N00164.AR.001817
NSA CRANE
5090.3a

INTERIM MEASURES REPORT FOR REMOVAL AND BIOREMEDIATION OF MINE FILL A MATERIAL APPENDIX II OF II NSWC CRANE IN
10/1/2000
NAVFAC SOUTHERN

23

Interim Measures Completion Report for
Construction of Cap System at
SWMU 02/11 – Dye Burial Ground

NSWC Crane
Crane, Indiana

Unit Identification Code: N00164
Contract No. N62467-93-D-1106

VOLUME II OF II
APPENDIX E – APPENDIX N

December 1999

Revision 0

Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina
29419-9010

Interim Measures Completion Report for
Construction of Cap System at
SWMU 02/11 – Dye Burial Ground

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December 1999

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Southern Division
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North Charleston, South Carolina
29419-9010

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APPENDIX E
LABORATORY SOIL TEST RESULTS

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Initial and Follow-up Construction, Final Cover Soil, and Topsoil Test Results

PHILIP
ENVIRONMENTAL

Industrial Services Group
Midwest Region

August 19, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Dear Mr. McCumbers

Lois J. Bigley 08/21/98
Lois J. Bigley 08/21/98
Approved as noted

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Approval pending acceptable analytical sample results - On 08-21-98 Both MK & the EPD accepted analytical due to the natural high arsnic levels in the area.

Submittal No. 072

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-120	Topsoil Source	02200(2.1)(A)

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald Flowers

Donald L. Flowers,
Project Manager

cc: D. Beall

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

PHILIP
ENVIRONMENTAL

Industrial Services Group
Midwest Region

DBC – 55
August 19, 1998
Project 18328

Mr. W.D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Pursuant to the Contract Specifications, Section 02200, Part 2.1, A, Philip is providing the following information for the source of topsoil to be used for this project. Abrams and Hawkins will supply the topsoil. They will be shipping the material from their facility near Graysville, Indiana. The topsoil meets the minimum 5% organics according to the Contract Specifications. A sample of the material has already been provided to the MK Engineer. If you have any questions regarding this matter, please call me at (800) 733-7173.

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald Flowers

Donald L. Flowers,
Project Manager

Abram and Hawkins
PO Box 390
Sullivan Indiana 47882
Phone# 812-847-7525

cc: D. Beall

The topsoil has been strip from an underlying limestone source. Abram and Hawkins is both owner and supplier of the Topsoil.

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

Morrison Knudsen Corporation
NSWC Crane
DO #4324-0009

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

August 28, 1998
REPORT #122

Activity:

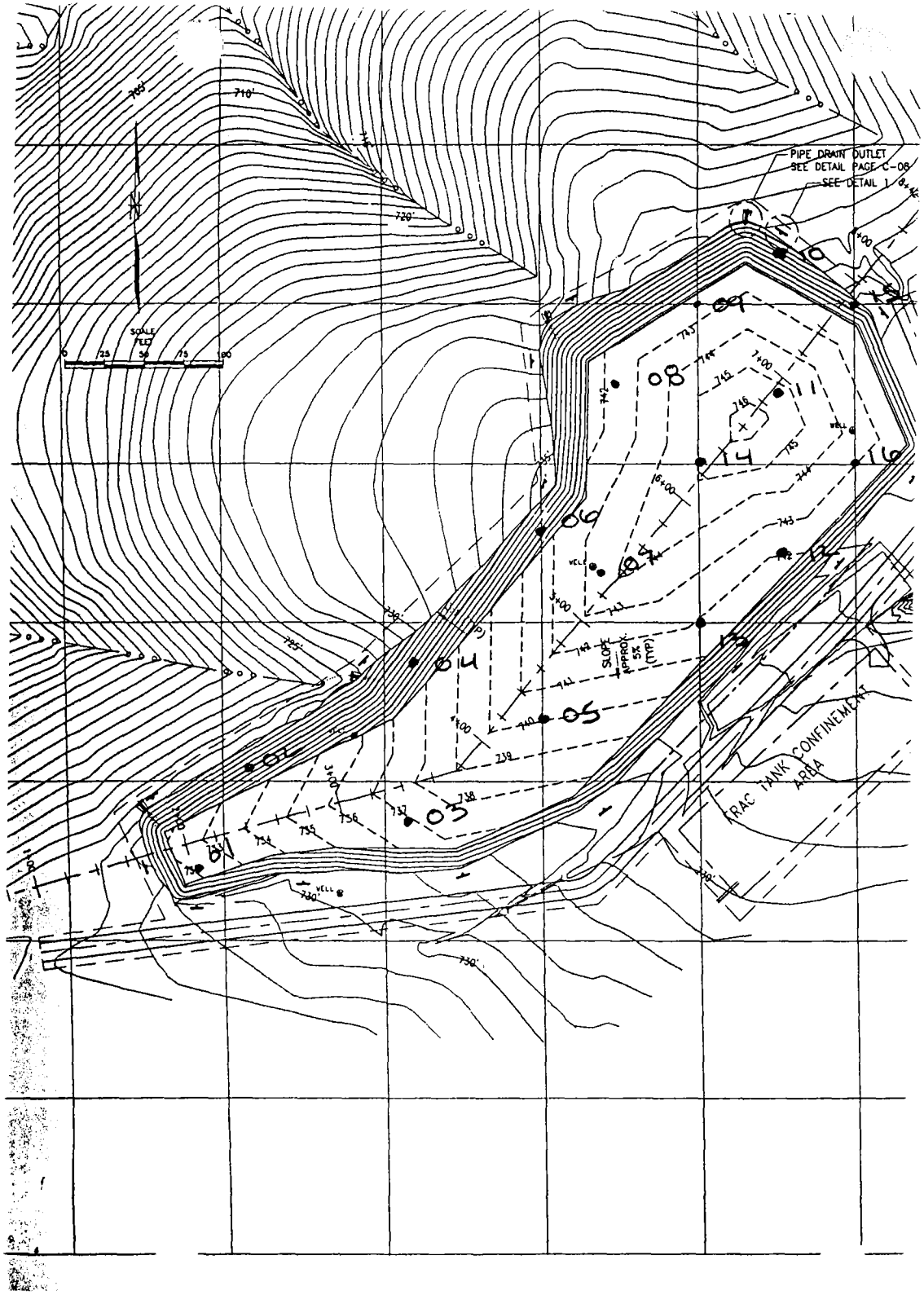
- 27" Soil Cover Layer - A three inch topsoil lift covering the cap was completed by PSG, finishing the 27 inch soil layer. Using a JD 550 dozer, the last three loads of topsoil from Abram & Hawkins, the approved off-site source, was spread over the ramp area on the east side of the cap. MSE cross-section surveyed the cap area for as-built conditions. To level and smooth the area, PSG graded the cap area.
- Site Restoration - PSG continues site grading, clean-up and restoration. The area near N1311500 E304930 was cleared of trash, graded, and covered with topsoil. A stockpile of topsoil was placed on the east side of the site near the FRAC tank storage area for placement around the cap area for disturbed areas outside the cap footprint; eight loads of topsoil were used.

Inspection:

- PSG - graded topsoil to final grade using set grade stakes.
- MSE - cross-section surveyed the finish grade to verify proper elevation and contour of the cap.
- MK - observed placement and spreading of topsoil both on the cap area and outside the cap footprint.
- MK - Verified depth of topsoil for topsoil cover material over the cap area with 16 random spot checks. (See attached sheet)

Attachments: 1

Signature/Date: Lois J. Bigley 08/28/98



Random Topsoil
Depth Check

01 - 3 1/8"
02 - 4 1/4"
03 - 3 1/8"
04 - 3 3/4"
05 - 4 1/4"
06 - 4 1/2"
07 - 3 1/4"
08 - 3 1/8"
09 - 3 3/4"
10 - 3 1/2"
11 - 4 "
12 - 3 1/2"
13 - 4 1/4"
14 - 3 1/4"
15 - 3 1/4"
16 - 3 1/2"

NSWC Crane
SWMU 02/11
Dye Burial Ground Interim Measures Cap

Topsoil Analytical Sample Results

Abram & Hawkins Borrow Source

Data File: /chem/i.i/i980817a.b/i28414.d
Report Date: 18-Aug-1998 10:35

SWOK/AATS

TARGET COMPOUNDS

Client Name:
Client Sample ID: NSWC-02/11-BP3
Sample Location:
Lab Sample ID: 35252.01
Sample Type: SOIL
Analysis Type: VOA
Data Type: MS DATA
Misc Info: MS326**INST:I*MKF-OH*35252.01*6.41G

Client SDG: i980817a.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/Kg	Q
75-71-8	DICHLORODIFLUOROMETHANE	3.90	U
74-87-3	CHLOROMETHANE	3.90	U
75-01-4	VINYL CHLORIDE	3.90	U
74-83-9	BROMOMETHANE	3.90	U
75-00-3	CHLOROETHANE	3.90	U
75-69-4	TRICHLOROFLUOROMETHANE	3.90	U
75-35-4	1 1-DICHLOROETHENE	3.90	U
75-09-2	METHYLENE CHLORIDE	16.63	
156-60-5	trans-1 2-DICHLOROETHENE	3.90	U
75-34-3	1 1-DICHLOROETHANE	3.90	U
594-20-7	2 2-DICHLOROPROPANE	3.90	U
156-59-2	cis-1 2-DICHLOROETHENE	3.90	U
74-97-5	BROMOCHLOROMETHANE	3.90	U
67-66-3	CHLOROFORM	3.90	U
71-55-6	1 1 1-TRICHLOROETHANE	3.90	U
56-23-5	CARBON TETRACHLORIDE	3.90	U
563-58-6	1 1-DICHLOROPROPENE	3.90	U
71-43-2	BENZENE	3.90	U
107-06-2	1 2-DICHLOROETHANE	3.90	U
79-01-6	TRICHLOROETHENE	3.90	U
78-87-5	1 2-DICHLOROPROPANE	3.90	U
74-95-3	DIBROMOMETHANE	3.90	U
75-27-4	BROMODICHLOROMETHANE	3.90	U
108-88-3	TOLUENE	3.90	U
79-00-5	1 1 2-TRICHLOROETHANE	3.90	U
127-18-4	TETRACHLOROETHENE	3.90	U
142-28-9	1 3-DICHLOROPROPANE	3.90	U
124-48-1	DIBROMOCHLOROMETHANE	3.90	U
106-93-4	1 2-DIBROMOETHANE	3.90	U
108-90-7	CHLOROBENZENE	3.90	U
630-20-6	1 1 1 2-TETRACHLOROETHANE	3.90	U
100-41-4	ETHYL BENZENE	3.90	U
13-302-07	m,p-XYLENES	3.90	U
95-47-6	o-XYLENE	3.90	U
100-42-5	STYRENE	3.90	U
75-25-2	BROMOFORM	3.90	U
98-82-8	ISOPROPYLBENZENE	3.90	U
108-86-1	BROMOBENZENE	3.90	U
96-18-4	1 2 3-TRICHLOROPROPANE	3.90	U

Data File: /chem/i.i/i980817a.b/i28414.d
Report Date: 18-Aug-1998 10:35

SWOK/AATS

TARGET COMPOUNDS

Client Name:
Client Sample ID: NSWC-02/11-BP3
Sample Location:
Lab Sample ID: 35252.01
Sample Type: SOIL
Analysis Type: VOA
Data Type: MS DATA
Misc Info: MS326**INST:I*MKF-OH*35252.01*6.41G

Client SDG: i980817a.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/Kg	Q
79-34-5	1 1 2 2-TETRACHLOROETHANE	3.90	U
103-65-1	n-PROPYLBENZENE	3.90	U
95-49-8	2-CHLOROTOLUENE	3.90	U
106-43-4	4-CHLOROTOLUENE	3.90	U
108-67-8	1 3 5-TRIMETHYLBENZENE	3.90	U
98-06-6	tert-BUTYLBENZENE	3.90	U
95-63-6	1 2 4-TRIMETHYLBENZENE	3.90	U
135-98-8	sec-BUTYLBENZENE	3.90	U
541-73-1	1 3-DICHLOROBENZENE	3.90	U
106-46-7	1 4-DICHLOROBENZENE	3.90	U
99-87-6	p-ISOPROPYLTOLUENE	3.90	U
95-50-1	1 2-DICHLOROBENZENE	3.90	U
104-51-8	n-BUTYLBENZENE	3.90	U
96-12-8	1 2-DIBROMO-3-CHLOROPROPANE	3.90	U
120-82-1	1 2 4-TRICHLOROBENZENE	3.90	U
91-20-3	NAPHTHALENE	3.90	U
87-68-3	HEXACHLOROBUTADIENE	3.90	U
87-61-6	1 2 3-TRICHLOROBENZENE	3.90	U
540-59-0	1,2-DICHLOROETHENE(total)	3.90	U
1330-20-7	XYLENES(total)	3.90	U
1868-53-7	DIBROMOFLUOROMETHANE	38.18	
2037-26-5	TOLUENE-d8	38.05	
460-00-4	4-BROMOFLUOROBENZENE	37.21	
17060-07-0	1,2-DICHLOROETHANE-d4	39.44	

Data File: /chem/u.i/u980817a.b/u15996.d
Report Date: 18-Aug-1998 10:39

SWOK/AATS

TARGET COMPOUNDS

Client Name:
Client Sample ID: NSWC-TB081398
Sample Location:
Lab Sample ID: 35252.02
Sample Type: WATER
Analysis Type: VOA
Data Type: MS DATA
Misc Info: MS326**INST:U*MKF-OH*35252.02*5ML

Client SDG: u980817a.b
Sample Date:
Sample Point:
Date Received: 08/12/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
75-71-8	DICHLORODIFLUOROMETHANE	5.00	U
74-87-3	CHLOROMETHANE	5.00	U
75-01-4	VINYL CHLORIDE	5.00	U
74-83-9	BROMOMETHANE	5.00	U
75-00-3	CHLOROETHANE	5.00	U
75-69-4	TRICHLOROFLUOROMETHANE	5.00	U
75-35-4	1 1-DICHLOROETHENE	5.00	U
75-09-2	METHYLENE CHLORIDE	5.00	U
156-60-5	trans-1 2-DICHLOROETHENE	5.00	U
75-34-3	1 1-DICHLOROETHANE	5.00	U
594-20-7	2 2-DICHLOROPROPANE	5.00	U
156-59-2	cis-1 2-DICHLOROETHENE	5.00	U
74-97-5	BROMOCHLOROMETHANE	5.00	U
67-66-3	CHLOROFORM	5.00	U
71-55-6	1 1 1-TRICHLOROETHANE	5.00	U
56-23-5	CARBON TETRACHLORIDE	5.00	U
563-58-6	1 1-DICHLOROPROPENE	5.00	U
71-43-2	BENZENE	5.00	U
107-06-2	1 2-DICHLOROETHANE	5.00	U
79-01-6	TRICHLOROETHENE	5.00	U
78-87-5	1 2-DICHLOROPROPANE	5.00	U
74-95-3	DIBROMOMETHANE	5.00	U
75-27-4	BROMODICHLOROMETHANE	5.00	U
108-88-3	TOLUENE	5.00	U
79-00-5	1 1 2-TRICHLOROETHANE	5.00	U
127-18-4	TETRACHLOROETHENE	5.00	U
142-28-9	1 3-DICHLOROPROPANE	5.00	U
124-48-1	DIBROMOCHLOROMETHANE	5.00	U
106-93-4	1 2-DIBROMOETHANE	5.00	U
108-90-7	CHLOROBENZENE	5.00	U
630-20-6	1 1 1 2-TETRACHLOROETHANE	5.00	U
100-41-4	ETHYL BENZENE	5.00	U
13-302-07	m,p-XYLENES	5.00	U
95-47-6	o-XYLENE	5.00	U
100-42-5	STYRENE	5.00	U
75-25-2	BROMOFORM	5.00	U
98-82-8	ISOPROPYLBENZENE	5.00	U
108-86-1	BROMOBENZENE	5.00	U
96-18-4	1 2 3-TRICHLOROPROPANE	5.00	U

ta File: /chem/u.i/u980817a.b/ul5996.d
port Date: 18-Aug-1998 10:39

SWOK/AATS

TARGET COMPOUNDS

lient Name:
lient Sample ID: NSWC-TB081398
ample Location:
ab Sample ID: 35252.02
ample Type: WATER
nalysis Type: VOA
ata Type: MS DATA
isc Info: MS326**INST:U*MKF-OH*35252.02*5ML

Client SDG: u980817a.b
Sample Date:
Sample Point:
Date Received: 08/12/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
79-34-5	1 1 2 2-TETRACHLOROETHANE	5.00	U
103-65-1	n-PROPYLBENZENE	5.00	U
95-49-8	2-CHLOROTOLUENE	5.00	U
106-43-4	4-CHLOROTOLUENE	5.00	U
108-67-8	1 3 5-TRIMETHYLBENZENE	5.00	U
98-06-6	tert-BUTYLBENZENE	5.00	U
95-63-6	1 2 4-TRIMETHYLBENZENE	5.00	U
135-98-8	sec-BUTYLBENZENE	5.00	U
541-73-1	1 3-DICHLOROBENZENE	5.00	U
106-46-7	1 4-DICHLOROBENZENE	5.00	U
99-87-6	p-ISOPROPYLTOLUENE	5.00	U
95-50-1	1 2-DICHLOROBENZENE	5.00	U
104-51-8	n-BUTYLBENZENE	5.00	U
96-12-8	1 2-DIBROMO-3-CHLOROPROPANE	5.00	U
120-82-1	1 2 4-TRICHLOROBENZENE	5.00	U
91-20-3	NAPHTHALENE	5.00	U
87-68-3	HEXACHLOROBUTADIENE	5.00	U
87-61-6	1 2 3-TRICHLOROBENZENE	5.00	U
1868-53-7	DIBROMOFLUOROMETHANE	50.98	
2037-26-5	TOLUENE-d8	44.28	
460-00-4	4-BROMOFLUOROBENZENE	47.87	
17060-07-0	1,2-DICHLOROETHANE-d4	53.82	

SOUTHWEST LABORATORY OF OKLAHOMA
GAS/LIQUID CHROMATOGRAPHY LABORATORY
ACID HERBICIDES BY SW-846,METHOD 8150

CLIENT	mkf-oh
CLIENT SAMPLE ID	NSWC-02/11-BP3
SWOK SAMPLE ID	35252.01
FILENAME	7_012088.D
SAMPLE MATRIX	SOIL
AMT. EXTRACTED	50 G
FINAL EXT.VOL.	10 mL
GPC CLEANUP	NO
% MOISTURE	14
DILUTION FACTOR	1
DATE RECEIVED	08/14/98
DATE EXTRACTED	08/17/98
DATE ANALYZED	08/19/98
REPORT DATE	08/19/98

QUANTITATION REPORT

HERBICIDE	QUANTITATION LIMIT (ug/Kg)	AMT.FOUND (ug/Kg)	FLAG
2,4-D	81	81	U
2,4,5-TP (SILVEX)	12	12	U
2,4,5-T	12	12	U
Dinoseb	23	23	U

SURROGATE - DCCA %RECOVERY= 102

SURROGATE SPIKED (ug/Kg): 174
DCAA SURROGATE RECOVERY LIMITS (18-94%)

FLAG DEFINITIONS
- U-- NOT DETECTED ABOVE QUANTITATION LIMIT
- B-- COMPOUND FOUND IN BLANK
- J-- ESTIMATED VALUE(BELOW QUANTITAION LIMIT)
- D-- SURROGATE DILUTED OUT SAMPLE RUN AT SECONDARY DILUTION
- I-- NOT QUANTITATIBLE DUE TO MATRIX INTERFERENCE

preliminary data

SOUTHWEST LABORATORY OF OKLAHOMA
GAS CHROMATOGRAPHY LABORATORY

CLIENT	MKF-OH	
CLIENT SAMPLE ID	NSWC-02/11-BP3	
SWOK SAMPLE ID	35252.01	
FILENAME	5_004142.D	
METHOD	SW-846 8140	
SAMPLE MATRIX	SOIL	
PERCENT MOISTURE	14	
SAMPLE AMOUNT	30	g
FINAL VOLUME	10	mL
DILUTION FACTOR	1	
DATE RECEIVED	08/14/98	
DATE EXTRACTED	08/17/98	
DATE ANALYZED	08/18/98	
DATE REPORTED	08/19/98	

ORGANOPHOSPHORUS PESTICIDE QUANTITATION REPORT

ORGANOPHOSPHOROS PESTICIDE	QUANTITATION LIMIT (ug/Kg)	AMT FOUND	FLAG
Dichlorvos	99	99	U
Mevinphos	174	174	U
Demeton S	110	110	U
Ethoprop	198	198	U
Naled	349	349	U
Phorate	128	128	U
Diazinon	221	221	U
Disulfoton	140	140	U
Parathion-methyl	21	21	U
Ronnel	128	128	U
Fenthion	60	60	U
Chlorpyrifos	115	115	U
Trichloroanate	110	110	U
Stirophos	663	663	U
Tokuthion	166	166	U
Merphos	174	174	U
Fensulfothion	453	453	U
Bolstar	107	107	U
Azinphos-methyl	494	494	U
Coumaphos	581	581	U

SURROGATE RECOVERY: (ETHION) 63% ETHION SURR LIMITS (36 -134)
ETHION SPIKED (ug/Kg) : 155

FLAG DEF: U - NOT DETECTED ABOVE QUANTITATION LIMIT
B - COMPOUND FOUND IN BLANK
J - ESTIMATED VALUE (BELOW QUANT LIMIT OR ABOVE LINEAR RANGE)
D - SURROGATE OR MATRIX SPIKE DILUTED OUT SAMPLE RUN AT SECONDARY DILUTION
I - SURROGATE NOT QUANTITATIOBLE DUE TO MATRIX INTERFERENCE.

PRELIMINARY DATA

F:\QPW\OP\TAB\SOIL\880_S.WB2

Data File: /chem/m.i/m980818a.b/m11504.d
Report Date: 19-Aug-1998 11:29

SWOK/AATS

TARGET COMPOUNDS

Client Name: MKF-OH
Client Sample ID: NSWC-02/11-BP3
Sample Location:
Lab Sample ID: 35252.01
Sample Type: SOIL
Analysis Type: SV
Data Type: MS DATA
Misc Info: MS510**INSTM*MKF-OH*35252.01*30.2G/1ML/1UL*

Client SDG: m980818a.b
Sample Date:
Sample Point:
Date Received: 08/14/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/Kg	Q
108-95-2	Phenol	381.18	U
111-44-4	bis(2-Chloroethyl)ether	381.18	U
95-57-8	2-Chlorophenol	381.18	U
541-73-1	1,3-Dichlorobenzene	381.18	U
106-46-7	1,4-Dichlorobenzene	381.18	U
100-51-6	Benzyl alcohol	381.18	U
95-50-1	1,2-Dichlorobenzene	381.18	U
95-48-7	2-Methylphenol	381.18	U
108-60-1	bis(2-Chloroisopropyl)ether	381.18	U
106-44-5	4-Methylphenol	381.18	U
621-64-7	N-Nitroso-di-n-propylamine	381.18	U
67-72-1	Hexachloroethane	381.18	U
98-95-3	Nitrobenzene	381.18	U
78-59-1	Isophorone	381.18	U
88-75-5	2-Nitrophenol	381.18	U
105-67-9	2,4-Dimethylphenol	381.18	U
111-91-1	bis(2-Chloroethoxy)methane	381.18	U
65-85-0	Benzoic Acid	1848.14	U
120-82-1	1,2,4-Trichlorobenzene	381.18	U
91-20-3	Naphthalene	381.18	U
106-47-8	4-Chloroaniline	381.18	U
87-68-3	Hexachlorobutadiene	381.18	U
59-50-7	4-Chloro-3-methylphenol	381.18	U
91-57-6	2-Methylnaphthalene	381.18	U
77-47-4	Hexachlorocyclopentadiene	381.18	U
88-06-2	2,4,6-Trichlorophenol	381.18	U
95-95-4	2,4,5-Trichlorophenol	1848.14	U
120-83-2	2,4-Dichlorophenol	381.18	U
91-58-7	2-Chloronaphthalene	381.18	U
88-74-4	2-Nitroaniline	1848.14	U
131-11-3	Dimethylphthalate	381.18	U
208-96-8	Acenaphthylene	381.18	U
606-20-2	2,6-Dinitrotoluene	381.18	U
121-14-2	2,4-Dinitrotoluene	381.18	U
99-09-2	3-Nitroaniline	1848.14	U
83-32-9	Acenaphthene	381.18	U
51-28-5	2,4-Dinitrophenol	1848.14	U
100-02-7	4-Nitrophenol	1848.14	U
132-64-9	Dibenzofuran	381.18	U

ata File: /chem/m.i/m980818a.b/m11504.d
eport Date: 19-Aug-1998 11:29

SWOK/AATS

TARGET COMPOUNDS

Client Name: MKF-OH
Client Sample ID: NSWC-02/11-BP3
Sample Location:
Lab Sample ID: 35252.01
Sample Type: SOIL
Analysis Type: SV
Data Type: MS DATA
Misc Info: MS510**INSTM*MKF-OH*35252.01*30.2G/1ML/1UL*

Client SDG: m980818a.b
Sample Date:
Sample Point:
Date Received: 08/14/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/Kg	Q
84-66-2	Diethylphthalate	381.18	U
86-73-7	Fluorene	381.18	U
7005-72-3	4-Chlorophenyl-phenylether	381.18	U
100-01-6	4-Nitroaniline	1848.14	U
86-30-6	N-Nitrosodiphenylamine	381.18	U
534-52-1	4,6-Dinitro-2-methylphenol	1848.14	U
101-55-3	4-Bromophenylphenylether	381.18	U
118-74-1	Hexachlorobenzene	381.18	U
87-86-5	Pentachlorophenol	1848.14	U
85-01-8	Phenanthrene	381.18	U
120-12-7	Anthracene	381.18	U
84-74-2	Di-n-butylphthalate	381.18	U
206-44-0	Fluoranthene	381.18	U
129-00-0	Pyrene	381.18	U
85-68-7	Butylbenzylphthalate	381.18	U
56-55-3	Benzo(a)anthracene	381.18	U
91-94-1	3,3'-Dichlorobenzidine	762.35	U
218-01-9	Chrysene	381.18	U
117-81-7	bis(2-Ethylhexyl)phthalate	381.18	U
117-84-0	Di-n-octylphthalate	381.18	U
205-99-2	Benzo(b)fluoranthene	381.18	U
207-08-9	Benzo(k)fluoranthene	381.18	U
50-32-8	Benzo(a)pyrene	381.18	U
53-70-3	Dibenz(a,h)anthracene	381.18	U
193-39-5	Indeno(1,2,3-cd)pyrene	381.18	U
191-24-2	Benzo(g,h,i)perylene	381.18	U
367-12-4	2-Fluorophenol	3714.47	
4165-62-2	Phenol-d5	3858.29	E
4165-60-0	Nitrobenzene-d5	1453.51	
321-60-8	2-Fluorobiphenyl	1628.69	
118-79-6	2,4,6-Tribromophenol	2559.83	
98904-43-9	Terphenyl-d14	1787.58	

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

NSWC-02/11-BP3

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: MKF-O SDG No.: 35252

Matrix: (soil/water) SOIL Lab Sample ID: 35252.01

Sample wt/vol: 30.1 (g/mL) G Lab File ID:

% Moisture: 14 decanted: (Y/N) N Date Received: 08/14/98

Extraction: (SepF/Cont/Sonc) SONC Date Extracted: 08/17/98

Concentrated Extract Volume: 10000(uL) Date Analyzed: 08/18/98

Injection Volume: 0.5(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	1.5	U
319-85-7	beta-BHC	1.5	U
319-86-8	delta-BHC	1.5	U
58-89-9	gamma-BHC (Lindane)	1.5	U
76-44-8	Heptachlor	1.5	U
309-00-2	Aldrin	1.5	U
1024-57-3	Heptachlor epoxide	1.5	U
959-98-8	Endosulfan I	1.5	U
60-57-1	Dieldrin	2.9	U
72-55-9	4,4'-DDE	2.9	U
72-20-8	Endrin	2.9	U
33213-65-9	Endosulfan II	2.9	U
72-54-8	4,4'-DDD	2.9	U
1031-07-8	Endosulfan sulfate	2.9	U
50-29-3	4,4'-DDT	2.9	U
72-43-5	Methoxychlor	15	U
53494-70-5	Endrin ketone	2.9	U
7421-93-4	Endrin aldehyde	2.9	U
5103-71-9	alpha-Chlordane	1.5	U
5103-74-2	gamma-Chlordane	1.5	U
8001-35-2	Toxaphene	96	U
12674-11-2	Aroclor-1016	38	U
11104-28-2	Aroclor-1221	38	U
11141-16-5	Aroclor-1232	38	U
53469-21-9	Aroclor-1242	38	U
12672-29-6	Aroclor-1248	38	U
11097-69-1	Aroclor-1254	78	U
11096-82-5	Aroclor-1260	78	U
Surrogate amount spiked		15.47	

FORM I PEST

Form 1

PCDD/PCDF ANALYSIS DATA SHEET
Use for Sample and Blank Results

CLIENT ID.
N8WC-02/11-BP3

Lab Name: Southwest Lab. of Oklahoma — Episode No.: 35252

Client Name: MKF-OH — Lab Sample ID: 35252.01

Matrix (aqueous/solid/leachate): solid — Sample Wt/Vol: 10.06 g or mL: g

Sample Receipt Date: 08-14-98 — Initial Calibration Date: 05-04-98

Ext. Date: 08-18-98 — Instrument ID: HP5972_E GC

Analysis Date: 19-AUG-98 Time: 03:04:00 — GC Column:DB-5

Ext. Vol(ul): 100 — Sample Data Filename: E002281#1

Inj. Vol(ul): 2.0 — Blank Data Filename: E002278#1

Dilution Factor: 1 — Cal. Ver. Data Filename: E002277#1

Concentration Units (ng/L or ug/Kg dry weight): ug/Kg % Moisture: 13.59

ANALYTE	CONCENTRATION FOUND	DETECTION LIMIT	Qual. (1)	ION ABUND. RATIO (2)	RRT (2)	CCAL RRF
2,3,7,8-TCDD	*	0.068	U	*	*	0.82
1,2,3,7,8-PeCDD	*	0.072	U	*	*	1.35
1,2,3,4,7,8-HxCDD	*	0.107	U	*	*	0.76
1,2,3,6,7,8-HxCDD	*	0.108	U	*	*	0.75
1,2,3,7,8,9-HxCDD	*	0.100	U	*	*	0.81
1,2,3,4,6,7,8-HpCDD	*	0.091	U	*	*	0.75
OCDD	*	0.103	U	*	*	0.72
2,3,7,8-TCDF	*	0.060	U	*	*	0.89
1,2,3,7,8-PeCDF	*	0.058	U	*	*	1.28
2,3,4,7,8-PeCDF	*	0.050	U	*	*	1.48
1,2,3,4,7,8-HxCDF	*	0.053	U	*	*	1.04
1,2,3,6,7,8-HxCDF	*	0.049	U	*	*	1.12
1,2,3,7,8,9-HxCDF	*	0.053	U	*	*	1.05
2,3,4,6,7,8-HxCDF	*	0.053	U	*	*	1.05
1,2,3,4,6,7,8-HpCDF	*	0.031	U	*	*	1.43
1,2,3,4,7,8,9-HpCDF	*	0.036	U	*	*	1.23
OCDF	*	0.059	U	*	*	1.13
Total Tetra-Dioxins	*	0.068				
Total Penta-Dioxins	*	0.072				
Total Hexa-Dioxins	*	0.108				
Total Hepta-Dioxins	*	0.091				
Total Tetra-Furans	*	0.060				
Total Penta-Furans	*	0.050				
Total Hexa-Furans	*	0.049				
Total Hepta-Furans	*	0.031				

(1) Qualifier U indicates not detected; The X & I indicates EMPC. The C needs value from second column analysis. The B indicates possible blank contamination.

(2) Ion ratios and RRTs are specified in Tables 9 and 10, Method 8280.

8280F1

ORRISON KNUDSEN CORPORATION
K-FERGUSON PLAZA
500 WEST 3RD STREET
LEVELAND, OH 44113-140

Attn: RICK PURVIS

REPORT : 35252.01

REPORTED : 08/20/98

PROJECT : NSWC CRANE
LAB# : 35252.01
SAMPLE #: NSWC-02/11-BP3
LOCATION:
MATRIX : Soil

SAMPLED : 08/13/98
SUBMITTED: 08/14/98

%MOISTURE: 13.6

MISCELLANEOUS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
TOTAL CYANIDE	0.25	U	mg/kg	08/17/98	08/18/98	SW 9012A
TOTAL SULFIDE	20	U	mg/kg		08/17/98	EPA 376.1

**RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

1700 West Albany Broken Arrow, Oklahoma 74012 Office (918) 251-2858 Fax (918) 251-2599

MORRISON KNUDSEN CORPORATION
MK-FERGUSON PLAZA
1500 WEST 3RD STREET
CLEVELAND, OH 44113-140

REPORT : 35252.01

REPORTED : 08/21/98

Attn: RICK PURVIS

PROJECT : NSWC CRANE
LAB# : 35252.01
SAMPLE #: NSWC-02/11-BP3
LOCATION:
MATRIX : Soil

SAMPLED : 08/13/98
SUBMITTED: 08/14/98

%MOISTURE: 13.6

METAL PARAMETERS REPORTED ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
MERCURY	0.037	U	mg/kg	08/18/98	08/19/98	SW 7470A/7471A
ALUMINUM	9400		mg/kg	08/17/98	08/20/98	SW 6010A
ARSENIC	5.3		mg/kg	08/17/98	08/20/98	SW 6010A
ANTIMONY	1.6	U	mg/kg	08/17/98	08/20/98	SW 6010A
LEAD	12		mg/kg	08/17/98	08/20/98	SW 6010A
BARIUM	150		mg/kg	08/17/98	08/20/98	SW 6010A
ENIUM	0.55	U	mg/kg	08/17/98	08/20/98	SW 6010A
AYLLIUM	0.59		mg/kg	08/17/98	08/20/98	SW 6010A
THALLIUM	1.1	U	mg/kg	08/17/98	08/20/98	SW 6010A
CADMIUM	0.33	U	mg/kg	08/17/98	08/20/98	SW 6010A
CALCIUM	1400		mg/kg	08/17/98	08/20/98	SW 6010A
CHROMIUM	12		mg/kg	08/17/98	08/20/98	SW 6010A
COBALT	7.1		mg/kg	08/17/98	08/20/98	SW 6010A
COPPER	13		mg/kg	08/17/98	08/20/98	SW 6010A
IRON	13000		mg/kg	08/17/98	08/20/98	SW 6010A
MAGNESIUM	1300		mg/kg	08/17/98	08/20/98	SW 6010A
MANGANESE	940		mg/kg	08/17/98	08/20/98	SW 6010A
NICKEL	12		mg/kg	08/17/98	08/20/98	SW 6010A
POTASSIUM	1000		mg/kg	08/17/98	08/20/98	SW 6010A
SILVER	1.1	U	mg/kg	08/17/98	08/20/98	SW 6010A
SODIUM	280		mg/kg	08/17/98	08/20/98	SW 6010A
VANADIUM	22		mg/kg	08/17/98	08/20/98	SW 6010A
ZINC	46		mg/kg	08/17/98	08/20/98	SW 6010A

**RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

E-2

Initial and Follow-up Sand Drainage Layer Test Results

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 28, 1998
REPORT #097

Activity:

- Sand Drainage Layer - PSG completed placement, spreading, and grading of the six inch sand drainage layer.

  Using a JD 550 dozer, PSG tracked the entire length of the DBG cap to lightly compact the sand drainage layer once placement and grading were completed.

  An as-built survey of 25 foot center was conducted by MSE, a subcontractor for PSG. All areas out of tolerance were corrected by PSG. Average depth of sand ranged from 0.5 to 0.7 feet.

  After the MSE survey and random spot check cleared an area, PSG and EDCI began deployment, placement, and sewing of the non-woven geotextile over the sand layer. Starting at the NE end and working southwest, the panels were placed across the width of the cap per panel layout. EDCI is using TNS R70 six ounce non-woven geotextile and KemFast thread for the geotextile Type 1, filter fabric. Pursuant to the subcontractors request, heat bonding of the geotextile was approved for use however, EDCI elected to continue to sew the geotextile panels together.
- Biotic Layer - held preparatory meeting for the installation of the six inch biotic layer with geotextile cover over the -2 inch rounded gravel layer.

Inspection:

- MK - performed ten random spot checks on the sand drainage layer thickness:

	Approximate Location		Sand Thickness	Photographed
1	N 1311650	E 3049200	5.8	yes
2	N 1311600	E 3049250	6.0	yes
3	N 1311550	E 3049250	6.2	yes
4	N 1311550	E 3049150	8.0	
5	N 1311450	E 3049100	8.0	
6	N 1311450	E 3049150	6.2	
7	N 1311400	E 3049100	6.7	
8	N 1311450	E 3049050	6.2	
9	N 1311400	E 3049000	6.7	
10	N 1311350	E 3048900	6.0	yes

4 of 10 areas were photographed for documentation.

- MK - observed placement, spreading, grading, and light compaction by tracking using a JD 550 dozer.
- MSE - performed a cross section of the cap area on 25 foot centers for an as-built of the sand layer.
- MK - confirmed that TNS R-70 geotextile, the approved Type 1 geotextile has all required submittals and is being deployed over the sand for the sand drainage layer.
- MK - after the survey was performed, MK approved placement of preceding layer for the DBG cap construction.
- MK - observed deployment of the first panel, GT-01, of the geotextile over the sand drainage layer on the NE end of the cap and confirmed that the panel was reasonably straight and smooth.
- MK - visually inspected the following geotextile panels and seams for rips, tears, irregularities, and continuously interlocking stitching:

Morrison Knudsen Corporation
NSWC Crane
DO #4324-0009

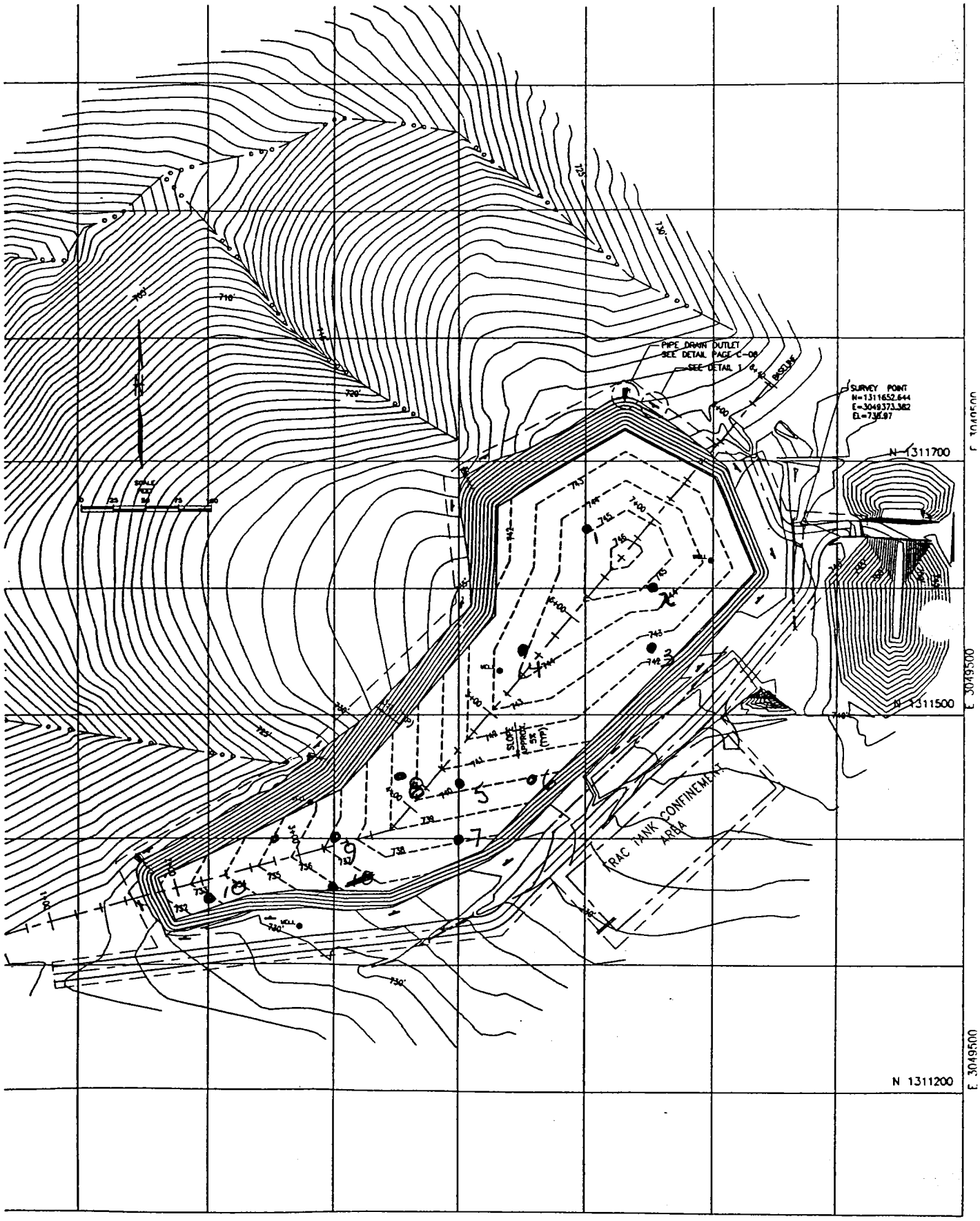
PANEL #	ROLL #	STRIP STATION
GT-4	0992138	1
GT-5	0992165	1
GT-3	0992138	2
GT-2	0992124	2
GT-1	0992124	3
GT-6	0992165	4
GT-8	0992138	5
GT-7	0992165	5
GT-9	0991894	6
GT-11	0991844	7
GT-10	0991894	7
GT-12	0991894	8
GT-13	0991844	8
GT-14	0992118	9
GT-15	0991868	10
GT-16	0992118	10
GT-17	0991868	11

Attachments: 0

Signature/Date: Lois J. Bigley 07/28/98

60-3

Radom Sand drainage thickness check



PHILIP
ENVIRONMENTAL

Environmental Services Group
North Central Region

SEP 0 8 1997

K-CRANE

September 04, 1997
Project 18328

Mr. Vernon D. Logan
Contract Administrator
Morrison Knudsen Corporation
300 Highway 361
NSWC - CTR 12
Crane, Indiana 47522

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62467-93-D-1108, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is APPROVED FOR USE.

Certified by Submittal Reviewer (signature when applicable) L. Bigley Date 9/18/97

Certified by QC Manager (signature) Lois J. Bigley Date 9/18/97

Dear Mr. Logan

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Re-Submittal No. 017A

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-47	Drainage Layer Gradation, Permeability Sand Type - #23/24	02200

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

TOTAL WEIGHT 519.2 GRAMS LBS. Report No. Contract No. PS 4-95

SIEVE SIZE	% SAND DEPARTURE	WEIGHT RETAINED	WEIGHT PASSING	PERCENT PASSING	CONTROL LIMIT	SPECIFICATION
3" (75 mm)	X					
2 1/2" (63 mm)	X					
2" (50 mm)	X					
1 1/2" (37.5 mm)	X					
1" (25 mm)	X					
3/4" (19 mm)	X					
1/2" (12.5 mm)	P/F					
3/8" (9.5 mm)						
No. 4 (4.75 mm)		2.5	516.7	99.5		95-100
No. 8 (2.36 mm)		72.3	444.4	85.5		80-100
No. 12 (1.70 mm)						
No. 16 (1.18 mm)		78.5	365.9	70.4		50-85
No. 20 (850 µm)						
No. 30 (600 µm)		106.9	259	49.8		25-60
No. 50 (300 µm)		202.7	56.3	10.8		5-30
No. 60 (250 µm)						
No. 80 (180 µm)						
No. 100 (150 µm)		52.9	3.4	.6		0-10
No. 140 (106 µm)						
No. 200 (75 µm)		2.2	1.2	.2		0-3
No. 270 (53 µm)						
No. 325 (45 µm)						
PAN 1.2	ORIGINAL	FINAL	GRAMS LOSS	% LOSS		
DECANT					FM	2.83

NON-DURABLE	TOTAL WT. 3/8" UP	WT. OF NON-DUR.	% NON-DUR.	LONG GRADED MATERIAL	TOTAL WT. PASS. No. 4	SAMPLE SIZE	PROPORT. FACTORS
					GM	GM	
TOTAL CHERT	SAMPLE WT. 3/8" UP	WT. OF TOT. CHERT	% TOTAL CHERT	TOTAL CHERT	SAMPLE WT. No. 4 UP	WT. OF TOT. CHERT	% TOTAL CHERT
AGG. SIZE 3, 4, 57, 53, 73				AGG. SIZE 9, 11			
MECH. CRUSHED	SAMPLE WT. No. 4 UP	WT. OF MECH. CRUSHED PT.	% MECH. CRUSHED	TOTAL CRUSHED	SAMPLE WT. No. 4 UP	WT. TOTAL CRUSHED	% TOTAL CRUSHED

1.
2.
3.
4.
5.
6.

ROGERS GROUP

SAMPLE FROM 2613 PLA

TEST NO. 97-401 LOCATION Greene Co

LEDGES SHOT LOCATION # 3

SAMPLE DATE No. 8 Day 12 19 97 Module CRS CMB

MATERIAL 23 Sand TIME SAMPLED 12:00 FREQUENCY ☐ ITEM GROUP ☐ ORIGINAL

SPECIFICATION ☐ AS - 1965 AB - 1966 SP - SPEC. PROV. PURPOSE ☐ ⊗ PI - ACB CONTROL PI - ACB PAYMENT

SAMPLED BY R. Campbell SUPERINTENDENT L. Huffine TONS REP. BY TEST 2000 PRODUCTION ☑ STOCKPILE ☐ YES - 3 DELETERIOUS TESTS PERFORMED NO - 4

MATERIAL STATUS A2 ACCEPTED X4 REJECTED I7 VISUAL L1 INFO WEATHER cloudy 70°

QUALITY CHECKS AND CORRECTIVE ACTION

TOO FINE

TOO COARSE

CRUSHER SETTINGS

JAW SETTING

SCREEN CHANGES

SEGREGATION

CONTAMINATION

WASH SAMPLE

DRY SHAKE

RESAMPLE

REMARKS

#23/24 Sand

BOWSER-MORNER, INC.

CORPORATE: 4518 Taylorsville Road • P. O. Box 51 • Dayton, Ohio 45401 • 513/236-8805

LABORATORY REPORT

Report To: Rogers Group, Inc.
Attn: Steve Roseberry
P.O. Box 849
Bloomington, IN 47402-0849

Date January 18, 1995
Report No. 000157
W.O. No. 105030

Report On: Laboratory Analyses of Two Granular Materials for the Daviess County Landfill Lateral Expansion Project

On January 16, 1995, two sand samples were submitted for laboratory analyses for the above referenced project.

Testing was performed in accordance with the following ASTM procedures as specified by the client:

ASTM D422, "Particle-Size Analysis of Soils".
ASTM D1140, "Amount of Material in Soils Finer Than the No. 200 (75-µm) Sieve".
ASTM D2434, "Permeability of Granular Soils (Constant Head)".
ASTM D4318, "Liquid Limit, Plastic Limit, and Plasticity Index of Soils".
ASTM D2487, "Classification of Soils for Engineering Purposes".

Results are summarized in Table 1 and detailed on the attached data sheets.

Should you have any questions, or if we may be of further service, please contact us at (513) 236-8805.

Respectfully submitted,

BOWSER-MORNER, INC.

James W. Fletcher, Manager
Construction Materials and
Geotechnical Laboratories

JWF/ofw
000157
1-Client
1-File

All Reports Remain The Confidential Property Of BOWSER-MORNER And No Publication Or Distribution Of Reports May Be Made Without Our Express Written Consent, Except As Authorized By Contract. Results Contained In This Report Are Reflective Only of The Items Calibrated Or Tested. Unless Otherwise Agreed, Samples Or Specimens Will Be Discarded Or Returned At Bowser-Morner's Discretion.

W.O. No. 105030
Report No. 000157
January 18, 1995
Page 2

Rogers Group

Table I

Summary of Results

Sample ID:	950006 Stabilizer	950005 23-24 Sand
Sieve Size	Percent Passing	
1"	100	
3/4"	98	
1/2"	93	
3/8"	85	
#4	71	100
#10	55	80
#20	45	53
#40	31	22
#60	17	4
#100	12	0
#200	11	0
Gravel, %:	30	0
Sand, %:	60	100
Silt, %:	5	0
Clay, % (0.002mm):	5	0
Liquid Limit:	26	
Plastic Limit:	18	Non-Plastic
Plasticity Index:	8	
USCS Classification:	SW-SC	SP
Permeability, cm/sec.:	--	3.8

~~2.3×10^{-1} inch³/sec~~ 48

CONSTANT HEAD PERMEABILITY TEST

ASTM 2434

Date: January 18, 1995

Project No.: 105030

Client: Rogers Group

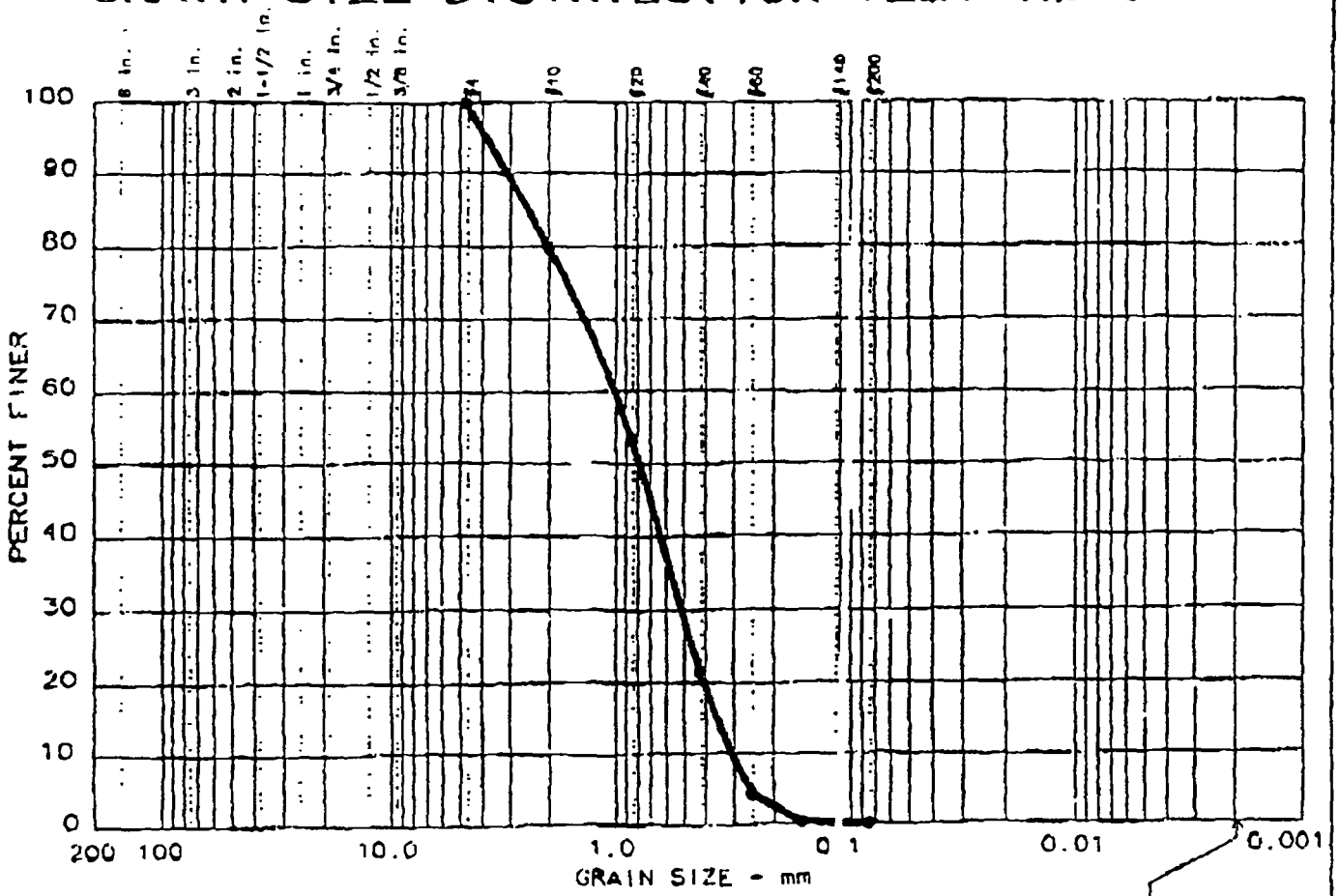
Project: Drainage Layer Material 950005

Material Description: 23-24 Sand

SPECIMEN DATA

Dimension, Inches.	
Height:	6.2
Diameter:	6.0
Weight, lbs.:	11.15
Dry Unit Weight, pcf:	110.0
Permeability, cm/sec..	
k:	3.8

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	0.0	99.9	0.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●		NP	2.48	1.01	0.78	0.511	0.3560	0.3065	0.84	3.3

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SAND	SP	

Project No.: 105030 ROGERS GROUP
Project: DAVIESS CO. LANDFILL LATERAL EXPANSION
● Location: 950005 23-24 SAND

Date: 01-17-95

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT
BOWSER-MORNER, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 7

:e: 01-17-95
ɔject No.: 105030 ROGERS GROUP
ɔject: DAVIESS CO. LANDFILL LATERAL EXPANSION

Sample Data

ɔation of Sample: 950005 23-24 SAND
mple Description: BROWN SAND
CS Class: SP
SHTO Class:
Liquid limit:
Plasticity index: NP

Notes

marks:

g. No.:

Mechanical Analysis Data

	Initial
y sample and tare=	741.00
re =	219.19
y sample weight =	521.81

re for cumulative weight retained= 0

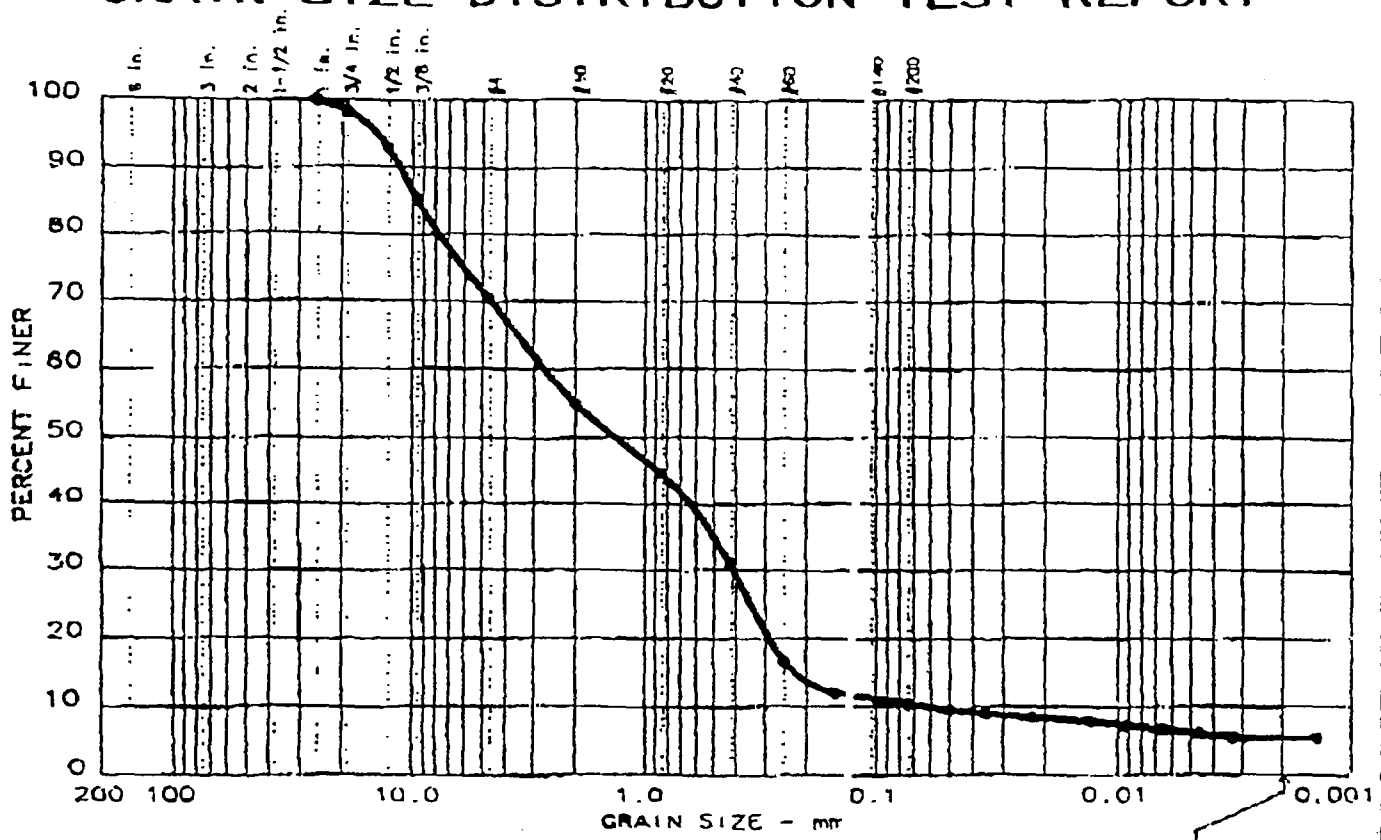
S: e	Cumul. Wt. retained	Percent finer
# 4	0.00	100.0
# 10	105.54	79.8
# 20	243.06	53.4
# 40	409.78	21.5
# 60	499.78	4.2
# 100	519.96	0.4
# 200	521.54	0.1

Fractional Components

ravel/Sand based on #4 sieve
and/Fines based on #200 sieve
+ 3 in. = 0.0 % GRAVEL = 0.0 % SAND = 99.9
FINES = 0.1

85= 2.48 D60= 1.007 D50= 0.782
30= 0.5105 D15= 0.35604 D10= 0.30655
c = 0.8443 Cu = 3.2847

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	29.5	60.0	5.1	5.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	26	8	9.44	2.69	1.32	0.407	0.2213	0.0596	1.04	45.2

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN WELL-GRADED SAND WITH CLAY AND GRAVEL	SW-SC	

Project No.: 105030 ROGERS GROUP
Project: DAVIESS CO. LANDFILL LATERAL EXPANSION
● Location: 950008 STABILIZER

Date: 01-18-95

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

BOWSER-MORNER, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 8

e: 01-18-95
ject No.: 105030 ROGERS GROUP
ject: DAVIESS CO. LANDFILL LATERAL EXPANSION

Sample Data

ation of Sample: 950006 STABILIZER
ple Description: BROWN WELL-GRADED SAND WITH CLAY AND GRAVEL
S Class: SW-SC Liquid limit: 26
HTO Class: Plasticity index: 8

Notes

arks:

g. No.:

Mechanical Analysis Data

	Initial
y sample and tare=	1869.80
re =	216.40
y ple weight =	1653.40

mple split on number 10 sieve
lit sample data:
Sample and tare = 50.04 Tare = 0 Sample weight = 50.04
Cumulative weight retained tare= 0
re for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
1 inches	0.00	100.0
0.75 inches	27.80	98.3
0.5 inches	114.32	93.1
0.375 inches	245.49	85.2
# 4	487.40	70.5
# 10	743.91	55.0
# 20	9.38	44.7
# 40	21.81	31.0
# 60	34.76	16.8
# 100	39.04	12.1
# 200	40.47	10.5

Hydrometer Analysis Data

eparation sieve is number 10
ercent -# 10 based on complete sample= 55.0
eight of hydrometer sample: 50.04
ygroscopic moisture correction:
I it weight & tare = 52.78

Dry weight & tare = 52.02
Tare = 29.94
Hygroscopic moisture= 3.4 %
Calculated biased weight= 87.94
Automatic temperature correction
Composite correction at 20 deg C =-5

Meniscus correction only= 0
Specific gravity of solids= 2.65
Specific gravity correction factor= 1.000
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	22.0	13.0	8.4	0.0133	13.0	14.2	0.0501	9.6
2.0	22.0	12.5	7.9	0.0133	12.5	14.2	0.0355	9.0
5.0	22.0	12.0	7.4	0.0133	12.0	14.3	0.0225	8.4
15.0	22.0	11.5	6.9	0.0133	11.5	14.4	0.0130	7.9
30.0	21.9	11.0	6.4	0.0133	11.0	14.5	0.0093	7.3
60.0	21.7	10.5	5.8	0.0134	10.5	14.6	0.0066	6.6
123.0	21.4	10.0	5.3	0.0134	10.0	14.7	0.0046	6.0
240.0	21.5	9.5	4.8	0.0134	9.5	14.7	0.0033	5.4
1331.0	21.5	9.5	4.8	0.0134	9.5	14.7	0.0014	5.4

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
+ 3 in. = 0.0 % GRAVEL = 29.5 % SAND = 60.0
SILT = 5.1 % CLAY = 5.4

D85= 9.44 D60= 2.692 D50= 1.318
D30= 0.4074 D15= 0.22131 D10= 0.05957
Cc = 1.0351 Cu = 45.1856

E-3

Biotic Layer Test Results

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

August 3, 1998
REPORT #102

Activity:

- Biotic Layer - PSG placed, spread and graded RH-5,-2" rounded gravel over the SW end of the DBG cap, completing placement of the biotic material. MSE performed a cross-section survey of the cap area and MK/PSG ran random checks on thickness of the biotic gravel. PSG, using a JD 550 dozer, re-graded and corrected any area found to be out of tolerance.
- Cover Layer - PSG/MK conducted a Preparatory Meeting discussing placement, compaction, and grading of the 27 inch cover layer.

