS06-G, collected from

the sloping shoreline and transition zone. The highest values were found in cores NS12-G and NS18-G collected from the distal lake bottom. The anomalously low value measured from the center of NS05-G may be attributed to the presence of suspected coke briquettes found in this sample. The higher moisture content measured for this sample during the tilting table analysis may have been due to an absence of suspected coke briquettes in the analyzed portion of the sample, and may be more representative of the sediment moisture content in the sample.

Porosity calculated from specific gravity (ASTM D 854) and bulk unit weight (ASTM D 2937)

The porosity of samples ranged from 0.59 to 0.95. The lowest values were measured in samples NS05-G and NS06-G collected from the sloping shoreline and transition zone, whereas the highest values were found in samples NS12-G and NS18-G collected from the distal lake bottom.

Consolidation (ASTM D 2435)

The rate of consolidation of saturated clay deposits is a function of several factors that include permeability, void ratio, sample thickness, and the ratio of new loading relative to the loading history. A higher consolidation coefficient (c_v) indicates a longer time required for a given percentage of consolidation to occur during loading. Maximum consolidation measured for each sample ranged from 0.05 to 0.7 ft^2/day, with the highest consolidation coefficient identified for sample NS06-G.

Vane shear (ASTM D 4648)

Measurements of the unconfined shear strength of samples were conducted in the laboratory on undisturbed cores using a hand-held vane shear apparatus fitted with large vanes (vane ratio of 0.2). Results of the vane shear testing were highly variable and ranged from <20 lbs/ft^2 (the minimum reading possible) to 400 lbs/ft^2. The anomalously high value was found in sample NS05-G and may be due to the presence of the suspected coke briquettes or other debris found in this sample.

Tilting table (Parsons et al. 2001)

The yield strength calculated from the tilting table ranged from 5.3 to 14 lbs/ft^2. Results indicate that all of the core samples are composed of extremely weak sediments.

Dredging Considerations

The lake bottom sediments are very weak, compressible, and exhibit extremely high water contents. The properties of the soft sediments may pose some difficulties with the application of dredging technologies whether mechanical or hydraulic. The geotechnical properties of the soft sediments (low strength and high water content) are not sufficient to maintain a stable cut surface or sidewall during dredging. The soft sediments will be prone to re-suspension and sloughing at the dredge margin. Total source removal by dredging (without an excessive amount of over-excavation) may not be possible due to these limitations. The risks to in-water infrastructure (e.g., shoreline and piers) as a result of dredging is not a significant concern due to the depth of embedment of existing piles below the weak surface sediments and the shallow depth (less than 4 feet) of anticipated dredging.

Table 1. Summary of geotechnical laboratory results for sediment cores collected from Lake Union adjacent to the Northlake Shipyard.

Station		NS05-G	NS05-G	NS06-G	NS12-G	NS12-G	NS18-G	NS18-G
Depth Interval (Inches)		0 - 24	24 - 48	0 - 18	0 - 24	24 - 48	0 - 24	24 - 48
Date Sampled		4/20/2009	4/20/2009	4/20/2009	4/20/2009	4/20/2009	4/20/2009	4/20/2009
Time Sampled		13:05	13:05	17:30	15:05	15:05	16:20	16:20
Particle/ Grain Size	Gravel (percent)	0.2	0.3	10.8	0.1	0.1	0.1	9.9
	Sand (percent)	3.0	5.8	76.6	2.9	0.7	9.4	10.2
	Silt (percent)	52.4	50.9	7.4	48.9	47.0	43.7	33.4
	Clay (percent)	44.5	42.9	5.2	48.0	52.5	46.9	46.5
Wet Density (lb/ft^3)		96.7	64.5	95.7	72.9	62.9	84.9	59.1
Moisture Content (percent)	Center of core	126	126	38.1	881	881	843	843
	Tilting Table sample	120	684	42.6	252	870	163	NA[1]
Dry Density (lb/ft^3)		42.8	28.5	69.3	7.4	6.4	9.0	6.3
Porosity (standard units)		0.73	0.75	0.59	0.95	0.95	0.94	0.95
Atterberg Limits	Plasticity Index (percent)	28.1	493	NA[2]	345	453	390	519
	Liquid Limit (percent)	87.4	655	NA[2]	486	625	510	718
	Plastic Limit (percent)	59.3	162	NA[2]	141	172	120	199
	USCS Classification	MH	OH	SM	OH	OH	OH	OH
Max. Consolidation, c_v (ft^2/day)		0.21	0.2	0.7	0.08	0.05	0.11	0.18
Shear Strength, Vane Shear (lb/ft^2)		<20	400	<20	<20	<20	<20	<20
Shear Strength, Tilting Table (lb/ft^2)		10	8.8	14	5.3	5.3	12	NA[1]

[1] A tilting table test was not performed for sample NS18-6 (24-48) because the sample was disturbed during an attempt to setup for a triaxial test.

[2] Atterberg limits are not available for sample NS06-G (0-18) due to lack of fines.