Inspection:

- MSE - cross-section surveyed the top of the biotic gravel for as-built conditions of the biotic layer.
- PSG/MK - performed 16 random spot checks on the thickness of the biotic layer.

SAMPLE #	APPROXIMATE LOCATION	DEPTH	RECHECK	STATUS
1	N1311600 E3049300	4"	5 1/2"	Pass
2	N1311660 E3049260	8"	7"	Pass
3	N1311610 E3049220	4"	5 1/2"	Pass
4	N1311680 E3049210	9"	7"	Pass
5	N1311660 E3049125	10 1/2"	7"	Pass
6	N1311580 E3049150	6 1/2"	7"	Pass
7	N1311550 E3049200	10 1/2"	7 1/4"	Pass
8	N1311500 E3049150	7"	7"	Pass

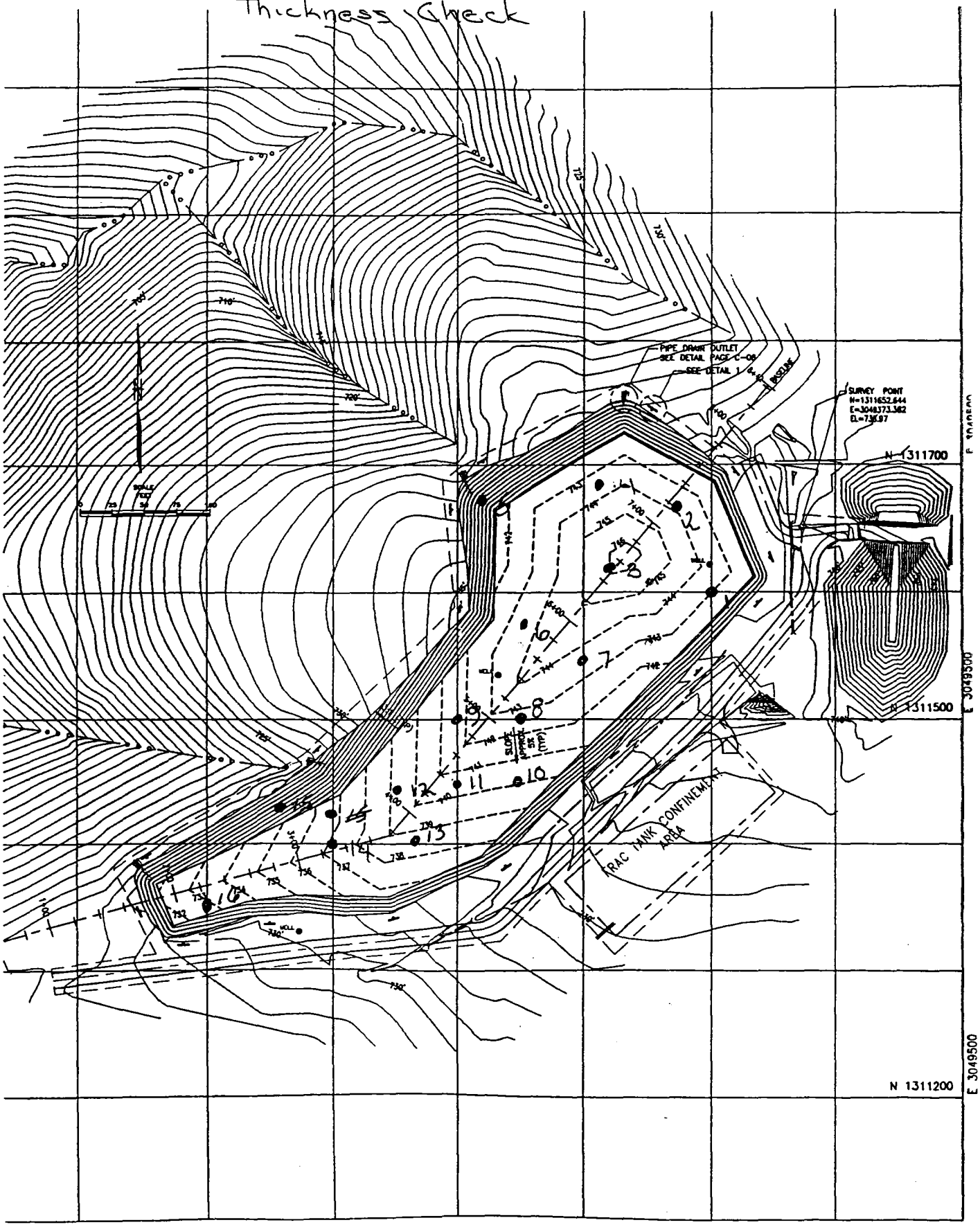
SAMPLE #	APPROXIMATE LOCATION	DEPTH	RECHECK	STATUS
9	N1311500 E3049100	6 1/2"	6 1/2"	Pass
10	N1311450 E3049150	6 3/4"	6 3/4"	Pass
11	N1311450 E3049100	7"	7"	Pass
12	N1311450 E3049050	8 1/2"	7"	Pass
13	N1311400 E3049060	7"	7"	Pass
14	N1311400 E3049060	8 1/2"	7"	Pass
15	N1311410 E3048950	4"	5 1/2"	Pass
16	N1311375 E3048900	9"	6 1/2"	Pass

- MK - recorded meeting minutes of 27 inch cover layer Preparatory Meeting.
- MK - accepted biotic rock placement at the end of the shift for deployment and installation of geotextile.

Lois J. Bigley 08/03/98

Attachments: 0 Signature/Date:

Radon Biotic Layer Thickness Check



PHILIP ENVIRONMENTAL

Environmental Services Group
North Central Region

August 15, 1997
Project 18328

Mr. Vernon D. Logan
Contract Administrator
Morrison Knudsen Corporation
300 Highway 361
NSWC - CTR 12
Crane, Indiana 47522

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62467-93-D-1106, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is APPROVED FOR USE

Certified by Submittal Reviewer _____, Date____
(signature when applicable)

Certified by QC Manager _____, Date____
(signature)

INCOMPLETE NEED PERMEABILITY
REVISE AN RESUBMITTE 1-48
8/19/97 SB

Dear Mr. Logan

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Submittal No. 017

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-45,	Gradation Permeability Drainage Rock Stone Types - #53, #2, #8L	01300
1-47	Drainage Layer Gradation, Permeability Sand Type - #23/24	02200
1-48	Biotic Layer Gradation, Permeability Stone Type - RH5	02200

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald L. Flowers,
Project Manager

TOTAL WEIGHT	6552.7	GRAMS	LBS.	Report No.		Contract No.		RS 4-96

SIEVE SIZE	LONG GRAD. WEIGHT RET.	WEIGHT RETAINED	WEIGHT PASSING	PERCENT PASSING	CONTROL LIMITS	CUSTOMER SPECS.
3" (75 mm)						
2 1/2" (63 mm)						
2" (50 mm)						
1 1/2" (37.5 mm)				100		
1" (25 mm)		2205.3	4347.4	66.3		
3/4" (19 mm)		3103.1	1244.3	19.0		
1/2" (12.5 mm)	P/F	1188.5	55.8	.9		
3/8" (9.5 mm)						
No. 4 (4.75 mm)						
No. 5 (3.35 mm)						
No. 8 (2.36 mm)						
No. 12 (1.70 mm)						
No. 16 (1.18 mm)						
No. 20 (850 mm)						
No. 30 (600 mm)						
No. 50 (300 mm)						
No. 60 (250 mm)						
No. 80 (180 mm)						
No. 100 (150 mm)						
No. 140 (106 mm)						
No. 200 (75 mm)						
No. 270 (53 mm)						
No. 325 (45 mm)						
PAN 55.8	ORIGINAL	FINAL	GRAMS LOSS	% LOSS		
DECANT						

ROGERS GROUP

SAMPLE FROM
TEST NO.
LEDGES
SAMPLE DATE Mo. 8 Day 15 1997 Moisture (CAS) (CAB) %

PLANT
LOCATION Martinsville
SHOT LOCATION #

MATERIAL Septic
TIME SAMPLED
FREQUENCY ☐ START-UP ☐ NORMAL
SPECIFICATION 98 - 1993 95 - 1996 SP - SPEC. PROV.
PURPOSE 72 - JOB CONTROL 75 - INFORMATION
SAMPLED BY Dan Bringer
SUPERINTENDENT
TONS REP. BY TEST PR. ☐ SP. ☐
DELETERIOUS TESTS PERFORMED YES - 3 NO - 4
MATERIAL STATUS K2 ACCEPTED K5 REJECTED K7 VISUAL L1 INFO
WEATHER

QUALITY CHECKS AND CORRECTIVE ACTION

TOO FINE
TOO COARSE
CRUSHER SETTINGS
JAW SETTING
SCREEN CHANGES
SEGREGATION
CONTAMINATION
WASH SAMPLE
DRY SHAKE
RESAMPLE

RHS

NON-DURABLE	TOTAL WT. 3/8" UP	WT. OF NON-DUR.	% NON-DUR.	LONG GRADED MATERIAL	TOTAL WT. PASS No. 4	SAMPLE SIZE	PROPORT. FACTORS	AUDIT SAMPLED BY
					GM	GM		
TOTAL CHERT	SAMPLE WT. 3/8" UP	WT. OF TCT CHERT	% TOTAL CHERT	TOTAL CHERT	SAMPLE WT. No. 4 UP	WT. OF TOTAL CHERT	% TOTAL CHERT	1. Stock/Stockpile 2. Bin or Tank 3. Processing Equipment 4. Truck, Barg, or Car 5. Inplace, Jobsite 6. Ledge or Pit
				AGG. SIZE 9, 11				
MECH. CRUSHED	SAMPLE WT. NO. 4 UP	WT. OF MECH CRUSHED PT.	% MECH. CRUSHED	TOTAL CRUSHED	SAMPLE WT. No. 4 UP	WT. TOTAL CRUSHED	% TOTAL CRUSHED	

RECEIVED
JUN 04 1998
MK-CRANE

PHILIP SERVICES CORP.
210 WEST SAND BANK ROAD
COLUMBIA, IL 62236
(618 281-7173)

FACSIMILE TRANSMITTAL SHEET

TO: Lois Bigley
COMPANY: Morrison Knudsen
FAX NUMBER: 812-854-6944
PHONE NUMBER:
RE:

FROM: DON FLOWERS
DATE: 6-4-98
TOTAL NO. OF PAGES INCLUDING COVER: 3
SENDER'S REFERENCE NUMBER: 18328
YOUR REFERENCE NUMBER:

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

Permeability Test For Biotic Rock

NSWC - CRANE 4324-0009			
PROJECT MEMBER	ACT	INFO	INIT
PROJECT MANAGER		X	
PROJECT ENGINEER			
[illegible]UPT			
SAFETY AND HEALTH			
QA/QC [illegible]		X	R
PROJECT CONTROLS			
FIELD ENGINEERING			
PMO-CHARLESTON			
FILE:			
FILE:			
FILE: 11-9-0009			

PHILIP ENVIRONMENTAL

Environmental Services Group
North Central Region

June 04, 1998
Project 18328

Mr. W.D. "John McCumbers
Contract Administrator
Morrison Knudsen Corporation
300 Highway 361
NSWC - CTR 12
Crane, Indiana 47522

Lois J Bigley 06-04-98
Lois J. Bigley 06-04-98

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Re-Submittal No. 017C

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-48	Biotic Layer Gradation, Permeability Stone Type - RH5	02200

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

CONSTANT HEAD PERMEABILITY TEST
ASTM D2434

Date: September 22, 1997

Project No.: 112239

Client: Rogers Group

Project: Rogers Group No. 970613

Material Description: Identified as 5L Gravel in accordance to Aimei Parsay of Rogers Group 5L is the name RHS @ the Mitchell quarry

SPECIMEN DATA

Dimension, inches,	
Height:	6.2
Diameter:	6.0
Weight, lbs.:	9.7
Dry Unit Weight, pcf:	96.1
Permeability, cm/sec.,	
k:	45.2

Bowser Morner

E-4

Borrow Source Soil Report

MOI ON KNUDSEN CORPORATION

CHAIN OF CU. ODY RECORD

COC #142

720 Park Blvd., P.O. Bo
Boise, Idaho 83729
(208) 386-5000

Project No.: 4324-0009-07

Project Name: NSWC Crane Dye Burial

Samplers: (Signature)

Sampler: (Print) Peter J. Chevalier

Analysis Required

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	8240	8270 VOC	8080	8150	8140	9010	8280	6010A/7471	9036							Remarks
Soil	borrow pit - E wall 4'	10/1/97	1445	NSWC 02/11BP1		✓	–	–	–	–	–	–	–	–	–							
Soil	borrow pit - N wall 3'	10/1/97	1445	NSWC 02/11BP2		✓	–	–	–	–	–	–	–	–	–							
																						Compu-Chem

Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:
	10/2/97 1530				
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Received for Laboratory By: (Signature) Company:	Date/Time	Total No. Samples This Shipping Container: Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:

Seal #s 5263, 5264

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

0211BP1

Lab Name: COMPUCHEM_ENV._CORP._____ Contract: SW-846____
Lab Code: COMPU_ Case No.: 31923 SAS No.: _____ SDG No.: 1366C_
Matrix (soil/water): SOIL_ Lab Sample ID: 871147
Level (low/med): LOW__ Date Received: 10/03/97
% Solids: _84.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony_	0.48	B	N	P
7440-38-2	Arsenic__	4.1		*	P
7440-39-3	Barium___	46.1		EN	P
7440-41-7	Beryllium	0.86		E	P
7440-43-9	Cadmium__	0.09	B		P
7440-47-3	Chromium_	22.4		E*	P
7440-50-8	Copper___	14.2		*	P
7439-92-1	Lead____	11.5		E	P
7439-97-6	Mercury__	0.06	U	N	CV
7440-02-0	Nickel___	13.1		E	P
7782-49-2	Selenium_	0.76		N	P
7440-22-4	Silver___	0.09	U		P
7440-28-0	Thallium_	0.59	U		P
7440-62-2	Vanadium_	24.7		E	P
7440-66-6	Zinc_____	25.6		*	P
7440-31-5	Tin_____	1.3	B	N	P

Color Before: BROWN____ Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW___ Clarity After: _____ Artifacts: _____

Comments:
Undecanted_Dry_Weights____Container:1.27g__Wet:6.20g__Dry:5.44g_____
Duplicate_(0211BP1D)

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

0211BP1

Lab Name: COMPUCHEM_ENV._CORP._____ Contract: SW-846____

Lab Code: COMPU_ Case No.: 31923_ SAS No.: _____ SDG No.: 1364C_

Matrix (soil/water): SOIL_ Lab Sample ID: 871163

Level (low/med): LOW__ Date Received: 10/03/97

% Solids: _84.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Cyanide	0.59	U		AS

Color Before: BROWN____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

Duplicate_(0211BP1D)

FORM I - IN ILM03.0

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

0211BP2

Lab Name: COMPUCHEM_ENV._CORP._____ Contract: SW-846____
Lab Code: COMPU_ Case No.: 31923 SAS No.: _____ SDG No.: 1366C_
Matrix (soil/water): SOIL_ Lab Sample ID: 871152
Level (low/med): LOW__ Date Received: 10/03/97
% Solids: _86.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony_	0.33	U	N	P_
7440-38-2	Arsenic__	2.9		*	P_
7440-39-3	Barium___	34.0		EN	P_
7440-41-7	Beryllium	0.30	B	E	P_
7440-43-9	Cadmium__	0.03	U		P_
7440-47-3	Chromium_	12.9		E*	P_
7440-50-8	Copper___	7.6		*	P_
7439-92-1	Lead____	8.4		E	P_
7439-97-6	Mercury__	0.06	U	N	CV
7440-02-0	Nickel___	6.2		E	P_
7782-49-2	Selenium_	0.53	B	N	P_
7440-22-4	Silver___	0.09	U		P_
7440-28-0	Thallium_	0.57	U		P_
7440-62-2	Vanadium_	17.0		E	P_
7440-66-6	Zinc____	18.1		*	P_
7440-31-5	Tin_____	1.5	B	N	P_

Color Before: BROWN____ Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW___ Clarity After: _____ Artifacts: _____

Comments:
Undecanted_Dry_Weights____Container:1.26g__Wet:6.28g__Dry:5.61g_____

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

0211BP2

Lab Name: COMPUCHEM_ENV._CORP._____ Contract: SW-846____

Lab Code: COMPU_ Case No.: 31923_ SAS No.: _____ SDG No.: 1364C_

Matrix (soil/water): SOIL_ Lab Sample ID: 871172

Level (low/med): LOW__ Date Received: 10/03/97

% Solids: _86.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Cyanide	0.58	U		AS

Color Before: BROWN____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN ILM03.0

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

0211BP1

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 31923 SAS No.: SDG No.: 1356C

Matrix: (soil/water) SOIL Lab Sample ID: 871142

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH071142B52.D

Level: (low/med) LOW Date Received: 10/03/97

% Moisture: not dec. 15 Date Analyzed: 10/14/97

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	21	B
67-64-1	Acetone	20	B
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
540-59-0	1,2-Dichloroethene (total)	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	12	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
1330-20-7	Xylene (Total)	12	U

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

0211BP1

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 31923 SAS No.: SDG No.: 1356C

Matrix: (soil/water) SOIL Lab Sample ID: 871142

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH071142B52.D

Level: (low/med) LOW Date Received: 10/03/97

% Moisture: not dec. 15 Date Analyzed: 10/14/97

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
75-05-8	acetonitrile	12	U
107-02-8	acrolein	12	U
107-05-1	3-chloropropene	12	U
106-93-4	1,2-dibromoethane	12	U
74-95-3	dibromomethane	12	U
110-57-6	trans-1,4-dichloro-2-butene	12	U
75-71-8	dichlorodifluoromethane	12	U
123-91-1	1,4-dioxane	12	U
107-12-0	propionitrile(ethylcyanide)	12	U
97-63-2	ethyl methacrylate	12	U
74-88-4	iodomethane	12	U
78-83-1	isobutyl alcohol	12	U
126-98-7	methacrylonitrile	12	U
80-62-6	methyl methacrylate	12	U
630-20-6	1,1,1,2-tetrachloroethane	12	U
96-18-4	1,2,3-trichloropropane	12	U
108-05-4	vinyl acetate	12	U
96-12-8	1,2-dibromo-3-chloropropane	12	U
75-69-4	trichlorofluoromethane	12	U
107-13-1	acrylonitrile	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

0211BP1

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 31923 SAS No.: SDG No.: 1356C

Matrix: (soil/water) SOIL Lab Sample ID: 871142

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH071142B52.D

Level: (low/med) LOW Date Received: 10/03/97

% Moisture: not dec. 15 Date Analyzed: 10/14/97

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	CO2 (NOT IN TIC TOTAL)	0.99	240	JB
2.				
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FORM I VOA-TIC

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

0211BP2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 31923 SAS No.: SDG No.: 1356C

Matrix: (soil/water) SOIL Lab Sample ID: 871168

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH071168B52.D

Level: (low/med) LOW Date Received: 10/03/97

% Moisture: not dec. 13 Date Analyzed: 10/14/97

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	11	U
74-83-9	Bromomethane	11	U
75-01-4	Vinyl Chloride	11	U
75-00-3	Chloroethane	11	U
75-09-2	Methylene Chloride	12	B
67-64-1	Acetone	13	B
75-15-0	Carbon Disulfide	11	U
75-35-4	1,1-Dichloroethene	11	U
75-34-3	1,1-Dichloroethane	11	U
540-59-0	1,2-Dichloroethene (total)	11	U
67-66-3	Chloroform	11	U
107-06-2	1,2-Dichloroethane	11	U
78-93-3	2-Butanone	11	U
71-55-6	1,1,1-Trichloroethane	11	U
56-23-5	Carbon Tetrachloride	11	U
75-27-4	Bromodichloromethane	11	U
78-87-5	1,2-Dichloropropane	11	U
10061-01-5	cis-1,3-Dichloropropene	11	U
79-01-6	Trichloroethene	11	U
124-48-1	Dibromochloromethane	11	U
79-00-5	1,1,2-Trichloroethane	11	U
71-43-2	Benzene	11	U
10061-02-6	trans-1,3-Dichloropropene	11	U
75-25-2	Bromoform	11	U
108-10-1	4-Methyl-2-Pentanone	11	U
591-78-6	2-Hexanone	11	U
127-18-4	Tetrachloroethene	11	U
79-34-5	1,1,2,2-Tetrachloroethane	11	U
108-88-3	Toluene	11	U
108-90-7	Chlorobenzene	11	U
100-41-4	Ethylbenzene	11	U
100-42-5	Styrene	11	U
1330-20-7	Xylene (Total)	11	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

0211BP2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 31923 SAS No.: SDG No.: 1356C

Matrix: (soil/water) SOIL Lab Sample ID: 871168

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH071168B52.D

Level: (low/med) LOW Date Received: 10/03/97

% Moisture: not dec. 13 Date Analyzed: 10/14/97

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
75-05-8	acetonitrile	11	U
107-02-8	acrolein	11	U
107-05-1	3-chloropropene	11	U
106-93-4	1,2-dibromoethane	11	U
74-95-3	dibromomethane	11	U
110-57-6	trans-1,4-dichloro-2-butene	11	U
75-71-8	dichlorodifluoromethane	11	U
123-91-1	1,4-dioxane	11	U
107-12-0	propionitrile(ethylcyanide)	11	U
97-63-2	ethyl methacrylate	11	U
74-88-4	iodomethane	11	U
78-83-1	isobutyl alcohol	11	U
126-98-7	methacrylonitrile	11	U
80-62-6	methyl methacrylate	11	U
630-20-6	1,1,1,2-tetrachloroethane	11	U
96-18-4	1,2,3-trichloropropane	11	U
108-05-4	vinyl acetate	11	U
96-12-8	1,2-dibromo-3-chloropropane	11	U
75-69-4	trichlorofluoromethane	11	U
107-13-1	acrylonitrile	11	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

0211BP2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 31923 SAS No.: SDG No.: 1356C

Matrix: (soil/water) SOIL Lab Sample ID: 871168

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH071168B52.D

Level: (low/med) LOW Date Received: 10/03/97

% Moisture: not dec. 13 Date Analyzed: 10/14/97

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	CO2 (NOT IN TIC TOTAL)	0.97	190	JB
2.				
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FORM I VOA-TIC

QUANTERRA INCORPORATED

PRELIMINARY DATA SUMMARY

The results shown below may still require additional laboratory review and are subject to change. Actions taken based on these results are the responsibility of the data user.

Compuchem Environmental
COMPUCHEM
Project Number: COMPUCHEM

PAGE

Lot #: C7J070119 **Date Reported:** 10/20/97

Client Sample ID: 0211BP1
Sample #: 001 **Date Sampled:** 10/01/97 14:45 **Date Received:** 10/04/97 **Matrix:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	ANALYTICAL METHOD	
Organophosphorous Compounds by GC					Reviewed
Dimethoate	ND	37	ug/kg	SW846 8141	
Disulfoton	ND	75	ug/kg	SW846 8141	
Famphur	ND	37	ug/kg	SW846 8141	
Methyl parathion	ND	37	ug/kg	SW846 8141	
Parathion	ND	37	ug/kg	SW846 8141	
Phorate	ND	37	ug/kg	SW846 8141	
Tetraethyldithiopyro-phosphate	ND	37	ug/kg	SW846 8141	
Thionazin	ND	37	ug/kg	SW846 8141	
O,O,O-Triethylphosphoro-thioate	ND	37	ug/kg	SW846 8141	

Results and reporting limits have been adjusted for dry weight.

Inorganic Analysis					In Review
Acid-insoluble Sulfide	ND	56	mg/kg	SW846 9030A	
Total Residue as Percent Solids	89.1		%	MCAWW 160.3 MOD	

Results and reporting limits have been adjusted for dry weight.

Client Sample ID: 0211BP2
Sample #: 002 **Date Sampled:** 10/01/97 14:45 **Date Received:** 10/04/97 **Matrix:** SOLID

Organophosphorous Compounds by GC					Reviewed
Dimethoate	ND	38	ug/kg	SW846 8141	
Disulfoton	ND	77	ug/kg	SW846 8141	
Famphur	ND	38	ug/kg	SW846 8141	
Methyl parathion	ND	38	ug/kg	SW846 8141	
Parathion	ND	38	ug/kg	SW846 8141	
Phorate	ND	38	ug/kg	SW846 8141	
Tetraethyldithiopyro-phosphate	ND	38	ug/kg	SW846 8141	
Thionazin	ND	38	ug/kg	SW846 8141	
O,O,O-Triethylphosphoro-thioate	ND	38	ug/kg	SW846 8141	

(Continued on next page)

QUANTERRA INCORPORATED

PRELIMINARY DATA SUMMARY

The results shown below may still require additional laboratory review and are subject to change. Actions taken based on these results are the responsibility of the data user.

Compuchem Environmental

Lot #: C7J070119 COMPUCHEM Date Reported: 10/20/97 PAGE :

Project Number: COMPUCHEM

PARAMETER	RESULT	REPORTING LIMIT	UNITS	ANALYTICAL METHOD
Client Sample ID: 0211BP2				
Sample #: 002 Date Sampled: 10/01/97 14:45 Date Received: 10/04/97 Matrix: SOLID				
Organophosphorous Compounds by GC				Reviewed
Results and reporting limits have been adjusted for dry weight.				
Inorganic Analysis				In Review
Acid-insoluble Sulfide	ND	57	mg/kg	SW846 9030A
Total Residue as Percent Solids	87.6		%	MCAWW 160.3 MOD
Results and reporting limits have been adjusted for dry weight.				

MORRISON KNUDSEN CORPORATION

Client Sample ID: 0211BP2

Dioxins

Lot-Sample #...: H7J070130-002 Work Order #...: CU9VM102 Matrix.....: SOLID
Date Sampled...: 10/01/97 Date Received..: 10/04/97
Prep Date.....: 10/09/97 Analysis Date...: 10/16/97
Prep Batch #...: 7202177
Dilution Factor: 1
% Moisture.....: 14

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.023	ng/g	SW846 8280
Total TCDD	ND	0.023	ng/g	SW846 8280
Total PeCDD	ND	0.038	ng/g	SW846 8280
Total HxCDD	ND	0.023	ng/g	SW846 8280
Total TCDF	ND	0.015	ng/g	SW846 8280
Total PeCDF	ND	0.020	ng/g	SW846 8280
Total HxCDF	ND	0.010	ng/g	SW846 8280

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	109	(25 - 160)
13C-2,3,7,8-TCDF	93	(25 - 160)
13C-1,2,3,7,8-PeCDD	122	(25 - 160)
13C-1,2,3,6,7,8-HxCDD	112	(25 - 160)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MORRISON KNUDSEN CORPORATION

Client Sample ID: 0211BP1

Dioxins

Lot-Sample #...: H7J070130-001 Work Order #...: CD9VK102 Matrix.....: SOLID
Date Sampled...: 10/01/97 Date Received..: 10/04/97
Prep Date.....: 10/09/97 Analysis Date..: 10/16/97
Prep Batch #...: 7282177
Dilution Factor: 1
% Moisture.....: 14

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.018	ng/g	SW846 8280
Total TCDD	ND	0.018	ng/g	SW846 8280
Total PeCDD	ND	0.071	ng/g	SW846 8280
Total HxCDD	ND	0.015	ng/g	SW846 8280
Total TCDF	ND	0.018	ng/g	SW846 8280
Total PeCDF	ND	0.012	ng/g	SW846 8280
Total HxCDF	ND	0.010	ng/g	SW846 8280

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	100	(25 - 160)
13C-2,3,7,8-TCDF	83	(25 - 160)
13C-1,2,3,7,8-PeCDD	108	(25 - 160)
13C-1,2,3,6,7,8-HxCDD	99	(25 - 160)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

RECEIVED
AUG 29 1997
TK-CRANE

August 26, 1997

EARTH EXPLORATION

7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1690
317-273-2250 (FAX)

Ms. Lois Bigley
Morrison Knudsen Corporation
300 Hwy 361 CTR 12
P.O. Box 310
Crane Village, IN 47522

Re: Laboratory Testing
Dye Burial Cap (FY97)
NSWC - Crane
Crane Village, Indiana
EEI Project No. 3483

Dear Ms. Bigley:

On August 11, 1997, a representative of our company obtained nine bag samples of soil from three proposed borrow areas and transported them to our laboratory for testing. The requested testing included standard Proctors (ASTM D 698) on the nine individual bag samples and standard Proctors, sieve analyses (ASTM D 422), Atterberg limits (ASTM D 4318) and falling head permeabilities (ASTM D 5084) on composite samples from the Bio Facility stockpile and the DBG Borrow Area 2 161-B. In addition, a composite sample from the DBG Borrow Area 1A 58/161-1A has been retained for possible back-up testing if necessary. The results of the Proctors and sieve analyses are enclosed.

The composite samples for the permeability tests were molded to approximately 90 percent of the standard Proctor density at a moisture content of two percent above the optimum moisture content as requested. The results of the permeability tests are as follows:

Sample	Soil Description	Dry Density, lbs/cu ft	Moisture Content, %	% Maximum Dry Density	Permeability, cm/sec
BS-14	CL,Silty Clay	102.6	15.6	90.1	2.7×10^{-5}
BS-15	CL, Silty Clay	96.6	18.7	90.1	3.1×10^{-5}

We appreciate the opportunity to provide testing services to your firm. Should you have any questions regarding this information, please feel free to call.

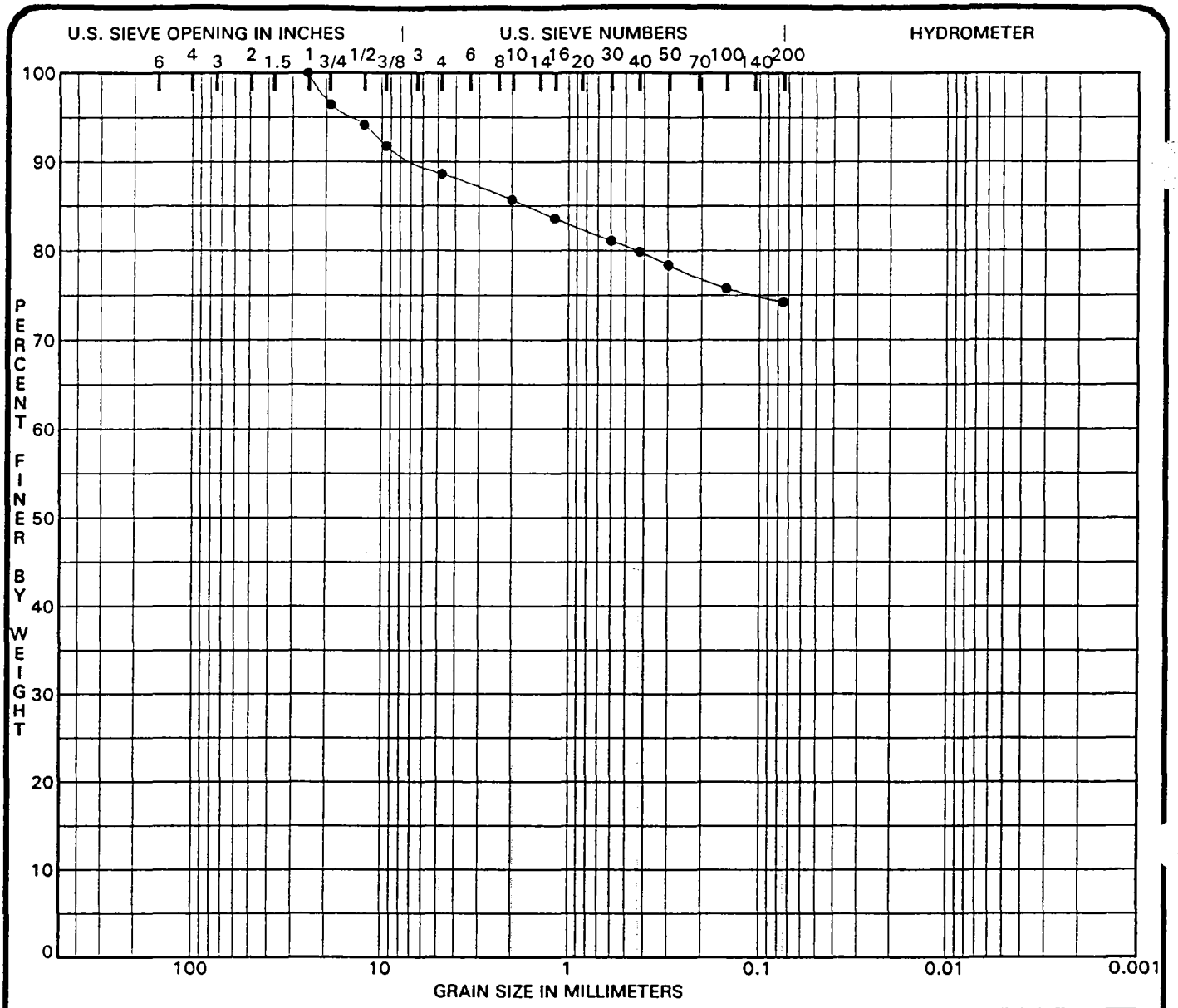
Sincerely,

EARTH EXPLORATION, INC.

Kirk J. Egold

Kirk J. Egold
Laboratory Services

Enclosures: Moisture-Density Relations (11)
Grain Size Distribution Curves (2)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Identification	USCS Classification	MC%	LL	PL	PI	Cc	Cu
● BS-14	CL, Silty Clay, little sand and gravel	--	31	19	12		

% Gravel (>4.75mm)	% Sand (4.75 to .075mm)	% Silt (.075 to .005 mm)	% Clay (<.005mm)
11.4	14.4		

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
64.0	100.0	0.5	80.5	0.016	
16.0	95.5	0.25	77.7	0.008	
4.0	88.0	0.125	75.4	0.005	
2.0	85.7	0.075	74.2	0.002	
1.0	83.0	0.050			

EARTH EXPLORATION

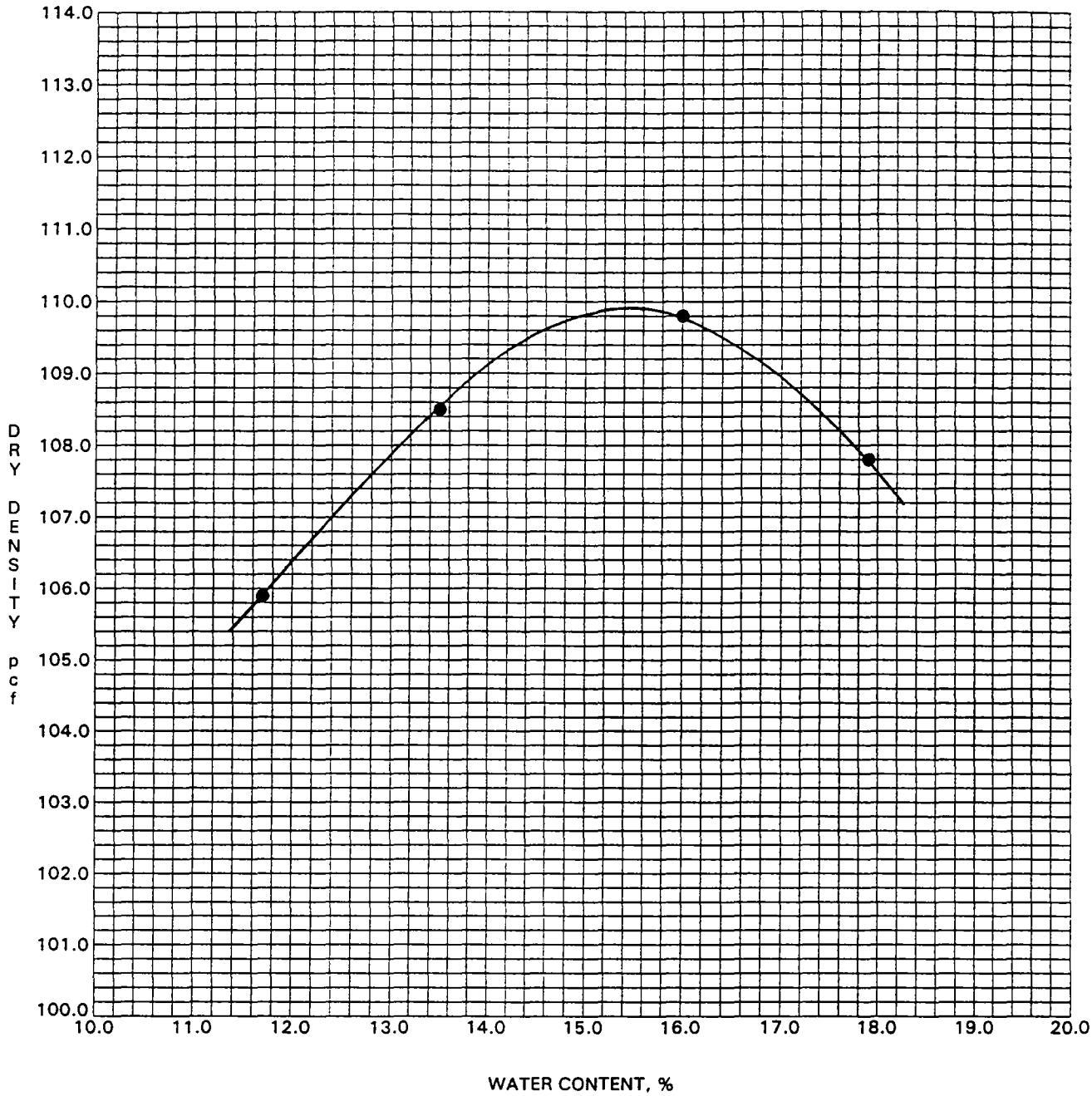
PROJECT Dye Burial Cap (FY97)
LOCATION NSWC Crane, Indiana
CLIENT Morrison Knudsen Corporation
EEI PROJECT NO. 3483

Bio - Stockpile

CLIENT ID NO. ---
DATE 8-15-97

GRAIN SIZE DISTRIBUTION CURVE

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-5
Classification CL, Silty Clay, brown
Source on site *

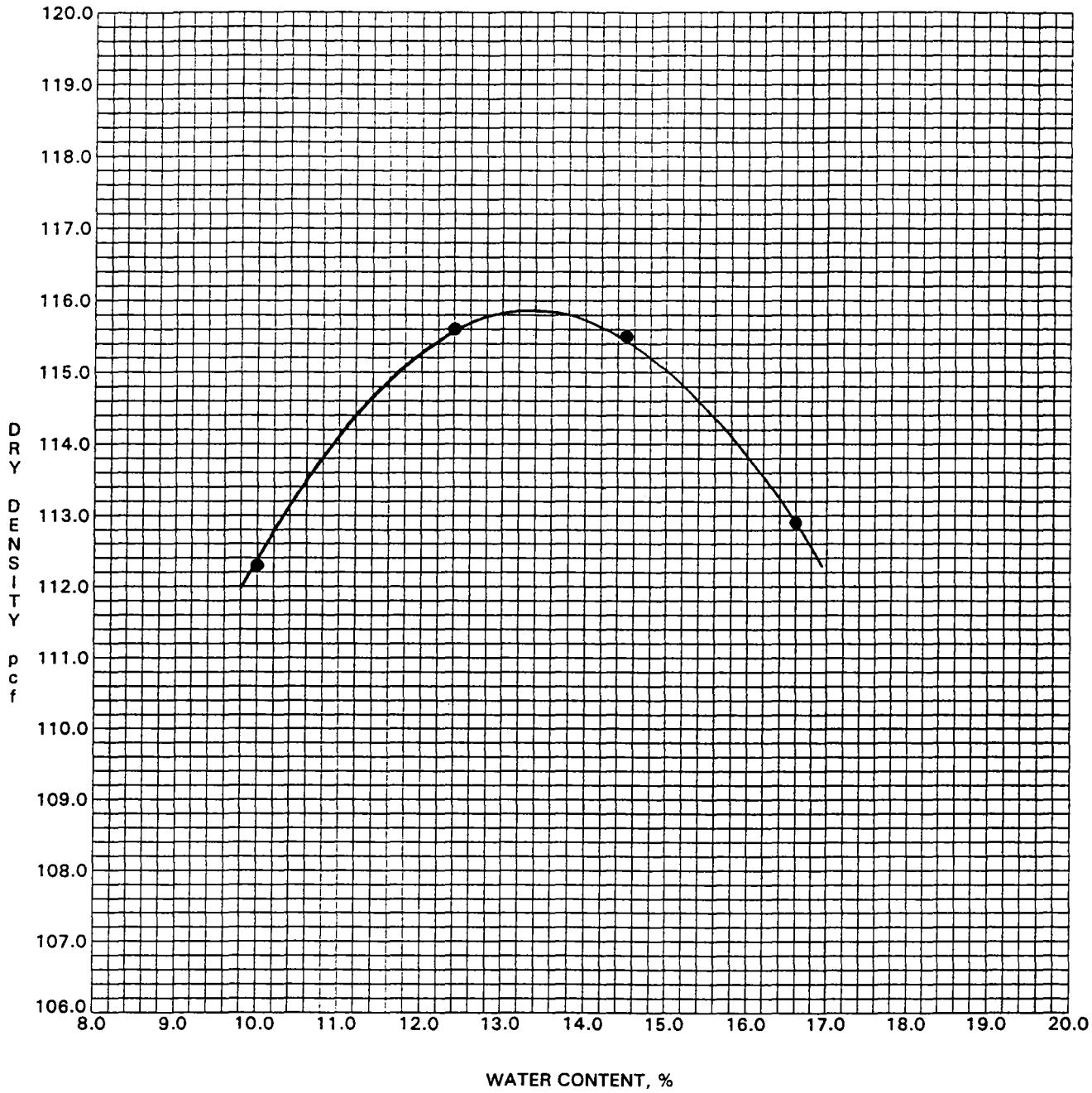
Optimum Moisture Content, % 15.6
Maximum Dry Density, pcf 109.9
Test Method ASTM D 698 (A) Manual

Remarks: * Sampled from Biofacility stockpile north end from 3-5'.
Relative Proportions: trace to little sand, trace gravel

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-6
Classification CL, Silty Clay, brown
Source on site *

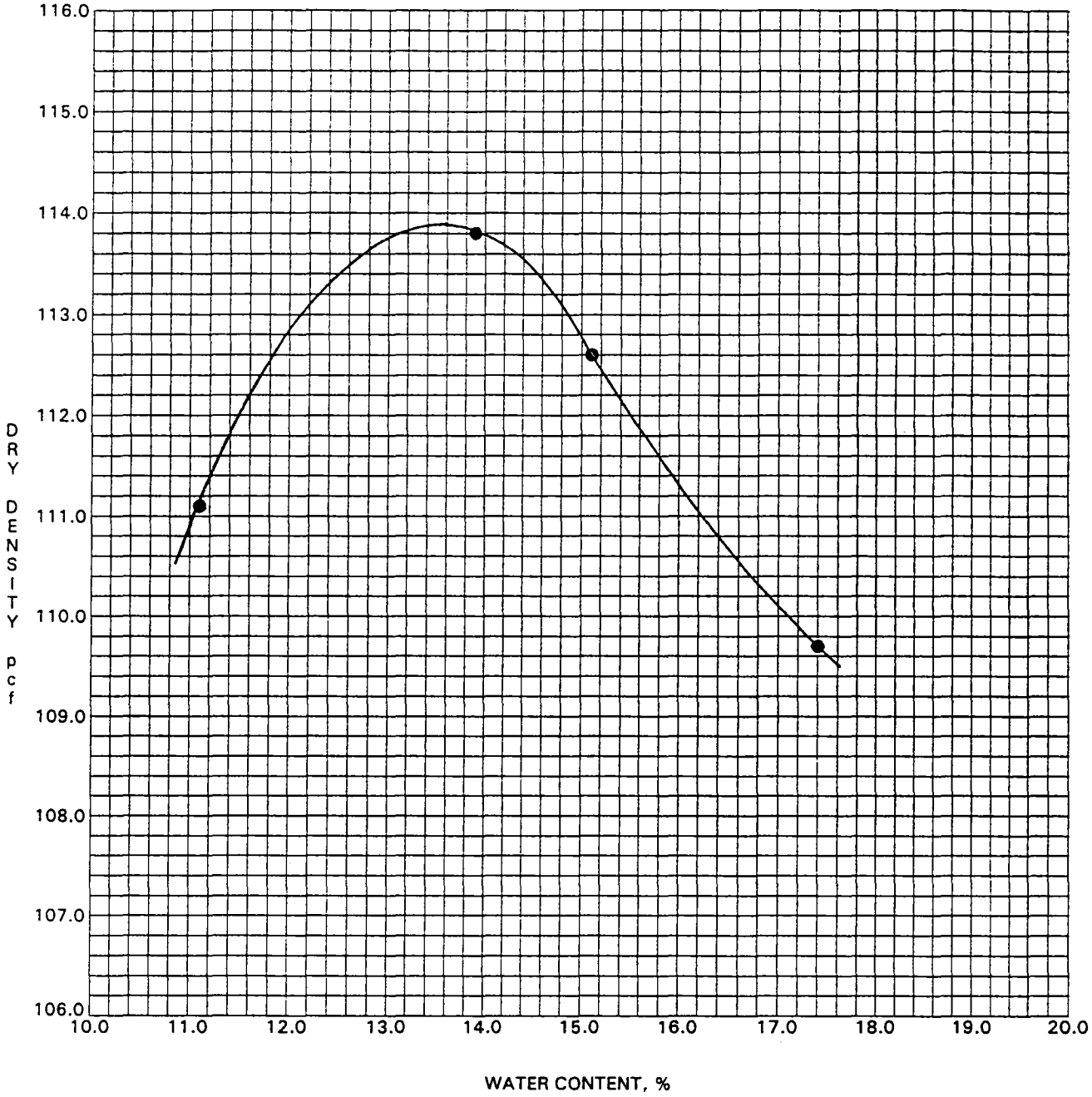
Optimum Moisture Content, % 13.4
Maximum Dry Density, pcf 115.9
Test Method ASTM D 698 (A) Manual

Remarks: * Sampled from Biofacility stockpile south end from 3-5'.
Relative Proportions: little to some sand, trace gravel

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-14
Classification CL, Silty Clay, brown
Source on site *

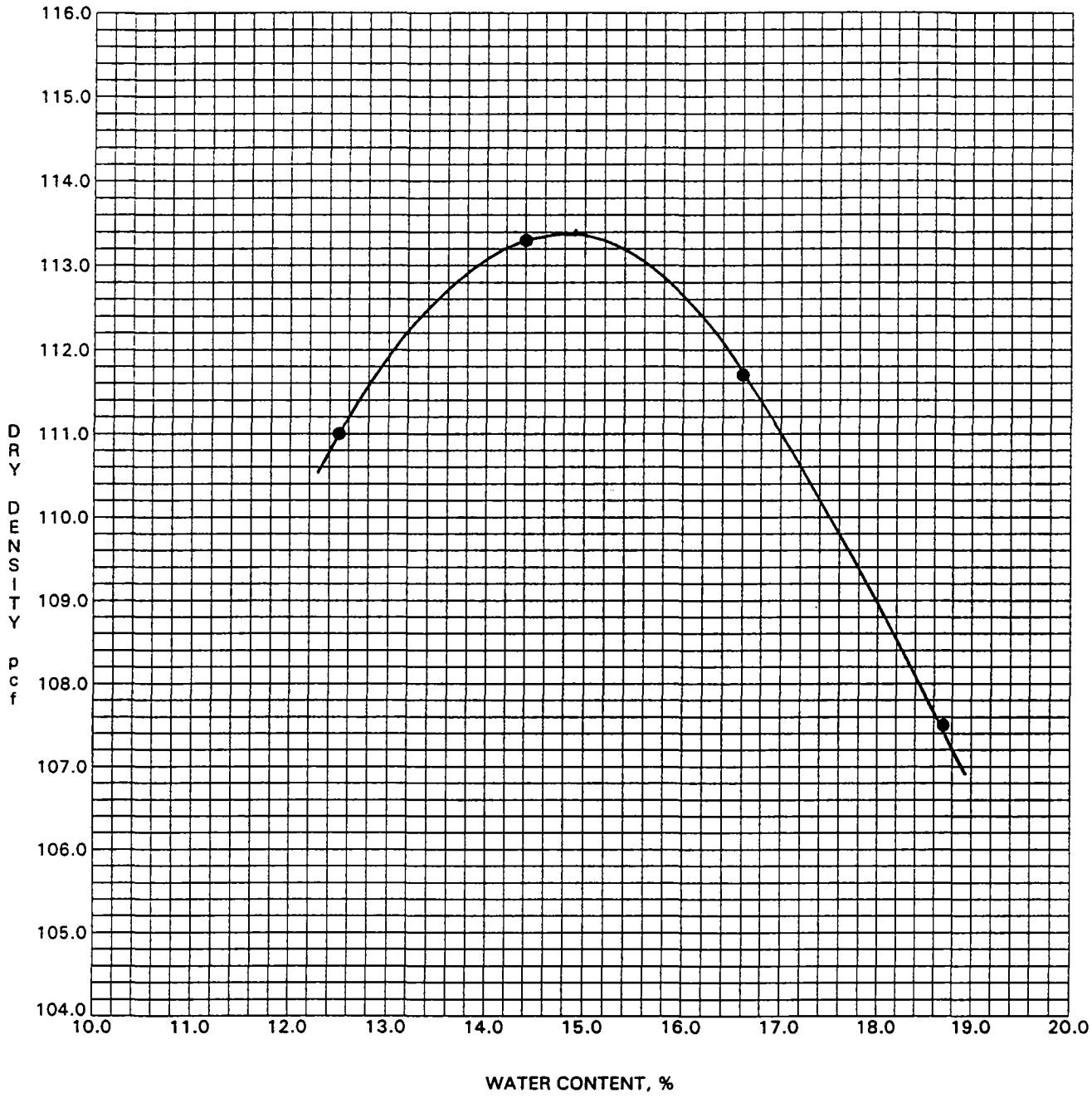
Optimum Moisture Content, % 13.6
Maximum Dry Density, pcf 113.9
Test Method ASTM D 698 (A) Manual

Remarks: * Composite sample of Biofacility stockpile (BS-5 & BS-6).
Relative Proportions: little sand and gravel

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-15-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-8
Classification CL, Silty Clay, brown
Source on site *

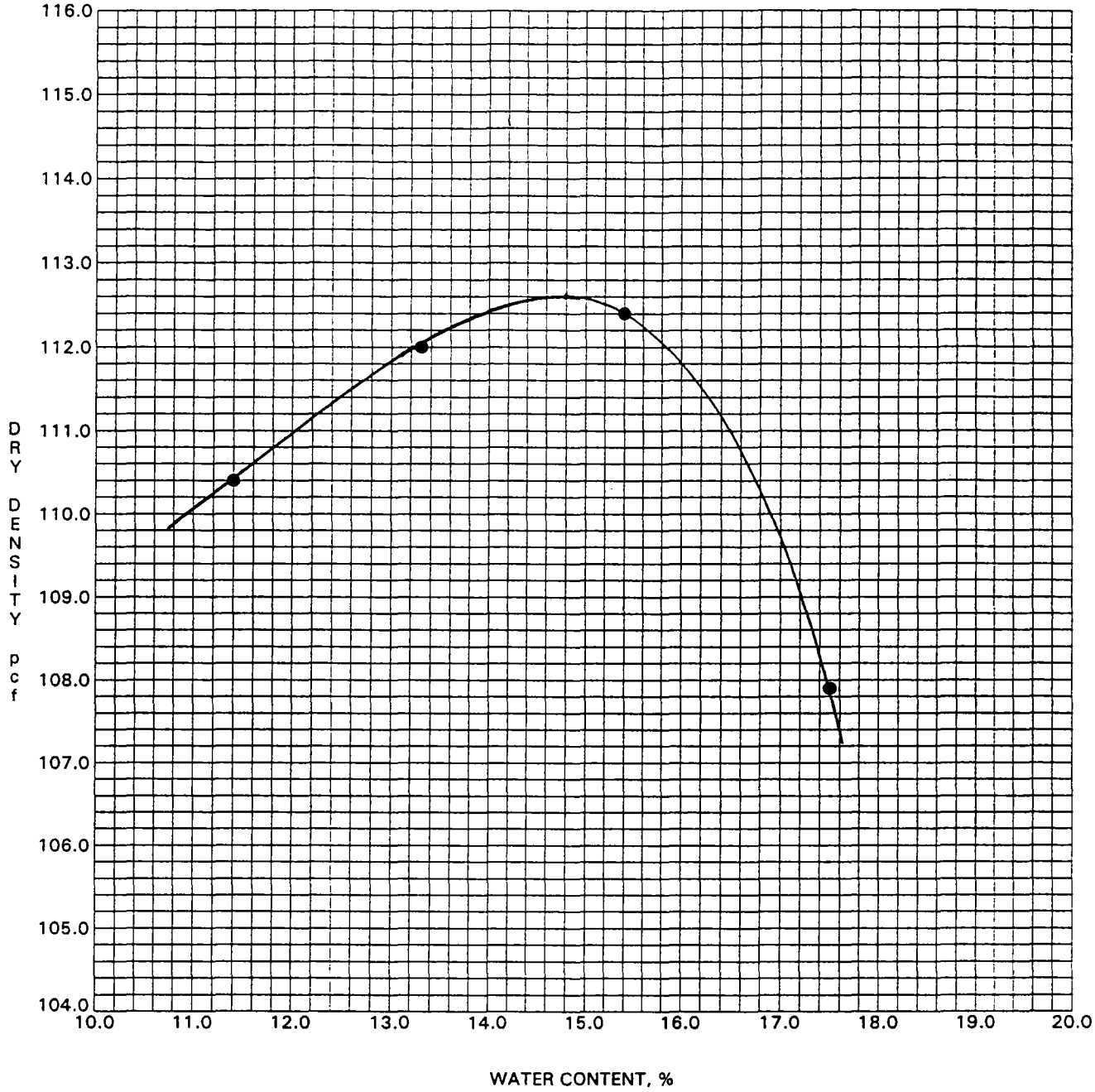
Optimum Moisture Content, % 14.9
Maximum Dry Density, pcf 113.4
Test Method ASTM D 698 (A) Manual

Remarks: * Sampled from DBG Borrow Area 1A 58/161-1A from 5-7'.
Relative Proportions: Little to some sand, trace gravel

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-15-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-7
Classification CL, Silty Clay, brown
Source on site *

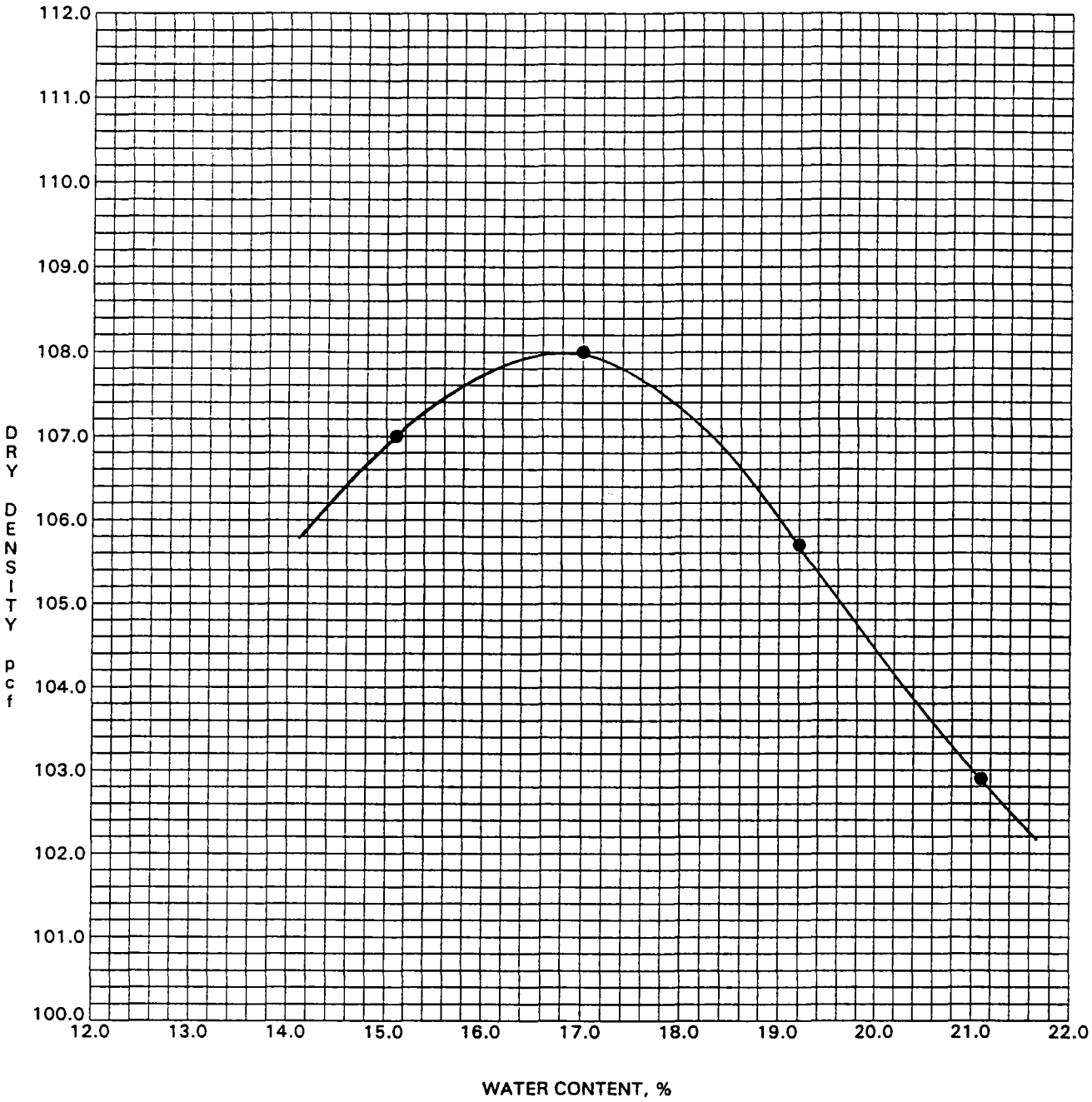
Optimum Moisture Content, % 14.8
Maximum Dry Density, pcf 112.6
Test Method ASTM D 698 (A) Manual

Remarks: * Sampled from DBG Borrow Area 1A 58/161-1A from 3-5'.
Relative Proportions: little to some sand, trace gravel

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-15-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-9
Classification CL, Silty Clay, brown
Source DBG Borrow Area 2 *

Optimum Moisture Content, % 16.9
Maximum Dry Density, pcf 108.0
Test Method ASTM D 698 (A) Manual

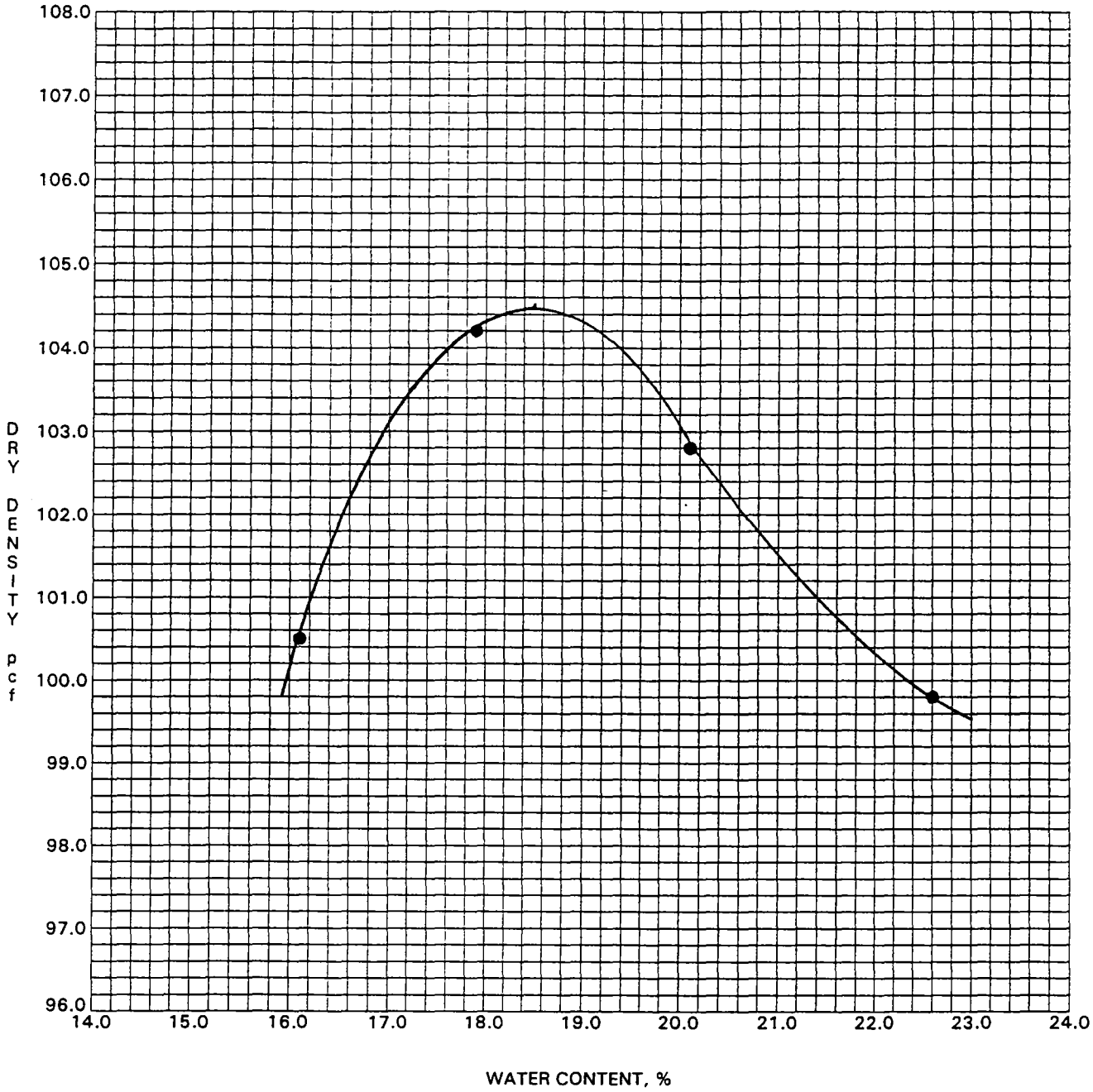
Remarks: * Sampled from DBG Borrow Area 2 161-B, north end from 0.5-2.5'.
Relative Proportions: trace to little sand, trace gravel

EARTH EXPLORATION

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-10
Classification CL, Silty Clay, brown
Source DBG Borrow Area 2 *

Optimum Moisture Content, % 18.5
Maximum Dry Density, pcf 104.5
Test Method ASTM D 698 (A) Manual

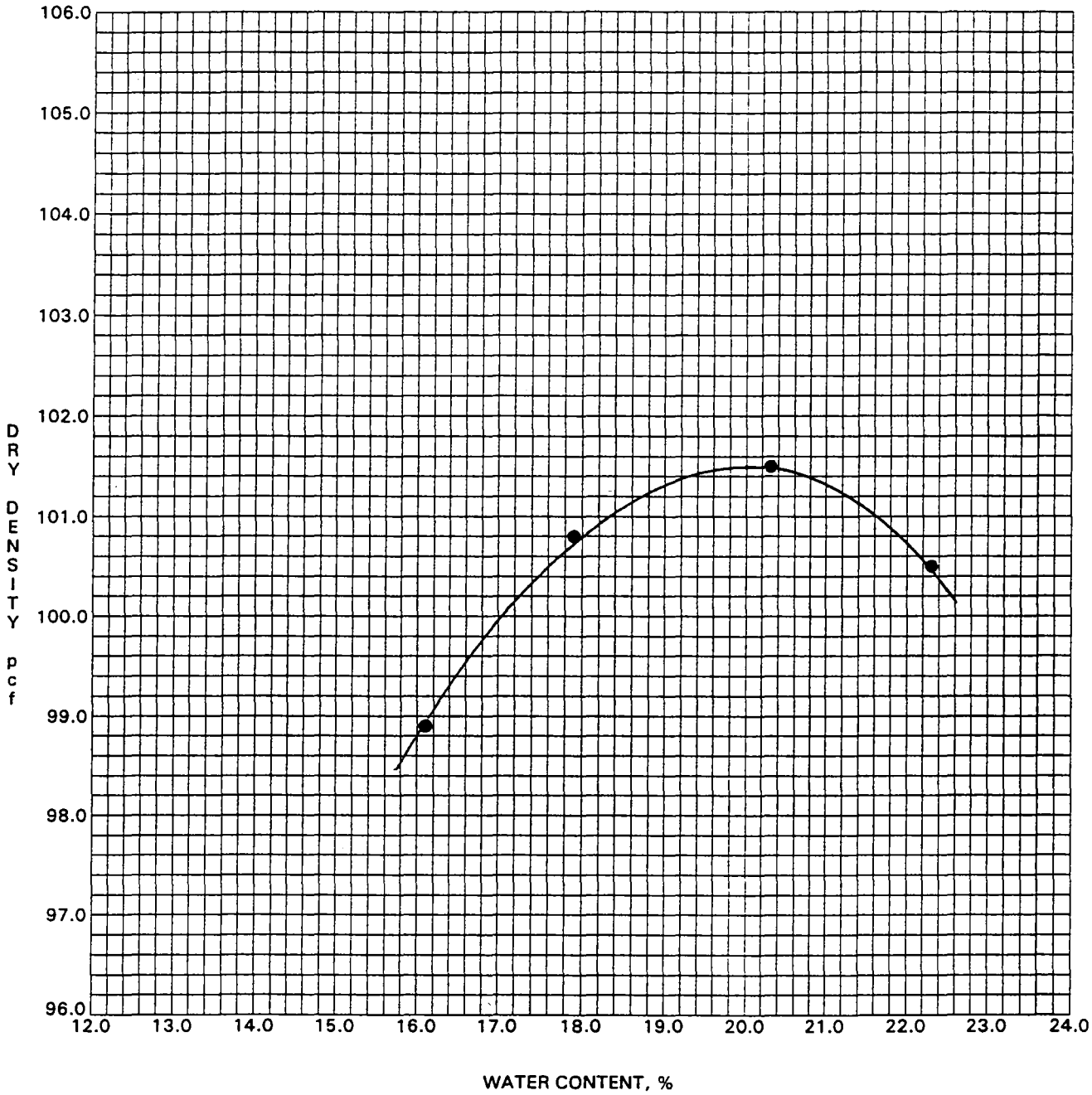
Remarks: * Sampled from DBG Borrow Area 2 161-B, north end from 2.5-4.5'.
Relative Proportions: trace to little sand, trace gravel

EARTH EXPLORATION

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-11
Classification CL, Silty Clay, brown
Source DBG Borrow Area 2 *

Optimum Moisture Content, % 20.0
Maximum Dry Density, pcf 101.5
Test Method ASTM D 698 (A) Manual

Remarks: * Sampled from DBG Borrow Area 2 161-B, south end from 1-3'.
Relative Proportions: trace sand and gravel

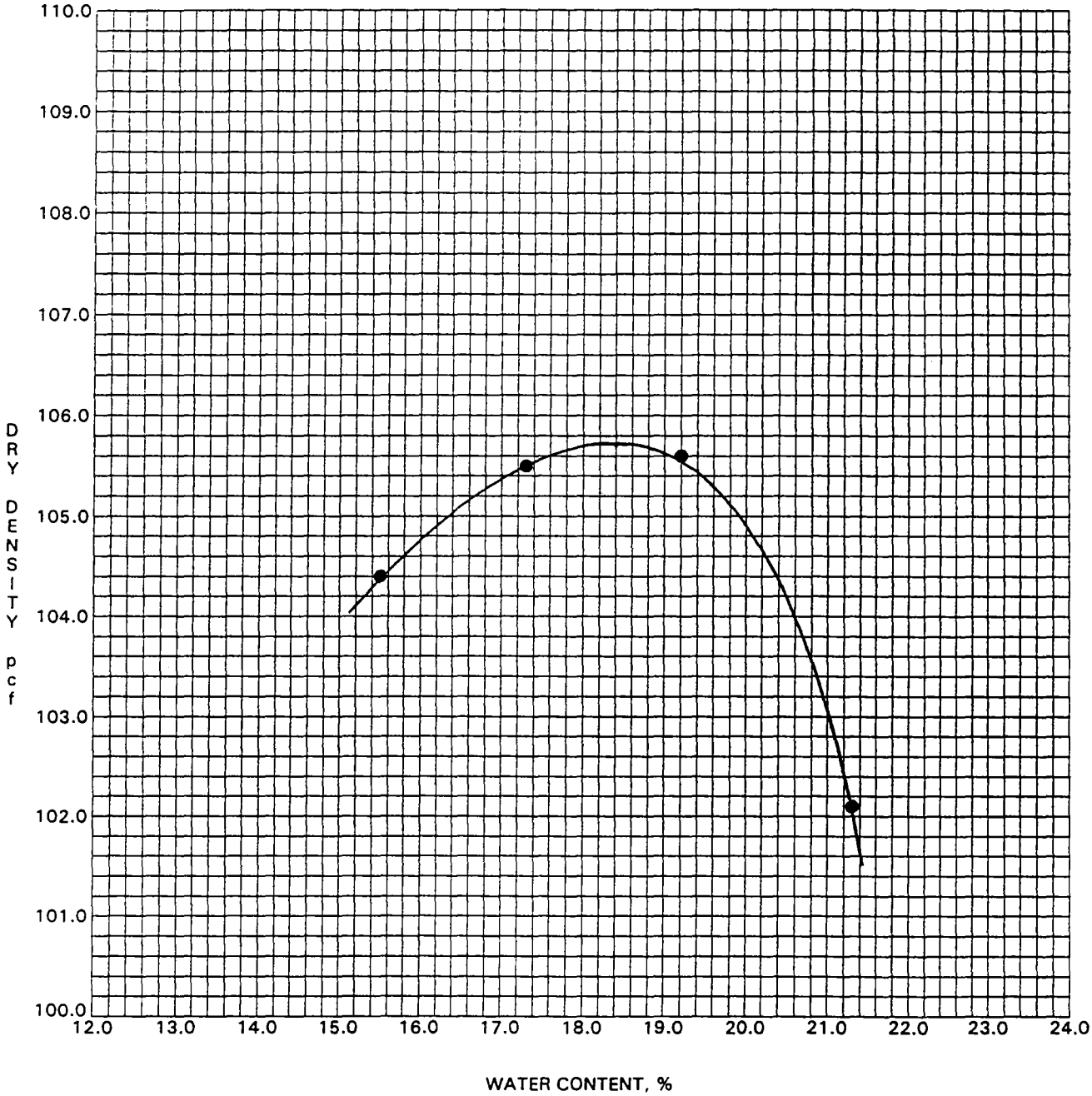
EARTH EXPLORATION

Project Dye Burial Cap (FY97)
Client Morrison Knudsen Corporation
A/E Morrison Knudsen Corporation

Location NSWC Crane, Indiana
EEI Proj. No. 3483
Date 8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-12
Classification CL, Silty Clay, brown
Source DBG Borrow Area 2 *

Optimum Moisture Content, % 18.4
Maximum Dry Density, pcf 105.7
Test Method ASTM D 698 (A) Manual

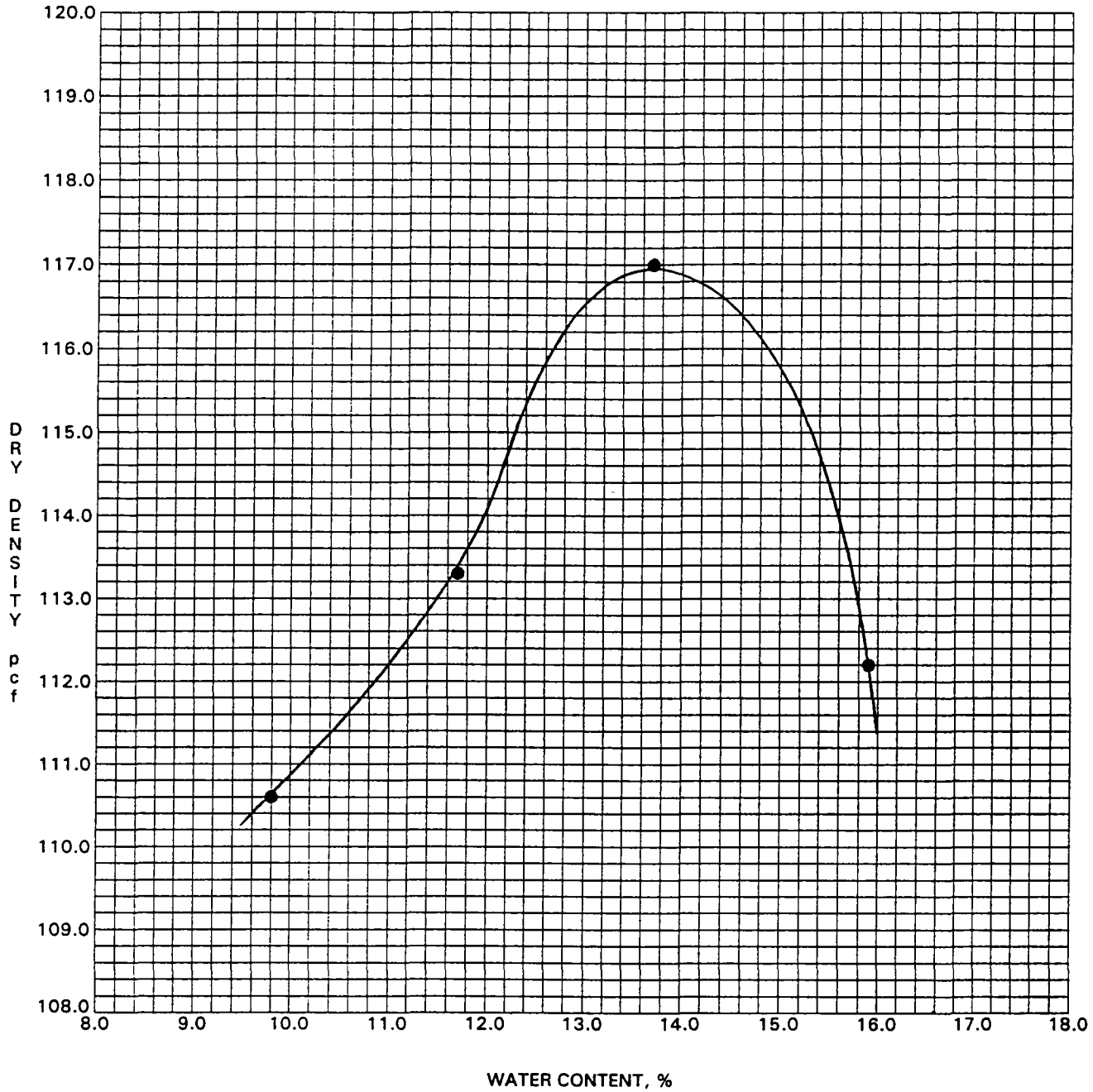
Remarks: * Sampled from DBG Borrow Area 2 161-B, south end from 3-5'.
Relative Proportions: trace to little sand, trace gravel

EARTH EXPLORATION

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-13
Classification CL, Silty Clay, brown
Source DBG Borrow Area 2 *

Optimum Moisture Content, % 13.7
Maximum Dry Density, pcf 117.0
Test Method ASTM D 698 (A) Manual

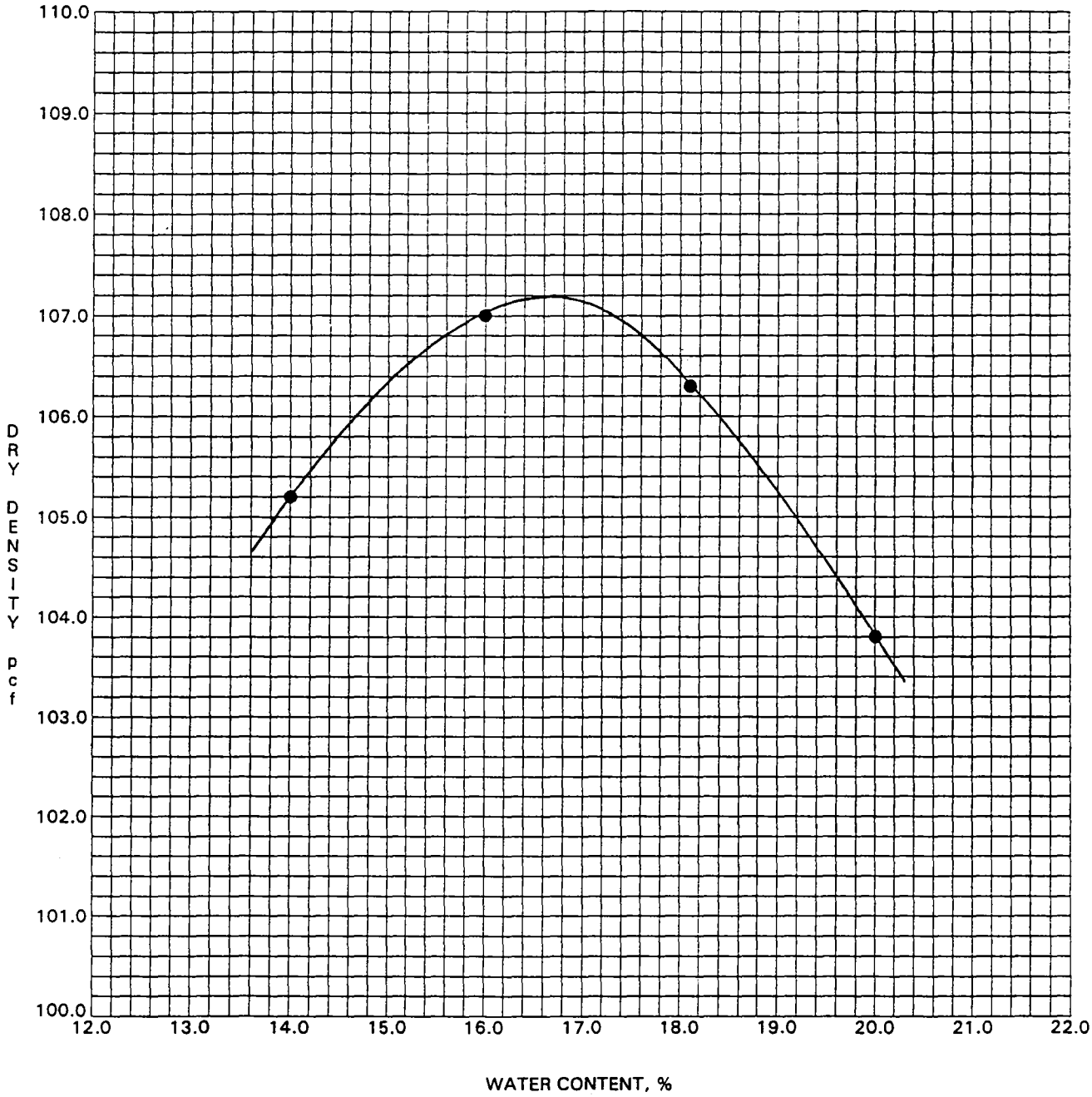
Remarks: * Sampled from DBG Borrow Area 2 161-B, south end from 5-7'.
Relative Proportions: little to some sand, trace gravel

EARTH EXPLORATION

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-14-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



Sample No. BS-15
Classification CL, Silty Clay, brown
Source on site *

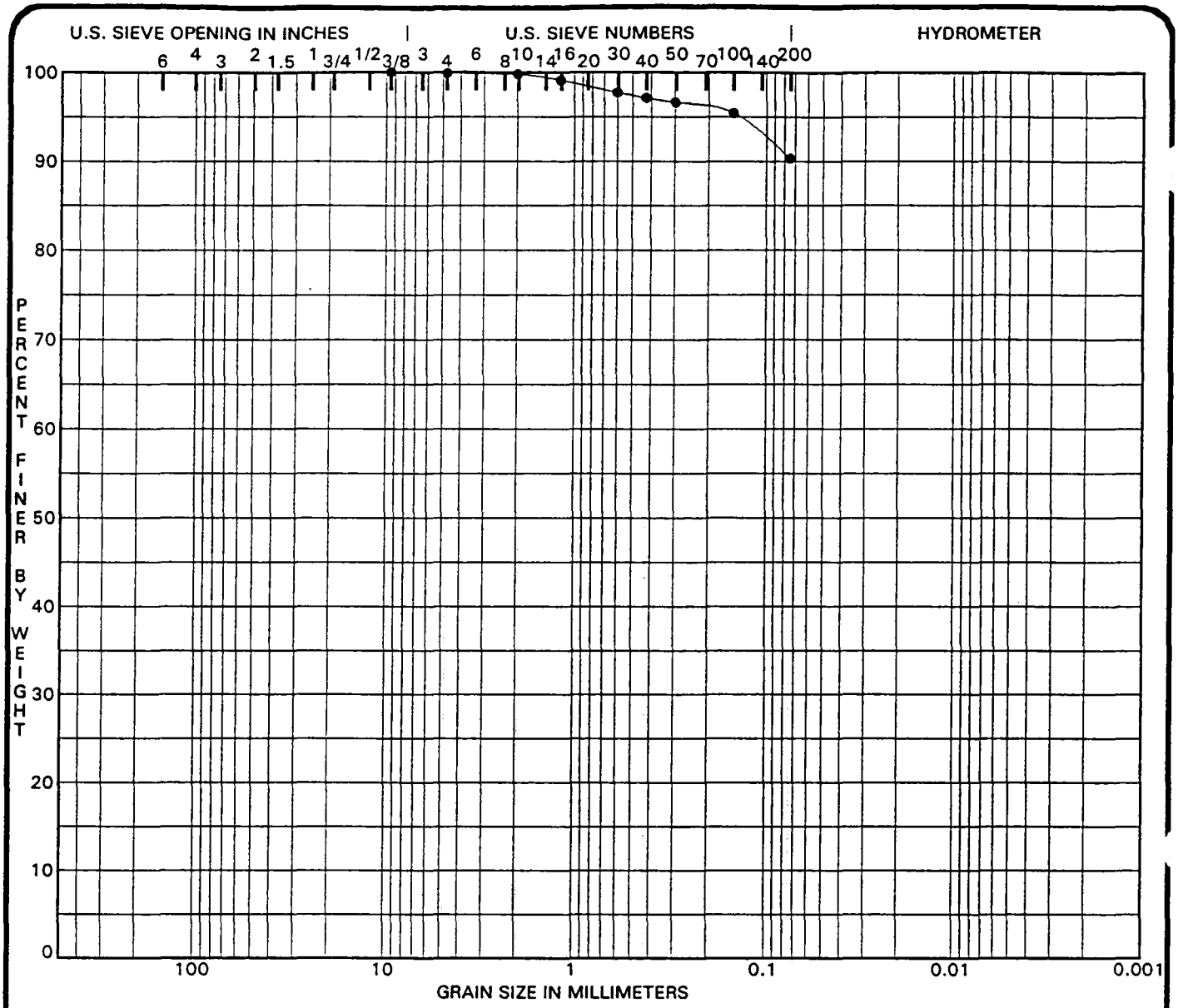
Optimum Moisture Content, % 16.7
Maximum Dry Density, pcf 107.2
Test Method ASTM D 698 (A) Manual

Remarks: * Composite sample of DBG Borrow Area 2 161-B (BS-9,10,11,12,&13).
Relative Proportions: little sand, trace gravel

Project	Dye Burial Cap (FY97)	**Location**	NSWC Crane, Indiana
Client	Morrison Knudsen Corporation	**EEI Proj. No.**	3483
A/E	Morrison Knudsen Corporation	**Date**	8-15-97

MOISTURE - DENSITY RELATIONS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Identification	USCS Classification	MC%	LL	PL	PI	Cc	Cu
● BS-15	CL, Silty Clay, little sand, trace gravel	--	33	19	14		

% Gravel (>4.75mm)	% Sand (4.75 to .075mm)	% Silt (.075 to .005 mm)	% Clay (<.005mm)
0.1	9.6		

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
64.0	100.0	0.5	97.4	0.016	
16.0	100.0	0.25	96.3	0.008	
4.0	99.9	0.125	94.1	0.005	
2.0	99.8	0.075	90.3	0.002	
1.0	98.8	0.050			

EARTH EXPLORATION

PROJECT Dye Burial Cap (FY97) DBG 161/822 Bore
LOCATION NSWC Crane, Indiana
CLIENT Morrison Knudsen Corporation **CLIENT ID NO.** ---
EEI PROJECT NO. 3483 **DATE** 8-15-97

GRAIN SIZE DISTRIBUTION CURVE

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

APPENDIX F

TYPE 1 AND TYPE 2 GEOTEXTILE DATA

APPENDIX F
TYPE 1 AND TYPE 2 GEOTEXTILE DATA

INDEX

F-1 Pre-construction Conformance Test Sample Log

F-2 Conformance Tests Results/Report

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F-5 Panel Placement/Deployment Sheets

F-6 Seam Inspection/Test Sheets

F-1

Pre-construction Conformance Test Sample Log

- DBG -
SWMU 02/11
SUBCONTRACT 4324/106
PHILIP SERVICE GROUP

TYPE 1 GEOTEXTILE - FILTER FABRIC
R070 BY TNS

ROLL #	DELIVERIED / STORED	DEPLOYED	REMARKS
991833 *	06-18-98	07-29-98 08-05-98	GTS-48 GTB-4, 5, 6 Man QC Sample
* 991844	06-18-98	07-27-98	GTS- 11, 13 Conformation Sample
991845	06-18-98	07-27=98 07-29-98	GTS 27, 28
991847	06-18-98	08-05-98	GTB-29, 30, 31
991856	06-18-98	07-29-98	GTS-41, 42, 43, 44
991865	06-18098	07-27-98	GTS-25, 26
991860	06-18-98	08-05-98	GTB-15, 16
991868	06-18-98	07-27-98	GTS-15, 17
991873	06-18-98	08-05-98	GTB-21, 22
991874	06-18-98	08-05-98	GTB-2, 3
991894 *	06-18-98	07-27-98	GTS9, 10, 12 Man. QC Samplt
991897	06-18-98	08-05-98	GTB-32, 33, 34
991898	06-18-98	08-05-98	GTB-35, 36, 37
991900	06-18-98	08-05-98	GTB-38, 39, 40
991911	06-18-98	08-05-98	GTB-44, 45, 46, 47
991913	06-18-98	08-05-98	GTB-26, 27, 28
991944	06-18-98	08-05-98	GTB-58, 49, 50, 51, 52
991948	06-18-98	08-05-98	GTB-10, 11, 13
991968	06-18-98	08-05-98	GTB-8, 9
991972	06-18-98	07-29-98	GTS-35, 36, 40
991973	06-18-98	07-27-98	GTS-18, 19, 20
991987	06-18-98	08-05-98	GTB-17, 18b
992118 *	06-18-98	07-27-98	GTS-14, 16 Man QC Sample
992124	06-18-98	07-27-98	GTS-1, 2
992127	06-18-98	07-27-98	GTS-21, 22
992130	06-18-98	08-05-98	GTB- 18a, 19
992132	06-18-98	07-29-98	GTS-37, 38, 39, 45
992138	06-18-98	07-27-98	GTS-3, 4, 8
992145	06-18-98	07-27-98	GTS-29, 30
992160	06-18-98	08-05-98	GTB-12, 14, 20
992161	06-18-98	07-29-98	GTS-33, 34, 52
992165	06-18-98	07-27-98	GTS-5, 6, 7
* 992171	06-18-98	07-27-98 08-05-98	GTS-23, 24 GTB-53 Conformation Sample
992181	06-18-98	08-05-98	GTB-23, 24, 25
992246 *	06-18-98	07-29-98	GTS-46, 47, 49, 50, 51 Man QC Sample
993194	06-18-98	07-29-98	GTS- 31, 32
993498 *	06-18-98	08-05-98	GTB-41, 42, 48 Man QC Sample

- DBG -
SWMU 02/11
SUBCONTRACT 4324/106
PHILIP SERVICE GROUP

TYPE 1 GEOTEXTILE - FILTER FABRIC
1202 BY SYNTHENTIC INDUSTRIES

ROLL #	DELIVERIED / STORED	DEPLOYED	REMARKS
4102070A	06-18-98	DITCHLINE	Roll cut in half and used to line the dranage trence GTB- 54, 55, 56, 57, 58, 59
4109148A	06-18-98	DITCHLINE 08-05-98	Roll cut in half and used to line the dranage trence
4109156A	06-18-98		NOT USED
4109171A	06-18-98		NOT USED
4109180A	06-18-98		NOT USED
4109191A	06-18-98		NOT USED
4109202A	06-18-98	DITCHLINE	Roll cut in half and used to line the dranage trence

- DBG -
SWMU 02/11
SUBCONTRACT 4324/106
PHILIP SERVICE GROUP

GEOTEXTILE TYPE 2 - CUSHION
1201 BY SYNTHETIC INDUSTRIES

ROLL #	DELIVERIED / STORED	DEPLOYED	REMARKS
4094557A *	06-24-98	07-11-98	GT-1, 2
4102007A	06-18-98	07-12-98	GT-30, 31, 32
4102010A	06-24-98	07-11-98	GT-10, 11
4102021A	06-24-98	07-11-98	GT-8, 9
4102034A	06-18-98	07-12-98	GT-19, 20
4102035A	06-24-98	07-11-98	GT-12, 13
4102037A	06-18-98	07-12-98	GT-21, 22, 23
4102070A	06-18-98	DITCH LINE	Cut in half and used as TYPE 1 to line Drainage trench Man. QC Sample
4102099A	06-24-98	07-11-98	GT-3, 4
4102105A	06-18-98	07-12-98	GT-16, 17, 18
4102131A	06-18-98	07-12-98	GT-36, 37, 38
4102135A	06-18-98	07-12-98	GT-27, 28, 29
4102138A	06-18-98	07-12-98	GT-48, 49, 50, 54
4102143A	06-18-98	07-12-98	GT-33, 34, 35
4102155A	06-18-98	07-12-98	GT-24, 25, 26
4104606A	06-24-98	07-11-98	GT-5, 6, 7
4104674A	06-18-98	07-12-98	GT-45, 46, 47
4104683A	06-18-98	07-12-98	GT-14, 15 Conformation sample
4104687A	06-18-98	07-12-98	GT-39, 40, 41
4104783A	06-18-98	07-12-98	GT-51, 52, 53
4116898A	06-18-98	07-12-98	GT-42, 43, 44
———	---REJECTED---	———	———
4109148a	06-18-98	DITCH LINE	Cut in half and used as TYPE 1 to line Drainage trench
4109156a	06-18-98		
4109171a	06-18-98		
4109180a	06-18-98		
4109191a	06-18-98		
4109202a	06-18-98	DITCHLINE	Cut in half and used as TYPE 1 to line Drainage trench

F-2

Conformance Tests Results/Report

HTS, INC. Consultants
416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 10, 1998

HTS Report #:	PEN1254.002.doc

Mr. Don Flowers	Customer Project Name:	NSWC Crane
Philip Environmental	Customer Project #:	18328
510 DD Road	Lab Temperature:	73 degrees F.
Columbia, IL 62236	Lab Humidity:	50%

The following 3 samples were delivered to our laboratory on June 23, 1998.

SAMPLES RECEIVED								
	Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type
1	991844	GT	6			11		
2	992171	GT	7			12		
3	4104683A	GT	8			13		
4			9			14		
5			10			15		

Conformance testing was performed in accordance with the following test methods. The test results are summarized on the subsequent pages. It should be noted that the test specimens and test sample used for this work were believed to be representative of the material produced under this designation. However, these results are indicative only of the specimens that were actually tested. HTS, Inc. neither accepts responsibility for nor makes claims to the final use and purpose of the material.

TESTING PERFORMED	TESTING PERFORMED
ASTM D 5261 – Mass Per Unit Area	
ASTM D 4632 – Grab Tensile Properties	
ASTM D 4533 – Trapezoidal Tearing Strength	
ASTM D 3786 – Hydraulic Bursting Strength	
ASTM D 4833 – Puncture Resistance	
ASTM D 1777 – Thickness	

Very truly yours,

Larry L. McMichael
Vice President

ENVIRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

MASS PER UNIT AREA – ASTM D 5261

Sample Type: ASTM Specimen: 4" X 8"

Sample	Spec. #	Mass Per Unit Area (oz/yd^2)
991844	1	6.3
	2	6.9
	3	6.6
	4	7.2
	5	7.4
	Avg.	6.9
	S.D.	

Sample	Spec. #	Mass Per Unit Area (g/m^2)
992171	1	6.2
	2	6.5
	3	6.0
	4	5.9
	5	6.6
	Avg.	6.2
	S.D.	

Sample	Spec. #	Mass Per Unit Area (g/m^2)
4104683A	1	11.5
	2	15.6
	3	12.6
	4	12.8
	5	13.0
	Avg.	13.1
	S.D.	

GRAB TENSILE PROPERTIES – ASTM D 4632

Instron Series IX Automated Materials Testing System

Sample Type: ASTM — Cross Head Speed (in/min): 12.0000

Width (in): 4.000 — Spec. Gauge Length (in): 3.000

Thickness (in): .1000 — Grip Distance (in): 3.000

		Maximum Load (lbs/in)		Elongation (%)	
Sample	Spec. #	MD	XD	MD	XD
991844	1	211.9	151.5	50.13	62.53
	2	222.7	163.9	54.47	59.40
	3	165.1	204.7	45.93	62.43
	4	185.2	216.4	48.13	76.70
	5	196.8	191.9	52.60	59.83
	6	187.8	198.0	50.80	58.17
	7	198.4	207.9	51.07	67.83
	8	243.4	207.9	51.83	61.47
	9	204.3	184.8	66.33	63.13
	10	188.9	150.4	50.07	53.60
	Avg.	200.5	187.7	52.1	62.5

		Maximum Load (lbs/in)		Elongation (%)	
Sample	Spec. #	MD	XD	MD	XD
992171	1	211.7	188.8	55.77	76.43
	2	158.2	187.4	62.57	72.60
	3	183.4	195.4	69.17	71.63
	4	180.3	188.9	69.20	79.43
	5	173.2	190.3	57.47	81.47
	6	197.9	214.8	51.80	74.83
	7	195.7	199.6	63.50	90.00
	8	187.9	228.1	61.83	74.27
	9	154.8	209.1	73.50	72.90
	10	175.4	191.7	71.53	87.30
	Avg.	181.9	199.4	63.6	78.1

		Maximum Load (lbs/in)		Elongation (%)	
Sample	Spec. #	MD	XD	MD	XD
4104683A	1	283.5	361.1	69.93	81.07
	2	265.8	333.7	72.13	72.93
	3	287.4	383.5	75.30	75.90
	4	303.0	396.5	78.00	78.80
	5	264.8	364.0	69.43	76.93
	6	271.0	416.0	78.10	85.93
	7	324.3	374.6	84.80	78.60
	8	358.9	392.9	80.13	85.97
	9	346.6	382.8	75.77	85.00
	10	312.3	380.3	70.47	78.33
	Avg.	301.8	378.5	75.4	79.9

TRAPEZOIDAL TEARING STRENGTH – ASTM D 4533

Instron Series IX Automated Materials Testing System

Sample Type: ASTM — Cross Head Speed (in/min): 12.0000

Width (in): 3 — Spec. Gauge Length (in): 1

Thickness (in): .1000 — Grip Distance (in): 1

		Maximum Load (lbs)	
Sample	Spec. #	MD	XD
991844	1	62.01	74.28
	2	72.91	97.83
	3	88.83	123.30
	4	62.34	86.07
	5	76.67	84.62
	6	70.98	121.40
	7	70.47	72.27
	8	92.78	91.19
	9	80.05	129.60
	10	81.85	88.30
	Avg.	75.9	96.9

		Maximum Load (lbs)	
Sample	Spec. #	MD	XD
992171	1	76.24	95.95
	2	91.38	117.40
	3	74.85	82.25
	4	71.81	97.34
	5	83.17	135.20
	6	76.62	86.71
	7	67.62	138.40
	8	71.84	112.10
	9	55.73	98.31
	10	74.15	91.62
	Avg.	74.3	105.5

		Maximum Load (lbs)	
Sample	Spec. #	MD	XD
4104683A	1	173.9	124.30
	2	167.8	114.30
	3	190.9	148.00
	4	230.6	104.20
	5	228.6	127.10
	6	185.3	129.40
	7	137.6	92.70
	8	160.0	114.50
	9	184.1	117.90
	10	189.5	123.70
	Avg.	184.8	119.6

HYDRAULIC BURSTING STRENGTH – ASTM D 3786

Sample Type: ASTM

Hydraulic Diaphragm Bursting Tester: Model A

Sample	Spec. #	Bursting Strength (psi)
991844	1	430
	2	410
	3	380
	4	340
	5	390
	6	390
	7	415
	8	430
	9	410
	10	420
	Avg.	401.5

Sample	Spec. #	Bursting Strength (psi)
992171	1	430
	2	405
	3	370
	4	330
	5	370
	6	370
	7	330
	8	290
	9	290
	10	290
	Avg.	347.5

Sample	Spec. #	Bursting Strength (psi)
4104683A	1	465
	2	445
	3	505
	4	525
	5	526
	6	415
	7	415
	8	395
	9	420
	10	395
	Avg.	450.6

PUNCTURE RESISTANCE – ASTM D 4833

Instron Series IX Automated Materials Testing System

Sample Type: ASTM	Cross Head Speed (in/min): 12.0
Sample Size: 4" diameter	Spec. Gauge Length (in): .0600
Area (in^2): 2.4660	Platen Separation (in): .0600

Sample	Spec. #	Maximum Load (lbs)
991844	1	155
	2	155
	3	167
	4	113
	5	127
	6	128
	7	92
	8	97
	9	125
	10	93
	11	143
	12	95
	13	119
	14	112
	15	124
	Avg.	125.2
	S.D.	

Sample	Spec. #	Maximum Load (lbs)
992171	1	117
	2	101
	3	100
	4	84
	5	136
	6	99
	7	101
	8	120
	9	106
	10	98
	11	92
	12	121
	13	88
	14	94
	15	98
	Avg.	106.2

PUNCTURE RESISTANCE – ASTM D 4833

Instron Series IX Automated Materials Testing System

Sample Type: ASTM	Cross Head Speed (in/min): 12.0
Sample Size: 4" diameter	Spec. Gauge Length (in): .0600
Area (in^2): 2.4660	Platen Separation (in): .0600

Sample	Spec. #	Maximum Load (lbs)
4104683A	1	224
	2	177
	3	177
	4	232
	5	221
	6	204
	7	206
	8	218
	9	228
	10	195
	11	217
	12	220
	13	235
	14	233
	15	211
	Avg.	208.2

THICKNESS – ASTM D 1777

Sample Type: ASTM
Type of Apparatus: Mitutoyo
Dimension of Pressure Foot: 2.22 in
Pressure Applied: .29 psi
Loading Time Interval: 5 seconds

Sample	Spec. #	Thickness (mil)
991844	1	57.5
	2	60.0
	3	61.5
	4	60.5
	5	69.0
	6	61.0
	7	66.0
	8	65.0
	9	63.0
	10	64.0
	Avg.	62.8 failed + retested 75 mil req.

Sample	Spec. #	Thickness (mil)
992171	1	77.0
	2	77.5
	3	79.0
	4	79.0
	5	75.5
	6	78.0
	7	72.0
	8	77.0
	9	73.0
	10	76.0
	Avg.	76.4

Sample	Spec. #	Thickness (mil)
4104683A	1	132.5
	2	145.5
	3	137.0
	4	134.0
	5	139.5
	6	137.8
	7	127.0
	8	123.5
	9	136.5
	10	138.0
	Avg.	135.1

Retest Thickness

HTS, INC. Consultants
416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 13, 1998

HTS Report #:	PEN1254.004

Mr. Don Flowers	Customer Project Name:	NSWC Crane
Philip Environmental	Customer Project #:	18328
510 DD Road	Lab Temperature:	73 degrees F.
Columbia, IL 62236	Lab Humidity:	50%

The following 1 samples were delivered to our laboratory on 7/13/98.

SAMPLES RECEIVED								
	Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type
1	991844	Geotextile	6			11		
2			7			12		
3			8			13		
4			9			14		
5			10			15		

Conformance testing was performed in accordance with the following test methods. The test results are summarized on the subsequent pages. It should be noted that the test specimens and test sample used for this work were believed to be representative of the material produced under this designation. However, these results are indicative only of the specimens that were actually tested. HTS, Inc. neither accepts responsibility for nor makes claims to the final use and purpose of the material.

TESTING PERFORMED	TESTING PERFORMED
ASTM D 1777 - Thickness	

Very truly yours,

Larry L. McMichael
Vice President

IRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

THICKNESS – ASTM D 1777

Sample Type: ASTM
Type of Apparatus: Mitutoyo
Dimension of Pressure Foot: 2.22 in.
Pressure Applied: .29 psi
Loading Time Interval: 5 seconds

Sample	Spec. #	Thickness (mil)
991844	1	73.0
	2	74.0
	3	78.5
	4	85.0
	5	86.0
	6	78.5
	7	79.5
	8	75.0
	9	82.0
	10	83.0
	Avg.	79.5 (mil)

F-3

Manufacturer's QC Certificates

PHILIP ENVIRONMENTAL

Industrial Services Group
Midwest Region

June 10, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Lois J. Bigley 06-15-98
Lois J. Bigley 06-15-98

Dear Mr. McCumbers

APPROVED AS NOTED
Rolls 4109250A
4109160A FAIL
4109200A
Remaining rolls 1st pass

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Re-Submittal No. 025F

The following submittal is being presented in accordance with the Bid Documents, dated, July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-62	Test & Certification of Compliance	02249

Type 2 Geotextile

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

cc: D. Beall

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

SYNTHETIC INDUSTRIES

Geosynthetic Products Division
Fluid Systems Inc
Lisa Ambrose
1245 Corporate Blvd Suite 300
Aurora, IL 60504

June 2, 1998

NCWC Crane Dye Burial Cap

Michelle Lotz
205 551-0347

This is to certify that Product GEOTEX™ 1201, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Tensile Strength	ASTM D-4632	300 lbs	1335 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	115 lbs	510 N
Mullen Burst	ASTM D-3786	580 psi	3995 Kpa
Puncture Strength	ASTM D-4833	175 lbs	775 N
AOS	ASTM D-4751	100 US Standard Sieve	0.150 mm
Permittivity	ASTM D-4491	1.0 sec^{-1}	1.0 sec^{-1}
Permeability	ASTM D-4491	0.29 cm/sec	0.29 cm/sec
Flow Rate	ASTM D-4491	75 gpm/ft^2	3055 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product delivered hereunder other than at the time of delivery is free of the defects and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE, ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of these products are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this type and is subject to change without notice. This effective date for the product data is 01/1997

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-521-0444

6/12/98 12:41 Page 1

Synthetic Industries
Individual Roll Data
Bill of Lading:633710

Roll Number	Style	Mass/ Unit Qsy D6261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
4102010A	1201	11.3	136	323		74		141		640	183
4102030A	1201	11.6	145	340		67		145		707	195
4102040A	1201	11.0	142	318	418	67	66	170	232	613	203
4102070A	1201	11.1	143	348	417	67	67	178	252	633	217
4102100A	1201	11.6	141	366	445	65	68	175	213	687	228
4102130A	1201	11.2	136	336	421	68	66	146	205	627	197
4102140A	1201	11.3	142	351	422	70	69	167	228	627	212
4102140A	1201	11.3	142	351	422	70	69	167	228	627	218
4102150A	1201	11.6	143	363		67		145		654	218
4104680A	1201	11.1	132	324		74		163		593	183
4104680A	1201	11.1	132	324		74		163		593	183
4104790A	1201	11.7	133	360	435	72	75	161	221	613	192
4109150A	1201	12.2	112	339	459	73	63	138	214	690	221
4109160A	1201	12.0	111	323	440	69	61	144	215	601	226
4109200A	1201	11.8	108	308	433	67	62	120	183	593	191
4116890A	1201	11.4	128	323		65		143		576	204

Fail Req thickness 120 mil

Bid Weiss

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for age until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

FLUID SYSTEMS

Type 2 (SI)

June 19, 1998

Michelle Lotz
104 Wholesale Ave.
Huntsville, AL 35811

RE: Dye Burial Cap
Crane, IN

Dear Michelle:

The table labeled "Individual Roll Data" supplied by Synthetic Industries for the GEOTEX 1201 nonwoven geotextiles is the actual test data for the lot of geotextiles from which the rolls were taken to supply this project. It was mistakenly labeled as being for a particular bill of lading. The rolls supplied to the jobsite are correctly listed on the bill of lading number 623825 which arrived with the delivery. Due to testing frequency, most of the rolls sent to the jobsite fall between the rolls actually tested. This means that roll data for each roll shipped to the jobsite is not available. You can reasonably project roll data by comparing the data from the roll data above and below the roll number delivered to the site. Alternately, samples can be taken from the rolls onsite and tested.

Sincerely,

John D. Pyle

Regional Sales Manager

NSWC CRANE
DYE BURIAL GROUND CAP

Submittal Item No. 1-60(A)
Specification Section 02249

:ificate of Compliance by Geotextile Manufacturer

Lois J. Bigly 12-~~28~~ 29-97

Certified by GC Manager: Lois J. Bigly 12-~~28~~ 29-97
(signature)

Phillip Environmental Services Corp.
210 West Sand Bank Road
Columbia, IL 62236

Geosynthetics Contractor
Environmental Design & Construction, Inc.
104 Wholesale Avenue
Huntsville, AL 35811

SYNTHETIC INDUSTRIES
Construction • Civil Engineering Products Group

September 12, 1997

John Pyle
Fluid Systems, Inc.
South Carolina
Fax: 864.949.2686

RE: Dye Burial Cap, Crane, IN/Synthetic Industries' 1201

Dear John:

Please find below my response to the engineer's comments regarding the 1201 submittal items for the above referenced project:

1-55 Synthetic Industries quality control resin analysis and Fina certification included in original submittal packet. This information is "sample" as a representation of 1201 production.
1-56 Revised letter of compliance will be sent referencing this project.
1-57 Synthetic Industries does not add reclaimed polymer to the 1201 nonwoven. Only 1st quality virgin resin is used to produce the 1201 nonwoven.
1-58 The 1201 is comprised of greater than 95% polypropylene by unit weight. The remaining percentage is made up of carbon black and other processing additives. I am not at liberty to divulge the exact make-up of our nonwoven geotextiles. This information is considered proprietary in nature.
1-59 Synthetic Industries does not publish the mass per unit area or thickness of the 1201 nonwoven. This product is generally used in the civil highway marketplace where mass and thickness is not an issue. However, these properties will appear on the revised letter of compliance.
1-60 These properties will appear on the revised letter of compliance.
1-62 This information can be supplied at time of shipment.

Any further questions, please feel free to contact me.

Respectfully,

E. Cooper

Eddie E. Cooper
Engineering Assistant, Construction • Civil Engineering Products Group

cc: Danny Campbell, Synthetic Industries

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • 37416 USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

September 12, 1997

Fluid Systems Inc
John Pyle
1245 Corporate Blvd Suite 300
Aurora, IL 60504
Project: Dye Burial Cap Crane IN

This letter of compliance indicates that product GEOTEX™ 1201, a nonwoven polypropylene geotextile, produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. Nominal value, n. - for geotextiles, a term used to identify the mass per unit area of a material that may deviate from the mean.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Mass per unit area	ASTM D-5261 (Nominal)	12 oz/yd^2	405 g/m^2
Thickness	ASTM D-5199	105 mils	2.6 mm
Tensile Strength	ASTM D-4632	300 lbs	1335 N
Thickness	ASTM D-5199	105 mils	2.6 mm
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	115 lbs	510 N
Mullen Burst	ASTM D-3786	580 psi	3995 Kpa
Puncture Strength	ASTM D-4833	175 lbs	775 N
AOS	ASTM D-4751	100 US Standard Sieve	0.150 mm
Permittivity	ASTM D-4751	1.0 sec^{-1}	1.0 sec^{-1}
Permeability	ASTM D-4491	0.29 cm/sec	0.29 cm/sec
Flow Rate	ASTM D-4491	75 gpm/ft	3055 lpm/m^2
U V Resistance	ASTM D-4355	70 %	

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is purchase 04/06/97

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7819 • 1-800-821-0444

TNS
ADVANCED TECHNOLOGIES

681 DeYoung Road
Greer, South Carolina 29651
Tel: (864) 968-0592
Fax: (864) 879-4639
Toll Free: (800) 867-5181

December 2, 1997

REF: TNS R070
Dye Burial Ground Cap
Crane, IN
Environmental Design & Construction
Huntsville, AL

Dear Sir/Madam:

This is to certify that TNS R070 is a 100% polypropylene, nonwoven, needle-punched fabric. TNS R070 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. Polypropylene is stable within a pH range of 2 to 13. TNS R070 conforms to the physical properties listed in the following table.

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Minimum Average Roll Value
Weight (Typical)	ASTM D3376	oz/sy	7.0
Thickness	ASTM D5199	mils	90
Grab Tensile	ASTM D4632	lbs	180
Trap Tear	ASTM D4533	lbs	75
Puncture	ASTM D4833	lbs	105
Mullen Burst	ASTM D3786	psi	350
Permittivity	ASTM D4491	l/sec	1.5
Water Flow	ASTM D4491	gpm/sft.	100
Permeability	ASTM D4491	cm/sec	.30
UV Resistance	ASTM D4355	%	70
AOS	ASTM D4751	US Sieve	80

*At time of manufacturing, handling may change these properties

Sincerely,

Monte Thomas KC

Monte Thomas
Vice President
TNS Advanced Technologies

Type 1

TNS
ADVANCED TECHNOLOGIES

881 DeYoung Road
Greer, South Carolina 29651
Tel: (864) 968-0592
Fax: (864) 879-4639
Toll Free: (800) 867-5181

1-60

May 14, 1998
REF: TNS R070
PO: 93707
Quantity: 36 rolls

EDCI
Huntsville AL

Dear Sir/Madam:

This is to certify that TNS R070 is a 100% polypropylene, nonwoven, needle-punched fabric. TNS R070 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. Polypropylene is stable within a pH range of 2 to 13. TNS R070 conforms to the physical properties listed in the following table:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V
Weight(typical)	ASTM D 3776	oz/sy	7.0
Thickness	ASTM D 5199	mils	90
Grab Tensile	ASTM D 4632	lbs	180
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs	75
Puncture	ASTM D 4833	lbs	105
Mullen Burst	ASTM D 3786	psi	350
A.O.S.	ASTM D 4751	U.S. Sieve	80
Permeability	ASTM D 4491	cm/sec	0.30
Permitivity	ASTM D 4491	1/sec	1.5
Water Flow	ASTM D 4491	gpm/sq.ft.	100
U.V. Resistance	ASTM D 4355	% retained	70

Sincerely,

Paul M. Mosley
TNS Advanced Technologies

IN135R INS Packing List - 14:22, 05/12/98 Page 1

Roll #	Styl-Wtr-Yds	Gross	Tare	Net
Location "EDGI70" Available, Only				
991833	R070 180 300	224	17	207
991844	R070 180 300	223	17	206
991845	R070 180 300	224	17	207
991847	R070 180 300	222	17	205
991856	R070 180 300	223	17	206
991860	R070 180 300	223	17	206
991868	R070 180 300	223	17	206
991873	R070 180 300	225	17	208
991874	R070 180 300	224	17	207
991894	R070 180 300	225	17	208
991895	R070 180 300	225	17	208
991897	R070 180 300	227	17	210
991898	R070 180 300	225	17	208
991900	R070 180 300	225	17	208
991911	R070 180 300	225	17	208
991913	R070 180 300	223	17	206
991944	R070 180 300	229	17	212
991953	R070 180 300	226	17	209
991968	R070 180 300	226	18	208
991972	R070 180 300	226	18	208
991973	R070 180 300	226	18	208
991987	R070 180 300	226	18	208
992118	R070 180 300	226	17	209
992124	R070 180 300	226	18	208
992127	R070 180 300	226	18	208
992130	R070 180 300	225	18	207
992132	R070 180 300	225	18	207
992138	R070 180 300	224	18	206
992145	R070 180 300	229	18	211
992160	R070 180 300	226	18	208
992161	R070 180 300	227	18	209
992165	R070 180 300	226	18	208
992171	R070 180 300	227	18	209
992181	R070 180 300	228	18	210
992246	R070 180 300	252	18	234
993498	R070 180 300	252	18	234

"EDGI70" Totals: 8,154 529 7,535 36 Rolls----

TNS Mills, Inc. Nonwoven Quality Data 05/12/98 Page 1

Roll #	Code	Wt	Thk	Sl.Ld	Sl.Ms	Elng	Elng	Trap Tear	Trap Tear	Puncture	Puncture	Mullen	Mullen	Perm	Perm	AOS
		oz/yd²	mils	MD	CMD	MD	CMD	MD	CMD	Resist	Strng	Resist	Strng	cfm	l/cm²	
991833	R070	180	300	7.2	103	205	184	71	82	113	126	111	372	101	.37	1.5	80
991834	R070	180	300	7.0	96	195	184	58	18	88	98	106	387	101	.37	1.6	80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.37	1.6	80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.37	1.6	80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.37	1.6	80
992246	R070	180	300	7.0	99	211	235	59	71	75	75	136	423	102	.30	1.6	80
993498	R070	180	300	7.3	101	191	188	58	80	85	85	130	400	102	.30	1.6	80

F-4

Panel Layout Plans

MATERIAL SUMMARY

ROLL 1
P1-59'
P2-46'
P3-52'
P4-60'
P5-75'
P6-28'

ROLL 2
P7-57'
P8-94'
P-9-102'
P10-47'

ROLL 3
P11-63'
P12-116'
P13-119'

ROLL 4
P14-119'
P15-124'
P16-57'

ROLL 5
P17-77'
P18-137'
P19-86'

ROLL 6
P20-49'
P21-135'
P22-116'

ROLL 7
P23-21'
P24-138'
P25-136'

ROLL 8
P26-136'
P27-136'
P28-28'

ROLL 9
P29-107'
P30-136'
P31-57'

ROLL 10
P32-74'
P33-144'
P34-82'

ROLL 11
P35-74'
P36-168'
P37-58'

ROLL 12
P38-124'
P39-176'

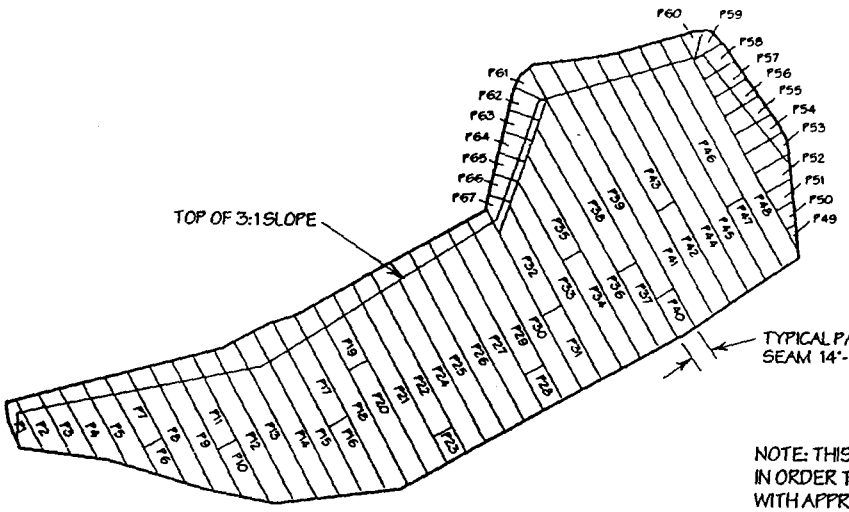
ROLL 13
P40-25'
P41-195'
P42-80'

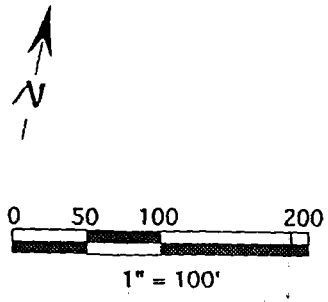
ROLL 14
P43-109'
P44-183'

ROLL 15
P45-179'
P46-121'
P47-51'
P48-165'
P49-7'
P50-13'
P51-20'
P52-25'

ROLL 16
P53-28'
P54-28'
P55-26'
P56-25'
P57-23'
P58-21'
P59-19'
P60-19'
P61-23'
P62-21'
P63-21'
P64-17'
P65-16'

ROLL 17
P66-15'
P67-21'





NOTE: THIS PANEL LAYOUT IS TENTATIVE AND MAY BE REVISED IN ORDER TO SUIT FIELD CONDITIONS BY EDCI SITE MANAGER WITH APPROVAL OF THE ENGINEER.

SCALE 1"= 100' DRAWN TAL DATE 8-8-97 DRAWING MAY BE REDUCED LINE EQUALS ONE INCH ON ORIGINAL DRAWING	NO.	DATE	REVISION	INIT.	ENVIRONMENTAL DESIGN AND CONSTRUCTION, INC. HUNTSVILLE, ALABAMA	DYE BURIAL GROUND INTERIM MEASURES CRANE, INDIANA	PROPOSED PANEL LAYOUT 12 oz SY NONWOVEN GEOTEXTILE SHEET 3 of 3

MATERIAL SUMMARY

ROLL 1
P1-39'
P2-46'
P3-52'
P4-60'
P5-75'
P6-83'
P7-94'
P8-51'

ROLL 2
P-9-51'
P10-110'
P11-116'
P12-119'
P13-104'

ROLL 3
P14-20'
P15-130'
P16-134'
P17-137'
P18-79'

ROLL4
P19-56'
P20-135'
P21-137'
P22-138'
P23-34'

ROLL 5
P24-103'

ROLL 5
P25-136'
P26-136'
P27-125'

ROLL 6
P28-10'
P29-136'
P30-131'
P31-144'
P32-79'

ROLL 7
P33-77'
P34-168'
P35-205'
P36-50'

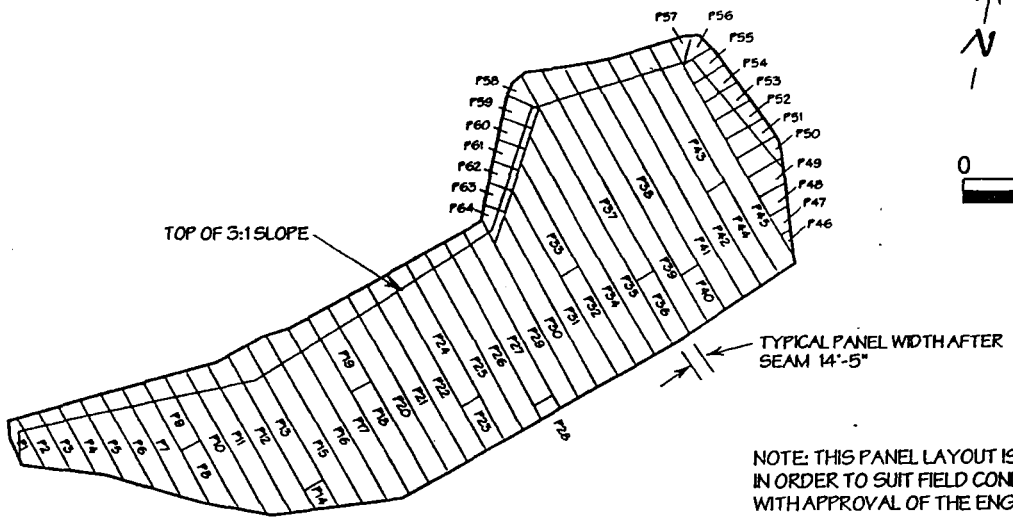
ROLL 8
P37-151'
P38-195'
P39-154'

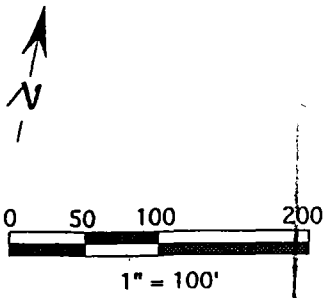
ROLL 9
P40-35'
P41-183'
P42-179'
P43-103'

ROLL 10
P44-69'
P45-165'
P46-7'

ROLL 10
P47-13'
P48-20'
P49-25'
P50-28'
P51-28'
P52-26'
P53-25'
P54-23'
P55-21'
P56-19'
P57-19'

ROLL 11
P58-23'
P59-21'
P60-21'
P61-17'
P62-16'
P63-15'
P64-21'





NOTE: THIS PANEL LAYOUT IS TENTATIVE AND MAY BE REVISED IN ORDER TO SUIT FIELD CONDITIONS BY EDCI SITE MANAGER WITH APPROVAL OF THE ENGINEER.

SCALE 1"= 100'	NO.	DATE	REVISION	INIT.	ENVIRONMENTAL DESIGN AND CONSTRUCTION, INC. HUNTSVILLE, ALABAMA	DYE BURIAL GROUND INTERIM MEASURES CRANE, INDIANA	PROPOSED PANEL LAYOUT 7 oz SY NONWOVEN GEOTEXTILE	SHEET 2 of 3
DRAWN TAL								
DATE 8-8-97								
DRAWING MAY BE REDUCED								
LINE EQUALS ONE INCH ON ORIGINAL DRAWING								

F-5

Panel Placement/Deployment Sheets

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
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DYE BURIAL GROUND CAP
CRANE INDIANA

Panel Placement Log

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
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TYPE 2 GEOTEXTILE

PROJECT NAME: DYE BURIAL GROUND SHEET 1 OF 1

PROJECT #: 97006 IN

PROJECT LOCATION: CRANE IN DATE: 7-11-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-1	4094557	12 oz	188	14.75	2,773
GT-2	4094557	12 oz	112	14.75	1,652
GT-3	4020899	12 oz	191	14.75	2,817
GT-4	4020999	12 oz	109	14.75	1,608
GT-5	4104606	12 oz	81	14.75	1,195
GT-6	4104606	12 oz	197	14.75	2,906
GT-7	4104606	12 oz	24	14.75	354
GT-8	4102021	12 oz	174	14.75	2,567
GT-9	4102021	12 oz	125	14.75	1,844
GT-10	4102010	12 oz	73	14.75	1,077
GT-11	4102010	12 oz	209	14.75	3,083
GT-12	4102035	12 oz	219	14.75	3,230
	TOTAL INSTALLED THIS PAGE				25,106
	TOTAL INSTALLED PREV. PAGE				Ø
	TOTAL INSTALLED TO DATE				25,106

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TYPE 2 GEOTEXTILE

PROJECT NAME: DYE BURIAL GROUND SHEET 1 OF 3

PROJECT #: 97006 (N)

PROJECT LOCATION: CRANO, IN DATE: 7-12-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-13	4102035	12 oz	82	14.75	1,210
GT-14	4104683	12 oz	134	14.75	1,977
GT-15	4104683	12 oz	166	14.75	2,449
GT-16	4102105	12 oz	50	14.75	738
GT-17	4102105	12 oz	216	14.75	3,186
GT-18	4102105	12 oz	39	14.75	575
GT-19	4102034	12 oz	171	14.75	2,522
GT-20	4102034	12 oz	127	14.75	1,873
GT-21	4102037	12 oz	50	14.75	738
GT-22	4102037	12 oz	170	14.75	2,508
GT-23	4102037	12 oz	80	14.75	1,180
GT-24	4102155	12 oz	76	14.75	1,121
GT-25	4102155	12 oz	156	14.75	2,301
GT-26	4102155	12 oz	73	14.75	1,077
GT-27	4102135	12 oz	82	14.75	1,210
GT-28	4102135	12 oz	142	14.75	2,095
GT-29	4102135	12 oz	69	14.75	1,018
GT-30	4102007	12 oz	85	14.75	1,254
GT-31	4102007	12 oz	149	14.75	2,198
GT-32	4102007	12 oz	62	14.75	915
	TOTAL INSTALLED THIS PAGE				29,275
	TOTAL INSTALLED PREV. PAGE				25,106
	TOTAL INSTALLED TO DATE				54,381

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TYPE 2 GEOTEXTILE

PROJECT NAME: DYE BURIAL GROUND SHEET 2 OF 3

PROJECT #: 97006 IN

PROJECT LOCATION: CRANE, IN DATE: 7-12-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-33	4102143	12 oz	90	14.75	1,328
GT-34	4102143	12 oz	147	14.75	2,168
GT-35	4102143	12 oz	59	14.75	870
GT-36	4102131	12 oz	83	14.75	1,224
GT-37	4102131	12 oz	145	14.75	2,139
GT-38	4102131	12 oz	65	14.75	959
GT-39	4104687	12 oz	79	14.75	1,165
GT-40	4104687	12 oz	132	14.75	1,947
GT-41	4104687	12 oz	89	14.75	1,313
GT-42	4116898	12 oz	40	14.75	590
GT-43	4116898	12 oz	134	14.75	1,977
GT-44	4116898	12 oz	129	14.75	1,903
GT-45	4104674	12 oz	122	14.75	1,800
GT-46	4104674	12 oz	97	14.75	1,431
GT-47	4104674	12 oz	71	14.75	1,047
GT-48	4102138	12 oz	37	14.75	546
GT-49	4102138	12 oz	87	14.75	1,283
GT-50	4102138	12 oz	78	14.75	1,151
GT-51	4104783	12 oz	72	14.75	1,062
GT-52	4104783	12 oz	70	14.75	1,033
	TOTAL INSTALLED THIS PAGE				26,936
	TOTAL INSTALLED PREV. PAGE				54,381
	TOTAL INSTALLED TO DATE				81,317

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TYPE 2 GEOTEXTILE

PROJECT NAME: DYE BURIAL GROUND SHEET 3 OF 3

PROJECT #: 97006 IN

PROJECT LOCATION: CRANE, IN DATE: 7-12-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-53	4104783	12 oz	70	14.75	1,033
GT-54	4102138	12 oz	70	14.75	1,033
	TOTAL INSTALLED THIS PAGE				2,066
	TOTAL INSTALLED PREV. PAGE				81,317
	TOTAL INSTALLED TO DATE				83,383

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PROJECT NAME: Dye Burial Grounds SHEET 1 OF

PROJECT #: Crane Weapons Naval Base Crane, Indiana

PROJECT LOCATION: Naval Crane Weapons Base Crane, Indiana DATE: 7-27-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-1	0992134	6oz	144'	15'	2160
GT-2	0992134	6oz	103'	15'	1545
GT-3	0992138	6oz	45'	15'	675
GT-4	0992138	6oz	87'	15'	1305
GT-5	0992165	6oz	53'	15'	795
GT-6	0992165	6oz	191'	15'	2865
GT-7	0992165	6oz	52'	15'	780
GT-8	0992138	6oz	184'	15'	2760
GT-9	0991894	6oz	196'	15'	2940
GT-10	0991894	6oz	101'	15'	1515
GT-11	0991844	6oz	114'	15'	1710
GT-12	0991894	6oz	18'	15'	270
GT-13	0991844	6oz	192'	15'	2880
GT-14	0992118	6oz	212'	15'	3180
GT-15	0991868	6oz	117'	15'	1755
GT-16	0992118	6oz	105'	15'	1575
GT-17	0991868	6oz	185'	15'	2775
GT-18	0991993	6oz	36'	15'	540
GT-19	0991993	6oz	183'	15'	2745
GT-20	0991993	6oz	14'	15'	210
GT-21	0992127	6oz	203'	15'	3045
GT-22	0992127	6oz	100'	15'	1500
GT-23	0992171	6oz	82'	15'	1230
GT-24	0992171	6oz	168'	15'	2520
GT-25	0991865	6oz	139'	15'	1985
GT-26	0991865	6oz	133'	15'	1895
GT-27	0991845	6oz	154'	15'	2310
GT-28	0991845	6oz	153'	15'	2295
GT-29	0992145	6oz	151'	15'	2265
	TOTAL INSTALLED THIS PAGE				54025
	TOTAL INSTALLED PREV. PAGE				—
	TOTAL INSTALLED TO DATE				54025

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PROJECT NAME: Dye Burial Grounds SHEET 2 OF

PROJECT #:

PROJECT LOCATION: Crane Naval Base, Crane Ind. DATE: 7-29-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-30	0992145	6oz	148'	180	2220
GT-31	0993194	6oz	150'	180	2250
GT-32	0993194	6oz	149'	180	2205
GT-33	0992161	6oz	140'	180	2100
GT-34	0992161	6oz	140'	180	2100
GT-35	0991972	6oz	122'	180	1830
GT-36	0991972	6oz	117'	180	1755
GT-37	0992132	6oz	114'	180	1710
GT-38	0992132	6oz	110'	180	1650
GT-39	0992132	6oz	39'	180	585
GT-40	0991972	6oz	28'	180	420
GT-41	0991856	6oz	28'	180	420
GT-42	0991856	6oz	98'	180	1470
GT-43	0991856	6oz	86'	180	1290
GT-44	0991856	6oz	70'	180	1050
GT-45	0992132	6oz	21'	180	315
GT-46	0992246	6oz	73'	180	1095
GT-47	0992246	6oz	72'	180	1080
GT-48	0991833	6oz	27'	180	405
GT-49	0992246	6oz	64'	180	960
GT-50	0992246	6oz	56'	180	840
GT-51	0992246	6oz	19'	180	285
GT-52	0992161	6oz	18'	180	270
	TOTAL INSTALLED THIS PAGE				26205
	TOTAL INSTALLED PREV. PAGE				54025
	TOTAL INSTALLED TO DATE				81230

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
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PROJECT NAME: Dye Burial Grounds SHEET 1 OF 3

PROJECT #:

PROJECT LOCATION: Crane Naval Base, Crane IND DATE: 8-5-98 (WED)

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-1	1833	60z	144'	15'	2160
GT-2	1874	60z	178'	15	2670
GT-3	1874	60z	130'	15	1950
GT-4	1833	60z	31'	15	465
GT-5	1833	60z	45	7.5	338
GT-6	1833	60z	45'	7.5	338
GT-7	1833	60z	33'	15	495
GT-8	1868	60z	148'	15	2220
GT-9	1868	60z	136'	15	2040
GT-10	1948	60z	64'	15	960
GT-11	1948	60z	175'	15	2625
GT-12	2160	60z	156'	15	1565
GT-13	1948	60z	57'	15	855
GT-14	2160	60z	144'	15	2160
GT-15	1860	60z	79'	15	1185
GT-16	1860	60z	270'	15	3300
GT-17	1987	60z	197'	15	2955
GT-18A	2130	60z	110'	15	1650
GT-18B	1987	60z	105'	15	1575
GT-20	2160	60z	27'	15	405
GT-21	1873	60z	186'	15	2790
GT-22	1873	60z	114'	15	1710
GT-23	2181	60z	57'	15	855
GT-24	2181	60z	173'	15	2595
GT-25	2181	60z	124'	15	1860
GT-26	1913	60z	57'	15	855
GT-27	1913	60	160'	15	2400
GT-28	1913	60z	93'	15	1395
GT-29	1847	60z	67'	15	975
	TOTAL INSTALLED THIS PAGE				47346
	TOTAL INSTALLED PREV. PAGE				Ø
	TOTAL INSTALLED TO DATE				47346

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

PROJECT NAME: _____ SHEET ____ OF _____

PROJECT #: _____

PROJECT LOCATION: _____ DATE: _____

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-30	1847	60z	155	15	2325
GT-31	1847	60z	78	15	1170
GT-32	1897	60z	80	15	1200
GT-33	1897	60z	153	15	2295
GT-19	2130	60z	187	15	2805
	TOTAL INSTALLED THIS PAGE				9795
	TOTAL INSTALLED PREV. PAGE				47346
	TOTAL INSTALLED TO DATE				57141

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
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PROJECT NAME: Dye Burial Grounds SHEET 3 OF 3

PROJECT #:

PROJECT LOCATION: Crane Naval Base, Crane IND DATE: 8-5

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-34	1897	6oz	89'	15	1335
GT-35	1898	6oz	32'	15	480
GT-36	1898	6oz	140'	15	2100
GT-37	1898	6oz	130'	15	1950
GT-38	1900	6oz	136'	15	2040
GT-39	1900	6oz	133'	15	1995
GT-40	1900	6oz	40'	15	600
GT-41	3498	6oz	100'	15	1500
GT-42	3498	6oz	130'	15	1950
GT-43	3498	6oz	72'	15	1080
GT-44	1911	6oz	50'	15	750
GT-45	1911	6oz	130'	15	1950
GT-46	1911	6oz	86'	15	1290
GT-47	1911	6oz	40'	15	600
GT-48	1944	6oz	63'	15	945
GT-49	1944	6oz	83'	15	1245
GT-50	1944	6oz	76'	15	1140
GT-51	1944	6oz	70'	15	1050
GT-52	1944	6oz	18'	15	270
GT-53	2171	6oz	46'	15	690
GT-54	148A	12oz	44'	7'	308
GT-55	148A	12oz	38'	7'	266
GT-56	148A	12oz	70'	7'	490
GT-57	148A	12oz	70'	7'	490
GT-58	148A	12oz	40'	7'	280
GT-59	148A	12oz	4'	7'	28
	TOTAL INSTALLED THIS PAGE			26822	[redacted]
	TOTAL INSTALLED PREV. PAGE			57141	[redacted]
	TOTAL INSTALLED TO DATE			83963	[redacted]

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

PROJECT NAME: Dye Burial Grounds SHEET 3 OF 3

PROJECT #:

PROJECT LOCATION: Crane Naval Base, Crane IND DATE: 8-5

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
GT-34	1897	6oz	89'	15	1335
GT-35	1898	6oz	32'	15	480
GT-36	1898	6oz	140'	15	2100
GT-37	1898	6oz	130'	15	1950
GT-38	1900	6oz	136'	15	2040
GT-39	1900	6oz	133'	15	1995
GT-40	1900	6oz	40'	15	600
GT-41	3498	6oz	100'	15	1500
GT-42	3498	6oz	130'	15	1950
GT-43	3498	6oz	72'	15	1080
GT-44	1911	6oz	50'	15	750
GT-45	1911	6oz	130'	15	1950
GT-46	1911	6oz	86'	15	1290
GT-47	1911	6oz	40'	15	600
GT-48	1944	6oz	63'	15	945
GT-49	1944	6oz	83'	15	1245
GT-50	1944	6oz	76'	15	1140
GT-51	1944	6oz	70'	15	1050
GT-52	1944	6oz	18'	15	270
GT-53	2171	6oz	46'	15	690
GT-54	148A	12oz	44'	7'	308
GT-55	148A	12oz	38'	7'	266
GT-56	148A	12oz	70'	7'	490
GT-57	148A	12oz	70'	7'	490
GT-58	148A	12oz	40'	7'	280
GT-59	148A	12oz	4'	7'	28
	TOTAL INSTALLED THIS PAGE			26822	[redacted]
	TOTAL INSTALLED PREV. PAGE			57141	[redacted]
	TOTAL INSTALLED TO DATE			83963	[redacted]

F-6

Seam Inspection/Test Sheets

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

CERTIFICATE OF ACCEPTANCE

PROJECT NAME: Dye Burial Ground DATE: 7-23-98
PROJECT LOCATION: Crane, IN

Details of Work Completed and Measured.....

Supplied, Installed, And Tested 84,772 Square Feet Of Type 2 (12oz) Geotextile, GCL, And 60 Mil Textured HDPE.

I, the undersigned, duly authorized representative of Phillips Services do hereby take over and accept the work described above from the date hereof, subject to the exceptions detailed below, and confirm that the work has been completed in accordance with the specifications and the terms and conditions of the contract. There is no apparent damage to the plastic lining, nor is there any interference within or without the surrounding works.

I have evaluated and measured the work together with the EDCI representative, and agree that the measurements shown above are true and correct, and that the installation has met our approval.

Exceptions.....

General Contractor/Owner	Environmental Design & Construction, Inc.
Russell Tomasko	Daniel R. Davis
Signature	Signature
Russell Tomasko	Daniel R Davis
Printed Name	Printed Name
Date: 7/23/98	Date: 7-23-98

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

CERTIFICATE OF ACCEPTANCE

PROJECT NAME: Dye Burial Ground DATE: 7·30·98

PROJECT LOCATION: Crane, Indiana

Details of Work Completed and Measured....
82,330 sq. ft. of Geotextile 6oz. seamed by stitching
covering layer of 6" sand.

I, the undersigned, a duly authorized representative of Phillip Services do hereby take over and accept the work described above from the date hereof, subject to the exceptions detailed below, and confirm that the work has been completed in accordance with the specifications and the terms and conditions of the contract. There is no apparent damage to the plastic lining, nor is there any interference within or without the surrounding works.

I have evaluated and measured the work together with the EDCI representative, and agree that the measurements shown above are true and correct, and that the installation has met our approval.

Exceptions.....

General Contractor/Owner
Signature
Russell Tomatsko
Printed Name
Date: 7/30/98

Environmental Design & Construction, Inc.
Signature
Richard T. Hastie
Printed Name
Date: 7-30-98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 11, 1998
REPORT #080

Activity:

- Drainage/anchor Trench: Using a Cat backhoe with a 24" bucket, PSG began excavation of the drainage/anchor trench, starting on the north end and working southward. The drainage/anchor trench is a 2 foot wide 1 foot trench with rounded corners located around the perimeter of the cap and four outlets. Approximately 900 liner foot was excavated today. Roots, organic matter, gravel, and a variety of geosynthetic material were found within the trench excavation and removed or layered in the bottom of the trench. Protruding roots were cut flush with the side wall using either a hatchet or a chain saw. PSG covered all exposed sections of the drainage/anchor trench with plastic sheeting at the end of the shift.
- Geotextile Cushion and GCL Installation - After a final inspection of the cap foundation surface, EDCI a sub to PSG, began deployment of the geotextile cushion, SI 1201 a 120 mil geotextile, starting at the northeast end and working southward. Using a Union Sewing Machine and KemFast, a polymer thread, panels of geotextile cushion are continuously sewn together with a locking stitch. The first 13 panels cover nearly 25,000 square feet, approximately 140 feet of the north end and were laid and three sections sewn.

Inspection:

- PSG - inspected the trench line rounding corners, cut protruding roots, and checked depth, width, and grade.

- MK - performed spot check on depth and condition of trench. Inspected entire trench line and spoils for dye contamination - no evidence of dye was found in any part of the trench.
- EDCI - prior to deployment of the geotextile cushion, inspected the cap foundation surface.
- MK - confirmed that the first panel was deployed straight. EDCI is deploying the geotextile by lifting the roll using the wheel loader and pulling the material across the cap.
- EDCI - inspected the geotextile panel for irregularities, rips, holes, tears and unspent raw material prior to seaming geotextile panels. GT-1, GT-2 roll #4094357; GT 3, GT-4 roll #4020099; GT-5, GT-6, GT-7 roll #4104606; GT-8, GT-9 roll #4102021; GT-10, GT-11 roll #4102010; GT-12, GT-13 roll #4102035.
- MK - confirmed that SI 1201 meets the subcontract specifications (all required submittals in and approved). The six rejected rolls set aside - material did not meet thickness requirements per manufacturer's QC certificates.
- MK - verified that approved thread, KemFast Tex 210, meets or exceeds the UV resistance of the geotextile.
- MK - visually inspected the following seams by walking down the entire length of the seam and that the panels are free of irregularities, flaws, holes, rips, or tears. Seams: GT-3 - GT-1; GT-1 - GT 5 & 2; GT-5 & 2 - GT-6.

Attachments: 0

Signature/Date: 07-11-98

Report #080

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 12, 1998
REPORT #081

Activity:

Drainage/anchor Trench: PSG completed excavation of the drainage/anchor trench and four outlet trenches using a Cat 246 backhoe with a 2' wide bucket. Standing water was uncovered near the southeast corner of the cap. No evidence of dye contamination.

- Geotextile Cushion and GCL Installation - The remainder of the cap was covered with SI 1201 120 mil geotextile cushion by EDCI, a sub of PSG. Using Union Sewing Machines the panels were continually sewn.

Inspection:

- PSG - inspected the trench line rounding corners and cutting protruding roots.
- PSG - using a survey level, PSG checked grade of the trench line to ensure all areas flow at a minimum of 1% grade to the four outlets.
- MK - verified PSG's inspection and grade check and performed random confirmation of the trench depth 1' minimum, width 2' and rounding of corners.
- MK - visually inspected trench and spoil material. No evidence of dye contamination was found.
- EDCI - inspected the geotextile panels for irregularities, rips, holes, and unspent raw materials prior to seaming.

- MK - visually inspected the following seams and panels by walking the entire length of the seam. Any defects were identified and EDCI repaired the area:
    - Seams: GT-3 - GT-4; GT-7 & 8 - GT 6 ; GT-9 & 10 - GT- 7 & 8; GT-11 - GT-9 & 10; GT-12 - GT-11; GT-13 & 14 - GT-12; GT-15 & 16 - GT-13 & 14.
- EDCI - tracked and measured panel layout ~~of~~ for the as-built.

Attachments: 0

Signature/Date:

Lois J. Bixby 07-12-98
Report # 081

Morrison Knudsen Corporation
NSWC Crane
DO #4324-0009

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 13, 1998
REPORT #082

Activity:

- Drainage/anchor Trench - PSG prepared lay down areas and received 10 loads of RH 5, 1 1/2" maximum rounded gravel for use as drainage rock in the drainage/anchor trench. Excess may be used in the biotic layer.
- Site Prep Work - PSG performed general site clean-up, constructed lay down areas, and removed and consolidated excess soil from the drainage/anchor trench.
- Geotextile Cushion and GCL Installation - Using KemFast thread, EDCI sub to PSG, completed sewing panels of geotextile cushion together.

Inspection:

- EDCI - inspected the geotextile panels for irregularities, rips, holes, and unspent raw materials prior to seaming the remaining panels. GT-16, GT-17, GT-18 roll #4102105; GT-19, GT-20 roll #4102034; GT-21, GT-22, GT-23 roll #410203~~5~~3; GT-30, GT-31, GT-32 roll #4102007; GT-33, GT-34, GT-35 roll #4102143; GT-36, GT-37, GT-38 roll #4102131; GT-39, GT-40, GT-41 roll #4104687; GT-42, GT-43, GT-44 roll #4116898; GT-45, GT-46, GT-47 roll #4104674; GT-48, GT-49, GT-50, GT-54 roll #4102138; GT-51, GT-52, GT-53 roll #4104783.

- MK - visually inspected the following seams and panels by walking the entire length of the seam. Any defects were identified and EDCI repaired the area then checked by MK to confirm area had been repaired:

- Seams: GT-15, 16-17; GT-17, 18 & 19; GT - 18, 19, 20 - GT-20, 21; GT-20, 21 - 22; GT-22 - 23, 24; GT-23, 24 - 25; GT-25 - 26, 27; GT-26, 27 - 28; GT-28 - 29, 30; GT-29, 30 - 31; GT-31 - 32,33; GT-32, 33 - 34; GT-34 - 35, 36; GT-35,36 - 37; GT-37 - 38, 39; GT-38, 39 - 40; GT-40 - 41,42; GT-41, 42 - 43; GT-43 - 44; GT-44 - 45; GT-45 - 46; GT-46 - 47, 48; GT-47,48 - 49; GT-49 - 50; GT-50 - 51; GT-51 - 52; GT-52 - GT-53; GT-53 - 54.

- A hole at seams between panel GT-18 and GT-19 of geotextile cushion was inadequately patched using two 3" x 3" pieces to cover the hole. Deficiency identified as rework item DEF-DBG-002.
- Due to the angle of the panel layout in relation to the drainage/anchor trench, a corner of panel #49 of the geotextile cushion, does not extend the full two feet beyond the anchor trench. Identified as DEF-DBG-003 on rework list.
- MK - randomly spot checked drainage/anchor trench and found soil clods had fallen into the trench and would not permit proper drainage. This item is identified as DEF-DBG-004 on the rework list.
- MK - verified stone for drainage rock delivered today meets subcontract specification - 2" x 1/2" rounded stone.
- Short 8 hour day
- PSG - QC technician Scott Leftman on site.

Attachments: 0

Signature/Date:

Lois J. Bigley 07-13-98
Report #82

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 28, 1998
REPORT #097

Activity:

- Sand Drainage Layer - PSG completed placement, spreading, and grading of the six inch sand drainage layer.

  Using a JD 550 dozer, PSG tracked the entire length of the DBG cap to lightly compact the sand drainage layer once placement and grading were completed.

  An as-built survey of 25 foot center was conducted by MSE, a subcontractor for PSG. All areas out of tolerance were corrected by PSG. Average depth of sand ranged from 0.5 to 0.7 feet.

  After the MSE survey and random spot check cleared an area, PSG and EDCI began deployment, placement, and sewing of the non-woven geotextile over the sand layer. Starting at the NE end and working southwest, the panels were placed across the width of the cap per panel layout. EDCI is using TNS R70 six ounce non-woven geotextile and KemFast thread for the geotextile Type 1, filter fabric. Pursuant to the subcontractors request, heat bonding of the geotextile was approved for use however, EDCI elected to continue to sew the geotextile panels together.
- Biotic Layer - held preparatory meeting for the installation of the six inch biotic layer with geotextile cover over the -2 inch rounded gravel layer.

Inspection:

- MK - performed ten random spot checks on the sand drainage layer thickness:

	Approximate Location		Sand Thickness	Photographed
1	N 1311650	E 3049200	5.8	yes
2	N 1311600	E 3049250	6.0	yes
3	N 1311550	E 3049250	6.2	yes
4	N 1311550	E 3049150	8.0	
5	N 1311450	E 3049100	8.0	
6	N 1311450	E 3049150	6.2	
7	N 1311400	E 3049100	6.7	
8	N 1311450	E 3049050	6.2	
9	N 1311400	E 3049000	6.7	
10	N 1311350	E 3048900	6.0	yes

4 of 10 areas were photographed for documentation.

- MK - observed placement, spreading, grading, and light compaction by tracking using a JD 550 dozer.
- MSE - performed a cross section of the cap area on 25 foot centers for an as-built of the sand layer.
- MK - confirmed that TNS R-70 geotextile, the approved Type 1 geotextile has all required submittals and is being deployed over the sand for the sand drainage layer.
- MK - after the survey was performed, MK approved placement of preceding layer for the DBG cap construction.
- MK - observed deployment of the first panel, GT-01, of the geotextile over the sand drainage layer on the NE end of the cap and confirmed that the panel was reasonably straight and smooth.
- MK - visually inspected the following geotextile panels and seams for rips, tears, irregularities, and continuously interlocking stitching:

Morrison Knudsen Corporation
NSWC Crane
DO #4324-0009

PANEL #	ROLL #	STRIP STATION
GT-4	0992138	1
GT-5	0992165	1
GT-3	0992138	2
GT-2	0992124	2
GT-1	0992124	3
GT-6	0992165	4
GT-8	0992138	5
GT-7	0992165	5
GT-9	0991894	6
GT-11	0991844	7
GT-10	0991894	7
GT-12	0991894	8
GT-13	0991844	8
GT-14	0992118	9
GT-15	0991868	10
GT-16	0992118	10
GT-17	0991868	11

Attachments: 0

Lois J. Bigley 07/28/98
Signature/Date

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 29, 1998
REPORT #098

Activity:

- Sand Drainage Layer - EDCI and PSG continued deployment, placement, and sewing of Type 1 Geotextile panels over the sand of the sand drainage layer. Using TNS R70 6 ounce geotextile and KemFast thread, Type 1 geotextile is placed across the width of the cap working from NE to SW.
- Biotic Layer - After the underlying layer is approved, PSG began placement of the biotic material from the NE corner. PSG set up the 60' conveyor on the NE end to transport -2" round rock (RH5) onto the cap area. Using a JD 550 dozer, the biotic material was placed, spread, and graded.
- Site Preparatory Work - PSG continues general site clean-up.

Inspection:

- MK - visually inspected the following geotextile panels and seams for rips, tears, irregularities, and continuously interlocking stitching:

PANEL #	ROLL #	STRIP STATION
GT-18	0991973	11
GT-20	0991973	12
GT-19	0991973	12
GT-21	0992127	13
GT-23	0992171	14
GT-22	0992127	14
GT-24	0992171	15

PANEL #	ROLL #	STRIP STATION
GT-25	0991865	16
GT-26	0991865	17
GT-27	0991845	18
GT-28	0991865	19
GT-29	0991845	20
GT-30	0991845	21
GT-31	0993194	22
GT-32	0993194	23
GT-33	0992161	24
GT-34	0992161	25
GT-35	0991972	26
GT-36	0991972	27
GT-37	0992132	28
GT-38	0992132	29
GT-39	0992132	30
GT-40	0991856	30
GT-41	0991972	30

All defects are identified and repaired

- MK - observed deployment, placement, and sewing of filter fabric over sand of the sand drainage layer.
- PSG - spot checked thickness of biotic rounded gravel continually during placement and grading.
- MK - confirmed that the required submittal for biotic material has been reviewed and approved.
- MK - observed biotic material, RH5, placement and method to ensure underlying material was not displaced or damaged during placement.
- EDCI - measured and recorded panel layout for the as-built drawing.
- ROICC - performed an informal safety inspection; no major safety violations were noted, however, there were a number of minor safety findings identified.

Attachments: 0

Signature/Date:

Lois J. Bigley 07/29/98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 30, 1998
REPORT #099

Activity:

- Sand Drainage Layer - EDCI and PSG completed deployment, placement, and sewing of Type 1 Geotextile panels on the southwest end of the cap. Using TNS R70 6 ounce geotextile and KemFast thread, a geotextile cover is placed over the six inch sand layer completing the sand drainage layer.
- Biotic Layer - Using a JD 550 dozer and a 60' conveyor, -2" rounded gravel biotic material is placed on the DBG from approximately station 6+00 to 5+10 working southwest down the top slope by PSG. Spreading and grading of the rock is accomplished using the JD 550 dozer with hand laborer continuously checking the depth of the biotic material. Moved the conveyor and power plant from the center of the NE end to the east side slope to assist in transporting biotic material from the east side to the center and west end of the DBG cap. 792 top of -2" round gravel was placed over the Type 1 geotextile of he sand drainage layer for a total of 1,463 tons of biotic material.
- Run-on/Run-off Controls - PSG inspected, removed, repaired, and installed silt fence around the DBG site.

Inspection:

- EDCI - measured and recorded panel layouts for as-built drawing of the geotextile placement.
- MK - visually inspected the following geotextile panels and seams for rips, tears, irregularities, and continues interlocking stitches:

PANEL #	ROLL #	STRIP STATION
GT-42	0991856	31
GT-43	0991856	32
GT-44	0991856	33
GT-45	0992132	33
GT-46	0992246	34
GT-47	0992246	35
GT-49	0992246	36
GT-50	0992246	37
GT-48	0991835	38
GT-52	0991856	38
GT-51	0992246	38

- MK - observed deployment, placement, and sewing of filter fabric over sand of the sand drainage layer.
- PSG - spot checked thickness of biotic rounded gravel continually during placement and grading by probing down to the sand drainage layer geotextile.
- MK - observed placement, spreading, and grading of the -2" rounded gravel biotic layer using a JD 550 dozer. MK confirmed material being delivered is Rogers Group RH5 rock which is a rounded -2" sandstone gravel.
- PSG - inspected site for run on/run off control and repaired, replaced, or installed silt fence around the DBG site as needed.

Attachments: 0

Signature/Date:

Lois J. Bigley 07/30/98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

August 4, 1998
REPORT #103

Activity:

- Biotic Layer - PSG and EDCI began installation of Type 1, geotextile, TNS R70 six ounce non-woven geotextile over six inch biotic gravel layer in preparation of the 27 inch cover layer. Starting at the NE end working SW down the top slope.
- 27" Cover Layer - PSG preparing 161/822 borrow area for removal of soil to start placement of 27 inches cover material beginning 8/5/98. Morning rains created wet conditions which impacted this activity.

Inspection:

- EDCI - measured and documented geotextile panel layout for as-built drawings.
- MK - witnessed the installation of Type 1 geotextile fabric to ensure a three inch overlap and stitching per specifications.

The following panels and seams were inspected:

PANEL #	ROLL #	PANEL LENGTH	SECTION
P-6	0991833	45	1
P-5	0991833	45	1
P-4	0991833	31	2
P-3	0991874	130	2
P-2	0991874	178	3
P-1	0991833	184	4

PANEL #	ROLL #	PANEL LENGTH	SECTION
P-7	0991833	33	5
P-8	0991868	148	5
P-10	0991948	64	6
P-9	0991868	136	6
P-11	0991948	175	7
P-12	0992160	156	8
P-13	0991868	57	8
P-15	0991860	79	9
P-14	0992160	144	9
P-16	0991860	220	10
P-17	0991987	197	11
P-18(A)	0992130	110	12
P-18(B)	0991987	105	12
P-20	0992160	27	13
P-19	0992130	187	13
P-21	0991873	186	14
P-23	0992181	57	15
P-24	0992181	173	16
P-26	0991913	57	17
P-25	0992181	124	17
P-27	0991913	160	18
P-29	0991847	69	19
P-28	0991913	93	19
P-30	0991847	155	20
P-32	0991897	80	21
P-31	0991847	78	21
P-33	0991897	153	22
P-35	0991898	32	23
P-34	0991897	89	23
P-36	0991898	140	24
P-37	0991898	130	25

- Type 1 geotextile, TNS R70 six ounce non-woven fabric, 15 foot width; section number from NE to SW down the top slope. Panels placed across the width of the cap.
- MK inspection performed by D. Beall.

Lois J. Bigley 08/11/98

Attachments: 0 Signature/Date:

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

August 5, 1998
REPORT #104

Activity:

- Biotic Layer - PSG and EDCI completed installation of Type 1, geotextile, TNS R70 six ounce non-woven geotextile on top of the six inch biotic layer.

Inspection:

- MK - observed the installation of Type 1 geotextile fabric to ensure a three inch overlap and stitching comply with specifications.
- PSG/EDCI/MK - inspected as-built fabric panels.
- MK - verified fabric installation to boundary shown on drawings; 2 feet beyond the drainage/anchor trench.

The following panels and seams were inspected:

PANEL #	ROLL #	PANEL LENGTH	SECTION
P-38	0991900	136	26
P-39	0991900	133	27
P-40	0991900	40	28
P-41	0993498	100	28
P-42	0993498	130	29
P-44	0991911	50	30
P-43	0993498	130	29
P-44	0991911	50	30
P-43	0993498	72	30
P-45	0991911	130	31
P-46	0991911	86	32
P-47	0991911	40	33
P-48	0991944	63	33

PANEL #	ROLL #	PANEL LENGTH	SECTION
P-49	0991944	83	34
P-50	0991944	76	35
P-51	0991944	70	36
P-53	0992171	46	37
P-52	0991944	18	37
P-54	4109148A	44	38
P-55	4109148A	38	38
P-59	4109148A	4	39
P-56	4109148A	70	39
P-57	4109148A	70	40
P-58	4109148A	40	41

P-1 through P-52 TNS R70 six ounce non-woven fabric 15' width.
P-53 through P-58 SI 1201 non-woven fabric 1/2 roll 7.5 width.

- EPD - inspected seams over entire cap and identified five small <3 inch length, requiring repair due to inadequate salvage.

1	P-9/P-11
2	P-11/P-12
3	P-25 at well
4	P-27/P-28
5	P-48/P-47/P-49

- MK inspection performed by D. Beall.

Attachments: 0

Signature/Date: Lois J. Bigley 02/11/98

APPENDIX G

GEOSYNTHETIC CLAY LINER DATA

APPENDIX G
GEOSYNTHETIC CLAY LINER DATA

INDEX

G-1	Seam Inspection/Test Results
G-2	Panel Deployment Sheets
G-3	Conformance Test Results/Report
G-4	Manufacturer's QC Certificates
G-5	Installation Procedures

G-1

Seam Inspection/Test Results

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

CERTIFICATE OF ACCEPTANCE

PROJECT NAME: Dye Burial Ground DATE: 7-23-98

PROJECT LOCATION: Crane, IN

Details of Work Completed and Measured.....

Supplied, Installed, And Tested 84,772 Square Feet Of Type 2 (12oz) Geotextile, GCL, And 60 Mil Textured HDPE.

I, the undersigned, duly authorized representative of Phillips Services do hereby take over and accept the work described above from the date hereof, subject to the exceptions detailed below, and confirm that the work has been completed in accordance with the specifications and the terms and conditions of the contract. There is no apparent damage to the plastic lining, nor is there any interference within or without the surrounding works.

I have evaluated and measured the work together with the EDCI representative, and agree that the measurements shown above are true and correct, and that the installation has met our approval.

Exceptions.....

General Contractor/Owner	Environmental Design & Construction, Inc.
Russell Tomasko	Daniel R Davis
Signature	Signature
Russell Tomasko	Daniel R Davis
Printed Name	Printed Name
Date: 7/23/98	Date: 7-23-98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 14, 1998
REPORT #083

Activity:

- GCL Installation - Using Bentofix GCL, EDCI began installation of the GCL. Starting on the northeast (uphill) corner and working south. Seams overlapped to the manufacturer's match line vertically and a minimum 10 inch overlap on the horizontal seam.
- HDPE Installation - Using the Volvo L70 wheel loader with the lifting device/spreader bar and a Polaris six wheeler, the 60 mil double textured HDPE by Polyflex was deployed over the GCL.
- Drainage/anchor Trench - PSG removed soil clods from the drainage/anchor trench by hand. This corrected DEF-DBG-004.
- Geotextile Cushion Installation - The hole at seam #18-19 was patched by EDCI.

Inspection:

- EDCI - measured panel layouts for as-built drawings for both the GCL and the HDPE.
- MK - inspected each panel of the GCL deployed for irregularities, flaws, and proper overlap. Roll #051716; #051687; #051705; #051693; #051697; #051688; #051712.
- MK - verified that GCL material, Bentofix conforms to subcontract specification.
- EDCI - performed pre seam field tests on Rescission R-88 EDCI #313 and EDCI #315, double shoe fusion welder; two peels and a shear were taken for each test using a Nelson Tension meter. Both tests passed and archive samples were taken.
    - Field Test 1 on EDCI #313
    - Field Test 2 on EDCI #315

- MK - verified overlap of minimum to match line and 10 inch minimum horizontal. Bentonite granules were placed at a minimum rate of 1/4 pound per linear foot of overlap.
- MK/PSG - witnessed field test of pre-seam test.
- MK/PSG - Inspected deployed HDPE liner panels:
    - P2: Roll #0254
    - P1: Roll #0254
    - P3: Roll #0254
    - P4: Roll #0260
    - P5: Roll #0260
- MK/PSG - observed seaming of P2-P1; P1-P3 & P4; P3 & P4 - P5; P3-P4.
- MK - confirmed that HDPE liner material, Poly-flex, conforms to subcontract specifications.
- MK - verified that the first panel was deployed straight.
- EDCI - performed end of day field test on fusion seams using the Nelson Tension meter on EDCI #313 and #315 double shoe fusion welder.
- MK/PSG - confirmed field testing at end of day seam testing - two peel and one shear; both tests passed and confirmation sample taken.
    - Field Test 3 on EDCI #313
    - Field Test 4 on EDCI #315
- MK - verified all GCL deployed was covered by HDPE and open end secured with ballast.
- MK/PSG - identified location of irregularity in the surface of HDPE Roll #0260 for repair using an extrusion bead.
- PSG - inspected trench line by walking entire trench line; removing any obstructions and ensuring proper flow.

Attachments: 0

Signature/Date:

Lois J. Bigley 07-14-98
Report # 083

Morrison Knudsen Corporation
NSWC Crane
DO #4324-0009

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 15, 1998
REPORT #084

Activity: Due to intermediate rain showers, no GCL or HDPE liner was deployed. Air Testing was performed on the existing seams until 0900, the end of shift due to inclement weather. Crew returned to the motel.

Inspection:

- EDCI - performed air testing on the following panel seams:
  - 1-2 passed
  - 1-3 failed
  - 1-4 failed
  - 3-5 passed
  - 4-5 passed
  - 3-4 untested
- MK /PSG - observed and confirmed air testing of double shoe fusion welded seams by pressurizing the air channel between the weld to 30-35 psi and holding the pressure +/- 3 pounds for five minutes then slicing the opposite end of the channel to release the pressure.
- Bi-weekly QC meeting held.
- Preparatory Meeting on Sand Drainage Layer was conducted.

Attachments: 0

Signature/Date:
Lois J. Bigley 07-15-98

Morrison Knudsen Corporation
NSWC Crane
DO #4324-0009

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 16, 1998
REPORT #085

Activity:

- HDPE Installation - Due to the wet site conditions, GCL or HDPE liner was not deployed. EDCI completed air testing the remain double shoe fusion welds.
- Drainage/Anchor Trench - PSG dewatered the drainage/anchor trench covered by liner by removing sand bags, liner blocks, and graded outlet.
- Run off/Run on controls - Silt fence was installed down gradient from the northwest drainage/anchor trench by PSG.

Inspection:

- EDCI - performed air testing on the following double shoe fusion welds:
  - panel 1-3 passed
  - panel 1-4 passed (2 sections)
  - panel 3-4 passed
- MK /PSG - observed and confirmed air by EDCI.
- MK/EDCI/PSG - inspected the subgrade, it was determined the cap was too wet to proceed with GCL and HDPE liner placement.

Attachments: 0

Signature/Date:
Lois J. Bigley 07-16-98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 17, 1998
REPORT #086

Activity:

- GCL Installation - Deployment of GCL resumed today, working southwest down the cap area, panel layout across the width of the cap. EDCI and PSG deployed six widths of GCL across the cap, alternated with 3 widths of GCL followed by 2 widths of HDPE liner. Granular bentonite was applied at a minimum rate of 1/4 pound per linear foot to all overlaps of the GCL.
- HDPE Installation - Approximately 18,500 square feet of 60 mil Polyflex double textured HDPE liner was deployed by EDCI and PSG across the DBG cap area. HDPE liner panel was seamed together using a double shoe fusion welder. Panels P-6 through P-10 were placed today, equaling 4 widths.
- Drainage/Anchor Collection System - MSE, a sub to PSG, surveyed the drainage/anchor trench for confirmation of drainage and as-built drawing.

Inspection:

- MK - confirmed granular bentonite was applied to overlaps of GCL for panel from rolls #051701, 051689, 051707, 051708, 051696, 051720, and 051715.
- EDCI - performed six field tests consisting of a minimum of two peel and one shear each on two pre-seams, end of the day, and two midday. Problems in the morning pre-seam test was due to dirt and moisture in the seams. EDCI took extra precaution to ensure seams were clean and dry. A second pre-seam test passed before the double shoe fusion welder was used to seam panels of the liner

together. Mid and end of the day field tests passed. Passing results were recorded for all tests.

- MK/PSG - verified field test procedures and EDCI testing field test FT-5 through FT-10.
  - PT 5/6 Pre-seam test
  - PT 7/8 Midday seam test
  - PT 9/10 End of Day seam test

  3 samples were taken from each test panel: 1 PSG, 2 MK (1 MK archive/1 EPD archive)
- EDCI/PSG - Pulled two destructive tests from locations identified by MK. After passing field tests, one sample from each test was sent to an independent lab for testing, the remaining two samples for archiving by MK and EPD.
- MK - verified field test of destructive tests passed. Selected location of destructive tests.
  - Destructive Test #1: seam 1/3 Roll #0254 Machine #313
  - Destructive Test #2: seam 7/5 Roll #206/253 Machine #315
  - Confirmed sample was sent to the approved independent lab.
- MK - confirmed field test performed on a tensometer capable of a constant rate of 217 per minute. Nelson Machine and Welding Tensometer s/n 261 c.p. Jan 8, 1998.
- EDCI conducted an air test on seams 5-6 and 5-7, both seams passed.
- MK - observed air pressure tests of seams 5-6 and 5-7. Seams were pressurized to 30 psi. Pressure held for a minimum of five minutes with no loss in pressure (allow a variance of 3 psi in 5 minutes). The end opposite the gauge is cut and the pressure released.

Attachments: 0

Signature/Date:

Lois J. Bigley 07-17-98
Report # 086

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 18, 1998
REPORT #087

Activity:

- GCL Installation - EDCI and PSG continue placement of GCL over the cap area working down the slope with panel layout across the width of the cap and across the top slope running NW to SE. The following rolls of Bentofix were placed today from approximately 6+20 to 5+20: #051691, 051705, 051704, 051714, 051711, 051710, 051718, 051679, 051713, 051680, and a portion of roll #051681 then covered by Polyflex 60 mil HDPE.
- HDPE Installation - Approximately 21,000 square feet of 60 mil HDPE liner was deployed over the GCL liner placed today by EDCI and PSG. EDCI seamed the HDPE liner placed today using #313 and #315 Rescission R/88, double shoe fusion welder.

Inspection:

- MK - verified granular bentonite was placed at a minimum rate of 1/4 pound per linear foot to overlap Bentofix, GCL.
- MK - inspected panels of GCL for signs of hydration or damage and proper over lay. Placement of rolls # 051691, 051705, 051704, 051714, 051711, 051710, 051718, 051679, 051713, and 051680.
- EDCI - performed five field tests on fusion welds:
  - Field Test 11: Pre weld seam
    #315 700^0 at 25% Time 7:57 a.m. Passed
    Peel: 112/110, 112/110, 114/115 psi
    Shear: 140 psi
  - Field Test 12: Pre weld seam

#313 700^0 at 30% Time 9:30 a.m. Passed
Peel: 108/102, 110/100, 107/100 psi
Shear: 141 psi

- Field Test 13: Midday weld seam
  #315 700^0 at 30% Passed
- Field Test 14: End of Day weld seam
  #315 700^0 at 30% Time: 4:45 p.m. Passed
  Peel: 110/113, 113/110 psi
  Shear: 140 psi
- Field Test 15: End of Day weld seam
  Passed
  Peel: 120/125, 130/125 psi
  Shear: 132 psi

- EDCI - Air tested the following seams:

SEAM	START TIME	FINISH TIME	PSI @ START	PSI @ FINISH	STATUS
7-8	2:39 PM	2:44 PM	30	30	P
8-9	8:10 AM	8:15 AM	30	29	P
9-10	8:10 AM	8:15 AM	30	30	P
6-7	2:52 PM	2:57 PM	30	29	P
6-8	2:53 PM	2:58 PM	30	28	P
10-11	4:02 PM	4:07 PM	30	29	P
11-12	4:25 PM	4:30 PM	31	31	P
11-13	4:15 PM	4:20 PM	31	30	P
12-14	4:29 PM	4:34 PM	30	30	P
13-14	4:32 PM	4:37 PM	30	30	P
12-13	4:17 PM	4:22 PM	31	31	P
14-15	4:05 PM	4:10 PM	31	30	P

- MK - visually inspected panels of Polyflex HDPE for signs of damage, flaws, and unspent raw product. Unacceptable areas were marked for test and/or repair. The following panels were inspected:
  - P-11 Roll #0247
  - P-12 Roll #0247
  - P-13 Roll #0246
  - P-14 Roll #0246
  - P-15 Roll #0246
  - P-16 Roll #0304

 Report # 067

- P-17 Roll #0304

- MK - witnessed air and field test and collected samples from field seaming.
- MK - observed fusion welding of panels and confirmed that welder operator was checking that seams were clean and dry and there was a 6" - 4" overlap for welding. Double shoe fusion welder with continuous read out was used for all welding - EDCI #313 and #315.
- MK - observed deployment and placement of GCL and HDPE liner.

Attachments: 0

Signature/Date:

Lois J. Bigley 07-18-98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 19, 1998
REPORT #088

Activity:

- GCL Installation - EDCI and PSG continue deployment of Bentofix-GCL over the width of the cap. Granular bentonite is applied to all overlaps at a minimum rate of 1/4 pound per linear foot. From approximately 5+20 to 4+00 the following rolls were placed: #051699, 051719, 051686, 051695, 051703, 051685 and then covered by Polyflex 60 mil HDPE.
- HDPE Installation - The deployment, placement, and fusion welding of the double textured 60 mil HDPE liner continues. Approximately 13,500 square feet of Polyflex 60 mil HDPE liner was placed and welded using a double shoe fusion welder by EDCI, the liner installation subcontractor, and PSG. A spreader bar and two box rollers attached to a Volvo L70 wheel loader and a 6 x 6 ATV are used along with hand labor to deploy and place the liner.

Inspection:

- MK - verified granular bentonite was applied all GCL overlaps.
- MK - inspected panels of GCL for signs of hydration or damage and proper overlap. No signs of damage or hydration were noticed in the rolls of GCL placed today. Placement of rolls #051699, 051719, 051686, 051695, 051703, and 051685. Vertical overlaps were to the manufacturers match lines exceed 12" and horizontal overlaps were over 24". GCL panels extend 2' beyond the anchor trench.

- EDCI - performed four field tests on fusion welds of the 60 mil HDPE liner:
  - Field Test 16: Pre weld seam
    #315 700^0 at 23% Time 8:00 a.m. Passed
    Peel: 115/105, 107/98, 105/100 psi
    Shear: 142 psi
  - Field Test 17: Pre weld seam
    #313 700^0 at 30% Time 8:00 a.m. Passed
    Peel: 117/125, 118/120, 114/115 psi
    Shear: 138 psi
  - Field Test 18: End of Day weld seam
    #313 700^0 at 30% Time: 1:25 p.m. Passed
    Peel: 110/107, 110/116 psi
    Shear: 151 psi
  - Field Test 19: End of Day weld seam
    #315 700^0 at 23% Time: 1:45 p.m. Passed
    Peel: 119/107, 110/116 psi
    Shear: 160 psi
- MK - visually inspected panels of Polyflex HDPE for signs of damage, flaws, and unspent raw product. Unacceptable areas were marked for test and/or repair. The following panels were inspected:
  - P-18 Roll #0304
  - P-19 Roll #0305
  - P-20 Roll #0305
  - P-21 Roll #0305
  - P-22 Roll #0305
- MK - observed field testing for pre-seam and end of the day welds and collected samples from test seams. A Nelson Machine and Welding Tensometer s/n #261 capable of maintaining a constant rate of 2 inches per minute was used for all field testing.
- MK - witnessed fusion welding of panels and confirmed that welder operator was checking that seams were clean, dry, and proper overlap. Machine #315 chain's came undone during seaming P-18 and P-22 and was reattached. The east end of the seam where a burn out occurred will require a patch.

- MK - received results form HTS, an independent lab, that destructive samples 1 and 2 passed all peel and shear requirements.
  - DS - 1 Welded 7/14/98 at 5:12 p.m.
    RM. #313 700^0 at 35% on seam 1/3 roll #0254
  - DS-2 Welded 7/17/98 at 11:50 a.m.
    RM. #315 700^0 at 25% on seam 7/5 roll #0260/0253
- Due to temperature extremes, no liner or GCL was deployed after 10:00 a.m.

Attachments: 0

Signature/Date:

Lois J. Bigley 07-19-98
Report # 88

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 20, 1998
REPORT #089

Activity:

- GCL Installation - EDCI and PSG continue deployment of Bentofix-GCL over the width of the cap until 11:00 when adverse conditions halted production for the day. Granular bentonite was applied to all overlaps. GCL was placed from approximately station 4+00 to 3+00 using the following rolls: remainder #051681, 051684, 051683, and 051692 and a portion of roll #051694.
- HDPE Installation - PSG and EDCI continued placement SW down the slope covering the GCL. Approximately 10,000 square feet of Polyflex 60 mil HDPE liner was placed and seamed today using a double shoe fusion welder at a temperature of 700^0F with continuous temperature read out.

Inspection:

- MK - witnessed granular bentonite was applied all GCL overlaps.
- MK - inspected panels of GCL for signs of hydration or damage and proper overlap. No signs of damage or hydration were noticed in the rolls of GCL placed today. Verified by visual inspection that vertical overlaps were to the manufacturers match lines and horizontal overlaps were a minimum of 12".
- EDCI - performed four field tests on fusion welds of the 60 mil HDPE liner:
    - Field Test 20: Pre weld seam
      #315 700^0 at 25% Time 6:5 a.m.

Peel: 114/109, 106/120, 116/104 psi
Shear: 146 psi

- Field Test 21: Pre weld seam
  #313 700^0 at 30%
  Peel: 114/108, 107/93, 114/110 psi
  Shear: 140 psi
- Field Test 22: End of Day weld seam
  #313 700^0 at 30%
  Peel: 110/107, 110/116 psi
  Shear: 140 psi
- Field Test 19: End of Day weld seam
  #315 700^0 at 25%
  Peel: 100/110, 100/107 psi
  Shear: 135 psi

Rain showers at 11:00 halted production and prevented an End of the Day field test on the seams welded today until after the welding machine was turned off.

- MK - visually inspected panels of Polyflex HDPE for signs of damage, flaws, and unspent raw product. Unacceptable areas were marked for test and/or repair. The following panels were inspected:
  - P-23 Roll #0305
  - P-24 Roll #0205
  - P-25 Roll #0205
  - P-26 Roll #0205
- MK - witnessed seaming and field testing of pre-seam welds and collected samples.
- MK - observed fusion welding of panels and confirmed that the Master Seamer was present and that the welder operators were checking seams were clean, dry, and with proper overlap. Excess material cut from the top panel with a hook knife.
- MK - verified that GCL placed today was covered by HDPE liner and that the edge was covered by sand bags. Photographs were taken of the folding of the GCL under the HDPE liner.

Attachments: 0

Signature/Date:
Lois J. Bigley 07-20-98
Report # 089

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 21, 1998
REPORT #090

Activity:

- Sand Drainage Layer - PSG cleaned asphalt off the conveyor, in preparation for use in transporting sand to the cap for placement as the sand drainage layer. After bulk material was removed PSG power washed the conveyor.
- Drainage/Anchor Trench - Today PSG began installation of the drainage system after patching, detailing and testing of HDPE was completed in the trench area by lining the drainage/anchor trench with non-woven geotextile filter fabric; next placing four inch ADS perforated pipe in the bottom of the trench, covering and filling the trench with two inches minus one half inch plus rounded gravel to a minimum six inch thickness over the pipe and then folding the filter fabric over the rock, wrapping the drainage system in filter fabric.
- HDPE Installation - EDCI patched, detailed and tested the northern end of the in-place HDPE represented by the first two destructive tests P-1 through P-6 placed from approximate station 7+ 70 to 6+75. The remainder of in-place liner was patched using double textured Polyflex 60 mil HDPE liner and extrusion welding through panel P-26. All seams have been air tested and destructive samples two through eight cut, set to HTS for testing and patched.

Inspection:

- MK - confirmed ADS pipe and drainage rock meets the subcontract specification requirements.

- MK - verified PSG was using manufacturer approved couplers to join 20 foot sections of ADS pipe.
- EDCI - performed air testing on the following 15 double shoe fusion welded seams:

SEAM	START TIME	END TIME	START PSI	END PSI	STATUS
15-16	8:59	9:04	30	29	P
16-17	8:58	9:03	30	29	P
17-18	8:57	9:02	30	30	P
17-22	8:45	8:50	30	30	P
18-22	8:46	8:51	31	31	P
19-22	9:00	9:05	30	29	P
18-19	9:00	9:05	30	29	P
19-20	9:03	9:08	30	30	P
20-21	9:07	9:22	34	34	P
21-23	9:37	9:42	30	28	P
21-24	9:54	9:59	31	29	P
23-24	9:34	9:39	32	32	P
23-25	9:57	10:02	32	31	P
24-25	9:35	9:40	30	29	P
25-26	9:44	9:49	30	29	P

- MK - observed all air testing performed today. Double shoe fusion welds are air tested by sealing the ends of the fusion weld, inserting a needle into the air channel formed between the two fusion welds, pressurizing the channel with 30 to 35 psi of air. The test passes if the air pressure in the channel does not vary more than three pounds in five minutes and is released when the channel is cut at the fore end.
- EDCI - vacuum box tested all extrusion welds on patches, seams, and beads and all areas marked for testing and/or repair for HDPE panels P-1 through P-5. Vacuum box testing is performed by placing a vacuum box with a window over the area to be tested once the area has been prepared with soapy water and pulling a five psi vacuum. Tests passes if no bubble line is noticed in the test area. The vacuum is then released and the box moved. EDCI had difficulty creating a seal due partly due to the heat expansion.

- EDCI - pulled destructive test samples 3-8 from MK marked locations and PSG sent samples to HTS, Inc. of Houston, TX, and independent testing lab.

  Field Results on Destructive Test Samples:

  - Destructive Test Sample 3: Seam 8-9 welded 7/17/98
    #313 700^0 at 32% Time 4:45 p.m.
    Peel: 100/105, 100/103, 107/108 psi
    Shear: 140 psi
    Destructive Test Sample 4: Seam 10-11 welded 7/18/98
    #315 700^0 at 25% Time: 3:15 p.m.
    Peel: 98/90, 100/98, 98/95 psi
    Shear: 142 psi
  - Destructive Test Sample 5: Seam 15-16 welded 7/18/98
    #313 700^0 at 32% Time: 4:40 p.m.
    Peel: 111/105, 104/107 psi, 110/102 psi
    Shear: 146 psi
  - Destructive Test Sample 6: Seam 18-19 welded 7/19/98
    #315 700^0 at 25% Time: 11:50 a.m.
    Peel: 86/109, 100/124, 96/110 psi
    Shear: 146 psi
  - Destructive Test Sample 7: Seam 20-21 welded 7/19/98
    #313 700^0 at 30% Time: 12:55 p.m.
    Peel: 119/110, 105/118, 110/109 psi
    Shear: 150 psi
  - Destructive Test Sample 8: Seam 24-25 welded 7/20/98
    #315 700^0 at 25%
    Peel: 115/116, 107/100, 112/110 psi
    Shear: 130 psi
- MK - verified that field results for destructive test samples passed and collected samples for archiving.
- MK - verified that pre-seam and End of the Day welds for extrusion welds passed test requirements and collected samples.

Extrusion Weld Pre Seam and End of Day Results:

- Extrusion Weld 1: Pre-seam
  EDCI #316 at 550^0F
  Peel: 100, 94, 92 psi
  Shear: 139 psi
- Extrusion Weld 2: Pre-seam
  EDCI #286 at 510^0F
  Peel: 118, 110, 112 psi
  Shear: 122 psi
- Extrusion Weld 3: End of Day
  EDCI #316 at 550^0F
  Peel: 104, 112 psi
  Shear: 138 psi
- Extrusion Weld 4: End of Day
  EDCI #286 at 510^0F
  Peel: 123, 114 psi
  Shear: 150 psi

- A Nelson Machine and Welding Tensometer s/n 261, capable of maintaining a constant rate of two inches per minute was used for all field peel and shear testing. The tensometer was calibrated January 8, 1998.
- Rescission EDCI #316 and #286 extrusion gun and Polyflex extrusion rod were used for all extrusion welding.

Attachments: 0

Signature/Date:
Louis J. Bigley 07-21-98
Report # 090

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 22, 1998
REPORT #091

Activity:

- GCL Installation - One panel of GCL was placed across the width of the cap by PSG and EDCI at approximate station 3+00 to 2+80. Granular bentonite was applied to the overlap at an approximate rate of 1/4 pound per linear foot. GCL was placed to the manufacturer's match lines and inspected for signs of hydration and /or damage prior to being covered by HDPE liner. A portion of Bentofix roll #051694 was deployed.
- HDPE Installation - Panel P-27 of the 60 mil double textured HDPE liner was deployed over the GCL and welded to panel P-26 using a Rescission R/88 double shoe fusion welder. EDCI also field constructed three boots from the 60 mil liner material for around the well using an extrusion welder. Well was extended and boots were placed over each of the three wells and extrusion welded to the HDPE liner.
- Drainage/Anchor Trench - HDPE liner, GCL, and geotextile cushion materials were trimmed to approximately 24 inches beyond the outside edge of the drainage/anchor trench. Trench outlets are lined with HDPE liner, GCL, and geotextile cushion material to a point approximately 9' 9" from the toe of the cap with material extending 12 inches beyond the outlet trench on each side.

  PSG installed approximately 440 linear feet of ADS perforated pipe along the southeast side of the cap area. The drainage system was constructed by lining the trench with Type 1 non-woven geotextile, filter fabric, placing four inches of ADS perforated pipe in the bottom of the two foot wide trench, covered with a minimum of six inches of drainage rock less than 2 inches to more

than 1/2 inch rounded gravel, graded by hand and wrapped with the filter fabric per construction drawings.

- Sand Drainage Layer - PSG began spreading #23/24 sand in a minimum of six inch lifts starting at the NE corner and working both west and NW using a JD 550 dozer to push material. Sand is always pushed in front of the dozer to prevent tracks from coming in contact with the underlying geosynthetics. A laborer works with the dozer to check depth and prevent expansion wrinkles from being trapped.

Inspection:

- PSG - spot checked depth of the sand layer to ensure a minimum of six inches of #23/24 sand.
- MK - verified sand meets the subcontract specification requirements. All submittals on material have been received.
- MK - confirmed that previous layers of geosynthetic had been tested and met specifications prior to placement of the sand drainage layer.
- EDCI - completed vacuum box testing of all remaining extrusion welds and beads along with any questionable areas. From P-6 to P-26 of the HDPE liner.
- MK - verified vacuum box was within calibration. Last calibration was June 6, 1998.
- EDCI - air tested the seam between HDPE panel P-26 and P-27.
- MK - observed air testing and confirmed test was performed per subcontract specifications.

SEAM	START TIME	END TIME	START PSI	END PSI	STATUS
26-27	9:48	9:53	30	30	P

- MK - witnessed deployment and welding of HDPE P-27 roll #0250.
- EDCI - performed pre-seam and End of the Day field tests on both fusion and extrusion welds.

- Field Test 24: Pre-Seam Weld
  #313 700^0 at 28% Time 7:30 a.m.
  Peel: 114/107, 104/110, 105/111 psi
  Shear: 155 psi
- Field Test 25: End of Day Weld
  Peel: 105/105. 110/102 psi
  Shear: 138 psi
- Extrusion Pre-seam Test 5:
  #286 510^0 Time: 9:30 a.m.
  Peel: 87, 76, 130 psi
  Shear: 132 psi
- Extrusion End of Day Weld 6:
  #286 510^0
  Peel: 114, 107 psi
  Shear: 140 psi

- MK - witnessed field testing of fusion and extrusion welds using a field tensometer and collected samples from the five foot seams for archiving.
- MK - observed extension of well using PVC piping and riveted couplers; placement of field fabricated boots around welds.
- MK- verified the collections system including, ADS four inch perforated pipe placed per construction drawing.
- MK - received and reviewed destructive test results from HTS, Inc. #3 through #8. All tests exceeded peel and shear requirements for the HDPE liner welds.

Test Results:

	AVERAGE PEEL	AVERAGE SHEAR
DDS #3	115	156
DDS #4	110	162
DDS #5	123	168
DDS #6	130	170
DDS #7	127	172
DDS #8	117	156

HDPE liner has been cleared for placement of the sand drainage layer up to P-26 or station 3+00.

Attachments: 0

Signature/Date: Lois J. Bigley Report 91 07-22-98

DYE BURIAL GROUND
SWMU 02/11
INTERIM MEASURES CAP CONSTRUCTION
DAILY INSPECTION REPORT

JULY 23, 1998
REPORT #092

Activity:

- GCL Installation - PSG and EDCI completed deployment and placement of Bentofix, GCL across the very southwest end of the DBG cap area from approximately station 2+80 to 1+90. The remainder of Bentofix roll #051694, roll #051698, 051716, and a portion of roll #051717 were deployed across the width of the cap. All overlaps were sealed by applying granular bentonite to the seam. Prior to placement of GCL panels, the subgrade was inspected by EDCI and MK due to the light morning drizzle and rain showers overnight. Placement of the GCL did not occur until early afternoon when the final roll of HDPE was delivered.
- HDPE Installation - HDPE liner installation was completed by EDCI and PSG; once the final, ninth roll of Polyflex 60 mil double textured HDPE, roll #0266, was received and inspected. During unloading, the first three feet of the roll was damaged and discarded. The last three panels of HDPE, P-28 through P-30 from roll #0266 were deployed, placed, and welded across the SW end of the cap. Due to the layout of the cap, an end piece had to be welded to maintain the two feet extension beyond the drainage/anchor trench. After the seam was welded and air tested, a location for the destructive test was chosen and DDS #9 was cut, field tested, and the area patched and vacuum box tested. The DDS #9 sample was cut into three pieces, one being sent to an independent lab for testing and two pieces stored for archiving. HDPE liner installation was completed with the air testing of fusion seam welds, and vacuum box testing of the extrusion weld for the destructive test patch. An extension was added to one

panel to provide a full two foot overlap beyond the drainage/anchor trench.
Drainage/Anchor Trench - Using ADS four inch perforated pipe, PSG continued construction of the drainage collection system down to the south end of the cap. Split rolls of SI 1201 non-woven geotextile are used to wrap the drainage pipe, ADS four inch perforated pipe, and drainage rock (-2" + 1/2" rounded rocks), for construction of the drainage collection system including one outlet.

- Sand Drainage Layer - PSG continues pushing #23/24 sand covering the cap area using a JD 550 dozer on the 5% top slope, with the 3:1 side slopes being worked by hand. Sand has been placed on the north end from 7+60 to 5+60 across the top slope and along the SE side. Only a portion of the 3:1 slope along the NW, north leg, of the DBG cap remains. Approximately 800 ton of sand was delivered and placed today.

Inspection:

- EDCI - measures and records panel layout of GCL for as-built drawings.
- MK - visually inspected panels of GCL for damage and signs of hydration; one small area was noted and repaired by overlapping the area.
- MK - observed and confirmed that GCL panels were deployed and placed to the manufacturer's match lines and granular bentonite was applied to all overlaps.
- EDCI - performed peel and shear field tests using a tensometer, on pre and EOD fusion and extrusion welds and on DDS #9 destructive test.
- MK - verified vacuum box was within calibration. Last calibration was June 6, 1998.
- MK - verified that Polyflex 60 mil double textured HDPE liner roll #0266 received today has required QC certificates and meets subcontract specifications.
- MK - chose location of ninth destructive test, observed field peel and shear testing, collected archive samples, and ensure one sample was prepared for shipment to HTS, Inc. of Houston, TX,

the independent testing lab. Due to the hour sample will be shipped 7/24/98.

- MK - visually inspected the following HDPE liner panels for signs of damage and/or irregularities. None were noted:

P-28	83 feet	Roll #0266
P-29	68 feet	Roll #0266
P-30	68 feet	Roll #0266

- MK - observed air testing and field testing performed by EDCI:

Field Test Fusion Welding:

Pre-Seam Weld:
#313 700^0 at 25% Time: 2:30 p.m.
Peel: 119/114 110/105 115/109 psi
Shear: 135 psi

EOD Weld:
#313 700^0 at 25% Time: 4:00 p.m.
Peel: 119/115 117/115 psi
Shear: 145 psi

Field Test Extrusion Welding:

Pre-Seam Weld:
#286 510
Peel: 95 85 80 psi
Shear: 143 psi

EOD Weld:
#286 510
Peel: 107 111 psi
Shear: 120 psi

Air Testing Fusion Welds:

SEAM	START TIME	END TIME	START PSI	END PSI	STATUS
27-28	3:05	3:10	31	31	P
28-29	3:30	3:35	30	30	P
29-30	3:40	3:45	30	30	P
30-END	3:51	3:56	30	30	P

- MK - verified by visual inspection that the drainage/anchor trench collection system was installed per construction drawings.
- MK - observed placement of sand over the HDPE as a sand drainage layer.
- PSG - continually spot checks thickness of sand drainage layer and that placement is not damaging underlying material.
- PSG - inspected site run-on/run-off controls.

Lois J. Bigley 07/23/98

Attachments: 0

Signature/Date:

G-2

Panel Deployment Sheets

- DBG -
SWMU 02/11
SUBCONTRACT 4324/106
PHILIP SERVICE GROUP

GEOSYNTHIC CLAY LINER
BY BENTOFIX

ROLL #	DELIVERIED / STORED	DEPLOYED	REMARKS
51679	06-22-98	07-18-98	C-37,39
51680	06-22-98	07-18-98	C-41
51681	06-22-98	07-18-98	C-42,49
51683	06-22-98	07-20-98	C-52,53
51684	06-22-98	07-20-98	C-50,51
51685	06-22-98	07-19-98	C-48
51686	06-22-98	07-19-98	C-45
51687	06-22-98	07-14-98	C-2,3,6
51688	06-22-98	07-14-98	C-11,12,13
51689	06-22-98	07-17-98	C-15
51690	06-22-98	07-17-98	C-20,21
51691	06-22-98	07-18-98	C-27
51692	06-22-98	07-20-98	C-54,55
51693	06-22-98	07-14-98	C-8
51694	06-22-98	07-20-98	C-56,57,58
51695	06-22-98	07-19-98	C-46
51696	06-22-98	07-17-98	C-22
51697	06-23-98	07-14-98	C-9
51698	06-23-98	07-23-98	C-59,C-60
51699	06-23-98	07-19-98	C-43
51700	06-23-98	07-17-98	C-24,26
51701	06-23-98	07-17-98	C-14
51703	06-23-98	07-19-98	C-47
51704	06-23-98	07-18-98	C-29
51705	06-23-98	07-14-98	C-4,5,7
51706	06-23-98	07-14-98	C-1
51707	06-23-98	07-17-98	C-16
51708	06-23-98	07-17-98	C-17,18,19
51709	06-23-98	07-18-98	C-28
51710	06-23-98	07-18-98	C-34
51711	06-23-98	07-18-98	C-33
51712	06-23-98	07-14-98	C-10
51713	06-23-98	07-18-98	C-40
51714	06-23-98	07-18-98	C-30,31,32,36,38
51715	06-23-98	07-17-98	C-25
51716	06-23-98	07-23-98	C-61,62
51717	06-23-98	07-23-98	PARTICIAL
51718	06-23-98	07-18-98	C-35
51719	06-23-98	07-19-98	C-44
51720	06-23-98	07-17-98	C-23

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

GCL

PROJECT NAME: Dyo Burial Ground SHEET 1 OF 1

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-14-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-1	051760	GCL	133	14.5	1,929
C-2	1687	GCL	52	14.5	754
C-3	1687	GCL	86	14.5	1,247
C-4	1705	GCL	102	14.5	1,479
C-5	1705	GCL	48	14.5	696
C-6	1687	GCL	Δ 20	14.5	145
C-7	1705	GCL	Δ 11	14.5	80
C-8	1693	GCL	150	14.5	2,175
C-9	1697	GCL	150	14.5	2,175
C-10	1712	GCL	150	14.5	2,175
C-11	1688	GCL	47	14.5	682
C-12	1688	GCL	47	14.5	682
C-13	1688	GCL	47	14.5	682
	TOTAL INSTALLED THIS PAGE				14,901
	TOTAL INSTALLED PREV. PAGE				∅
	TOTAL INSTALLED TO DATE				14,901

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
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GCL

PROJECT NAME: Dye Burial Ground SHEET 1 OF

PROJECT #: 97006 IN

PROJECT LOCATION: Crown, IN DATE: 7-17-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-14	051701	GCL	150	14.5	2,175
C-15	051689	GCL	150	14.5	2,175
C-16	051707	GCL	150	14.5	2,175
C-17	051708	GCL	50	14.5	725
C-18	051708	GCL	57	14.5	1,283
C-19	051708	GCL	18	14.5	261
C-20	051690	GCL	53	14.5	769
C-21	051690	GCL	97	14.5	1,407
C-22	051696	GCL	121	14.5	1,755
C-23	051720	GCL	148	14.5	2,146
C-24	061202	GCL	60	14.5	870
C-25	051715	GCL	150	14.5	2,175
C-26	061202	GCL	71	14.5	1,030
C-27					
	TOTAL INSTALLED THIS PAGE				18,946
	TOTAL INSTALLED PREV. PAGE				14,901
	TOTAL INSTALLED TO DATE				33,847

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

GCL

PROJECT NAME: Dye Burial Ground SHEET OF

PROJECT #: 27006LN

PROJECT LOCATION: Crane In DATE: 7-18-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-27	051691	GCL	150	14.5	2,175
C-28	051709	GCL	150	14.5	2,175
C-29	051704	GCL	150	14.5	2,175
C-30	051714	GCL	50	14.5	725
C-31	051714	GCL	36	14.5	522
C-32	051714	GCL	21	14.5	305
C-33	051711	GCL	132	14.5	1,914
C-34	051710	GCL	134	14.5	1,943
C-35	051718	GCL	136	14.5	1,972
C-36	051714	GCL	20	14.5	290
C-37	051679	GCL	22	14.5	319
C-38	051714	GCL	18	14.5	261
C-39	051679	GCL	128	14.5	1,856
C-40	051713	GCL	150	14.5	2,175
C-41	051680	GCL	150	14.5	2,175
C-42	051681	GCL	27	14.5	392
	TOTAL INSTALLED THIS PAGE				21,374
	TOTAL INSTALLED PREV. PAGE				33,847
	TOTAL INSTALLED TO DATE				55,221

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

GCL

PROJECT NAME: Dye Burial Ground SHEET ____ OF ____

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-19-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-43	051699	GCL	150	14.5	2,175
C-44	051819	GCL	150	14.5	2,175
C-45	051686	GCL	150	14.5	2,175
C-46	051695	GCL	150	14.5	2,175
C-47	051703	GCL	150	14.5	2,175
C-48	051685	GCL	150	14.5	2,175
	TOTAL INSTALLED THIS PAGE				13,050
	TOTAL INSTALLED PREV. PAGE				55,221
	TOTAL INSTALLED TO DATE				68,271

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
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GCL

PROJECT NAME: Dye Burial Ground SHEET ____ OF ____

PROJECT #: 97006 (a)

PROJECT LOCATION: Crano, (a) DATE: 7-20-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-49	051681	GCL	100	14.5	1,450
C-50	051684	GCL	126	14.5	1,827
C-51	051684	GCL	24	14.5	348
C-52	051683	GCL	117	14.5	1,697
C-53	051683	GCL	33	14.5	479
C-54	051692	GCL	83	14.5	1,204
C-55	051692	GCL	87	14.5	1,262
C-56	051694	GCL	35	14.5	508
	TOTAL INSTALLED THIS PAGE				8,775
	TOTAL INSTALLED PREV. PAGE				68,271
	TOTAL INSTALLED TO DATE				77,046

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

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GCL

PROJECT NAME: Dye Burial Ground SHEET 1 OF ____

PROJECT #: 95006 IN

PROJECT LOCATION: Crane, IN DATE: 7-22-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-57	051694	GCL	82	14.5	1,189
	TOTAL INSTALLED THIS PAGE				1,189
	TOTAL INSTALLED PREV. PAGE				77,046
	TOTAL INSTALLED TO DATE				78,235

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

GCL

PROJECT NAME: Dyes Burial Ground SHEET ____ OF ____

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-23-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
C-58	051694	GCL	18	14.5	261
C-59	051698	GCL	67	14.5	972
C-60	051698	GCL	77	14.5	1,117
C-61	051716	GCL	75	14.5	1,088
C-62	051716	GCL	75	14.5	1,088
C-63	051717	GCL	75	14.5	1,088
	TOTAL INSTALLED THIS PAGE				5,614
	TOTAL INSTALLED PREV. PAGE				78,235
	TOTAL INSTALLED TO DATE				83,849

G-3

Conformance Test Results/Report

GCL

PHILIP ENVIRONMENTAL

Industrial Services Group
Midwest Region

July 10, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Lois J. Bigley 07/10/98
Lois J. Bigley 07/10/98

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Submittal No. 063

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-~~120~~ 121	Test Lab Certificates - GCL conformation	02253

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

cc: D. Beall

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

HTS, INC. Consultants

416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 10, 1998

HTS Report #:	pen1254.003.doc

Mr. Don Flowerd	Customer Project Name:	NSWC Crane
Philip Environmental	Customer Project #:	18328
510 DD Road	Lab Temperature:	73 degrees F.
Columbia, IL 62236	Lab Humidity:	50%

The following 1 sample was delivered to our laboratory on 6/24/98.

SAMPLES RECEIVED								
	Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type
1	Roll#051700, Lot#8061202	GCL	6			11		
2			7			12		
3			8			13		
4			9			14		
5			10			15		

Conformance testing was performed in accordance with the following test methods. The test results are summarized on the subsequent pages. It should be noted that the test specimens and test sample used for this work were believed to be representative of the material produced under this designation. However, these results are indicative only of the specimens that were actually tested. HTS, Inc. neither accepts responsibility for nor makes claims to the final use and purpose of the material.

TESTING PERFORMED	TESTING PERFORMED
ASTM D 4632 – Grab Tensile Properties ASTM D 5084 – Permeability	

Very truly yours,

Larry L. McMichael
Vice President

ENVIRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

GRAB TENSILE PROPERTIES – ASTM D 4632

Instron Series IX Automated Materials Testing System

Sample Type: ASTM — Cross Head Speed (in/min): 12.0000
Width (in): 4.0" — Spec. Gauge Length (in): 3.000
Thickness (in): 0.23" — Grip Distance (in): 3.000

		Maximum Load (lbs/in)		Elongation (%)	
Sample	Spec. #	MD	XD	MD	XD
Roll# 051700	1	124.0	129.4	141.2	136.8
Lot# 8061202	2	103.4	98.6	136.7	117.6
	3	115.6	205.5	125.0	67.2
	4	130.1	253.6	142.6	69.9
	5	128.0	224.2	148.8	72.9
	6	105.3	255.2	80.1	66.3
	7	112.8	242.0	134.7	74.0
	8	109.5	251.3	116.1	66.2
	9	120.2	303.5	139.7	81.4
	10	282.5	287.0	81.5	75.8
	Avg.	133.1	225.0	124.6	82.8
	S.D.	53.3	65.2	24.9	24.3

INDEX FLUX – ASTM D 5084

Sample Type: ASTM

Roll #051700 Lot #8061202

Initial Sample Diameter:	4"	Initial Sample Area (in^2):	12.56
Initial Sample Height:	.230"	Type of Permeant Used:	Tap Water
Cell Pressure (psi):	50	Final Sample Height:	.230"
Range of Hydraulic Gradient:	28.55-31.57	Final Sample Area (in^2):	12.56
Final Sample Diameter:	4"		
Permeability:			3.7×10^{-9} cm/s

No.	Date	Time In Hr:Mn:Sc	Elapsed Time In Hr:Mn:Sc	Pressure @ Sample Top (psi)	Pressure @ Sample Bottom (psi)	Pore Pressure Transducer Reading (1) (psi)	Pipet/ Accum. Reading In (cm)	δHin (cm)	Pipet/ Accum. Reading Out (cm)	δHout (cm)
1	7/10/98	7:00:00	00:00:00	45	45.26	—	3.15	0.00	1.79	0.00
	7/10/98	7:06:05	00:06:05	45	45.02	—	3.05	0.10	1.82	0.03
2	7/10/98	11:00:00	00:00:00	45	45.26	—	3.15	0.00	1.79	0.00
	7/10/98	11:06:10	00:06:10	45	45.02	—	3.05	0.10	1.82	0.03
3	7/10/98	3:00:00	00:00:00	45	45.26	—	3.15	0.00	1.79	0.00
	7/10/98	3:06:10	00:06:10	45	45.02	—	3.05	0.10	1.82	0.03

G-4

Manufacturer's QC Certificates

PHILIP ENVIRONMENTAL

Industrial Services Group
Midwest Region

June 16, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Lois J. Bigly 06/17/
Lois J. Bigly 06/17/
* Approved as noted below

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Re-Submittal No. 0251

The following submittal is being presented in accordance with the Bid Documents, dated, July 3, 1997, Section 01300 - Submittals.

Item No.	Description	Section No.	
1-96	Manufacturer Test Results-Ben	02253	- Approved
1-97	Manufacturer Test Results- ~~GCL~~ non-woven & woven Geotextile	02253	- Revise & Resubmit
~~1-98~~	~~Manufactures Specification - GCL~~	~~02253~~	- N/A
~~1-99~~	~~Average Roll Value - GCL~~	~~02253~~	- N/A
1-100	Needle Certification – GCL	02253	- Approved
1-101	Manufactures QC Tests- GCL	02253	- Revise & Resubmit ~~N/A~~
1-102	Certificate of Compliance – GCL	02253	- Approved
1-103	Cert. % Montmoullonite content	02253	- Revise & Resubmit

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald L. Flowers,
Project Manager

cc: D. Beall

PHILIP ENVIRONMENTAL

Industrial Services Group
Midwest Region

June 19, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Lois J Bigley 06-19-98
Lois J Bigley 06-19-98

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

* Approved as noted below

Re-Submittal No. 025J

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.	
1-97	Manufacturer Test Results- GCL	02253	* Approved
1-101	Manufactures QC Tests- GCL	02253	* Approved
1-103	Certificate of Montmoullonite Content	02253	* Approved as noted - EPA Tech. Guidance Doc. EPA/600/R-93/182 list Methylene Blue Capacity Method as an acceptable method of determining the percent sodium montmorillonite clay in the GCL, certifying engineer concured.

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald Flowers

Donald L. Flowers,
Project Manager

cc: D. Beall

1-102

1-100

BENTOFIX TECHNOLOGIES, INC.

BENTOFIX MANUFACTURING CERTIFICATION

CUSTOMER: FLUID SYSTEMS INC.

DATE: 06-12-1998

PROJECT: PHILLIP ENVIRONMENAL SERVICES
NCWC CRANE - DYE BURIAL CAP

NO.ROLLS: 40 ROLLS

ORDER NUMBER: BT31110

PRODUCT TYPE: BENTOFIX NS

Bentofix Technologies, Inc. hereby certifies that the Bentofix Geosynthetic Clay Liner purchased and shipped for the above referenced project meets or exceeds Bentofix Technologies, Inc.'s specifications for Bentofix.

The Bentofix product has been continuously inspected for the presence of needles and is certified to be needle free.

The tests listed for the bentonite component have been performed on each batch of bentonite. The tests listed for the finished geocomposite product have been performed on at least every 3,716 sq. mt. (40,000 sq. ft.) for the Mass Per Unit Area according to method ASTM D5261 and for the Grab Tensile according to method ASTM D4632. The tests listed for the finished geocomposite product have been performed on at least every 9,290 sq. mt. (100,000 sq. ft.) for the geotextile component and the finished geocomposite water permeability according to method GRI GCL-2.

The lot and roll numbers for this project are as follows:

LOT# B8061202

ROLL# 51679,51680,51681,51683,51684,51685,51686,51687,51688,51689,51690

51691,51692,51693,51694,51695,51696,51697,51698,51699,51700,51701

51703,51704,51705,51706,51707,51708,51709,51710,51711,51712,51713

51714,51715,51716,51717,51718,51719,51720

KEVIN NEWMAN
Quality Control Manager

06/12/1998
DATE

1-101

BENTOFIX TECHNOLOGIES, INC.

QUALITY CONTROL CERTIFICATE

LOT#	ROLL #	DATE
88061202	51679	06/12/98

PRODUCT: BENTOFIX NS

DIMENSIONS: 150.00 ft x 15.5 ft
45.7 m x 4.72 m

1. FINISHED PRODUCT TYPE : BENTOFIX NS

MASS(lb/ft2)	TENSILE (lb) LENGTH	TENSILE (lb) CROSS	ELONGATION (%) LENGTH	ELONGATION (%) CROSS	PERMEABILITY, K (cm/s)	MOISTURE CONTENT (%)
1.106	112	212	113	72	<5E-9	8.2

2. TOP LAYER TYPE : NON-WOVEN

LAYER #	MASS(lb/ft2)
9806112058	0.054

3. BOTTOM LAYER TYPE : WOVEN

LAYER #	MASS(lb/ft2)
1300	0.023

4. BENTONITE TYPE : 30 MESH

SHIPMENT #	% MONTMORILLONITE	SWELL INDEX (ml)	MOISTURE CONTENT (%)	MOISTURE ABSORPTION (%)	MASS OF BENTONITE(lb/ft2)
453808	90	25	8.2	636	1.030

THIS IS A GRAB SAMPLE FROM THE ROLLS SUPPLIED BY BENTOFIX TECHNOLOGIES. ALL ROLLS SUPPLIED ARE FROM THE SAME LOT NUMBER.

D.A.

1-97

ALBARRIE CANADA LIMITED
85 Morrow Road
Barrie, Ontario
L4N 3V7

Tel: 705-737-0551
Fax: 705-737-4044

Date: 06/11/98

CERTIFICATE OF CONFORMANCE

This is to certify that Style 205B, non-woven polypropylene fabric, produced by Albarrie Canada Ltd., will meet the following certifiable minimum average value when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 95 percent confidence level.

Physical Property	Test Method	U.S. Units	S.I. Units
Mass per Unit Area	ASTM D-5261	6.6 oz/yd^2	225 gsm
Tensile Strength	ASTM D-4632	22 lbs	10 kg
Elongation	ASTM D-4632	100 %	100 %

Actual Test Results

Lot #: 9806112058

Roll #: 072396

	U.S. Units	S.I. Units
Mass per Unit Area	7.8 oz/yd^2	264 gsm
Tensile Strength	70 lbs	32 kg
Elongation	183 %	183 %

L. Kubbower
QUALITY CONTROL

THIS IS A GRAB SAMPLE WHICH REPRESENTS ALL ROLLS FURNISHED BY BONTOFIX TECHNOLOGIES. IN ADDITION, REPRESENTS LOT # 9806112058. ALL ROLLS BY BONTOFIX ARE OF THE SAME LOT.

D.S.

1-97

Bentofix

Number	Ticket Number	Warp Tensile (Lbs)	Weft Tensile(Lbs)	Mullen Burst((PSI)	ASTM D 5261 Weight (G/M2)	Elongation (%)	Date Shipped
1	608140	150.6	127	0	112.5	39 X 26	6/10/98
2	608960	148.4	108	0	115.5	34 x 30	6/10/98
3	609520	146.9	134.9	0	134.2	36 x 30	6/10/98
4	619250	157	119.4	0	112.5	38 x 30	6/10/98
5	619100	171.1	126.6	0	122.7	40 x 27	6/10/98
6	619050	145.7	136.4	0	129.7	40 x 30	6/10/98
7	619090	160	146.9	0	123.8	41 x 30	6/10/98
8	620050	160.5	125.2	0	110	35 x 28	6/10/98
9	619920	160.8	145	0	119.3	37 x 34	6/10/98
10	619940	147	133	0	122.8	40 x 26	6/10/98
11	619930	159.3	133.2	0	106.3	36 x 24	6/10/98
12	619740	152.3	108	0	104.4	34 x 25	6/10/98
13	619420	140	115	0	107.2	35 x 24	6/10/98
14	619320	157.4	137.7	0	114.9	34 x 29	6/10/98
15	620320	146.2	135.5	0	122.5	36 x 29	6/10/98
16	620310	163.8	143.1	0	119.9	38 x 31	6/10/98
17	620260	148.9	141.2	0	119.3	39 x 30	6/10/98
18	621340	154.9	120.8	0	116.2	34 x 28	6/10/98
19	621330	151.8	129	0	114.3	39 x 30	6/10/98
20	621240	139.9	122	0	114.7	40 x 32	6/10/98
21	623060	157.5	136.6	0	114.1	49 x 33	6/10/98
22	623480	[illegible]	[illegible]	0	119.3	38 x 28	6/10/98
23	623300	167.5	128	0	113.1	38 x 31	6/10/98
24	622410	147.6	140.5	0	121.1	36 x 30	6/10/98
25	622360	157.3	130.1	0	117.1	39 x 32	6/10/98
26	621840	160.3	139.9	0	125.9	36 x 33	6/10/98
27	621550	147.7	123.7	0	120.3	36 x 32	6/10/98
28	623570	151.3	139	0	119.6	33 x 32	6/10/98
29	623560	138.3	122.5	0	117.2	36 x 30	6/10/98
30	618840	160.2	138.3	0	116.1	37 x 32	6/10/98

THIS IS A GRAB SAMPLE OF NUMBER 23 WHICH REPRESENTS ALL ROLLS FURNISHED BY BENTOFIX TECHNOLOGIES WHICH ARE OF ALL THE SAME LOT.

1-96
~~1-101~~ approved as noted
included mans

FROM: MI DRILLING FLUIDS FAX NO.: 3877659587 05-21-98 02:24P P.05

MI DRILLING FLUIDS
P.O. Box 032 Greybull, Wyoming 82426
1-307-765-4496

LABORATORY ANALYSIS

Date Tested 5/20/98

SOLD TO:	SHIP TO:
BENTOFIX TECHNOLOGIES (BT1) 85 MORROW ROAD BARRIE, ONTARIO, CANADA L4N3V7	BENTOFIX TECHNOLOGI... (BT1) 23 TRUMAN ROAD BARRIE, ONTARIO, CAN...DA L4M6E7

SHIP DATE	RAILCAR OR TRUCK NUMBER	PLANT OF ORIGIN	TYPE OF MATERIAL
5/20/98	BN 453808	GREYBULL, WY	FEDERAL SEAL GRANULAR

NOTE: Our data for the above shipment shows the following test results:

	LABORATORY TEST RESULTS		LABORATORY TEST RESULTS
1	MOISTURE: 8.6 %	7	spec 12% max pass
2	SWELL: 26 ml	8	24 ml kg min pass
3	WPA: 779	9	-
4	Fluid Loss: 11.8 ml	10	18 ml max pass
5		11	
6		12	

Should you have any questions or require additional information please let us know (1-307-765-4496)

Chris Sorrel 5/21/98
SIGNED DATE

Approved By: B.B.

1-96
~~1-101~~

BENTOFIX TECHNOLOGIES, INC.
BENTONITE TEST DATA

DATE: JUNE 8, 1998 **SHIPMENT NO.:** BN 453808

SUPPLIER: MI DRILLING FLUIDS INC. **BENTONITE TYPE:** FEDERAL SEAL GRAN.

SAMPLE #: 2

1. MOISTURE CONTENT ACCORDING TO ASTM D4643-87:

WEIGHT "WET"	=	100.00	g
WEIGHT "DRY"	=	92.85	g
MOISTURE CONTENT	=	7.2 %	

2. PLATE WATER ABSORPTION ACCORDING TO ASTM E 946-92:

START TIME: 2:45 P.M FINISH TIME: 8:45 A.M

INITIAL TEMP.:	26.0	DEGREES C	INITIAL WT. "DRY":	2.00 g
FINAL TEMP.:	24.0	DEGREES C	FINAL WT. "WET":	15.01 g
AVERAGE TEMP.:	25.0	DEGREES C	TEMP. COEFFICIENT:	3.30

$$\text{ABSORPTION} = \frac{(Ww-Wd)}{Wd} \times 100 - [\,K(Ta - Tr)\,]$$

$$= 634\ \%$$

3. SWELL INDEX ACCORDING TO ASTM D5890:

START TIME: 9:00 AM FINISH TIME: 9:00 AM

SWELL INDEX = 25 ml

4. METHYLENE BLUE CAPACITY ACCORDING TO API - 13B:

$$\frac{\text{METHYLENE BLUE, (cm3)}}{\text{BENTONITE, (cm3)}} = 64\ \text{meq/100 g}$$

5. FLUID LOSS ACCORDING TO ASTM D5891:

FLUID LOSS = 12.8 ml

1-96
~~1-101~~

BENTOFIX TECHNOLOGIES, INC.
BENTONITE TEST DATA

DATE: JUNE 9, 1998 SHIPMENT NO.: BN 453808

SUPPLIER: MI DRILLING FLUIDS INC. BENTONITE TYPE: FEDERAL SEAL GRAN.

SAMPLE #: 1

1. MOISTURE CONTENT ACCORDING TO ASTM D4643-87:

WEIGHT "WET"	=	100.00	g
WEIGHT "DRY"	=	91.83	g

MOISTURE CONTENT = 8.2 %

2. PLATE WATER ABSORPTION ACCORDING TO ASTM E 946-92:

START TIME: 2:30 P.M FINISH TIME: 8:30 A.M

INITIAL TEMP.:	26.0	DEGREES C	INITIAL WT. "DRY":	2.00 g
FINAL TEMP.:	24.0	DEGREES C	FINAL WT. "WET":	15.59 g
AVERAGE TEMP.:	25.0	DEGREES C	TEMP. COEFFICIENT:	3.30

$$\text{ABSORPTION} = \frac{(Ww-Wd)}{Wd} \times 100 - [K(Ta-Tr)]$$

$$= 663\ \%$$

3. SWELL INDEX ACCORDING TO ASTM D5890:

START TIME: 8:45 AM FINISH TIME: 8:45 AM

SWELL INDEX = 26 ml

4. METHYLENE BLUE CAPACITY ACCORDING TO API - 13B:

$$\frac{\text{METHYLENE BLUE, (cm3)}}{\text{BENTONITE, (cm3)}} = 57\ \text{meq/100 g}$$

5. FLUID LOSS ACCORDING TO ASTM D5891:

FLUID LOSS = 12.0 ml

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL/GOVERNMENT GROUP

INTER-OFFICE CORRESPONDENCE

DATE: June 19, 1998

TO: Lois Bigley

FROM: Clair Waite CAW

LOCATION: NSWC Crane

LOCATION: Boise

SUBJECT: **SOUTHDIV - NSWC CRANE W.O. 4324-0009**
DYE BURIAL GROUND INTERIM MEASURES CAP
TEST METHOD APPROVAL FOR GEOSYNTHETIC CLAY LINER

In response to your inquiry, the "methylene-blue absorption" method of determining the percent sodium montmorillonite clay in the geosynthetic clay liner is approved as an acceptable alternate to the X-ray diffraction method called for in the Technical Specifications. Section 4.2.1 of U.S. EPA Technical Guidance Document EPA/600/R-93/182, "Quality Assurance and Quality Control for Waste Containment Facilities," lists both methods as acceptable.

Please let me know if you should have any questions.

cc: D. Beall
K. Ohsiek
File

1-102
1-100

BENTOFIX TECHNOLOGIES, INC.

BENTOFIX MANUFACTURING CERTIFICATION

CUSTOMER: FLUID SYSTEMS INC. **DATE:** 06-12-1998

PROJECT: PHILLIP ENVIRONMENAL SERVICES NCWC CRANE - DYE BURIAL CAP **NO.ROLLS:** 40 ROLLS

ORDER NUMBER: BT31110 **PRODUCT TYPE:** BENTOFIX NS

Bentofix Technologies, Inc. hereby certifies that the Bentofix Geosynthetic Clay Liner purchased and shipped for the above referenced project meets or exceeds Bentofix Technologies, Inc.'s specifications for Bentofix.

The Bentofix product has been continuously inspected for the presence of needles and is certified to be needle free.

The tests listed for the bentonite component have been performed on each batch of bentonite. The tests listed for the finished geocomposite product have been performed on at least every 3,716 sq. mt. (40,000 sq. ft.) for the Mass Per Unit Area according to method ASTM D5261 and for the Grab Tensile according to method ASTM D4632. The tests listed for the finished geocomposite product have been performed on at least every 9,290 sq. mt. (100,000 sq. ft.) for the geotextile component and the finished geocomposite water permeability according to method GRI GCL-2.

The lot and roll numbers for this project are as follows:

LOT# B8061202

ROLL# 51679,51680,51681,51683,51684,51685,51686,51687,51688,51689,51690

51691,51692,51693,51694,51695,51696,51697,51698,51699,51700,51701

51703,51704,51705,51706,51707,51708,51709,51710,51711,51712,51713

51714,51715,51716,51717,51718,51719,51720

KEVIN NEWMAN
Quality Control Manager

06/12/1998
DATE

BENTOFIX TECHNOLOGIES, INC.

QUALITY CONTROL CERTIFICATE

~~1-101~~
1-103

LOT#	ROLL #	DATE
88061202	51679	06/12/98

PRODUCT: BENTOFIX NS

DIMENSIONS: 150.00 ft x 15.5 ft
45.7 m x 4.72 m

1. FINISHED PRODUCT TYPE : BENTOFIX NS

MASS(lb/ft2)	TENSILE (lb) LENGTH	TENSILE (lb) CROSS	ELONGATION (%) LENGTH	ELONGATION (%) CROSS	PERMEABILITY, K (cm/s)	MOISTURE CONTENT (%)
1.106	112	212	113	72	<5E-9	8.2

2. TOP LAYER TYPE : NON-WOVEN

LAYER #	MASS(lb/ft2)
9806712058	0.054

3. BOTTOM LAYER TYPE : WOVEN

LAYER #	MASS(lb/ft2)
623300	0.023

4. BENTONITE TYPE : 30 MESH

SHIPMENT #	% MONTMORILLONITE	SWELL INDEX (ml)	MOISTURE CONTENT (%)	MOISTURE ABSORPTION (%)	MASS OF BENTONITE(lb/ft2)
453808	90	25	8.2	634	1.030

WHAT TEST METHOD
if you are going to
~~to~~ use this formate you will
need one cert. for each
roll.

1-103

BENTOFIX TECHNOLOGIES, INC.

QUALITY CONTROL CERTIFICATE

LOT#	ROLL #	DATE
88061202	51679	06/12/98

PRODUCT: BENTOFIX NS

DIMENSIONS: 150.00 ft x 15.5 ft
45.7 m x 4.72 m

1. FINISHED PRODUCT TYPE : BENTOFIX NS

MASS(lb/ft2)	TENSILE (lb) LENGTH	TENSILE (lb) CROSS	ELONGATION (%) LENGTH	ELONGATION (%) CROSS	PERMEABILITY, K (cm/s)	MOISTURE CONTENT (%)
1.106	112	212	113	72	<5E-9	8.2

2. TOP LAYER TYPE : NON-WOVEN

LAYER #	MASS(lb/ft2)
9806112058	0.054

3. BOTTOM LAYER TYPE : WOVEN

LAYER #	MASS(lb/ft2)
623300	0.023

4. BENTONITE TYPE : 30 MESH

SHIPMENT #	% MONTMORILLONITE	SWELL INDEX (ml)	MOISTURE CONTENT (%)	MOISTURE ABSORPTION (%)	MASS OF BENTONITE(lb/ft2)
453808	90	25	8.2	634	1.030

THE MONTMORILLONITE PERCENTAGE WAS TESTED BY THE METHYLENE BLUE CAPACITY METHOD. THIS IS AN ACCEPTABLE TEST METHOD IN THE GCL INDUSTRY

DO

BENTOFIX TECHNOLOGIES, INC.

QUALITY CONTROL CERTIFICATE

1-101

For one roll what about the other 39 rolls?

LOT#	ROLL #	DATE
88061202	51679	06/12/98

PRODUCT: BENTOFIX NS

DIMENSIONS: 150.00 ft x 15.5 ft
45.7 m x 4.72 m

1. FINISHED PRODUCT TYPE : BENTOFIX NS

MASS(lb/ft2)	TENSILE (lb) LENGTH	TENSILE (lb) CROSS	ELONGATION (%) LENGTH	ELONGATION (%) CROSS	PERMEABILITY, K (cm/s)	MOISTURE CONTENT (%)
1.106	112	212	113	72	<5E-9	8.2

2. TOP LAYER TYPE : NON-WOVEN

LAYER #	MASS(lb/ft2)
9806112058	0.054

3. BOTTOM LAYER TYPE : WOVEN

LAYER #	MASS(lb/ft2)
623300	0.023

4. BENTONITE TYPE : 30 MESH

SHIPMENT #	% MONTMORILLONITE	SWELL INDEX (ml)	MOISTURE CONTENT (%)	MOISTURE ABSORPTION (%)	MASS OF BENTONITE(lb/ft2)
453808	90	25	8.2	634	1.030

1-97

Bentofix Woven Geotextile

Number	Ticket Number	Warp Tensile (Lbs)	Weft Tensile(Lbs)	Mullen Burst(PSI)	ASTM D 5261 Weight (G/M2)	Elongation (%)	Date Shipped
1	608140	150.6	127	0	112.5	39 X 26	6/10/98
2	608960	148.4	108	0	115.5	34 x 30	6/10/98
3	609520	146.9	134.9	0	134.2	36 x 30	6/10/98
4	619250	157	119.4	0	112.5	38 x 30	6/10/98
5	619100	171.1	126.6	0	122.7	40 x 27	6/10/98
6	619050	145.7	136.4	0	129.7	40 x 30	6/10/98
7	619090	160	146.9	0	123.8	41 x 30	6/10/98
8	620050	160.5	125.2	0	110	35 x 28	6/10/98
9	619920	160.8	145	0	119.3	37 x 34	6/10/98
10	619940	147	133	0	122.8	40 x 26	6/10/98
11	619930	159.3	133.2	0	106.3	36 x 24	6/10/98
12	619740	152.3	108	0	104.4	34 x 25	6/10/98
13	619420	140	115	0	107.2	35 x 24	6/10/98
14	619320	157.4	137.7	0	114.9	34 x 29	6/10/98
15	620320	146.2	135.5	0	122.5	36 x 29	6/10/98
16	620310	163.8	143.1	0	119.9	38 x 31	6/10/98
17	620260	148.9	141.2	0	119.3	39 x 30	6/10/98
18	621340	154.9	120.8	0	116.2	34 x 28	6/10/98
19	621330	151.8	129	0	114.3	39 x 30	6/10/98
20	621240	139.9	122	0	114.7	40 x 32	6/10/98
21	623060	157.5	136.6	0	114.1	49 x 33	6/10/98
22	623480	159.8	128	0	119.3	38 x 28	6/10/98
23	623300	167.5	128	0	113.1	38 x 31	6/10/98
24	622410	147.6	140.5	0	121.1	38 x 36	6/10/98
25	622360	157.3	130.1	0	117.1	39 x 32	6/10/98
26	621840	160.3	139.9	0	125.9	36 x 33	6/10/98
27	621550	147.7	123.7	0	120.3	36 x 32	6/10/98
28	623570	151.3	139	0	119.6	33 x 32	6/10/98
29	623560	138.3	122.5	0	117.2	36 x 30	6/10/98
30	618840	160.2	138.3	0	116.1	37 x 32	6/10/98

does not meet MARV

1-97

~~1-101~~

ALBARRIE CANADA LIMITED
85 Morrow Road
Barrie, Ontario
L4N 3V7

Tel: 705-737-0551
Fax: 705-737-4044

~~1-10~~
1-97

Date: 06/11/98

CERTIFICATE OF CONFORMANCE

This is to certify that Style 205B, non-woven polypropylene fabric, produced by Albarrie Canada Ltd., will meet the following certifiable minimum average value when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 95 percent confidence level.

Physical Property	Test Method	U.S. Units	S.I. Units
Mass per Unit Area	ASTM D-5261	6.6 oz/yd^2	225 gsm
Tensile Strength	ASTM D-4632	22 lbs	10 kg
Elongation	ASTM D-4632	100 %	100 %

Actual Test Results only one roll, what of the other rolls used?

Lot #: 980611205B

Roll #: 072396

	U.S. Units	S.I. Units
Mass per Unit Area	7.8 oz/yd^2	264 gsm
Tensile Strength	70 lbs	32 kg
Elongatio	183 %	183 %

K. Kubbonen
QUALITY CONTROL

G-5

Installation Procedures

NSWC CRANE
DYE BURIAL GROUND CAP

Submittal Item No. 1-105(A)
Specification Section 02253

Manufacturers Specifications

Phillip Environmental Services Corp.
210 West Sand Bank Road
Columbia, IL 62236

Geosynthetics Contractor
Environmental Design & Construction, Inc.
104 Wholesale Avenue
Huntsville, AL 35811

Lois J Bigley 12-29-97
Lois J. Bigley 12/29/97

FLUID SYSTEMS

Friday, September 12, 1997

Michelle Lotz
Environmental Design & Construction
104 Wholesale Avenue
Huntsville, AL 35611

RE: Dye Burial Cap
Crane, IN.

Dear Michelle,

I have reviewed the submittal comments for the GCL and offer the following for resubmittal:

1-95 Resin Origin Supplier for GCL
Synthetic Industries is the geotextile supplier for our GCL. The resin origin certificates supplied for 1-55 will be the same for 1-95.

1-96 Test Results from GCL Manufacturer on Bentonite
Bentonite test data is supplied in our Bentofix Manufacturing Certification. The actual test results can not be supplied until rolls are picked for shipment. Sodium bentonite clay is a raw material and as such does not have a product name. Our source for this material is listed in FIX-509. Certified bentonite properties are listed in FIX-501.

1-98 Manufacturers Specification for GCL
Bentofix certified properties are listed in FIX 501. The test method, frequency and value are listed for each component as well as the finished GCL. All finished GCL properties are tested once per 40,000 sf as required with the exception of permeability (hydraulic conductivity) which is tested once per shift or 100,000 sf. It has been our experience that by monitoring the mass per unit area 1/40,000 sf, it is not necessary to also check permeability at that same frequency since permeability is dependent on bentonite mass. In addition, puncture is tested periodically and is a TYPICAL value not MARV. It is listed in FIX 502 and is attached for reference.

1-99 Written Certification of Minimum Average Roll Values
FIX-501 is list of certified MARV values. Actual test results are supplied when rolls are picked for shipment. See notes above on test frequency.

1-100 Needle Free Certification
Job specific, signed copy provided when rolls shipped.

1-101 Manufacturers Quality Control Certificates and Test Results and Test Procedures
Certification and test results provided for actual rolls shipped. Please see notes under 1-98 relating to test procedures and frequency.

FLUID SYSTEMS

1-102 Certificate of Compliance
Completed and signed when actual rolls are picked for shipment.

1-103 Certificate of Montmorillonite Content
Certification is included in manufacturing certification. Test method is X-ray diffraction. This is shown in FIX-502 TYPICAL property sheet.

1-105 Manufacturers Specifications
Unloading, storage and handling instructions attached.

I have contacted Synthetic Industries for additional information pertaining to the geotextile and will forward when I receive it. Please review the above information and let me know if you feel like any additional information will be needed.

Sincerely,

John Pyle

John Pyle

FLUID SYSTEMS

BENTOFIX® GEOSYNTHETIC CLAY LINER INSTALLATION GUIDELINES

1.0 Unloading and Storage

1.1 Arrangements should be made by the contractor or installer to store the rolls of Bentofix® GCL in a suitable location. While in storage it is important to keep the material dry and in the same condition as it was shipped.

1.1.1 Methods of storing the material on site include: leaving the rolls in the covered van or on the flat bed trailer under appropriate tarps; storing the rolls under roof in a clean, dry area; storing the rolls on high ground, preferably on pallets, covered with protective waterproof tarps.

1.1.2 The rolls should remain in their original, unopened plastic wrapping until it is time to install the material.

1.1.3 Any rolls that come in contact with moisture while in storage should be set aside to await examination by the engineer, installer, and/or manufacturer's representative. Damaged rolls should also be set aside and examined to determine the suitability of the liner for use.

1.2 Lifting the rolls requires a minimum 3" outside diameter steel pipe, preferably soild, but with a wall thickness capable of supporting the weight of the roll. The pipe is inserted through the center cardboard roll core. Heavy duty slings are attached to each end of the pipe, which are fastened to a spreader bar. The assembly can then be lifted by crane, back hoe, end loader or any other suitable piece of equipment.

An all-terrain, extendible boom, fork lift, or Lull, can be fitted with a special, solid steel pole, 14 to 16 feet in length, having an outside diameter of no more than 3-$^{3}/_{8}$". The pole is inserted into the cardboard core of the roll. The roll should not be fully suspended until the pole extends through the full length of the core so that the core does not break. This device has a long reach and is particularly useful for unloading containers or covered vans.

As with any lifting or loading operations, appropriate safety equipment should be employed and proper safe handling methods practised.

2.0 Earthwork

2.1 The surface upon which the Bentofix® GCL is installed shall be smooth and free of debris, roots and sticks, and sharp rocks larger than two inches. Site specific compaction requirements should be followed in accordance with the project plans and specifications. At a minimum, the level of compaction should be such that no rutting is caused by installation equipment or other construction vehicles which traffic the area of deployment.

2.2 In applications where the Bentofix® GCL will be subjected to a hydraulic head that exceeds the confining stress (common in liquid surface impoundments), subgrade surfaces consisting of gravel or granular soils may not be acceptable due to their large void content. For these applications, the top six inches of the subgrade soil should possess a particle size distribution where at least 80 percent of the soil is finer than 0.2 mm (#60 sieve).

2.3 Directly prior to deployment of the Bentofix® GCL, the subgrade shall be final-graded to fill in any remaining voids or desiccation cracks and proof-rolled to ensure that no sharp irregularities or abrupt elevation changes exist. The surfaces to be lined shall be maintained in this condition, free of standing water.

2.4 The subgrade surface and preparation shall be approved and certified by the CQA inspector prior to Bentofix® GCL placement.

2.5 Upon approval by the CQA inspector, it shall be the installer's responsibility to indicate to the engineer any change in the condition of the subgrade that could cause it to be out of compliance with any of the requirements of this section or the project specific specification.

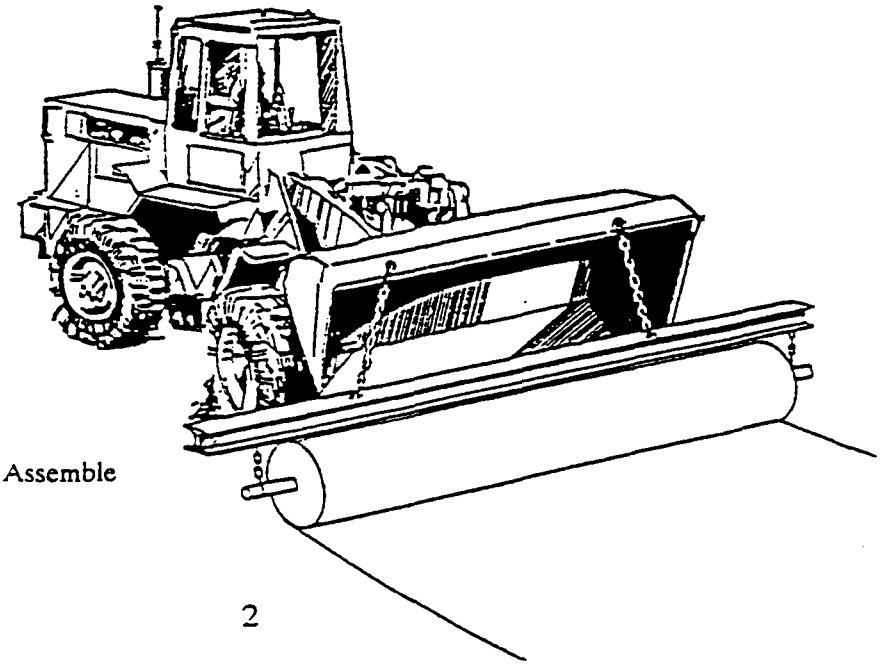


Figure 1 - Typical Lifting Assemble

3.0 Liner Deployment

3.1 As rolls are selected for deployment, the labels are removed and recorded in the file, along with any other pertinent information.

3.2 The rolls are transported from the storage area and carried into position using the lifting equipment described in Section 1.2.

3.3 The roll of Bentofix® GCL is supported so that the fabric designated as the upper surface in the contract drawings faces out, away from the installation vehicle. The free end is them pulled across the area to be lined by the installation crew.

Alternately, the free end of the roll can be secured and the vehicle supporting the roll slowly backs away, deploying the GCL as it goes.

3.4 Successive sheets are overlapped according to the match lines stenciled on the upper surface of the Bentofix® GCL, as described in Section 5.0.

3.5 Whenever possible, Bentofix® GCL installation should begin at high elevation and proceed to low elevation. This allows precipitation accumulation to drain quickly without adversely affecting the GCL.

3.6 The edges of exposed sheets should be weighted down with adequate ballast to prevent uplift.

3.7 Only deploy as much Bentofix® GCL as can be covered at the end of the day, or that can be covered in a reasonably short time in the event of precipitation.

3.7.1 When Bentofix® GCL is being installed under a polymeric geomembrane, the leading edge of the GCL should be folded back under the membrane at the end of the construction day. The leading edge of the membrane should be secured by sandbags or suitable ballast to prevent uplift and the infiltration of runoff water.

3.7.2 When Bentofix® GCL is being installed alone, as the primary hydraulic barrier, the GCL should be covered by the full thickness of gravel, sand, or soil called for in the drawings. The leading edge should be left uncovered, but protected by plastic sheeting and weighted with suitable ballast.

3.8 Bentofix® GCL should be installed in a relaxed condition, and be free of wrinkles and folds.

3.9 When fitting Bentofix® GCL into small areas or around construction details, use a sharp knife to cut the liner to the appropriate dimensions. Adjacent panels should overlap at the edges as described in Section 5.0.

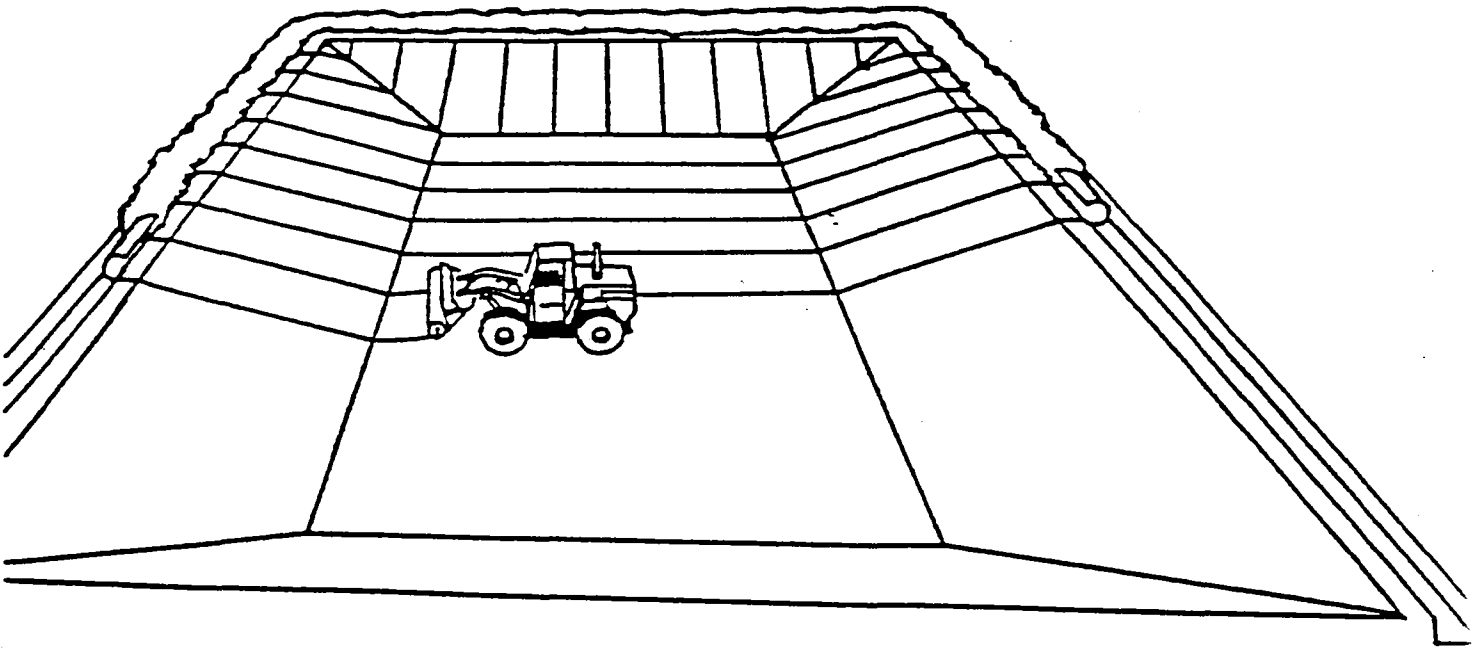


Figure 2 - Anchoring and Deployment

4.0 Anchoring

4.1 Bentofix® GCL is anchored in a trench around the perimeter of the containment basin to provide the required pull-out resistance. In most cases Bentofix® GCL can be anchored in the same trench as any adjacent geosynthetic liner components. Dimensions and location of the trench should be provided in the contract drawings.

4.2 Steps should be taken to ensure that precipitation will not accumulate in the trench, prior to backfilling, allowing the premature hydration of the GCL.

4.3 The trench should be backfilled and properly compacted prior to placing cover soil on the slopes. When Bentofix® GCL is used alone, sufficient overlap should be provided on the base, beyond the toe of the slope, to allow for movement of the liner up the slope as the trench is back filled and compacted.

5.0 Overlapping, Seaming and Sealing

5.1 Adjacent sheets of Bentofix® GCL should overlap each other according to the match line on the bottom sheet. This match line is typically located 10 inches from the edge of the 15'2" wide sheet. Bentofix® GCL is manufactured with a 1½" protective edge that contains the bentonite and prevents edge loss. An all inclusive 10 inch overlap provides a minimum of six inch overlap of bentonite.

5.2 When Bentofix® GCL is used alone, it is necessary to place additional granular bentonite or bentonite paste between the sheets at the overlap to ensure the seal. Bentonite is applied at the rate of approximately 1/4 pound per lineal foot of seam and is the same bentonite as is used in the manufacture of the GCL itself.

5.3 Transverse overlaps at the ends of rolls should be a minimum of twelve inches in length. There are no match lines or protective edges at the ends of the rolls.

5.4 When the liner is cut to fit in small areas, in corners, or around details, adjacent panels should overlap a minimum of six inches, adding bentonite when specified in the project specifications.

5.5 Seams should be shingled in a down slope direction so that water flows across the seam from top sheet to bottom sheet.

6.0 Sealing Around Appurtenances

6.1 Bentofix® GCL should be installed around penetrations, structures, pipes, supports and other appurtenances according to the contract drawing.

6.2 Additional granular bentonite, and in some cases a bentonite paste, will be necessary to ensure a watertight seal.

6.3 Bentofix® GCL may be secured to the appurtenance by use of a stainless steel batten or clamp, mechanical fasteners, or other appropriate device.

7.0 Repairing Damaged Areas

7.1 In the event an area of Bentofix® GCL becomes damaged, torn, or punctured during installation, the affected area should be repaired in accordance with these guidelines.

7.2 On relatively level surfaces, the damaged area is covered with a larger piece of Bentofix® GCL extending at least 12 inches beyond the affected area in every direction. Granular bentonite can again be used to augment the seal as specified by the engineer.

7.3 Patches on side slopes should be minimized. GCL panels that require patching should be moved and used on the base whenever possible.

7.4 Areas that are inadvertently exposed to standing water or excess precipitation and allowed to hydrate prior to being covered by a confining soil layer should be examined. If the engineer and installer determine that the GCL has hydrated and that the bentonite would displace under the expected load, the GCL must be removed and replaced.

7.5 Any GCL material exposed to hydrocarbon fuels, chemicals, pesticides, leachates, or other liquids during installation, should be cut out, removed, disposed of away from any components of the liner presently under construction and replaced.

8.0 Cover Material

8.1 Bentofix® GCL must be covered with a geomembrane as soon after placement as possible to protect it from the climatic elements. In cases where Bentofix® GCL is used alone, the GCL should be covered with the specified thickness of cover soil immediately following deployment. Only install the amount of Bentofix® GCL that can be anchored, inspected, and covered the same day.

8.2 When construction and installation is halted at the end of the day, the GCL must be protected from inclement weather overnight.

8.2.1 When a geomembrane is being installed over the GCL, the leading edge of Bentofix® GCL should be folded back under the membrane so that the membrane extends beyond the GCL two top three feet. The leading edge of the membrane is then weighted with sand bags or suitable ballast to safeguard against wind uplift and the flow to runoff water under the liner.

8.2.2 When Bentofix® GCL is used alone, the solid cover should be placed within 30 inches of the leading edge of the GCL. The leading edge should then be covered with plastic sheeting that is folded under the exposed edge approximately 12 inches.

Sand bags or suitable ballast should be placed on the protected liner to hold the plastic in place and to partially confine the GCL. The next morning the ballast and the plastic are removed an the subsequent rolls of GCL placed as described in Section 5.0.

8.3 Cover soil placed directly on the GCL should have an appropriate gradation so as not to damage or puncture the GCL. It is recommended that particle sizes not exceed 2 inches when the material is angular, 3 inches when it is rounded. Appropriate placement methods should be used at all times to protect the GCL.

8.4 Compatibility of Bentofix® GCL with soils with a high salt content should be verified by the engineer.

8.5 Backfill should be pushed across the seams from top sheet to bottom sheet to prevent the cover material from lodging between the overlapped sheets.

8.6 Only after the cover material has been placed should the Bentofix® GCL be allowed to hydrate. Once hydration has occurred no vehicles should be allowed to traffic the area directly above the GCL unless sufficient separation exists between the GCL and the vehicle to adequately distribute the vehicle load.

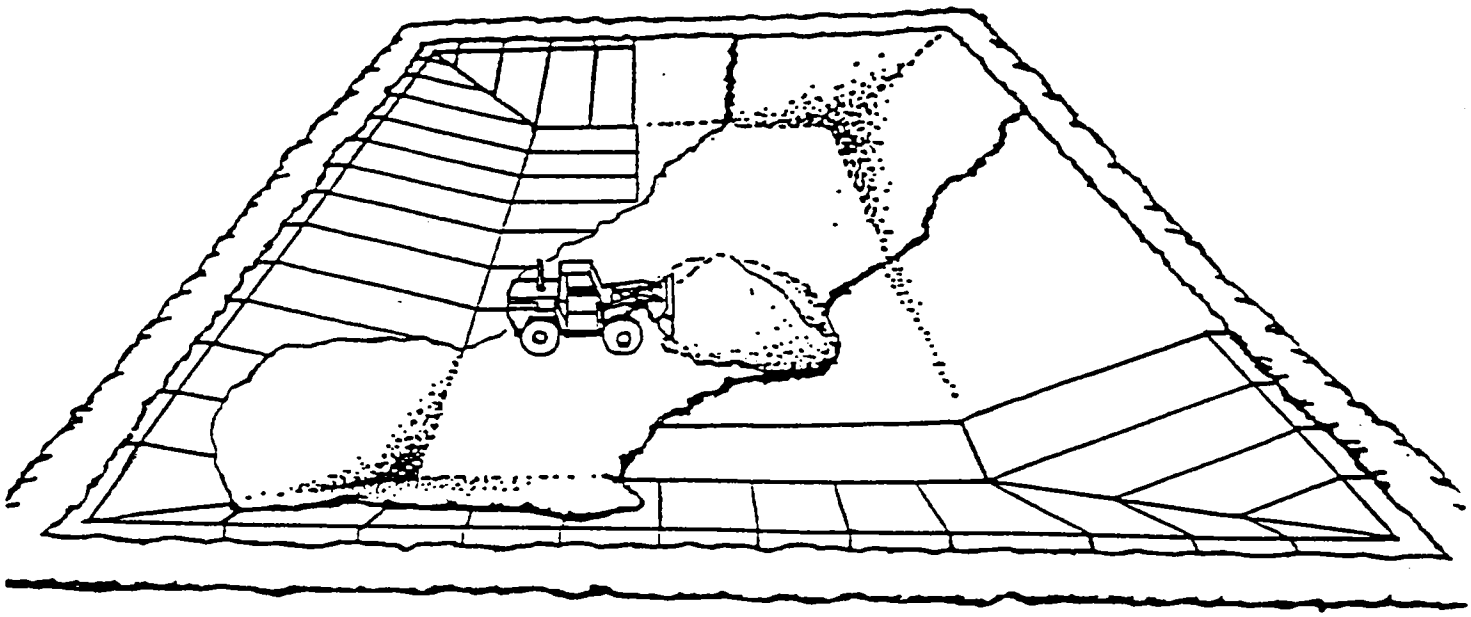


Figure 3 - Backfilling

9.0 Bentonite Hydration in Tank Farm Applications

9.1 In applications where Bentofix® GCL is used alone to line the secondary containment basins, around above ground storage tanks, the GCL must first be hydrated with fresh water. Non-aqueous chemicals will not activate the bentonite. Therefore, activation by rain water or sprinkler/irrigation is necessary. Once hydrated, Bentofix® GCL is an excellent barrier to hydrocarbon fuels, fertilizers, and other such chemicals. Contact Fluid Systems for further details regarding chemical compatibility.

9.2 Periodic inspection of the liner to ensure proper coverage and adequate moisture content is recommended when Bentofix® GCL is used alone under a minimum depth of cover soil. In arid regions it may be necessary to irrigate the containment area at some predetermined frequency.

The information contained herein has been compiled by Fluid Systems and is, to the best of our knowledge, true and accurate. All suggestions and recommendations are offered without guarantee. Final determination of suitability for use based on any information provided, is the sole responsibility of the user. There is no implied or expressed warranty of merchantability of fitness of the product for the contemplated use.

APPENDIX H

HDPE GEOMEMBRANE LINER DATA

APPENDIX H
HDPE GEOMEMBRANE LINER DATA

INDEX

H-1	Panel Layout Plan
H-2	Seam Inspection/Test Results
H-3	Panel Deployment Sheets
H-4	Manufacturer's QC Certificates
H-5	Warranties
H-6	Installation Procedures

H-1

Panel Layout Plan

MATERIAL SUMMARY

ROLL 1
P1-41'
P2-53'
P3-68'
P4-85'
P5-100'
P6-111'
P7-15'

ROLL 2
P8-100'
P9-125'
P10-134'
P11-116'

ROLL 3
P12-20'
P13-137'
P14-137
P15-137'
P16-44'

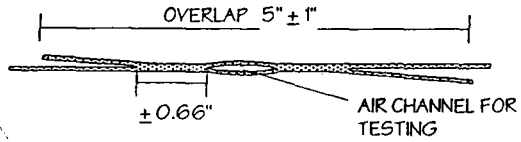
ROLL 4
P17-93'
P18-135
P19-143'
P20-104'

ROLL 5
P21-33'
P22-158'
P23-177'
P24-107'

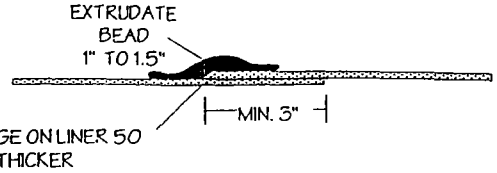
ROLL 6
P25-94'
P26-185'
P27-176'
P28-20'

ROLL 7
P29-155'
P30-17'
P31-30'
P32-35'
P33-33'
P34-31'
P35-30'
P36-22'
P37-20'
P38-27'
P39-27'
P40-24'
P41-20'

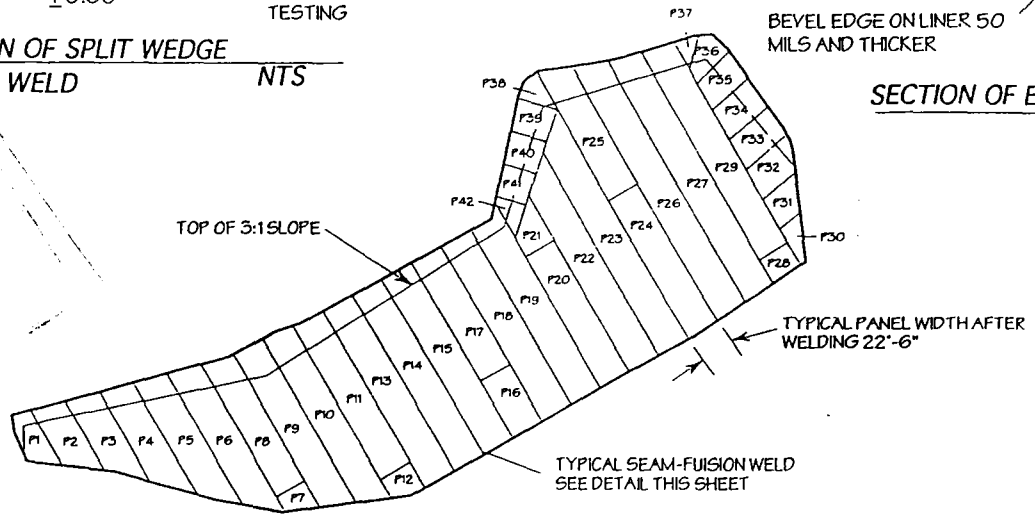
ROLL 8
P42-20'

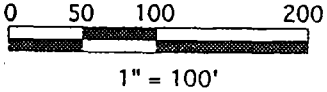


SECTION OF SPLIT WEDGE FUSION WELD NTS



SECTION OF EXTRUSION WELD NTS





NOTE: THIS PANEL LAYOUT IS TENTATIVE AND MAY BE REVISED IN ORDER TO SUIT FIELD CONDITIONS BY EDCI SITE MANAGER WITH APPROVAL OF THE ENGINEER

SCALE 1"= 100' DRAWN TAL DATE 8-8-97	NO.	DATE	REVISION	INIT.	ENVIRONMENTAL DESIGN AND CONSTRUCTION, INC. HUNTSVILLE, ALABAMA	DYE BURIAL GROUND INTERIM MEASURES CRANE, INDIANA	PROPOSED PANEL LAYOUT 60 MIL HDPE TEXTURED CAP	SHEET 1 of 3
DRAWING MAY BE REDUCED LINE EQUALS ONE INCH ON ORIGINAL DRAWING								

H-2

Seam Inspection/Test Results

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

CERTIFICATE OF ACCEPTANCE

PROJECT NAME: Dyo Burial Ground DATE: 7-23-98
PROJECT LOCATION: Crane, IN

Details of Work Completed and Measured.....

Supplied, Installed, And Tested 84,772 Square Feet Of Type 2 (12oz) Geotextile, GCL, And 60 Mil Textured HDPE.

I, the undersigned, duly authorized representative of Phillips Services do hereby take over and accept the work described above from the date hereof, subject to the exceptions detailed below, and confirm that the work has been completed in accordance with the specifications and the terms and conditions of the contract. There is no apparent damage to the plastic lining, nor is there any interference within or without the surrounding works.

I have evaluated and measured the work together with the EDCI representative, and agree that the measurements shown above are true and correct, and that the installation has met our approval.

Exceptions.....

General Contractor/Owner	Environmental Design & Construction, Inc.
Russell Tomasko	Daniel R. Davis
Signature	Signature
Russell Tomasko	Daniel R Davis
Printed Name	Printed Name
Date: 7/23/98	Date: 7-23-98

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

TRIAL WELD TEST LOG

JOB NAME: Dye Burial Ground

PAGE: 1 OF

JOB NUMBER: 990061N

Ambient Temp. ___ a.m.

MIN. PEEL: 90 ppi

LOCATION: Grant, IN

___ p.m.

MIN. SHEAR: 120 ppi

Q.A. TECHNICIAN: D. Davis

SHEET THICKNESS: mil 60

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/Fail
1	7-14	12:30P	SITE	RM	313	700/35	110 102	101 106	108 105			P	140					P
2	"	1:30P	"	RL	315	700/27.5	100 101	95 90	109 100			P	150					P
3	"	5:53P	"	RM	313	700/35	100 101	95 90	109 100			P	144					P
4	"	600 5:58P	"	RL	315	700/27.5	95 103	98 106				P	140					P
5	7-17	8:15A	"	RM	313	700/32	115 106	107 110	107 107			P	156					P
6	"	8:05A	"	RM	315	700/25	120 105	115 107	120 104			P	150					P
7	"	4:00P	"	RM	315	700/30	95 110	97 95	106 95			P	131					P
8	"	4:00P	"	RM	313	700/32	98 105	103 106	102 104			P	131					P

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

TRIAL WELD TEST LOG

JOB NAME: Dye Burial Ground

PAGE: 2 OF

JOB NUMBER: 970061N

Ambient Temp. ___ a.m.

MIN. PEEL: 90 ppi

LOCATION: Crane, IN

___ p.m.

MIN. SHEAR: 120 ppi

Q.A. TECHNICIAN: D. Davis

SHEET THICKNESS: mil 60

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/Fail
9	7-17	EOD 5:30P	Site	RM	313	700/32	115 111	119 113				P	125					P
10	7-17	6:00P	"	RM	315	700/30	103 /	110 103	103 99	110 110		P	120					P
11	7-18	830A	"	RM	313	700/30	108 102	110 100	107 100			P	141					P
12	"	800A	"	RM	315	700/25	112 110	112 110	114 115			P	146					P
13	"	400P	"	RM	313	700/32	115 102	100 112	104 116			P	138					P
14	"	EOD 445P	"	RM	315	700/25	110 113	113 110				P	140					P
15	"	EOD 530P	"	RM	313	700/32	120 125	130 125				P	132					P
16	7-19	800A	"	RM	315	700/23	115 105	107 98	105 100			P	142					P

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

TRIAL WELD TEST LOG

JOB NAME: Dye Burial Ground

PAGE: 3 OF

JOB NUMBER: 97006 IN

Ambient Temp. ___ a.m.

MIN. PEEL: 90 ppi
EXT 78 PPI

LOCATION: Crane, IN

___ p.m.

MIN. SHEAR: 120 ppi

Q.A. TECHNICIAN: D. Davis

SHEET THICKNESS: mil 60

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/ Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/ Fail
17	7-19	800A	SITE	RM	313	700/23	117 125	118 120	114 115			P	138					P
18	"	EOD 130P	"	RH	315	700/23	119 130	115 122				P	160					P
19	"	EOD 130P	"	RM	313	700/30	110 107	110 116				P	151					P
20	7-20	645A	"	RH	315	700/25	114 109	106 120	116 104			P	146					P
21	7-20	645A	"	RM	313	700/30	114 108	107 93	114 110			P	140					P
22	"	EOD 1145A	"	RM	313	700/30	95 101	108 116				P	140					P
23	"	EOD 1150A	"	RH	315	700/25	100 110	100 107				P	135					P
24	7-21	900A	"	RM	316 EXT	550	100	92	94			P	139					P

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

TRIAL WELD TEST LOG

JOB NAME: Old Burial Ground

PAGE: 4 OF

JOB NUMBER: 97006 IN

Ambient Temp. ___ a.m.

MIN. PEEL: 90 ppi
EXT 78 PPI

LOCATION: Craven, IN

___ p.m.

MIN. SHEAR: 120 ppi

Q.A. TECHNICIAN: D. Davis

SHEET THICKNESS: mil 60

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/Fail
25	7-21	11:13A	Site	RH	EXT 286	510	118	110	112			P	122					P
26	"	EOD 2:02P	"	RM	EXT 316	550	104	112				P	138					P
27	"	EOD 2:45P	"	RH	EXT 286	510	123	114				P	150					P
28	7-22	7:30A	"	RM	313	700/28	114 107	104 110	105 111			P	155					P
29	"	EOD 8:45A	"	RM	313	700/28	105 105	110 102				P	138					P
30	"	9:30A	"	RH	EXT 286	510	87	76	130			P	132					P
31	7-23	10:20A	"	RH	EXT 286	510	105	119	115			P	145					P
32	"	2:30P	"	RM	313	700/28	114 111	110 105	115 109			P	135					P

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

TRIAL WELD TEST LOG

JOB NAME: Dye Burial Ground

PAGE: OF

JOB NUMBER: 970061N

Ambient Temp. ___ a.m.

MIN. PEEL: 90 ppi
EXT 78

LOCATION: Crank, IN

___ p.m.

MIN. SHEAR: 120 ppi

Q.A. TECHNICIAN: D. Davis

SHEET THICKNESS: mil 60

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/ Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/ Fail
33	7-23	1500 466P	Site	RM	313	700/28	120 115	117 115				P	145					P
34	"	~~1500~~ 415P	"	RH	EXT 286	510	95	85	80			P	143					P
35	"	1500 5:15P	"	RH	EXT 286	510	107	111				P	140					P

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

DYE BURIAL GROUND CAP
CRANE INDIANA

Geomembrane Seaming & Test Record

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

JOB NAME: Dye Burial Ground
PROJECT #: 97006 IN
LOCATION: Crane, IN
WEATHER: Cloudy
QA/QC: D. Davis
DATE: 7-14-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
1/2	186	12:50P	RM	313	700/35	-	8:10A	8:15A	30	30	RH	P	7-16-98			Yes
1/3	97	5:12P	RM	313	700/35	-	133A	138A	31	31	RH	P	7-16-98			Yes
1/4	100	5:40P	RM	313	700/35	-	142A	147A	32	32	RH	P	7-16-98			Yes
3/4	23	5:05P	RM	313	700/35	-	153A	158A	32	32	RH	P	7-16-98			Yes
3/5	97	5:20P	RL	315	700/27.5	-	156A	201A	30	29	RH	P	7-16-98			Yes
4/5	100	5:30P	RL	315	700/27.5	-	156A	201A	30	29	RH	P	7-16-98			Yes

ENVIRONMENTAL D 'GN & CONSTRUCTION, INC.

104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811

256-551-0372

JOB NAME Dye Burial Ground

PROJECT # 97006 IN

LOCATION Crane, IN

WEATHER Clear

QA/QC D. Davis

DATE 7-17-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
5/6	165	11:50A	RH	315	700/25		109P	114P	30	29	RH	P	7-17			Yes
5/7	38	12:30P	RH	315	700/25		109P	114P	30	29	RH	P	7-17			Yes
6/7	23	11:40A	RM	313	700/30		252P	257P	30	29	RH	P	7-18			Yes
6/8	165	11:50A	RM	313	700/30		247P	258P	30	28	RH	P	7-18			Yes
7/8	38	12:30P	RM	313	700/32		239P	244P	30	30	RH	P	7-18			Yes
8/9	207	4:45P	RM	313	700/32		810A	815A	30	29	RH	P	7-18			Yes
9/10	210	5:12P	RH	315	700/30		810A	815A	30	30	RH	P	7-18			Yes

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811

256-551-0372

JOB NAME: Dye Burial Ground

PROJECT #: 97006 IN

LOCATION: Crane, IN

WEATHER: Cloudy

QA/QC: D. Davis

DATE: 7-18-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
10/11	196	11:40A	RH	315	700/25		402P	407P	30	29	RH	P	7-18			Yes
11/12	55	12:30P	RB	313	700/30		425P	430P	31	31	RH	P	7-18			Yes
11/13	106	12:05P	RB	313	700/30		415P	420P	31	31	RH	P	7-18			Yes
12/13	23	11:55A	RB	313	700/30		417P	422P	31	31	RH	P	7-18			Yes
12/14	55	12:50P	RH	315	700/25		429P	434P	30	30	RH	P	7-18			Yes
13/14	106	12:23P	RH	315	700/25		432P	43P	30	30	RH	P	7-18			Yes
14/15	156	1:20P	RB	313	700/30		405P	410P	31	30	RH	P	7-18			Yes
15/16	155	4:10P	RB	313	700/32		852A	902A	30	30	RH	P	7-21			Yes
16/17	155	4:45P	RB	313	700/32		855A	905A	30	29	RH	P	7-21			Yes

ENVIRONMENTAL DE GN & CONSTRUCTION, INC.

104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811

256-551-0372

JOB NAME Dye Burial Ground

PROJECT # 97006 IN

LOCATION Crane, IN

WEATHER Clear / Hot

QA/QC D. Davis

DATE 7-19-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
17/18	137	11:55A	RB	313	700/25		857A	902A	30	30	RH	P	7-21			Yes
17/22	11	11:50A	RB	313	700/25		845A	850A	30	30	RH	P	7-21			Yes
18/19	136	11:50A	RH	315	700/25		900A	905A	30	29	RH	P	7-21			Yes
18/22	23	11:40A	RH	315	700/25		846A	851A	31	31	RH	P	7-21			Yes
19/20	135	1:20P	RH	313	700/25		903A	908A	30	30	RH	P	7-21			Yes
19/22	11	11:45A	RH	315	700/25		900A	905A	30	29	RH	P	7-21			Yes
20/21	137	12:55P	RM	313	700/25		922A	927A	30	30	RH	P	7-21			Yes

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811

256-551-0372

JOB NAME D45 Burial Ground

PROJECT # 97006 IN

LOCATION Grace, IN

WEATHER Cloudy

QA/QC D. Davis

DATE 1-20-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
21/23	39	9:40A	RH	315	700/25		931A	943A	30	28	RH	P	1-21			YES
21/24	108	9:50A	RH	315	700/25		934A	954A	31	29	RH	P	1-21			YES
23/24	23	9:29A	RH	315	700/25		934A	938A	30	30	RH	P	1-21			YES
23/25	39	10:20A	RH	315	700/25		951A	1002A	32	31	RH	P	1-21			YES
24/25	108	10:30A	RH	315	700/25		935A	940A	30	29	RH	P	1-21			YES
25/26	109	10:20A	RH	313	700/30		944A	944A	30	29	RH	P	1-21			YES

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

JOB NAME Dye Burial Ground

PROJECT # 97006.IN

LOCATION Crane, IN

WEATHER Cloudy

QA/QC D. Davis

DATE 7-22-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
26/27	95	8:20 A	RM	313	700/28		8:43A	8:48A	30	30	RH	P	7-22-98			yes

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
256-551-0372

JOB NAME Dye Burial Ground

PROJECT # 97006IN

LOCATION Crane, IN

WEATHER Cloudy

QA/QC D. Davis

DATE 7-23-98

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/QC MONITOR PRESENT
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	END	PRESSURE START	END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	
27/28	83	2:45P	RM	313	700/28		3105P	3:10P	31	31	RH	P	7-23			YES
28/29	68	3:05P	RM	313	700/28		320P	335P	31	30	RH	P	7-23			YES
29/30	68	3:20P	RM.	313	700/28		340 P	345P	30	30	RH	P	7-23			YES

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

DYE BURIAL GROUND CAP
CRANE INDIANA

Destructive Test Log

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811

DESTRUCTIVE TEST LOG

JOB NAME: Dye Burial Ground
JOB NUMBER: 97006 IN
LOCATION: Gary, IN
Q.A. TECHNICIAN: D. Davis

Ambient Temp. ____ a.m. ____ p.m.

PAGE: 1 OF ____
MIN. PEEL: 90 ppi
MIN. SHEAR: 120 ppi
SHEET THICKNESS: 60 ~~ppi~~ mil

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/Fail
DS-1	7-14-98	5:12P	5 1/3 41' N/T	RM	313	700/35	98 93	103 96	102 104			P	131					P
DS-2	7-17-98	11:50A	22' S/T	RH	315	700/25	101 120	112 103	112 100			P	130					P
DS-3	7-17-98	4:45P	8/9 86' S/T	RM	313	700/32	100 105	100 103	107 108			P	140					P
DS-4	7-18-98	11:40A	10/11 66' S/T	RH	315	700/25	98 90	100 98	96 95			P	142					P
DS-5	7-18-98	4:40P	15/16 62' S/T	RM	313	700/32	111 105	104 107	110 102			P	146					P
DS-6	7-19-98	11:50A	18/19 66' N/T	RH	315	700/25	86 109	100 124	96 110			P	146					P
DS-7	7-19-98	12:55P	20/21 22' S/T	RM	313	700/30	119 100	105 118	110 109			P	150					P
DS-8	7-20-98	10:30A	24/25 45' S/T	RH	315	700/25	115 114	107 100	112 110			P	130					P
DS-9	7-23-98	3:30P	28/29 25' S/T	RM	313	700/28	119 114	110 108	110 109			P	150					P

HTS, INC. Consultants

416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 18, 1998

Philip Environmental
510 DD Road
Columbia, IL 62236

Attn: Mr. Don Flowers

Re: NSWC Crane
Peel and Shear Tests of Seams
60 mil textured HDPE
HTS Report No. PEN1254.005.doc

TEST PARAMETERS AND LABORATORY CONDITIONS			
Sample Type	ASTM	Sample Width (in)	1
Humidity (%)	50	Spec Gauge Length (in)	1
Temperature (deg. F)	73	Grip Distance (in)	1
Operator Name:	K. Phouangsavanh	Crosshead Speed (in/min)	2

Please find attached peel and shear reports of 60 samples delivered to our laboratory on 7/18/98. Peel and shear tests were performed in accordance with Test Method ASTM D 4437. The test results are summarized on the following pages:

SAMPLE I.D.	NOMINAL THICKNESS	SAMPLE I.D.	NOMINAL THICKNESS
DS-1	60		
DS-2	60		

Very truly yours,

Larry L. McMichael

Larry L. McMichael KP
Vice President

ENVIRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

		PEEL			SHEAR		
Sample	Spec. No.	lb / in.	% Peel	Break Code	lb / in.	% Peel	Break Code
DS-1	1	107		FTB/SE1	154		FTB/BRK
	2	103		FTB/SE1	152		FTB/BRK
	3	105		FTB/SE1	153		FTB/BRK
	4	107		FTB/SE1	155		FTB/BRK
	5	110		FTB/SE1	157		FTB/BRK
	AVG.	106			154		
DS-2	1	114		FTB/SE1	159		FTB/BRK
	2	110		FTB/SE1	158		FTB/BRK
	3	108		FTB/SE1	157		FTB/BRK
	4	110		FTB/SE1	157		FTB/BRK
	5	115		FTB/SE1	155		FTB/BRK
	AVG.	111			157		

HTS, INC. Consultants

HTS, INC. Consultants

416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 22, 1998

Philip Environmental
510 DD Road
Columbia, IL 62236

Attn: Mr. Don Flowers

Re: NSWC Crane
Peel and Shear Tests of Seams
60 mil textured HDPE
HTS Report No. PEN1254.006.doc

TEST PARAMETERS AND LABORATORY CONDITIONS			
Sample Type	ASTM	Sample Width (in)	1
Humidity (%)	50	Spec Gauge Length (in)	1
Temperature (deg. F)	73	Grip Distance (in)	1
Operator Name:	K. Phouangsavanh	Crosshead Speed (in/min)	2

Please find attached peel and shear reports of 6 samples delivered to our laboratory on 7/22/98. Peel and shear tests were performed in accordance with Test Method ASTM D 4437. The test results are summarized on the following pages:

SAMPLE I.D.	NOMINAL THICKNESS	SAMPLE I.D.	NOMINAL THICKNESS
DDS-3	60		
DDS-4	60		
DDS-5	60		
DDS-6	60		
DDS-7	60		
DDS-8	60		

Very truly yours,

Larry L. McMichael
Vice President

ENVIRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

		PEEL			SHEAR		
Sample	Spec. No.	lb / in.	% Peel	Break Code	lb / in.	% Peel	Break Code
DDS-3	1	123		FTB/SE1	156		FTB/BRK
	2	109		FTB/SE1	157		FTB/BRK
	3	114		FTB/SE1	157		FTB/BRK
	4	116		FTB/SE1	155		FTB/BRK
	5	112		FTB/SE1	154		FTB/BRK
	AVG.	115			156		
DDS-4	1	111		FTB/SE1	162		FTB/BRK
	2	111		FTB/SE1	162		FTB/BRK
	3	107		FTB/SE1	161		FTB/BRK
	4	116		FTB/SE1	161		FTB/BRK
	5	105		FTB/SE1	162		FTB/BRK
	AVG.	110			162		
DDS-5	1	128		FTB/SE1	167		FTB/BRK
	2	123		FTB/SE1	169		FTB/BRK
	3	117		FTB/SE1	169		FTB/BRK
	4	124		FTB/SE1	169		FTB/BRK
	5	121		FTB/SE1	168		FTB/BRK
	AVG.	123			168		
DDS-6	1	119		FTB/SE1	170		FTB/BRK
	2	120		FTB/SE1	171		FTB/BRK
	3	119		FTB/SE1	171		FTB/BRK
	4	151		FTB/SE1	169		FTB/BRK
	5	143		FTB/SE1	171		FTB/BRK
	AVG.	130			170		
DDS-7	1	129		FTB/SE1	174		FTB/BRK
	2	131		FTB/SE1	171		FTB/BRK
	3	130		FTB/SE1	173		FTB/BRK
	4	120		FTB/SE1	173		FTB/BRK
	5	126		FTB/SE1	172		FTB/BRK
	AVG.	127			173		

HTS, INC. Consultants

		PEEL			SHEAR		
Sample	Spec. No.	lb / in.	% Peel	Break Code	lb / in.	% Peel	Break Code
DDS-8	1	109		FTB/SE1	157		FTB/BRK
	2	121		FTB/SE1	157		FTB/BRK
	3	123		FTB/SE1	156		FTB/BRK
	4	113		FTB/SE1	156		FTB/BRK
	5	119		FTB/SE1	156		FTB/BRK
	AVG.	117			156		

HTS, INC. Consultants

416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 27, 1998

Philip Environmental
510 DD Road
Columbia, IL 62236

Attn: Mr. Don Flowers

Re: NSWC Crane
Peel and Shear Tests of Seams
60 mil textured HDPE
HTS Report No. PEN1254.007.doc

TEST PARAMETERS AND LABORATORY CONDITIONS			
Sample Type	ASTM	Sample Width (in)	1
Humidity (%)	50	Spec Gauge Length (in)	1
Temperature (deg. F)	73	Grip Distance (in)	1
Operator Name:	K. Phouangsavanh	Crosshead Speed (in/min)	2

Please find attached peel and shear reports of 1 sample delivered to our laboratory on 7/27/98. Peel and shear tests were performed in accordance with Test Method ASTM D 4437. The test results are summarized on the following pages:

SAMPLE I.D.	NOMINAL THICKNESS	SAMPLE I.D.	NOMINAL THICKNESS
DDS-9	60		

Very truly yours,

Larry L. McMichael
Vice President

ENVIRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

		PEEL			SHEAR		
Sample	Spec. No.	lb / in.	% Peel	Break Code	lb / in.	% Peel	Break Code
DDS-9	1	123		FTB/SE1	165		FTB/BRK
	2	123		FTB/SE1	166		FTB/BRK
	3	121		FTB/SE1	163		FTB/BRK
	4	126		FTB/SE1	163		FTB/BRK
	5	118		FTB/SE1	162		FTB/BRK
	AVG.	122			164		

HTS, INC. Consultants

416 PICKERING STREET • HOUSTON, TEXAS 77091
713/692-8373 • 800/692-TEST • FAX 713/692-8502

July 10, 1998

HTS Report #:	PEN1254.001.doc

Mr. Don Flowers	Customer Project Name:	NSWC Crane
Phillip Environmental	Customer Project #:	18328
510 DD Road	Lab Temperature:	73 degrees F.
Columbia, IL 62236	Lab Humidity:	50%

The following 3 samples were delivered to our laboratory on June 23, 1998.

SAMPLES RECEIVED								
	Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type		Sample I.D.	Mat'l Type
1	250260-47	GMT	6			11		
2	260-47	GMT	7			12		
3	304-47	GMT	8			13		
4			9			14		
5			10			15		

Conformance testing was performed in accordance with the following test methods. The test results are summarized on the subsequent pages. It should be noted that the test specimens and test sample used for this work were believed to be representative of the material produced under this designation. However, these results are indicative only of the specimens that were actually tested. HTS, Inc. neither accepts responsibility for nor makes claims to the final use and purpose of the material.

TESTING PERFORMED	TESTING PERFORMED
ASTM D 638 – Tensile Properties ASTM D 1505 – Density ASTM D 5199 – Thickness	

Very truly yours,

Larry L. McMichael
Vice President

ENVIRONMENTAL • GEOTECHNICAL ENGINEERING • CONSTRUCTION MATERIALS TESTING • ANALYTICAL SERVICES
SERVING THE CONSTRUCTION AND WASTE INDUSTRIES

TENSILE PROPERTIES – ASTM D 638

Instron Series IX Automated Materials Testing System

Sample Type: Dumbell — Cross Head Speed (in/min): 2.0
Width (in): .25 — Spec. Gauge Length (in): 2.0
Thickness (in): .06000 — Grip Distance (in): 2.50

	Spec.	Strength @ Break (lbs/in)		Strength @ Yield (lbs/in)		Elong. @ Break (%)		Elong. @ Yield (%)	
Sample	#	MD	XD	MD	XD	MD	XD	MD	XD
250-47	1	52.60	115.30	150.3	156.0	249.4	360.2	15.98	19.05
	2	173.20	148.70	151.3	162.0	404.4	393.2	14.68	20.56
	3	75.28	177.70	147.	145.2	190.1	440.0	17.26	18.52
	4	184.00	119.0	155.2	157.5	442.4	193.0	15.18	18.01
	5	201.90	105.40	163.5	161.3	462.4	278.2	15.70	17.56
	Avg.	137.4	133.2	153.5	156.4	349.7	332.9	15.8	18.7
260-47	1	126.4	166.0	177.9	174.1	267.6	395.3	19.32	19.79
	2	117.7	162.70	150.9	165.6	314.4	399.3	19.82	20.54
	3	164.2	158.80	167.4	157.4	406.0	402.8	19.32	19.32
	4	129.9	72.68	151.1	159.4	325.3	372.4	18.48	19.50
	5	139.0	152.90	157.7	156.8	357.0	386.4	22.29	20.05
	Avg.	135.4	142.6	161.0	162.7	334.1	391.2	19.8	19.8
304-47	1	146.2	116.10	148.0	127.7	410.4	233.8	14.69	15.96
	2	118.2	121.20	150.3	135.3	200.0	473.2	14.95	15.69
	3	168.0	138.10	163.1	132.7	385.6	377.1	15.14	18.21
	4	149.8	151.20	159.1	158.5	392.0	390.6	16.96	13.38
	5	144.8	144.0	135.3	159.6	412.0	357.2	16.40	14.43
	Avg.	145.4	134.1	151.2	142.8	360.0	366.4	15.6	15.5

DENSITY – ASTM D 1505

Sample Type: ASTM

Sample	Spec. #	Density (g/cc)
250-47	1	.943
	2	.943
	3	.943
	Avg.	0.943

Sample	Spec. #	Density (g/cc)
260-47	1	.946
	2	.946
	3	.946
	Avg.	0.946

Sample	Spec. #	Density (g/cc)
304-47	1	.948
	2	.948
	3	.948
	Avg.	0.948

THICKNESS – ASTM D 5199

Sample Type: ASTM
Type of Apparatus: Mitutoyo
Dimension of Pressure Foot:
Pressure Applied: Dead-weight
Loading Time Interval: 5 seconds
5 sec.

Sample	Spec. #	Thickness (mil)
250-47	1	61.0
	2	62.5
	3	63.5
	4	63.5
	5	64.0
	6	62.0
	7	61.5
	8	61.5
	9	64.0
	10	61.5
	Avg.	62.5

Sample	Spec. #	Thickness (mil)
260-47	1	61.0
	2	63.0
	3	61.0
	4	64.5
	5	62.5
	6	62.5
	7	60.5
	8	61.0
	9	61.5
	10	62.5
	Avg.	62.0

Sample	Spec. #	Thickness (mil)
304-47	1	62.5
	2	62.5
	3	63.5
	4	62.5
	5	62.5
	6	62.5
	7	60.0
	8	63.0
	9	62.0
	10	62.5
	Avg.	62.4

PHILIP ENVIRONMENTAL

Industrial Services Group
Midwest Region

June 12, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Lois Bigly 06-15-
Lois J. Bigly 06-15-

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Re-Submittal No. 025H

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-72	Manufacturer Test Results	02250

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

cc: D. Beall

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

POLY-FLEX, INC. 2008 W. Marshall Drive Grand Prairie, Texas 75051 USA
888-765-9359 972-337-7113 FAX 972-337-7233

June 12, 1998

Michelle Lotz
Environmental Design & Construction, Inc.
104 Wholesale Ave.
Huntsville, AL 35811

Re: 970658 Dye Burial Cap
Resin Verification

Dear Mrs. Lotz,

Poly-Flex, Inc. test data verifies the manufacturers test data.

		Melt Index
Blend #	7180098	.12
	7180099	.12
	7180248	.12

Sincerely,

Lou Jacobsen

Lou Jacobsen

H-3

Panel Deployment Sheets

- DBG -
SWMU 02/11
SUBCONTRACT 4324/106
PHILIP SERVICE GROUP

60MIL HDPE LINE
BY POLY-FLEX INC

ROLL #	DELIVERIED / STORED	DEPLOYED	REMARKS
GR-6-98 246-47	06-18-98	07-18-98	P-13,14,15
GR-6-98 247-47	06-18-98	07-17-98 07-18-98	P-10 P-11,12
GR-6-98 250-47 *	06-18-98	07-20-98	P-24,25,26 Conformation Sample
GR-6-98 253-47	06-18-98	07-17-98	P-7,8,9
GR-6-98 254-47	06-18-98	07-14-98	P-1,2,3
GR-6-98 260-47 *	06-18-98	07-14-98 07-17-98	P-4,5,6 Conformation Sample
GR-6-98 304-47 *	06-18-98	07-18-98 07-19-98	P-16,17,18 Conformation sample
GR-6-98 305-47	06-18-98	07-19-98 07-20-98	P-19,20,21,22,23
GR-6-98 266-47	07-23-98	07-23-98	P-28,29,30

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

60 MIL HDPE

PROJECT NAME: Dye Burial Ground SHEET 1 OF 1

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-14-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-1	0254	60 MIL	189	22.5	4,253
P-2	0254	60 MIL	186	22.5	4,185
P-3	0254	60 MIL	97	22.5	2,183
P-4	0260	60 MIL	100	22.5	2,250
P-5	0260	60 MIL	193	22.5	4,343
	TOTAL INSTALLED THIS PAGE				Ø
	TOTAL INSTALLED PREV. PAGE				17,214
	TOTAL INSTALLED TO DATE				17,214

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

60 MIL HDPE

PROJECT NAME: Dye Burial Ground SHEET 2 OF

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-17-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-6	0260	60 MIL	165	22.5	3,713
P-7	0253	60 MIL	38	22.5	855
P-8	0253	60 MIL	207	22.5	4,658
P-9	0253	60 MIL	210	22.5	4,725
P-10	0247	60 MIL	214	22.5	4,815
	TOTAL INSTALLED THIS PAGE				18,766
	TOTAL INSTALLED PREV. PAGE				17,214
	TOTAL INSTALLED TO DATE				35,980

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

60 MIL HDPE

PROJECT NAME: Dye Burial Ground SHEET OF

PROJECT #: 97006/N

PROJECT LOCATION: Crane, IN DATE: 7-18-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-11	0247	60 MIL	196	22.5	4,410
P-12	0247	60 MIL	55	22.5	1,238
P-13	0246	60 MIL	106	22.5	2,385
P-14	0246	60 MIL	157	22.5	3,533
P-15	0246	60 MIL	156	22.5	3,510
P-16	0304	60 MIL	155	22.5	3,488
P-17	0304	60 MIL	159	22.5	3,578
	TOTAL INSTALLED THIS PAGE				22,142
	TOTAL INSTALLED PREV. PAGE				35,980
	TOTAL INSTALLED TO DATE				58,122

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

60 MIL HDPE

PROJECT NAME: Dye Burial Ground SHEET ___ OF ___

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-19-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-18	0304	60 MIL	148	22.5	3,330
P-19	0305	60 MIL	147	22.5	3,308
P-20	0305	60 MIL	146	22.5	3,285
P-21	0305	60 MIL	137	22.5	3,083
P-22	0305	60 MIL	11	22.5	248
	TOTAL INSTALLED THIS PAGE				13,254
	TOTAL INSTALLED PREV. PAGE				58,122
	TOTAL INSTALLED TO DATE				71,376

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

60 HDPE

PROJECT NAME: Dye Burial Ground SHEET ____ OF ____

PROJECT #: 97006 IN

PROJECT LOCATION: Crand, IN DATE: 7-20-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-23	8305	60 MIL	39	22.5	878
P-24	0250	60 MIL	108	22.5	2,430
P-25	0250	60 MIL	128	22.5	2,880
P-26	0250	60 MIL	109	22.5	2,453
	TOTAL INSTALLED THIS PAGE				8,641
	TOTAL INSTALLED PREV. PAGE				71,376
	TOTAL INSTALLED TO DATE				80,017

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

60 MIL HDPE

PROJECT NAME: Dye Burning Ground SHEET ____ OF ____

PROJECT #: 97006 IN

PROJECT LOCATION: Crane, IN DATE: 7-22-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-27	8250	60 MIL	95	22.5	2,138
	TOTAL INSTALLED THIS PAGE				2,138
	TOTAL INSTALLED PREV. PAGE				80,017
	TOTAL INSTALLED TO DATE				82,155

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (256) 551-0372 • Fax: (256) 551-0347

60 MIL HDPE

PROJECT NAME: Dye Burial Ground SHEET ____ OF ____

PROJECT #: 97006 IN

PROJECT LOCATION: Crown, IN DATE: 7-23-98

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
P-28	0266	60 MIL	83	22.5	1,868
P-29	0266	60 MIL	68	22.5	1,530
P-30	0266	60 MIL	68	22.5	1,530
					4,928
	TOTAL INSTALLED THIS PAGE				~~4,928~~
	TOTAL INSTALLED PREV. PAGE				82,155
	TOTAL INSTALLED TO DATE				87,083

H-4

Manufacturer's QC Certificates

PHILIP
ENVIRONMENTAL

...ial Services Group
...est Region

RECEIVED
MAY 27 1998
MK-CRANE

May 22, 1998
Project 18328

Mr. Vernon D. Logan
Contract Administrator
Morrison Knudsen Corporation
300 Highway 361
NSWC - CTR 12
Crane, Indiana 47522

Lois J. Bigley 05/31/98
Lois J. Bigley 05-31-98

Dear Mr. Logan

DATA PROVIDED ALSO MEETS THE REQ for THE FOLLOWING DATA SUBMITTALS
1-71 Resin QC certs
1-60 Cert of Compliance for Typal Geotextile

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Re-Submittal No. 025D

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-62	Quality Control Certificates	02249
1-76	Manufacturer Quality Control Certificates	02250

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

Poly-Flex

Geomembrane Shipment Inspection

Date: 13-May-98 Trip # Pre-Cert

Drop # 1
Poly-Flex # 970658
Customer: EDCI
Destination:
Carrier:

	Blend	Roll Number	Weight	Roll Description
1	7180098	GR-6-98- 0246- 47	3,350	23' x 475' x .060HDR
2	7180098	GR-6-98- 0247- 47	3,342	23' x 475' x .060HDR
3	7180099	GR-6-98- 0250- 47	3,348	23' x 475' x .060HDR
4	7180099	GR-6-98- 0253- 47	3,350	23' x 475' x .060HDR
5	7180099	GR-6-98- 0254- 47	3,336	23' x 475' x .060HDR
6	7180099	GR-6-98- 0260- 47	3,338	23' x 475' x .060HDR
7	7180248	GR-6-98- 0304- 47	3,330	23' x 475' x .060HDR
8	7180248	GR-6-98- 0305- 47	3,340	23' x 475' x .060HDR
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Pieces shipped		**26,734**	
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

I certify that all loading requirements and roll conditions were inspected and approved.

GENE RODRIGUEZ
Truck Loader

CERTIFICATION SHEET

POLY-FLEX, INC.

2000 W. Marshall Drive
Grand Prairie, Texas 75051

PROJECT NO: 970658 DATE: 5/13/98

TRIP NO: Pre-Certified CERTIFIED BY: [signature]

TEST DESCRIPTION		THICKNESS	CARBON BLACK	TEAR	PUNCTURE	TENSILE @ YIELD	ELONG @ YIELD	TENSILE @ BREAK	ELONG @ BREAK	CAR. BLK. DISPERSION	DENSITY	ESCR (cond. B)
ASTM METHOD		D1593	D1603	D1004	FTMS 101	D638	D638	D638	D638	D3015	D1505	D1693
(modifications)		min/avg			2065							1500 hrs
UNITS		mils	%	lb	lb	ppi	%	ppi	%		gm/cc	PASS
60HDR SPECIFICATION		54/60	2 - 3	40	~~78~~ 80	132	12	132	240	A1/A2/B1	0.940	1500
ROLL NUMBER	BLEND											(Start)
GR-6-98 246-47	7180098	54/ 62	2.8	52	90	145	22	159	453	A-1	0.947	4/04/98
GR-6-98 247-47	7180098	54/ 62	2.8	52	90	145	22	159	453	A-1	0.947	4/04/98
GR-6-98 250-47	7180098	54/ 62	2.6	48	92	144	22	162	487	A-1	0.947	4/04/98
GR-6-98 253-47	7180098	54/ 62	2.8	49	85	142	13	157	453	A-1	0.947	4/04/98
GR-6-98 254-47	7180098	54/ 62	2.8	49	85	142	13	157	453	A-1	0.947	4/04/98
GR-6-98 260-47	7180099	56/ 62	2.7	48	97	138	17	167	512	A-1	0.947	4/04/98
GR-6-98 304-47	7180248	54/ 62	2.7	50	96	150	15	150	402	A-1	0.947	4/11/98
GR-6-98 305-47	7180248	54/ 62	2.7	50	96	150	15	150	402	A-1	0.947	4/11/98

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3665
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

February 05, 1998

JHV# 2626-98

FAX: 972-337-7407

Poly America, Inc.
2000 West Marshall Drive
Grand Prairie, TX 75051

Dee Averitte

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 hours
(not tested on each lot)

Type:	HHM TR-400G
Lot Number:	7180098
P.O. Number:	17798
Date Shipped:	02/04/98
Package:	PSPX 9147
Quantity:	183050 LBS.
HLMI Flow Rate,ASTM D1238:	12.0 G/10 MIN
Melt Index, ASTM D1238:	.120 G/10 MIN
Density, ASTM D1505:	.937 G/CC

J. H. Vaden
Quality Assurance Manager

For COA questions call Sharon Robinette, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

Mr. Jim Nobert
Poly America, Inc.
2000 West Marschall Drive
Grand Prairie, TX 75051

1-71

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

February 09, 1998

JHV# 2811-98

FAX: 972-337-7407

Poly America, Inc.
2000 West Marshall Drive
Grand Prairie, TX 75051

Dee Averitte

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 hours
(not tested on each lot)

Type:	HHM TR-400G
Lot Number:	7180099
P.O. Number:	17798
Date Shipped:	02/06/98
Package:	PSPX 6202
Quantity:	182450 LBS.
HLMI Flow Rate,ASTM D1238:	12.7 G/10 MIN
Melt Index, ASTM D1238:	.090 G/10 MIN
Density, ASTM D1505:	.937 G/CC

J. H. Vaden
Quality Assurance Manager

For COA questions call Sharon Robinette, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

Mr. Jim Nobert
Poly America, Inc.
2000 West Marschall Drive
Grand Prairie, TX 75051

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

March 05, 1998

JHV# 4915-98

FAX: 972-337-7407

Poly America, Inc.
2000 West Marshall Drive
Grand Prairie, TX 75051

Dee Averitte

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 hours (not tested on each lot)

Type:	HHM TR-400G
Lot Number:	7180248
P.O. Number:	18419
Date Shipped:	03/04/98
Package:	PSPX 2327
Quantity:	186300 LBS.
HLMI Flow Rate,ASTM D1238:	12.1 G/10 MIN
Melt Index, ASTM D1238:	.090 G/10 MIN
Density, ASTM D1505:	.938 G/CC

J. H. Vaden
Quality Assurance Manager

For COA questions call Sharon Robinette, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

Mr. Jim Nobert
Poly America, Inc.
2000 West Marschall Drive
Grand Prairie, TX 75051

Type 1

TNS
ADVANCED TECHNOLOGIES

881 DeYoung Road
Greer, South Carolina 29651
Tel: (864) 968-0592
Fax: (864) 879-4639
Toll Free: (800) 867-5181

1-60

May 14, 1998
REF: TNS R070
PO: 93707
Quantity: 36 rolls

EDCI
Huntsville AL

Dear Sir/Madam:

This is to certify that TNS R070 is a 100% polypropylene, nonwoven, needle-punched fabric. TNS R070 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. Polypropylene is stable within a pH range of 2 to 13. TNS R070 conforms to the physical properties listed in the following table:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V
Weight(typical)	ASTM D 3776	oz/sy	7.0
Thickness	ASTM D 5199	mils	90
Grab Tensile	ASTM D 4632	lbs	180
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs	75
Puncture	ASTM D 4833	lbs	105
Mullen Burst	ASTM D 3786	psi	350
A.O.S.	ASTM D 4751	U.S. Sieve	80
Permeability	ASTM D 4491	cm/sec	0.30
Permitivity	ASTM D 4491	1/sec	1.5
Water Flow	ASTM D 4491	gpm/sq.ft.	100
U.V. Resistance	ASTM D 4355	% retained	70

Sincerely,

Paul M. Mosley
TNS Advanced Technologies

IN1358 INS Packing List - 14:22, 05/12/98 Page 1

Roll #	Styl-Wtr-Yds	Gross	Yard	Net
Location "EDGI70" Available, Only				
991833	R070 180 300	224	17	207
991844	R070 180 300	223	17	206
991845	R070 180 300	224	17	207
991847	R070 180 300	222	17	205
991856	R070 180 300	223	17	206
991860	R070 180 300	223	17	206
991868	R070 180 300	223	17	206
991873	R070 180 300	225	17	208
991874	R070 180 300	224	17	207
991894	R070 180 300	225	17	208
991895	R070 180 300	225	17	208
991897	R070 180 300	227	17	210
991898	R070 180 300	225	17	208
991900	R070 180 300	225	17	208
991911	R070 180 300	225	17	208
991913	R070 180 300	223	17	206
991944	R070 180 300	229	17	212
991953	R070 180 300	226	17	209
991958	R070 180 300	226	18	208
991972	R070 180 300	226	18	208
991973	R070 180 300	226	18	208
991987	R070 180 300	226	18	208
992118	R070 180 300	226	17	209
992124	R070 180 300	226	18	208
992127	R070 180 300	226	18	208
992130	R070 180 300	225	18	207
992132	R070 180 300	225	18	207
992138	R070 180 300	224	18	206
992145	R070 180 300	229	18	211
992160	R070 180 300	226	18	208
992161	R070 180 300	227	18	209
992165	R070 180 300	226	18	208
992171	R070 180 300	227	18	209
992181	R070 180 300	228	18	210
992246	R070 180 300	252	18	234
993498	R070 180 300	252	18	234

"EDGI70" Totals: 8,154 529 7,535 36 Rolls----

TNS Mills, Inc. Nonwoven Quality Data 05/12/98 Page 1

Roll #	Coll Wgt	Ins	Wgt	Thick	Stnd	Stnd	Elng	Elng	Trap	Trap	Burst	Burst	Flow	Perm	Perm	BOS
					MD	XMD	MD	XMD	MD	XMD	Rate	Strg	Rate	Sel	Rev	
991833	R070	180	300	7.2	103	205	184	71	82	113	126	111	372	101	.37	1.5	80
991894	R070	180	300	7.0	96	195	184	58	78	88	98	106	387	101	.37	1.6	80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.37	1.6	80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.37	1.6	80
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.37	1.6	80
992246	R070	180	300	7.0	99	211	235	59	71	75	75	136	423	102	.30	1.6	80
993498	R070	180	300	7.3	101	191	188	58	80	85	85	130	400	102	.30	1.6	80

CERTIFICATION SHEET

POLY-FLEX, INC.
2000 W. Marshall Drive
Grand Prairie, Texas 75051

PROJECT NO: 970658 DATE: 7/22/98
TRIP NO: CPU CERTIFIED BY:

TEST DESCRIPTION		THICKNESS	CARBON BLACK	TEAR	PUNCTURE	TENSILE @ YIELD	ELONG @ YIELD	TENSILE @ BREAK	ELONG @ BREAK	CAR. BLK. DISPERSION	DENSITY	ESCR (cond. B)
ASTM METHOD		D1593	D1603	D1004	FTMS 101	D638	D638	D638	D638	D3015	D1505	D1693
(modifications)		min/avg			2065							2000 hrs
UNITS		mils	%	lb	lb	ppi	%	ppi	%		gm/cc	PASS
60HDR SPECIFICATION		54/60	2 - 3	40	78	132	12	132	240	A1/A2/B1	0.940	1500
ROLL NUMBER	BLEND											(Start)
GR-6-98 266-X	7180099	54/ 61	2.6	53	95	151	15	171	450	A-1	0.947	4/04/98

JUL-23-1998 09:50 2055510379 94% P.03

1-76

Poly-Flex

Geomembrane Shipment Inspection

Tractor # CPU Trailer # CPU Date: 21-Jul-98 Trip # 276198

Drop # 1
Poly-Flex # 970668(276198)
Customer: EDIC
Destination: CRANE,IN
Carrier: CPU

Jois J Bejes 07-23-98

Date 07-23-98

	Blend	Roll Number	Weight	Roll Description
1	7180099	GR-6-98- 0266- X	3,178	23' X 455' X .060HDR
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Pieces shipped		3,178	
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

I certify that all loading requirements and roll conditions were inspected and approved.

GENE RODRIGUEZ
Truck Loader

NSWC CRANE
DYE BURIAL GROUND CAP

Submittal Item No. 1-75(A)
Specification Section 02250

Written Certificate of Compliance

Phillip Environmental Services Corp.
210 West Sand Bank Road
Columbia, IL 62236

Geosynthetics Contractor
Environmental Design & Construction, Inc.
104 Wholesale Avenue
Huntsville, AL 35811

Lois J. Bigley, Date 12-28-97

Certified by QC Manager Lois J. Bigley, Date 12/28/97
(signature)

POLY-FLEX, INC. 2800 W. Marshall Drive Grand Prairie, Texas 75051 USA
888-765-9359 972-337-7113 FAX 972-337-7233

Ms. Michelle Lotz
Environmental design and Construction, Inc.
104 Wholesale Avenue
Huntsville, AL 35811

September 12, 1997

Subject: Dye Burial Project, Crane, Indiana

Dear Michelle,

Here is the information you requested regarding the above referenced project.

1-65 Poly-Flex has been manufacturing textured geomembranes since 1989. Poly-Flex has successfully manufactured nearly 1 billion square feet of polyethylene geomembranes since 1986, a large percentage has been textured sheet.

1-70 Poly-Flex primarily uses Phillips resin, HHM TR-400G. A typical resin certificate from Phillips is included with this transmittal.

1-72 Poly-Flex tests all incoming resins to verify the resins meet the Poly-Flex specifications. At a minimum, these tests include density (ASTM D 1505), melt index (ASTM D 1238), and carbon black content (ASTM D 1603), if applicable. A copy of this test report will be supplied upon request.

1-73 Poly-Flex geomembrane consists of approximately 97% polyethylene resin, 2.5% carbon black, and 0.5% anti-oxidants. No plasticizers or fillers are used.

1-74 & 1-75 Poly-Flex has taken no exceptions to the project's liner specification under Table 1, page 02250-9. Poly-Flex, Inc. certifies that all rolls for the above referenced project will meet the Poly-Flex standard specification and the property values listed under Table 1 of the project specification.

1-76 A blank Poly-Flex standard certification sheet is included with this transmittal. Poly-Flex uses ASTM D 1593, weight/density correlation, to measure and report the material thickness. Poly-Flex, Inc. certifies that its 60 mil textured HDPE meets the project's thickness requirement based on the ASTM D 5199 (i.e. 0.25" diameter dial head micrometer) and the required puncture resistance per ASTM D 4833 test method.

Sincerely,

George Yazdani

George Yazdani, MSc., P.E.
Regional Manager

H-5
Warranties

MORRISON KNUDSEN CORPORATION
300 Highway 361, CTR-12
P.O. Box 310
Crane, IN 47522
(812) 854-6941
Fax: (812) 854-6944

October 19, 1998 FMK-0009-073

Mr. Donald Flowers
Project Manager, Philip Environmental Services
210 West Sand Bank Road
Columbia, IL 62236

Reference: Subcontract 4324-106, Submittals

Subject: Submittal No. 085

Dear Mr. Flowers:

The attached subject submittal is accepted. Please retain the attached for your records.

If you have any questions or concerns, please contact me at (812) 854-6941.

Sincerely,
MORRISON KNUDSEN CORPORATION

D Beall

Dave Beall
Project Manager

Attachments

cc: J. McCumbers w/o attachments D. Beall w/o attachments **K. Ohsiek**

file: 13-1.2-0009 17-26-0009

PHILIP
ENVIRONMENTAL

Industrial Services Group
Midwest Region

September 14, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Lois J. Bigley 09-17-
Lois J. Bigley 9/1

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Submittal No. 079

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-90	Installers Written Warranty	02250

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald L. Flowers

Donald L. Flowers,
Project Manager

cc: D. Beall

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

104 Wholesale Avenue, Huntsville, AL 35811 • **Tel: (256) 551-0372** • Fax: (256) 551-0347

WORKMANSHIP WARRANTY....

Warranty No: 97006IN
Effective Date: 8/5/98

Environmental Design & Construction Inc., hereinafter referred to as EDCI, warrants each Liner System installed by EDCI to be free from defects in workmanship. This "Workmanship Warranty" shall be in effect from the date the installation of the Liner is completed and accepted by the Owner for a period of Twenty (20) years of normal use in approved applications. This Limited Warranty does not include damage or defects in Liner resulting from Acts of God, or casualty or catastrophe including, but not limited to: earthquakes, floods, piercing hail, tornadoes, hurricanes, high winds, lightening, fire, or force majeure. The term "normal use" as used herein does not include, among other things, the exposure of Liner to harmful chemicals or sharp objects; abuse of Liner by machinery, equipment, animals or people; excessive pressures or stresses from any source; subsurface or overburdened soil conditions; total or differential soil settlements and the effect these may have on the liner system; improper site preparation or design and engineering by parties other than EDCI; and any other event beyond the reasonable control of EDCI. In addition, and unless otherwise confirmed in writing by EDCI, the act of installing material shall not constitute an acceptance by EDCI that site preparation, design & engineering by others were proper at such time.

Any claim for any alleged breach of this warranty must be made in writing, by certified mail, to the president of EDCI within thirty (30) days after the alleged defect is first noticed. Should the required notice not be given, the defect and all warranties shall be deemed to have been waived by the Purchaser and Purchaser shall have no right of recovery against EDCI.

After receipt of the foregoing notice, EDCI shall notify the Purchaser that EDCI representatives will inspect the material, that additional information is required from the Purchaser, or that the alleged claim is not covered by this warranty. If, after conducting an inspection, EDCI determines the claim is not covered by this warranty, then the Purchaser shall pay EDCI all reasonable travel expenses, published per diem rates and appropriate fees, and related expenses for EDCI personnel examining the site.

Under no circumstances shall the Purchaser repair, replace, remove, alter or disturb the liner material or permit any other party to do so prior to EDCI inspection of the same or receipt that the claim is excluded from this warranty; otherwise, this warranty shall be void in its entirety.

In the event repairs or replacements are to be effected, said repairs and/or replacements shall not become due until the area subject to replacement of Liner is available to EDCI in a clean, dry, unencumbered condition. This includes, but is not limited to, the area made available for repair or replacement of liner to be free from all water, dirt, sludge, residuals, and liquids of any kind.

Should defects or premature loss of use within the scope of the above Limited Warranty occur, EDCI will, at its option, repair or replace the liner on a pro-rata basis at the then current price in such manner as to charge the Purchaser/User only for that portion of the warranted life which has elapsed since purchase of the material. Any installation repair or replacement will be covered by the unexpired term of this warranty.

EDCI's liability under this warranty shall in no event exceed the replacement cost of the material sold to the Purchaser for the particular installation in which it failed. Further, under no circumstances shall EDCI be liable for any special, direct, indirect or consequential damages arising from loss of production or any other losses, including losses due to personal injuries and product liability owing to the failure of the material or installation.

EDCI neither assumes nor authorizes any person, other than an Officer of EDCI, to assume for it any other or additional liability in connection with the liner than what has been made the basis of this Limited Warranty. The Limited Warranty herein is given in lieu of all other possible warranties, either express or implied, and by accepting delivery of material, purchaser waives all other such possible warranties, except those specifically given. In the event any term or provision of this warranty is inconsistent or conflicts with any writing, purchase order or contract executed by EDCI and the Purchaser of the installation services, then to the extent such inconsistency or conflict exists, the terms and provisions of this warranty shall control in all respects.

EDCI MAKES NO WARRANTY OF ANY KIND OTHER THAN THAT GIVEN ABOVE AND HEREBY DISCLAIMS ALL WARRANTIES, BOTH EXPRESS AND IMPLIED OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Purchaser acknowledges by acceptance that the Limited Warranty given herein is accepted in preference to any and all other possible warranties.

The parties expressly agree that the sale hereunder is for commercial or industrial use only.

WARRANTY BECOMES EFFECTIVE UPON RECEIPT OF PAYMENT IN FULL.

I hereby state I have read and understand the above and foregoing Limited Warranty and agree to such by signing hereunder.

Purchaser/User	Naval Facilities Engineering Command, Southern Div.
Location of Installation	NSWC Crane - Dye Burial Grounds
Description of Intended Use	Cap Installation
Purchaser/User Signature	_____
Environmental Design & Construction, Inc.	Diane P. Harris Diane P. Harris - President

Sworn before me this 9th day of September, 1998.

Marcia Allen Bayl

Notary Public - My Commission Expires on July 10, 2000.

PHILIP ENVIRONMENTAL

Industrial Services Group
Midwest Region

RECEIVED
OCT 14 1998
MK-CRANE

October 8, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

NSWC - CRANE			
4324-0009			
PROJECT MEMBER	ACT	INFO	INIT
PROJECT MANAGER		X	
PROJECT ENGINEER			
GNL SUPT			
SAFETY AND HEALTH			
QA/QC			
PROJECT CONTROLS			
FIELD ENGINEERING			
PMO-CHARLESTON			
FILE:			
FILE:			
FILE:			

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Submittal No. 085

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-89	Manufactures Warrenty	02250

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald L. Flowers,
Project Manager

cc: D. Beall

POLY-FLEX LINER
LIMITED WARRANTY

Warranty No: 98-44-053
Project No: 970658
Effective Date: 09/25/98

OWNER NAME: Commander, Crane Division, NSWC
ADDRESS: Code 095, Building No. 3260
300 Highway 361
CITY, STATE, ZIP: Crane, IN 47522

PROJECT NAME: Dye Burial Ground
DESCRIPTION: Cap
ADDRESS: 300 Hwy. 361 NSWC Center 12
CITY, STATE, ZIP: Crane, IN 47522

POLY-FLEX, INC. warrants each POLY-FLEX LINER to be free from defects in materials and to be able to withstand normal weathering from date of installation or sale, whichever occurs first, for a period of 20 years for normal use in approved applications.

This Limited Warranty does not include damages or defects in Poly-Flex Liner resulting from acts of God, casualty or catastrophe including but not limited to: earthquakes, floods, piercing hail, tornadoes or force majeure. The term "normal use" as used herein does not include, among other things, the exposure of Poly-Flex Liner to harmful chemicals, abuse of Poly-Flex Liner by machinery, equipment or people, excessive pressures or stress from any source. Poly-Flex material warranty is intended for commercial use only and is not in effect for the consumer as defined in the Magnuson-Moss Warranty Act or any similar federal, state, or local statutes.

Should defects or premature loss of use within the scope of the above Limited Warranty occur, Poly-Flex, Inc. will, at its option, repair or replace the Poly-Flex Liner on a pro-rata basis at the then current price in such manner as to charge the Purchaser/User only for that portion of the warranted life which has elapsed since purchase of the material. Poly-Flex, Inc. will have the right to inspect and determine the cause of any alleged defect in the Poly-Flex Liner and to take appropriate steps to repair or replace the Poly-Flex Liner if a defect exists and is within the term of this Limited Warranty.

Any claim for any alleged breach of this warranty must be made in writing, by certified mail, to the General Manager of Poly-Flex. Inc. within thirty (30) days after the alleged defect is first noticed. Should the required notice not be given, the defect and all warranties shall be deemed to have been waived by the Purchaser, and Purchaser shall have no right of recovery against Poly-Flex, Inc. In the event repairs and/or replacements are to be effected, said repairs and/or replacements shall not become due until the area subject to repair and/or replacement of Poly-Flex Liner is available to Poly-Flex, Inc. in a reasonably clean, dry, unencumbered condition. This includes, but is not limited to, the area made available for repair and/or replacement of Poly-Flex Liner to be free from all water, dirt, sludge, residuals, and liquids of any kind.

Poly-Flex, Inc.'s liability under this warranty shall in no event exceed the replacement cost of the material sold to the Purchaser for the particular installation in which it failed. Further, under no circumstances shall Poly-Flex, Inc. be liable for any special, direct, indirect, or consequential damages arising from loss of production or any other losses including losses due to personal injuries and product liability owing to the failure of the material or installation and no allowance will be made for repairs, replacements, or alterations made by the Purchaser without the express written consent of Poly-Flex, Inc.

Poly-Flex, Inc. neither assumes nor authorizes any person other than an officer of Poly-Flex, Inc. to assume for it any other or additional liability in connection with the Poly-Flex Liner made the basis of this Limited Warranty. The Limited Warranty on the Poly-Flex Liner herein is given in lieu of all other possible material warranties, either express or implied, and by accepting delivery of the material, Purchaser waives all other possible warranties, except those specifically given.

The parties expressly agree that the sale hereunder is for commercial or industrial use only.

Poly-Flex Limited Warranty is extended to the purchaser/owner and is non-transferable and non-assignable, without Poly-Flex, Inc. consent.

Purchaser acknowledges by acceptance that the Limited Warranty given herein is accepted in preference to any and all other possible materials warranties.

POLY-FLEX, INC. MAKES NO WARRANTY OF ANY KIND OTHER THAN THAT GIVEN ABOVE AND HEREBY DISCLAIMS ALL WARRANTIES, BOTH EXPRESS OR IMPLIED, OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

WARRANTY BECOMES EFFECTIVE UPON RECEIPT OF FINAL PAYMENT

I hereby state I have read and understood the above and foregoing Limited Warranty and agree to such by signing hereunder.

PURCHASER NAME: _____

SIGNATURE: _____

TITLE: _____

DATE: _____

POLY-FLEX, INC. _____
General Manager

Sworn before me this 28 day of September 1998.

Lisa McCormick

Submittal 1-89
"Accepted"
D Bell 10/15/98

LISA MCCORMICK
NOTARY PUBLIC
STATE OF TEXAS
MY COMM. EXP. 09-17-2002

H-6

Installation Procedures

NSWC CRANE
DYE BURIAL GROUND CAP

[illegible] (material) [illegible] proposed to be incorporated into [illegible] is in compliance with the [illegible] installed in the allocated spaces [illegible] QUAL.

Con[illegible] Reviewer Lois J Bigley Date 12-23-97
(signature when applicable)

Certified by QC Manager Lois J. Bigley Date 12-23-97
(signature)

Submittal Item No. 1-80
Specification Section 02250

Installation and Repair Procedure

Philip Environmental Services Corp.
210 West Sand Bank Road
Columbia, IL 62236

Geosynthetics Contractor
Environmental Design & Construction, Inc.
104 Wholesale Avenue
Huntsville, AL 35811

· · · We Make A World Of Difference

LINER INSTALLATION AND QUALITY CONTROL/ QUALITY ASSURANCE MANUAL

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.

Corporate Office: 104 Wholesale Avenue, Huntsville AL 35811

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*Dr. Henry Haxo, Matrecon, Inc., Alameda, CA.

INTRODUCTION

EDCI has developed this Liner Installation and Quality Control/Quality Assurance Manual based on its experience in the field. If projects have specifications not addressed in this Manual, such specifications shall become an appendix to this Manual. EDCI warrantees its workmanship and the manufacturers warrantee the materials.

Although the most commonly used geosynthetic used for liners is the geomembrane systems, other lining systems are discussed such as geotextiles, geonets and geocomposites.

EDCI's duties as the Installer are:

- Develop and implement staffing, equipment and operational plans prior to job start.
- Determines if surface conditions are satisfactory for deployment according to project specifications.
- Performs/supervises the deployment, seaming, testing, repair and detailing of the geosynthetic components installation.
- Performs/supervises the welding technicians and support help to perform the these tasks.
- Performs/supervises repair and maintenance of all equipment and vehicles used on the jobsite.
- Interfaces with the owner/agent on all matters of scheduling involving the scope of the installation process.
- Develop time and scope estimates for any applicable change orders.
- Supervises the completion of all lining installation work including clean up of the jobsite.
- Perform as the primary on-site interfacer with owner/agent or third party CQA personnel.
- Review safety plans and procedures.
- Review panel layout and numbering systems for panels, seams and test samples.
- Review methods of measuring production.
- Review procedures for incremental acceptance.
- Review procedures for initiating and documentation requirements.

- Visit jobsite for review of surface preparation, physical location of site and site access.

1.0 DEFINITIONS

EDCI has planned a system of routine QA/QC inspections to monitor and control the quality of a construction project. The system includes inspections, verifications, audits and evaluations of materials and workmanship necessary to determine and document the quality of the constructed project.

2.0 PARTIES INVOLVED

A successful liner installation depends on the responsible and timely interaction of all involved parties and coordination of all installation, inspection, testing and documentation.

Owner	Owner of the property and/or facility; responsible for the final acceptance of the work performed.
Designer	Architectural and/or engineering entity responsible for project planning, design, specifications, and drawings. The Designer may also be the Project Manager. The Designer is responsible for the selection and specification of geotextiles,geonets, geogrids and geocomposites.
Project Manager	Authorized representative of the owner in charge of project scheduling and coordination of construction activities.
General Contractor	Prime Contractor for the project may delegate specific tasks in a contractual agreement to one or more subcontractor. The General Contractor is System Installer and/or Earth Work Contractor.
Liner System	Subcontractor for the complete installation of the Installer synthetic liner system must perform according to its contract with the Owner or the General Contractor. EDCI will follow the manufacturer's specifications and recommendations for handling the materials.
Liner Manufacturer	Manufacturer of the geomembrane from raw (resin) material. The manufacturer shall provide the installer or project manager with a list of "minimum average roll value" properties for the type of material delivered. The manufacturer shall also provide the installer or project manager a Quality Assurance document for each load of material stating that those specific rolls of material meet or exceed the minimum average roll values as published. The manufacturer shall identify all rolls of geotextile with *manufacturer name, product identification, lot number, roll number, roll dimensions.*
Soil CQA Consultant	Party independent of the General Contractor and the Liner Installer in charge of monitoring, testing, inspecting and documenting all earth work. Also referred to as a Soil Inspector.
Geosynthetic CQA Consultant	Party independent of the General Contractor and the Liner Installer who monitors tests, inspects and documents the installation of all geosynthetic materials such as geomembranes, geotextiles, geonets and geogrids. Also referred to as Third Party CQA or Liner Inspector.
Independent Laboratory	Testing laboratory. CQA for the installer or the general contractor for a project.

3.0 PERSONNEL QUALIFICATIONS

The CQA plans should identify the required qualifications of the CQA officer and the CQA inspection personnel and describe their expected duties.

3.1 CONSTRUCTION QUALITY ASSURANCE OFFICER

CQA officer is assigned singular responsibility for all aspects of the CQA plan implementation. The CQA officer is responsible to the facility Owner/Operator and should function independently of the Owner/Operator, Design Engineer and the Construction Contractor. The CQA officer's position within the project's overall organizational structure (which includes the facility Engineer, Construction Contractor and permitting agencies) should be clearly described within the CQA plan.

The CQA officer should possess adequate formal academic training in engineering, engineering geology or other closely related disciplines. He must also posses sufficient practical, technical and administrative experience to successfully over-see and implement CQA activities for land disposal facilities. The responsibilities of a CQA officer may require his or her formal registration as a Professional Engineer or equivalent. Because a CQA officer must communicate at all project personnel levels, communication skills of a high order are essential. The CQA officer must impress upon all affected personnel the importance and implications of all CQA-related matters and mobilize them to action.

3.2 CQA INSPECTION PERSONNEL

CQA Inspection personnel should posses adequate formal training and sufficient practical, technical and execute and document inspection activities. Such personnel must demonstrate knowledge of specific field practices relating to techniques used in the construction of waste land disposal facilities, and of all codes/regulations concerning material and equipment installation, observation and testing procedures, equipment, documentation procedures and site safety.

3.3 CONSULTANTS

Authorities in Geology, Geotechnical Engineering, Civil or Environmental Engineering, or other technical disciplines may be called in from external organizations in the event of unusual site conditions or inspection results. The CQA plan should stipulate in detail the qualifications of such consultants, in the event that it becomes necessary to obtain and use an outside opinion as the basis for a decision implicating construction quality assurance. Consultants should not be used to collect and interpret data when suitable objective observations and test procedures are readily available.

4.0 MEETINGS

A pre-construction meeting shall be held at the work site prior to commencing the liner installation to discuss work activities, quality control and quality assurance procedure.

A daily meeting shall be held at the work site just prior to commencing the work day. The meeting must include the installed the liner inspector and will include discussion of both recently completed and imminent activities.

4.1 PRE-CONSTRUCTION MEETINGS

A meeting should be held after the award of the contract and prior to starting the construction of the facility to resolve any uncertainties and review construction objectives. The owner, designer, CQA personnel, general contractor and the subcontractors should attend this meeting to discuss the following topics:

- The provision of all organizations with all relevant CQA documents and supporting information.
- The familiarization of all organizations with the site specific CQA plan and its role relative to the design criteria, plans and specifications.
- What, if any, modifications to the CQA plan are necessary to ensure the facility will satisfy or exceed the specified construction design.
- The current responsibilities of each organization.
- The chain of command and communication protocols within each organization.
- The merits of established procedures/protocols for observations and tests (including sampling strategies).
- The merits of established procedures/protocols regarding construction deficiencies, repairs and retesting.
- Methods for documenting and reporting inspection data.
- Security and safety protocols for the work area.
- The protection of construction materials from changes in climate and vandalism.

This meeting should conclude with a walk around the site to review construction material and inspecting equipment storage locations. A designated person should document the meeting and minutes should be distributed to all parties.

4.2 DAILY PROGRESS MEETINGS

A daily meeting shall be held at the work site just prior to commencing the work day. The meeting must include the installer and the liner inspector. The purpose of the meeting is to:

- Review the previous day's activity.
- Agree on measurements and specific areas of the previous day's approved work.
- Review the work schedule.
- Review work activity and location for the day.
- Discuss the Installer's personnel assignments for the day.
- Discuss possible problem areas and situations.

5.0 MATERIAL LOGISTICS

5.1 TRANSPORTATION

Geomembrane rolls or panels are packaged and shipped in a manner that will protect them from damage. Transportation is the responsibility of the manufacturer.

5.2 DELIVERY

Off-loading and storage of the geomembrane is the responsibility of the General Contractor. The manufacturer is responsible for replacing any damaged or unacceptable material at no cost to the Owner. No off-loading shall be done unless the liner inspector is present. Damage during off-loading shall be documented by the inspector and General Contractor. All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the Owner's representative. The Owner's representative will be the final authority on determination of damage.

5.3 ON-SITE STORAGE

Stored geomembrane shall be safely protected against puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat and other potentially damaging conditions.

Geomembrane rolls shall be stored on a prepared surface (not wooden pallets), and shall not be stacked more than two high on soil subgrades. This requirement does not necessarily apply where a concrete pad or warehouse is available for storage purposes.

6.0 EARTHWORK

The owner or his representative (soil quality assurance contractor) shall supervise the subgrade preparation. Prior to liner installation the exposed subgrade shall be scored to a depth of at least six (6) inches and compacted to 95% of standard proctor (ASTM D 698), maximum laboratory dry density. Weak or compressible areas which cannot be satisfactorily compacted should be removed and replaced with properly compacted fill. All surfaces to be lined shall be smooth, free of all foreign and organic material, sharp objects, or debris of any kind. These surfaces shall provide a firm, unyielding foundation with no sharp changes or abrupt breaks in grade. Standing water or excessive moisture shall not be allowed. Stones or rocks over 3/8" in diameter are not allowed in the top six (6) inches of soil.

6.1 ANCHOR TRENCH

The anchor trench shall be excavated to the line, grade, width and depth shown on the construction drawings, prior to liner system placement. The soil inspector shall verify that the anchor trench has been constructed according to construction drawings.

If the anchor trench is located in a clay susceptible to desiccation, no more than the amount of trench required for the base geomembrane to be anchored in one day shall be excavated to minimize desiccation of the anchor trench soils.

Slightly rounded corners shall be provided in the trench where the geomembrane adjoins the trench so as to avoid sharp bends in the geomembrane.

7.0 LINER DEPLOYMENT

Liner Installer is responsible for the following:

- No equipment or tools shall damage the geomembrane by handling, trafficking, or other means.
- No personnel working on the geomembrane shall smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane.
- The method used to unroll the panels shall neither score, scratch or crimp the geomembrane nor, damage the supporting soil or underlying geotextiles.
- The method used to place the panels shall minimize wrinkles (especially differential wrinkles between adjacent panels. Wrinkles shall be identified as to proper location and compensation shall be identified on the Contractor's and Inspector's drawings. Ballast shall be used to prevent the relocation of such compensating wrinkles by wind.

- Adequate loading (e.g., sand bags or similar items that will not damage the geomembrane) shall be placed to prevent uplift by wind. In cases of high wind, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels.

- Direct contact with the geomembrane shall be minimized, i.e., the geomembrane in traffic areas shall be protected by geotextiles, extra geomembrane or other suitable materials.

7.1 BASIC SEAMING STRATEGIES

Seams shall be oriented parallel to the line of maximum slope, i.e., oriented down, not across the slope. Seams shall not be located where subgrade slopes interact (corners). Where geomembrane must be placed in geometrically unusual areas, the number of field seams shall be minimized.

7.2 SEAM OVERLAP

Panels of geomembrane must have a finished overlap of a minimum of four inches for hot shoe fusion welding and three inches for extrusion welding, but in any event, sufficient overlap shall be provided to allow peel tests to be performed on the seam.

No solvent or adhesive may be used unless the product is approved by the Owner's representative. (Samples shall be submitted to the Design Engineer for testing and evaluation.)

The procedure used to temporarily bond adjacent panels together shall not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any spot welding apparatus shall be controlled such that the geomembrane is not damaged.

7.3 FIELD SEAM TESTING

Field tests shall be conducted on geomembrane liner seams to verify that seaming conditions are satisfactory. Test seams shall be conducted at the beginning of each seaming period, at the inspector's discretion, and at least once every four hours, for each seaming apparatus used that day.

All test seams shall be made at a location by the Inspector in the area of the seaming and in contact five feet long for hot shoe welding and three feet long for extrusion welding with the seam centered lengthwise. Specimens one inch wide shall be cut from each opposite end of the test seam by the Inspector. The Inspector shall use a tensiometer to test these specimens for shear and peel. If a test seam fails to meet field seam specifications, the seaming apparatus and/or seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected.

8.0 WEATHER CONDITIONS

Liner deployment will proceed below ambient temperatures of 32° F. only after the Inspector verifies that the material can be seamed in accordance with the specifications and with the approval of the Owner's representative. Geomembrane will not be placed in the midst of precipitation or moisture of any type (e.g., fog, rain, dew) or in the presence of excessive winds, as determined by the installation supervisor. Observation of temperature, humidity, precipitation and wind should be noted to ensure that weather conditions are acceptable prior to membrane placement.

9.0 SEAMING EQUIPMENT AND ACCESSORIES

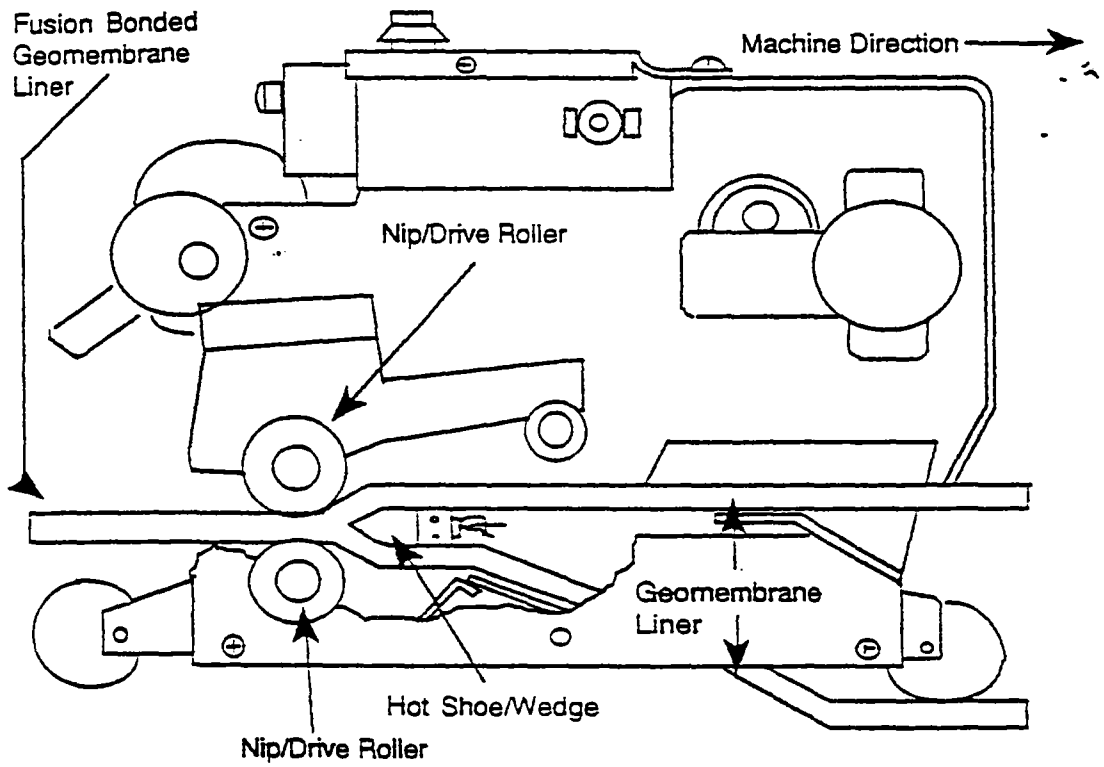
The approved field seaming tools are the hot shoe fusion welders and extrusion welders.

10.0 HOT SHOE WELDING

10.1 HOT SHOE WELDING SYSTEM

The hot shoe seaming device is a completely self-contained system. The hot shoe system produces a bonded seam by running a hot metal wedge (hot shoe) between the overlapped area of the geomembranes. Its role is similar to that of the moving portion of a zipper except that it fixes two material planes together by overlapping them not by joining them at the edge. The hot wedge melts the facing surfaces of the two contiguous liners and creates a permanent bond between them using precisely controlled heat. The wedge is blocky at the leading end and tapered at the trailing end. The heated geomembrane overlaps come together at the tapered end of the hot shoe, under pressure from two nip/drive rollers, and are permanently fused together. Hot air tacking (as employed in extrusion weld seaming) is not necessary.

Figure 1 - Hot Shoe Welder



A single hot wedge is shaped like an anvil and is smooth over its entire surface. A dual hot wedge has a central, canal-like recession along its length. This type of wedge creates a channel in the liner seam between two parallel bonds. Figure 2 illustrates both wedge types.

Knurled rollers are used to apply pressure to the sheets where they have just passed over the taper of the hot shoe and been bonded. These should have smooth surfaces and beveled edges.

As the edges of the overlapping liners pass through the welder, they must contact the full length and width of the hot wedge, or the facing surfaces will not be equally hot. Idler rollers or similar pressure devices, which press the liners against both sides of the hot wedge, must be adjusted so that material of any thickness strictly conforms to the wedge's taper while passing through the welder. Such adjustments should be made while the wedge is cold.

This proprietary seaming method is designed to:

1) Monitor operating temperatures via digital readout.

2) Form uniform bonds by applying uniform and consistent pressure to the membrane.

3) Reduce surface tension and remove surface contamination without grinding, which improves bond strength.

4) Ensure high reliability, which results in consistent seam integrity.

5) Minimize operator error, as the machine is semi-automatic.

10.2 LINER PREPARATION FOR HOT SHOE WELDING

Hot shoe welding represents the primary seaming method for geomembrane liners. It is assumed the appropriate liner has been delivered to the site, has been unrolled and is situated in its approximate plan position where it awaits final installation and seaming. No more material than can be seamed within the current day should be deployed. All deployed material must be ballasted immediately to prevent wind uplift.

- The two liners to be joined must be positioned to create an overlap of 3-5 inches.

- If the overlap is not substantially wide to contain the wedge, "float" the liner into better position by lifting it high enough to draw air beneath it, guiding it upon this air to an improved position. Avoid dragging the liner, particularly across rough soil subgrades.

- If the overlap between the placed liners is excessive, the excess must be trimmed away. This should be done by trimming the lower sheet. If this is not possible and the upper sheet must be trimmed, use a knife with a shielded or hook blade. An unshielded, downward-facing blade cutting from above can easily scratch the liner in a vulnerable location.

- All cutting and preparation of odd-shaped sections or small fitted pieces must be completed at least fifty (50) feet ahead of the seaming operation, so that seaming may be conducted with the fewest interruptions.

- Before joining the two contiguous liners, make sure they are not excessively scratched, blemished or flawed and are general visually acceptable.

- If the Plans require overlaps to be shingled in a particular direction, make sure this is being done.

- Excessive undulations (waves) along the seams during the seaming operation should be avoided. These occur when the upper and lower sheets have unequal slack between them. This condition can lead to the undesirable formation of "fish mouths" which must be trimmed, laid flat and reseamed with a patch.

- HDPE needs approximately 2% slack to account for expansion and contraction caused by weather, facility, and procedural conditions. This is a design consideration and the Plans and Specifications must be project-specific on the amount and orientation of slack.

- Sheets which are overlapped and ready for seaming must be clean. If dirty, they must be wiped clean with dry rags.

- The seam area must be completely free of moisture before the overlapping sheets can be properly seamed. Dry rags can be used to wipe any such moisture up from the seam surface. If sufficient quantity of dry rags is unavailable for this purpose, air blowers can be used.

- Seaming is not to be performed during rain or snow unless measures are taken to allow the seam to be made on dry liner materials, e.g., within an enclosure or shelter.

- Seaming is not to be performed when the soil surface beneath the liners is saturated, because the hot seaming apparatus will draw moisture into the ongoing seam. Seaming activity on frozen soil is unacceptable for the same reason. Puddled water on the soil's surface beneath the liner is unacceptable.

- Seaming should only be conducted when ambient temperatures (measured two feet above the liner) are between 32 -105° F (0-40° C), unless it can be proven via test strips that good seams can be fabricated at such temperatures. The general effect of low ambient temperature upon the integrity of liner seams is less important than that of moisture, but it is not to be discounted. Above 105° F, the liner is extremely hot, and working conditions become very dangerous.

- When seaming in cold weather, make extra test welds, which can be used to suggest adjustments to the seaming activity (such as equipment temperatures and seaming rate).

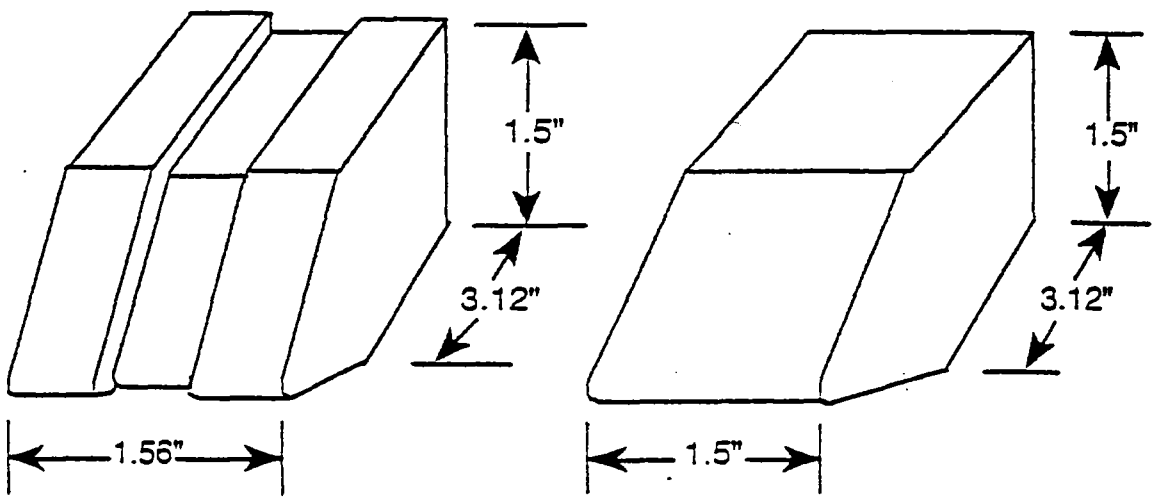
10.3 HOT SHOE EQUIPMENT PREPARATION

1) A functional, small electric generator must be kept in the proximity of the seaming area, and must have enough extension cord to range the length of the seam. It must either be fitted with rubber tires, or be placed on a stable and smooth moveable base, such as a scrap of liner, so that no damage will be inflicted upon the liner or subgrade by its movement. The generator's fuel (gasoline or diesel) must be stored off the liner.

2) Surface grinding before application of the hot wedge is neither necessary nor allowed.

3) The hot wedge, or "anvil", should be inspected to see that it is symmetrically balanced and gradually tapered. A variety of wedge types are available. Some have a smooth surface; some are ridged where they follow the direction of the seam. The taper of a hot wedge varies according to the type of welding machine it is designed for. It is imperative that a wedge have no sharp edges on any surface that contacts the liner during the welding process.

Figure 2 - Single and Dual (Split) Hot Wedge Elements



4) The chain drive powering any portion of the welder should be synchronized, properly lubricated and physically sound.

Idler roller heights are adjustable to allow for varying liner thicknesses. Normal adjustments are made while the welder is at ambient temperature. The procedure for most wedge-type welders is as follows:

1) Take two material samples and insert them above and below the wedge into the nip drive rollers.

2) Lock the wedge into its operating position. This is done by shifting the wedge forward, into the clutch of the upper and lower nip rollers.

3) Adjust the idler rollers until they are snug against the membrane liners, which sandwich the wedge. A correctly adjusted set of idler rollers ensures that the membrane liners pass along the surface of the hot wedge with optimum contact, before they meet after the wedge taper and bond.

4) Set the maximum distance that the wedge can move into the nip rollers. Unsecured, the wedge might make direct contact with the nip rollers when the machine has no liner material running through it and damage the machine.

5) The wedge and surrounding rollers are now configured for seaming the liner. Remember to discharge the hot wedge from its forward position in the roller apparatus as the machine reaches the end of a seam. This will keep the wedge from advancing into the nip rollers and damaging them.

6) The forward face of the welding machine should be inspected for sharp corners and irregular details which may damage the liner as it advances during the process of seaming.

7) Temperature controllers on the wedge device should be set according to liner thickness, ambient temperature, and seaming rate. The "test strip" mentioned earlier helps determine these settings. Temperature gauges should be checked for accuracy and repeatability.

10.4 HOT WEDGE SEAMING PROCESS

The objective of hot wedge seaming is to heat two facing liner surfaces to their melting point before forcing them together and creating a permanent bond. The wedge is situated between the overlap of the two liners and moves along somewhat like a zipper. The hot wedge reduces the surface tension of the viscous polymer sheets and acts as a scraper and mixer, so that the nip rollers can pressure the two liners together. The result is that the two facing surfaces are bonded into one continuous molecular structure.

All types of thermoplastic liners can be seamed by the hot wedge method, but temperature settings will vary according to their specific polymer components:

Typical Wedge Temperature Ranges for Hot Wedge Seaming of Thermoplastic Liner

LINER TYPE	MINIMUM[1]	MAXIMUM[2]
	°F (°C)	°F (°C)
HDPE	600 (320)	750 (400)

[1]For dry, warm weather seaming conditions
[2]For damp, cold weather seaming conditions

1) The hot wedge system should be properly positioned for making the desired single or dual (split) seam.

2) Ambient variables such as temperature, cloud cover, and wind speed may make it necessary to vary the temperature or speed of the wedge. It may be useful to document wedge temperatures used successfully in a variety of ambient conditions, so that the hot wedge

can be more accurately adjusted if new conditions are met, or if personnel changes occur.

3) The drive motor should be off when positioning the welding to seam. Place the machine where the sheets overlap. Guide the overlapped material between the idlers and the wedge, and into the drive/nip rollers. When continuing a weld that has been abandoned mid-seam, the liners must be spread where the seam leaves off and loaded into the respective sides of the machine. Raise the machine a few inches, load the bottom sheet first and then load the top sheet. When the nip rollers engage and the wedge is in position, turn on the drive motor. Immediately engage the sheets when they are between the nip rollers to prevent an imminent melt-through. Move the hot wedge into position and lock it.

4) The operator must constantly monitor the temperature controls, as well as the completed seam passing out of the machine. Occasional adjustments in temperature or speed will be necessary to maintain a consistent weld. Visual inspection and constant hand testing by the peel method (or other) is also recommended.

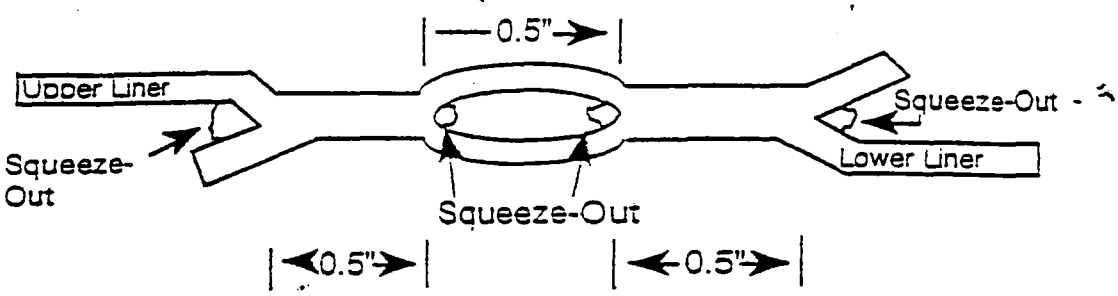
5) On some soils, the device tends to "bulldoze" into the ground as it travels, causing soil to enter the weld. A seam with soil trapped in its weld is unacceptable. To keep this from happening, the operator should lift the front of the machine slightly, if bulldozing occurs or seems likely. Alternatively, a moveable base for the machine to travel on can be used. Scrap strips of geotextile or geomembrane have proven to be effective materials upon which the welder can maintain traction. In adverse conditions, it is recommended that at least two people work together in making hot wedge seams: one as operator and one as helper.

10.5 AFTER HOT WEDGE SEAMING

1) A smooth insulating plate or heat insulating fabric is to be placed beneath the hot welding apparatus after usage.

2) A small amount of "squeeze-out" or "flashing" is a reliable indication that proper seaming temperatures have been achieved. The melted polymer will laterally extrude out of the same zone in properly welded seams, but not to excess. An excessive amount of extruded hot melt indicates that excessive heat or pressure, or both, was applied. Reduce the temperature and/or pressure to correct the situation.

Figure 3 - Cross Section of Dual (Split) Hot Wedge Seam



3) For liners of 40 mil thickness and less, a long, low, sinusoidal wavelength pattern in the direction of the seam along its top surface indicates a proper weld. If the wave peaks are too close together, machine speed should be increased until a satisfactory pattern shows. The absence of this wavelength pattern indicates that machine speed should be decreased. No wavy pattern will occur on liners thicker than 40 mil due to the inherent stiffness of these liners.

4) Nip/drive roller marks will always show on the surface when using knurled rollers. They should be noticeable to the eye, but just barely to the touch.

5) The hot wedge device has just a few adjustable parts, but it is critical that they be checked after a day of seaming. The machine should also be cleaned.

10.6 UNUSUAL CONDITIONS

It is assumed ambient air temperature is between 32° - 105°F (0 - 40°C). This range represents the lowest and highest temperatures at which it is considered feasible to seam liner. At temperatures below freezing, special precautions must be taken. Shielding, preheating, increasing extrudate temperature, and/or decreasing the rate of seaming may be necessary strategies. Thawed subgrade moisture in the seam area must not be tolerated. Frozen irregularities in the subgrade larger than one inch are also not tolerable. Temperatures outside the given range generally necessitate more frequent stripping and more diligent nondestructive testing.

1) High winds and wind gusts are always a problem for liners. Once unrolled, the liner panels must be securely ballasted with sandbags. The seaming process, however, will necessitate the removal of some sandbags, which leaves any windward edge vulnerable to uplift. Properly orient the overlap, if possible. Additional labor may be needed simply to remove the sandbags

immediately ahead of the seaming operation as it moves along, and replace them as the welder passes. Dirt and/or moisture left behind during the movement of sandbags must be cleaned away.

2) Patches must be made at locations where destructive test samples are removed, or where seams fail nondestructive testing. Such patches must extend at least six (6) inches beyond the outer perimeter of the area to be repaired. For HDPE liners the only method available is the hand-held extrusion weld procedure described in Extrusion Weld Seaming. Be extra careful not to apply too much heat to the point where the weld was initiated, once the machine travels around the patch and reaches that point again. Polymer should not be excessively heated twice. The spare extrudate at this point of overlap should not be excessive.

3) Details around sumps, pipes and other HDPE liner accessories are necessarily made by hand-held extrusion weld procedures. These are probably the most skill-intensive seams in a project. The extrudate bead should be of consistent width and thickness around the detail, even though it may encounter uneven material edges, corners, and areas of liner overlap. The overlapping point where the weld run begins and ends should not be distinguished by a large mass of extrudate.

11.0 EXTRUSION WELDING

11.1 EXTRUSION WELDING SYSTEM

An extrusion weld is produced by using a 4 mm or 5 mm diameter welding rod manufactured from the same resin used to produce geomembrane. The welding rod is applied as a "welded bead" at the edge of two overlapped geomembrane sheets, resulting in a welded seam.

PATCHING PROCEDURES USING EXTRUSION WELDER REQUIRE THAT:

- Surfaces shall be clean and dry.
- Test welds shall be performed prior to field seaming every day.
- The area which is to receive the extrusion bead shall be ground to remove surface contamination.
- The welding rod shall be free from dirt, dust, moisture and tangles at all times.
- The machine shall be purged for approximately thirty (30) seconds prior to actual extrudate welding.

- The bottom portion of the welding die shall stay in intimate contact with the sheet surface and conform to various seam angles and configurations.

- The welder die shall be kept "on center" at all times, ensuring that an equal amount of extrudate bead is applied to both portions of sheet overlap (top and bottom).

11.2 LINER PREPARATION FOR EXTRUSION WELD SEAMING

Extrusion weld seaming represents one of the primary ways to seam HDPE sheet. In fact, around details such as pipes and sumps it is always necessary to use a certain amount of extrusion weld seaming. It is also assumed that the appropriate liner has been delivered to the site, has been unrolled, and is situated in its approximate plan position, where it awaits final installation and seaming. No more material than can be seamed within the current day should be deployed. All deployed material must be ballasted immediately to prevent wind uplift.

1) The two liners to be joined must be positioned to create an overlap of at least three (3) inches.

2) If the overlap is not substantially wide, "float" the liner into better position by lifting it high enough to draw air beneath it, guiding it upon this air to an improved position. Avoid dragging the liner, particularly across the soil subgrade.

3) Check that the two contiguous liners to be joined are not excessively scratched, blemished, or flawed, and are in general visually acceptable.

4) If the construction plan requires overlaps to be shingled in a particular direction, make sure this is being done.

5) A properly planned seam run should terminate at a panel end, at a specific detail, or on a long, straight run where it can be easily resumed.

6) Excessive undulations (waves) along the seams during the seaming operation should be avoided. These occur when the upper and lower sheets have unequal slack between them. This condition can lead to the undesirable formation of "fishmouths" which must be trimmed, laid flat and reseamed with a patch.

7) HDPE needs approximately 2% slack to account for expansion and contraction caused by weather, facility, and procedural conditions. This is a design consideration and the Plans and Specifications must be project-specific on the amount and orientation of slack.

8) Sheets which are overlapped and ready for seaming must be clean. If dirty, they must be wiped clean with dry rags.

9) The seam area must be completely free of moisture before the overlapping sheets can be properly seamed. Dry rags can be used to wipe any such moisture up from the seam surface. If a sufficient quantity of dry rags is unavailable for this purpose, air blowers can be used.

10) Seaming is not to be performed during rain or snow unless measures are taken to allow the seam to be made on dry liner materials, e.g., within an enclosure or shelter.

11) Seaming is not to be performed when the soil surface beneath the liners is saturated, because the hot seaming apparatus will draw moisture into the ongoing seam. Seaming activity on frozen soil is unacceptable for the same reason. Puddled water on the soil's surface beneath the liner is unacceptable.

12) When seaming in cold weather, it is advisable to preheat the sheets with a hot air blower, to conduct seaming activity within a portable tent, to help prevent heat loss; and to make extra test welds, which can be used to suggest adjustments to the seaming activity (such as equipment temperature and seaming rate.)

11.3 EXTRUSION EQUIPMENT PREPARATION

1) A functional, small electric generator must be kept in the proximity of the seaming area, and must have enough extension cord to range the length of the seam. It must either be fitted with rubber tires, or be placed on a stable and smooth moveable base, such as a scrap of liner, so that no damage will be inflicted upon the liner or subgrade by its movement. The generator's fuel (gasoline or diesel) must be stored off the liner.

2) A hand-held electric rotary grinder having a circular disk grinding plate approximately 4.0 inches in diameter and adequate #80 grit paper must be available. #100 grit paper, which is finer than #80, is preferable. Sandpaper coarser than #80, e.g., #60, is not acceptable.

3) A hot air welder capable of 480°F (250°C) must be available to periodically tack weld the liner sheets after they are properly positioned. Patches are continuously tacked.

4) All extrusion weld seaming devices must be equipped with a properly functioning temperature controller which displays the extrusion barrel temperature.

5) All types of extrusion weld seaming devices have Teflon or metal dies, varied in shape and size, through which the extrudate passes onto the liner. These dies must be inspected for wear, sharp notches and creases, and for their appropriateness to the application at hand.

6) An adequate supply of dry, clean extrudate welding rods or pellets, of the same material constitution as the liner, must be available, and ready to feed through the extruder.

11.4 EXTRUSION WELD SEAMING PROCESS

1) For liners 50 mils and thicker, the upper sheet's leading edge must be ground to a 45° bevel. It is imperative that the sheet be lifted up and away from the lower sheet during the beveling so that no deep gouges are cut in the lower sheet. Beveling should therefore be done before tack welding.

2) After beveling, the upper sheet is lowered and laid flat against the lower sheet. The horizontal surface grinding across the interface of both sheets is completed. All surface sheen in the area to be seamed must be removed. Sand paper coarser than #80 is unacceptable because it can leave deep grooves in the weld area which represent potential stress points or leak channels. All material dust generated by grinding the liner must be wiped or blown away from the seaming zone.

Figure 4 - Beveling Upper Liner

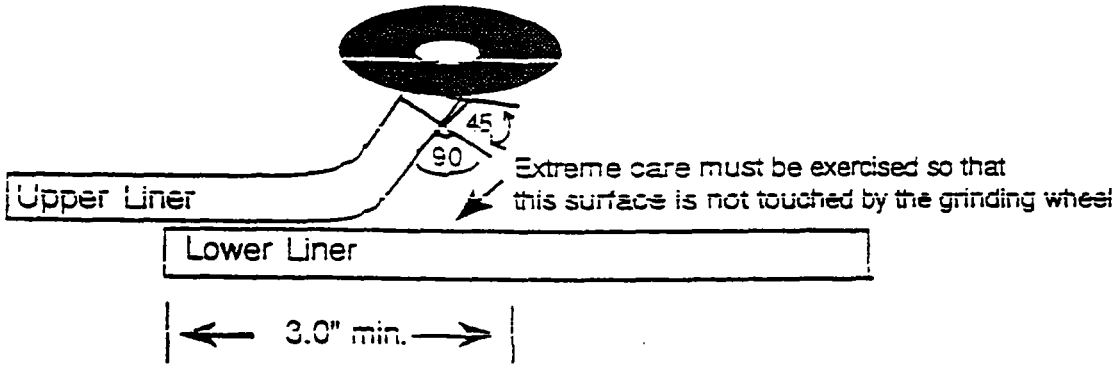
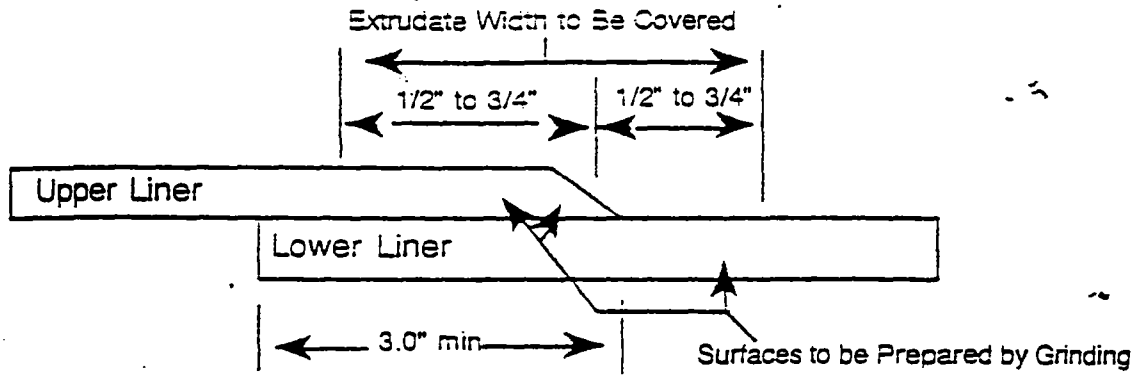


Figure 5 - Grinding Seam Area Prior to Extrusion Welding



3) Grinding marks should run perpendicular to the seam. Though this process is slower than grinding parallel to the seam, it does not create the deep, parallel grooves that significantly decrease the thickness of the parent material that can lead to seam failure. Although film tear bond criteria are generally satisfied, the integrity of the results is questionable since any reduced stress is due to inappropriately thin material. Parallel grinding marks can also initiate stress cracking. The illustrated grinding patterns exceed the area where extrudate should be applied, and should not be considered instructional.

4) Grind marks should never be deeper than 10% of the sheet thickness. Optionally, they should be about 5% of the sheet thickness. The only purpose of grinding is the removal of oxide layers and dirt from the liner surfaces, and the roughening of their interface for the extrudate.

5) If the final extrudate bead width is 1 1/2 inches, the width of the grinding trail should not exceed 2 inches.

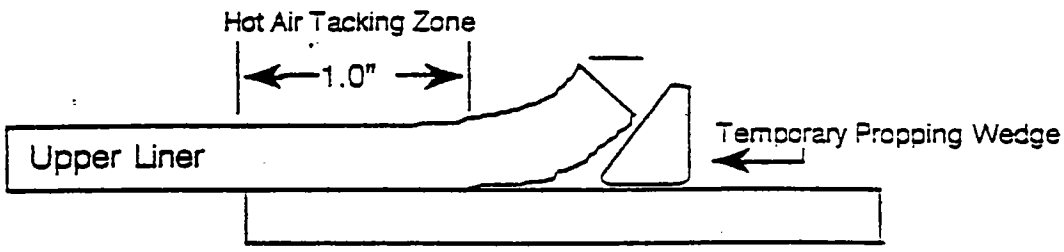
6) Seaming must take place no more than ten (10) minutes after grinding so that surface oxide layers do not reappear where the extrudate must be placed.

7) Never leave the hand held grinder running when it is not in use. If it makes contact with the liner while running it will cause serious damage.

8) A hot air device (often called a "gun") may be used to "tack" the two sheets together, ahead of the extrusion welder. The hot air gun prepares the seam for the extrusion weld by heating the ground surface and be creating a light bond between the two sheets, securing their position. The hot air gun is not meant to create a primary seam. No heat distortion should be evident on

the surface of the upper sheet. Double sided tape should not be used in lieu of the hot air gun, as it includes trace levels of hydrocarbon solvents that, if released, may affect environmental monitoring. Such tape can also melt into the weld and affect seam strength.

Figure 6 - Remedial Seam Wedge Prop



9) The extrusion welder's barrel shall be purged of all head-degraded extrudate before starting a seam. This must be done every time the extruder is restarted after two or more minutes of inactivity. The purged extrudate shall not be discharged onto the surface of previously placed liner, or onto prepared upgrade, where it would eventually form a lump under the liner and cause stress concentrations and possibly premature failure.

10) Molten, highly viscous extrudate is deposited along the overlapped seam. The center of the extrudate pass directly along the edge of the upper liner, at sufficient width to completely cover the edge and most of the outlying grind marks, at least to within 1/4 inch of their extremity.

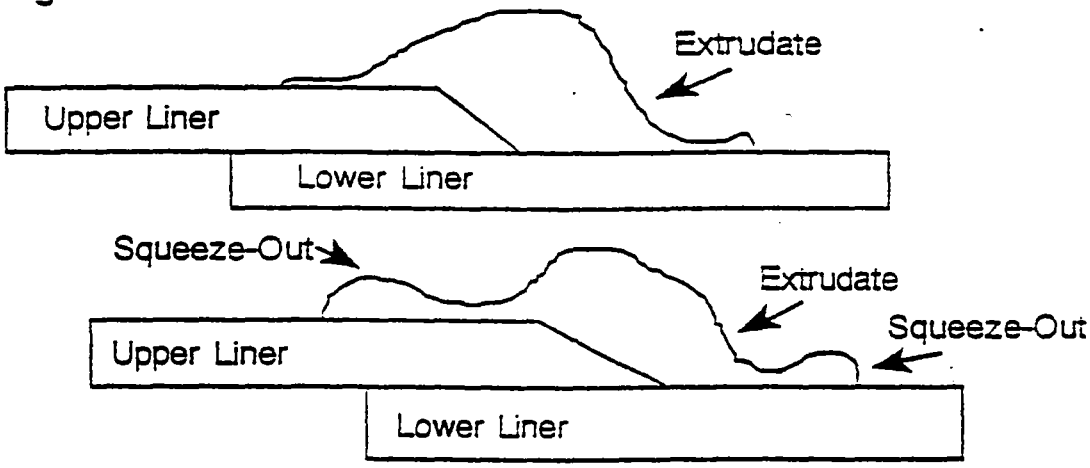
11) The extrudate should be approximately twice the specified sheet thickness, measured from the top of the bottom sheet to the top or "crown" of the extrudate. Excessive squeeze-out (or "flashing"), is acceptable, if it is equal on both sides and will not interfere with subsequent vacuum box testing, if, however, the extrudate can be pulled by its squeeze-out off the seam, the extrudate is unacceptable. The presence of squeeze-out may indicate that the extrusion die was not riding directly against the liner, that the extrudate temperature was improper for adequate flow, or that the seaming rate was too slow.

12) Where possible, inspect the underside of the lower liner for heat distortion. This can be done at the end of seams, and wherever samples are cut out of the seam. A slight amount of thermal "puckering" on relatively thin liners (less than 50 mil) is acceptable. It indicates that heat penetrated entirely through the sheet. However, if the underside is greatly distorted, either

lower the temperature or increase the rate of seaming. For liners 80 mil and greater, no thermal "puckering" should ever take place.

13) If the seaming process must be interrupted at mid-seam, the extrudate should trail off gradually, not terminate in a large mass of solidified extrudate. Where such welds are abandoned long enough to cool, they must be ground prior to continuing with new extrudate over the remainder of the seam. Grind where the extrudate trail-off begins. This restart procedure must be followed for patches, pipes, fittings, appurtenances and "T" and "Y" shaped seams.

Figure 7 - Extrusion Weld Seam Cross Sections



14) For practical purposes, one might document the variables whose combination yielded well-seamed liner. These include: the temperatures of the extrudating apparatus' melt zone, which generally varies from 435°F (225°C) to 525°F (275°C); the extrudate temperature at the nozzle; the liner surface temperature and the ambient temperature.

11.5 AFTER EXTRUSION WELD SEAMING

1) A smooth insulating plate or heat insulating fabric is to be placed beneath the hot welding apparatus after usage. The tip die and barrel must not be placed on any liner or other geosynthetic surface, as it is extremely hot and can cause severe damage.

2) The extrudate bead should be visually inspected. Look to see that its alignment is straight, its height is appropriate, and its surface texture is uniform. No bubbles or pock marks should appear in the extrudate, which indicate the undesirable presence of air, water or debris within the extrudate rod or pelletized polymer.

3) Grind marks should not be visible more than 1/4 inch beyond the extrudate. These should be very light and not contain heavy gouges. As stated previously, grinding is considered excessive when it is deeper than 10% of the liner thickness. It is unacceptable to apply additional extrudate over the original extrusion weld seam in an area of excessive grinding. A cap strip shall be placed over the entire portion of the seam where excessive grinding is seen.

11.6 UNUSUAL CONDITIONS

It is assumed ambient air temperature is between 32 - 105°F - (0 - 40°C). This range represents the lowest and highest temperatures at which it is considered feasible to taken. Shielding, preheating, increasing extrudate temperature, and/or decreasing the rate of seaming rate may be necessary strategies. Thawed subgrade moisture in the same area shall not be tolerated. Frozen irregularities in the subgrade one inch or greater in size shall not be tolerated. Temperatures outside the given range generally necessitate more frequent test stripping and more diligent nondestructive testing.

1) High winds, or gusts of wind, always pose problems for liners. After unrolling the liner, the panels must be securely ballasted with sandbags. The seaming process, however, will necessitate the removal of some of the sandbags, which will leave any windward edges vulnerable to wind uplift. Property orient the overlap, if possible. Additional labor may be needed for the sole purpose of removing the sandbags immediately ahead of the seaming operation as it moves along, and immediately replacing them as the welder passes. Any dirt and moisture left behind during the movement of sandbags must be cleaned away.

2) Patches must be made at locations where destructive test samples are removed, or where seams fail nondestructive testing. Such patches must extend at least six (6) inches beyond the outer perimeter of the area to be repaired. For HDPE liners the only method available is the hand-held extrusion weld procedure described in Extrusion Weld Seaming. Be extra careful not to apply too much heat to the point where the weld begins, having gone completely around the patch to remeet it. Particular care must be exercised when the end of the extrudate meets the beginning of the circumferential patching run. Polymer should not be excessively heated twice. The spare extrudate at this point of overlap should not be excessive.

3) Details around sumps, pipes and other HDPE liner accessories are necessarily made by hand-held extrusion procedures as described for Extrusion Seaming. These are

probably the most skill-intensive seams in a project. The extrudate should be symmetrical on each of the liners to be joined. It is difficult to maintain this symmetry around internal and external edges, and particularly at corners. The overlapping point where the weld run begins and ends should not be distinguished by a large mass of extrudate.

12.0 SEAM PROPERTIES AND FIELD TEST PROCEDURES

12.1 SEAM PROPERTIES

Field Seams Should Meet The Following Specifications:

SEAM PROPERTY	TEST METHOD	REQUIREMENTS
Shear Strength	ASTM D 3083 (as modified in App.A of NSF 54[1])	>90% of liner yield strength Film Tear Bond[2]
Peel Strength	ASTM D 413 (as modified in App. A of NSF 54[1])	>70% of liner yield strength Film Tear Bond[2]

1. Seam specimens are one inch wide, grip separation rate is two ipm.
2. Both shear seam strength and peel tests shall be run on five replicate specimens. A break through the weld or at the weld sheet interface shall be considered a Non-FTB (failure) in both seam strength (shear) and peel strength tests. Four of the five specimens shall pass.
3. Approved field seaming processes are hot shoe fusion welding and extrusion welding.
4. Welding rods or beads used for extrusion welding shall be HDPE and the physical properties shall be the same as those of the resin used in the manufacture of the HDPE geomembrane.

12.2 MINIMUM SEAM VALUES

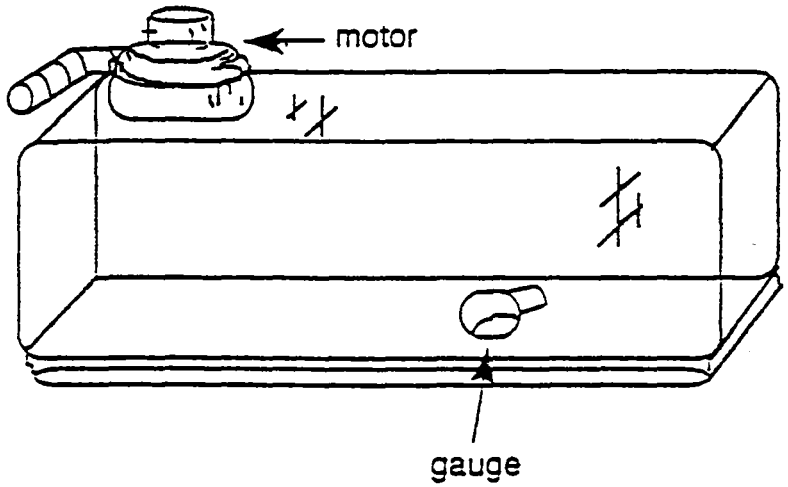
Seam Property (mil thickness)	20	30	40	60	80	100
Shear Strength (lbs/in) ASTM D 3803(as modified in Appendix A of NSF 54)	40	58	81	121	161	202
Peel Strength ASTM D 413 (as modified in Appendix A of NSF 54)	31	45	63	94	129	157

All test seams shall break by Film Tear Bond (FTB). Film Tear Bond is a condition where one of the welded sheets fails by tearing, but the weld between the two sheets remain in tact. In other words, the sheet tears before the weld separates fails.

12.3 NON-DESTRUCTIVE SEAM TESTING

Every field seam shall be non-destructively tested over its full length. All test equipment, including but not limited to that described below, shall be furnished by the installer. The vacuum box test apparatus is pictured.

Figure 8 - Vacuum Box (Transparent)



12.4 VACUUM BOX TESTING

The complete apparatus for testing single wedge fusion seams and extrusion seams shall be comprised of the following components.

1) A vacuum box assembly consisting of rigid housing transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.

2) A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections.

3) A rubber pressure/vacuum hose with fittings and connections.

4) A plastic bucket and wide paint brush.

5) A soapy solution.

The following procedure shall be followed:

1) Excess sheet overlap shall be trimmed away.

2) Clean the window, gasket, surfaces and check for leaks.

3) Energize the vacuum pump and reduce the tank pressure to approximately five psi.

4) Apply soapy solution to the seam so that an area approximately twelve (12) inches wide and forty-eight inches long is wetted.

5) Place the box over the wetted area and compress.

6) Close the bleed valve and open the vacuum valve.

7) Ensure that the resulting seal is air-tight.

8) For a period of approximately fifteen (15) seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.

9) If no bubbles appear after fifteen (15) seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum three inches overlap and repeat the process.

10) All areas where soap bubbles appear shall be marked, repaired and then retested.

The following procedure shall apply to locations where seams cannot be non-destructively tested, determined by the Inspector.

1) If the seam is accessible to testing equipment prior to final installation, the seam shall be non-destructively tested prior to final installation.

2) If the seam cannot be tested prior to final installation, the seaming operation shall be observed by the inspector for uniformity and completeness.

12.5 AIR PRESSURE TESTING (FOR DOUBLE SEAM ONLY)

The following procedures are applicable to those processes which produce a double seam with an enclosed air space.

Equipment for testing double fusion seams shall be comprised of the following.

1) An air pump equipped with pressure gauge capable of generating and sustaining between 25-30 psi mounted on a cushion to protect the geomembrane.

2) A manometer equipped with a sharp hollow needle, or other approved pressure feed device.

The following procedure shall be followed by the installer:

1) Seal both ends of a seam to be tested.

2) Insert needle or other approved pressure feed device into the tunnel created by the double wedge fusion weld.

3) Energize the air pump to between 25-30 psi, close its valve and sustain this pressure for approximately five minutes.

4) If more than four psi is lost, or pressure never stabilizes, locate faulty area, repair and retest.

5) Remove needle or other approved pressure feed device and seal.

13.0 DESTRUCTIVE SEAM TESTING

If destructive testing is required by the specifications, the installer will provide the liner inspector with a minimum of one destructive test sample per 500 feet of seam length from a location specified by the inspector. The installer shall not be informed in advance of the sample location. Figure 8 classifies destructive break types for thermal welded seams; Figure 9 classifies destructive break types for weld extrusion welded seams. These charts are located at the end of this section.

13.1 SAMPLING PROCEDURE

In order to obtain test results prior to completion of liner installation, samples shall be cut by the installer as the seaming progresses. Sampling times and locations shall be determined by the liner inspector. The inspector must witness the collection of all field test samples and the installer shall mark all samples with their location, roll, and seam number. The installer shall also record in writing the date, time, location, roll, seam number, ambient temperatures, and pass or fail status. A copy of this information must be attached to each sample portion. All holes in geomembrane created by collecting seam samples shall be immediately repaired. All patches shall be vacuum tested.

13.2 SIZE AND DISPOSITION OF SAMPLES

The samples shall be twelve (12) inches wide by twenty-four (24) inches long with the Seam centered lengthwise. The sample shall be cut into two pieces of equal length. One shall be given to the inspector, the other to the owner's representative. If the installer desires a sample, the sample length shall be increased to thirty-six (36) inches.

13.3 FIELD LABORATORY TESTING

The liner inspector shall cut the seam sample into ten one inch wide specimens. These shall be tested by the inspector. A grip separation rate of two imp shall be used. Five shall be tested for seam strength and

five for peel strength. Four of each five specimens must pass the test. A specimen which fails through the weld or by adhesion at the weld sheet interface in a Non-FTB break shall be considered a failure.

13.4 INDEPENDENT LABORATORY TESTING

The liner inspector will pack and ship to a laboratory at least two seam samples received from the installer. The lab will determine the shear and peel strengths of the samples using the same test methods and procedures followed in Field Laboratory Testing. Again, four or five specimens per sample must pass.

13.5 PROCEDURES FOR DESTRUCTIVE TEST FAILURE

The following procedures shall apply whenever a sample fails the field destructive test:

1) The installer shall reconstruct the seam between the failed location and any passed location.

2) The installer can retrace the welding path to an intermediate location (at least ten (10) feet from the failed location) at the liner inspector's discretion, and take a small sample for an additional field test. If this sample passes, the seam shall be reconstructed between that location and the original failed location. If the sample fails, the process is repeated from a farther intermediate location.

3) Over the length of a seam failure, the installer shall either cut out the old seam, reposition the panel and reseam, or add a cap strip, as required by the liner inspector.

4) At the liner inspector's request, additional destructive field test(s) shall be taken within the reseamed area after reseaming or placement of the cap strip. The reseamed sample shall be found acceptable if test results are approved by the inspector. If test results are not acceptable, this process shall be repeated until the reseamed length is judged satisfactory by the inspector.

In the event that a sample fails a laboratory destructive test, the above procedures shall be followed, considering laboratory tests exclusively.

14.0 DEFECTS AND REPAIRS

All seams and non-seam areas of the geomembrane shall be examined by the liner inspector for defects, holes, blisters, undispersed raw materials, and contamination by foreign matter. Because geomembrane is uniformly smooth, defects are easily detectable in normal daylight. Consequently, the surface of the geomembrane shall be clean during critical inspections.

14.1 EVALUATION

Each suspect seam and non-seam location shall be non-destructively tested as appropriate in the presence of the liner inspector. Each location that fails the nondestructive testing shall be marked by the inspector, and repaired accordingly.

14.2 REPAIR PROCEDURES

1) Defective seams shall be restarted/reseamed as described in these specifications.

2) Small holes shall be repaired by extrusion cap welding. If the hole is larger than 1/4 inch, it shall be patched with a piece of material extending six inches out from the seam.

3) Tears shall be repaired by patching. The sharp end of a tear on a slope, or in an area of particular stress, must be rounded prior to patching.

4) Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches.

5) HDPE surfaces to be patched shall be abraded and cleaned no more than fifteen (15) minutes prior to the repair. No more than 10% of the thickness shall be removed.

6) Patches shall be round or oval in shape, made of the same geomembrane, and extend a minimum of six inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only.

14.3 RESTART/RESEAMING PROCEDURES

The welding process shall restart by grinding the existing seam and rewelding a new seam. Welding shall commence where the grinding started and must overlap the previous seam by at least two inches. Reseaming over an existing seam without regrinding shall not be permitted.

14.4 VERIFICATION OF REPAIRS

Each repair shall be non-destructively tested, except when the inspector requires a destructive seam sample obtained from a repaired seam. A repair which passes the non-destructive test shall be considered adequate. Failed tests prompt the repetition and retesting of the repair until passing test results are achieved.

RECORDING OF RESULTS: Daily documentation shall identify all seams that initially failed the test and include evidence that these seams were repaired and successfully retested.

14.5 COVER SOIL REPLACEMENT

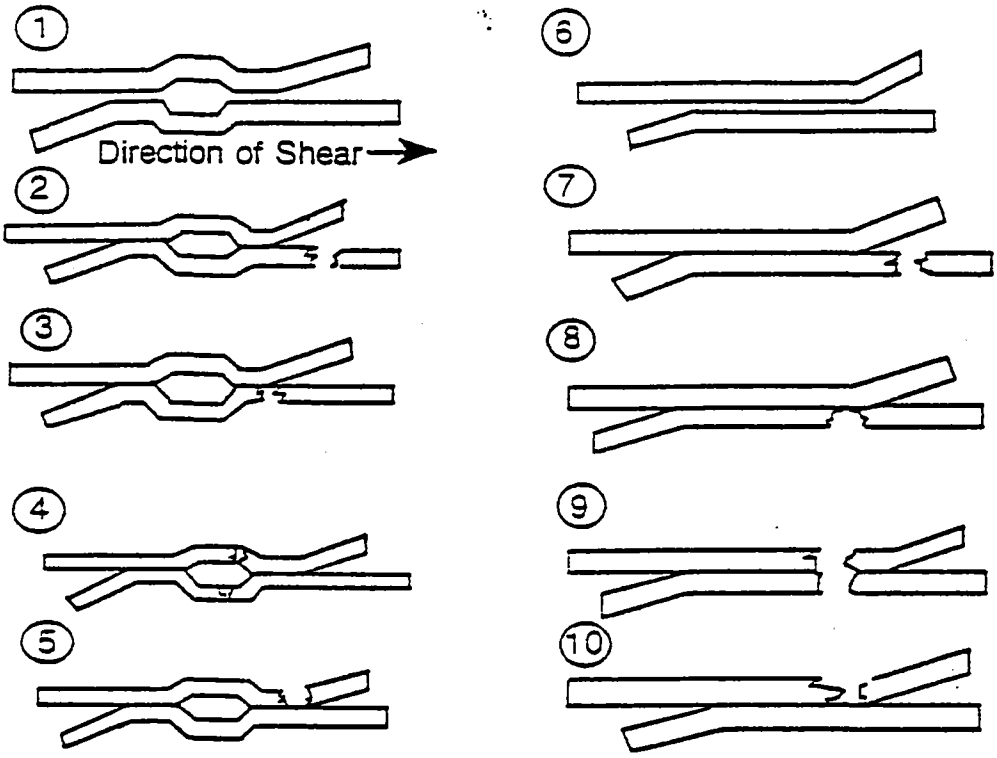
Unless otherwise specified in writing by the installer, the general contractor shall place the upper bedding layer, often referred to as a "protective cover", over the liner system on a daily basis as soon as any lined area of the facility has been completed and accepted by the owner. Extreme care shall be taken by the earthwork contractor not to damage the liner system during the cover soil placement. A minimum of twelve (12) inches of cover soil is needed prior to placing any earth-moving machinery over the liner system. The soil and rock particles within the lower six inches of the cover material shall be of such size and shape as to be harmless to the liner system. The upper particles' size limit is usually 3/8 inch. Angular or sharp rock fragments are not allowed. The general contractor may conduct a test on the job site simulating field subgrade, liner system and cover soil placement using the proposed method of cover soil placement to verify the integrity of the liner.

Cover soil shall be placed on side slopes from the bottom to the top of the slope. During the cover soil placement, the driver shall not make sharp turns, or sudden starts and stops. The machinery speed shall be slow, usually not to exceed five mph. Frozen soils are not to be used as cover material unless screened prior to placement.

14.6 ANCHORS AND PIPE PENETRATIONS

When a landfill or impoundment unit calls for penetrations in the flexible membrane liner, CQA personnel must insure that the seals around the penetrations have integrity and are compatible with the particular waste that will be impounded. Penetrations and seals should be isolated from the seasonal effects of liner expansion and contraction. Such penetrations should allow for reasonable access by extrusion welding equipment.

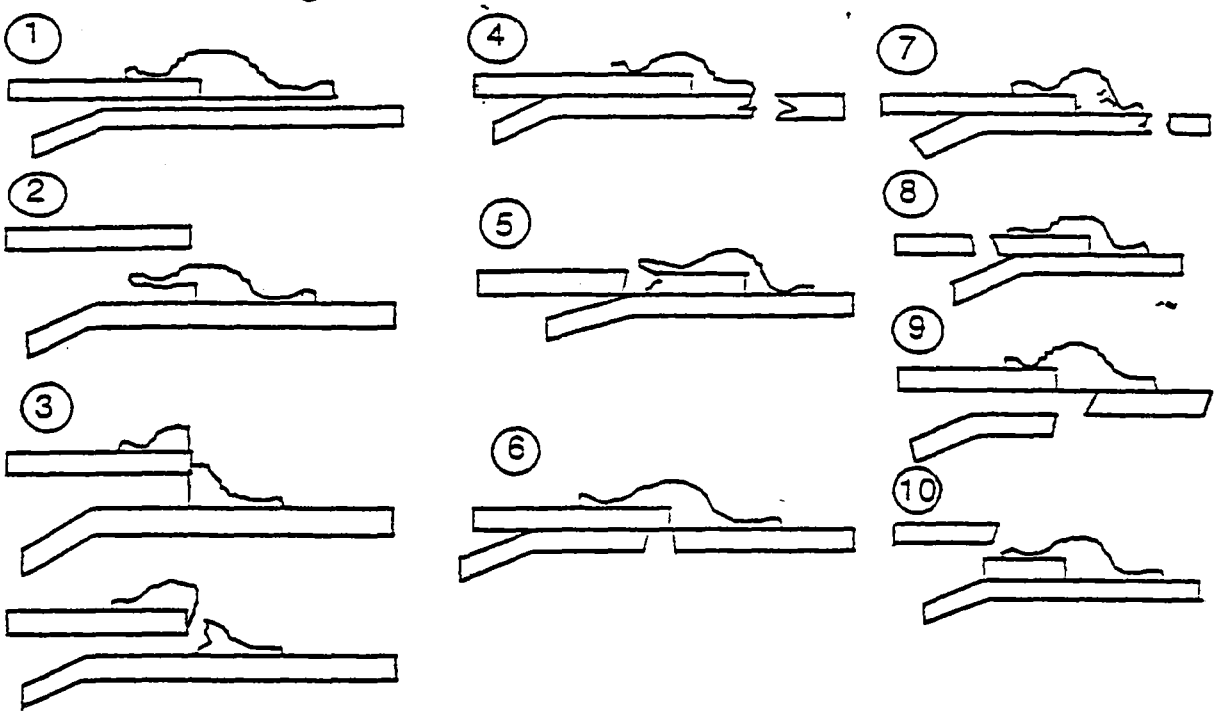
Figure 9 - Locus of Break Codes and Break Descriptions for Dual Thermal-Weld Seams Tested in Shear and Peel Modes



No.	Code	Classification	Break Description
1	AD	Non-FTB	Adhesion Failure.
2	BRK	FTB	Break in Sheeting.
3	SE-1	FTB	Break at outer edge of seam. Break can be either top or bottom sheet.
4	SE-2	FTB	Break at inner edge of seam.
5	AD-BRK	FTB	Break in first seam after some adhesion failure. Break can be either top or bottom sheet.
6	AD	Non-FTB	Adhesion Failure.
7	BRK	FTB	Break in Sheeting.
8	SE-1	FTB	Break at outer edge of seam. Break can be either top or bottom sheet.
9	SE-2	FTB	Break at inner edge of seam.
10	AD-BRK	FTB	Break in first seam after some adhesion failure. Break can be either top or bottom sheet.

*After Dr. Henry Haxo, Matrecon Inc., Alameda, CA.

Figure 10 - Locus of Break Codes and Break Descriptions for Hot Tacked Wedge Weld Seams*



No.	Code	Classification	Break Description
1	AD-1	Non-FTB	Adhesion Failure. Specimens may also delaminate under bead and break through the thin extruded material in the outer area.
2	AD-2	Non-FTB	Adhesion Failure.
3	AD-WLD	FTB	Break through weld. Such breaks range from those that start at the edge of the top sheet to those that run through the weld after some adhesion failure between the weld and the bottom sheet.
4	SE-1	FTB	Break at seam edge. Specimens may break anywhere from bead/outer area edge to the outer area/buffed area edge. (Shear only.)
5	SE-2	FTB	Break at seam edge. Specimens may break anywhere from bead/outer area edge to the outer area/buffed area edge.
6	SE-3	FTB	Break at seam edge. (Peel only.)
7	BRK-1	FTB	Break in sheeting. A "B" in parenthesis after the code means the specimen broke in the buffed area. (Shear only.)
8	BRK-2	FTB	Break in sheeting. A "B" in parenthesis after the code means the specimen broke in the buffed area.
9	AD-BRK	FTB	Break in sheeting after some adhesion failure between the weld and the bottom sheet. (Peel only.)

10	HT	FTB	Break at the edge of the hot tack for specimens which could not be delaminated in the hot tack. (Shear only.)

*After Dr. Henry Haxo, Matrecon Inc., Alameda, CA.

15.0 BACKFILLING OF ANCHOR TRENCH

Unless otherwise specified in writing by the installer, the anchor trench shall be backfilled and compacted by the general contractor as approved by the soil inspector. Trench backfill material shall be placed in 8 inch thick loose lifts and compacted by rolling with a light rubber-tired wheel or other light compaction equipment.

16.0 GEOMEMBRANE ACCEPTANCE

The installer shall retain all ownership and responsibility for the geomembrane until acceptance and payment by the owner.

The geomembrane liner shall be accepted by the owner when all of the following conditions are met:

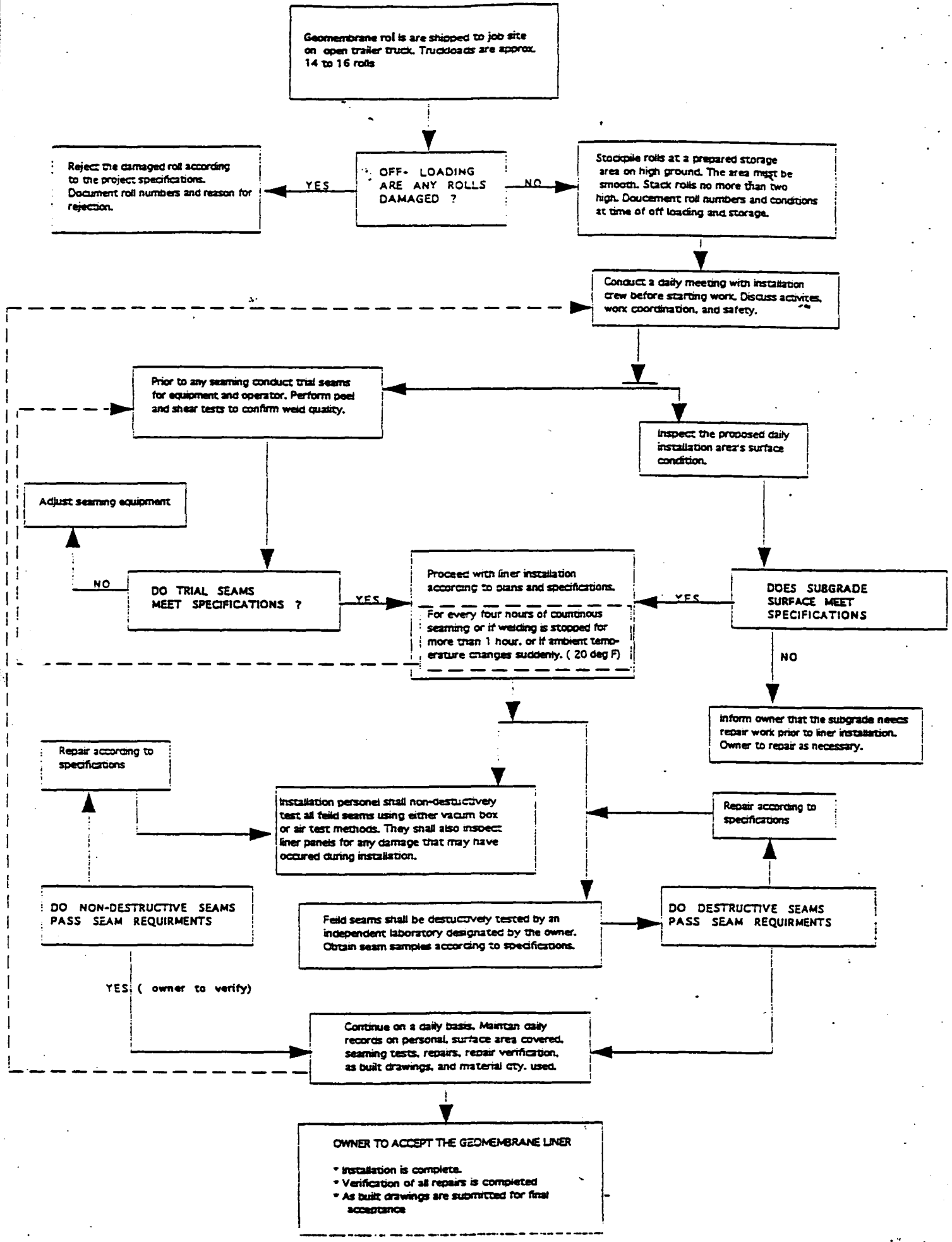
1) Installation is finished.

2) Verification of the adequacy of all field seams and repairs, including associated testing, is complete.

3) Certification, including "as built" drawing(s), is provided by the installer to the owner's representative.

17.0 STORAGE OF RECORDS

The manufacturer stores records of the CQA reports for the life of the project. All projects are recorded by project number in a computer file which allows us to trace and retrieve the product certificates issued at the time of shipping.


Geomembrane rol is are shipped to job site on open trailer truck. Truckloads are approx. 14 to 16 rolls
OFF- LOADING ARE ANY ROLLS DAMAGED ?
YES
Reject the damaged roll according to the project specifications. Document roll numbers and reason for rejection.
NO
Stockpile rolls at a prepared storage area on high ground. The area must be smooth. Stack rolls no more than two high. Doucement roll numbers and conditions at time of off loading and storage.
Conduct a daily meeting with installation crew before starting work. Discuss activites, work coordination, and safety.
Prior to any seaming conduct trial seams for equipment and operator. Perform peel and shear tests to confirm weld quality.
Inspect the proposed daily installation area's surface condition.
Adjust seaming equipment
NO
DO TRIAL SEAMS MEET SPECIFICATIONS ?
YES
Proceed with liner installation according to plans and specifications.
For every four hours of countinous seaming or if welding is stopped for more than 1 hour, or if ambient temperature changes suddenly. (20 deg F)
YES
DOES SUBGRADE SURFACE MEET SPECIFICATIONS
NO
Inform owner that the subgrade needs repair work prior to liner installation. Owner to repair as necessary.
Repair according to specifications
Installation personel shall non-destructively test all feild seams using either vacum box or air test methods. They shall also inspect liner panels for any damage that may have occured during installation.
Repair according to specifications
DO NON-DESTRUCTIVE SEAMS PASS SEAM REQUIRMENTS
Feild seams shall be destucovely tested by an independent laboratory designated by the owner. Obtain seam samples according to specifications.
DO DESTRUCTIVE SEAMS PASS SEAM REQUIRMENTS
YES (owner to verify)
Continue on a daily basis. Maintain daily records on personal, surface area covered, seaming tests, repairs, repair verification, as built drawings, and material qty. used.
OWNER TO ACCEPT THE GEOMEMBRANE LINER
• Installation is complete.
• Verification of all repairs is completed
• As built drawings are submitted for final acceptance

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

CERTIFICATE OF ACCEPTANCE

PROJECT NAME: _____ DATE: _____

EDCI JOB NO.: _____ PROJECT LOCATION: _____

Details of Work Completed and Measured...

_____

_____

_____

_____

_____

I, the undersigned, duly authorized representative of _____ do hereby take over and accept the work described above from the date hereof, subject to the exceptions detailed below, and confirm that the work has been completed in accordance with the specifications and the terms and conditions of the contract. There is no apparent damage to the plastic lining, nor is there any interference within or without the surrounding works.

I have evaluated and measured the work together with the EDCI representative, and agree that the measurements shown above are true and correct, and that the installation has met our approval.

Exceptions: _____

_____

General Contractor/Owner Date: _____

Name _____ Signature _____

Environmental Design & Construction, Inc. Date: _____

Name _____ Signature _____

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CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Project Name _____

Project No. _____

Location _____

Installer _____

Area to be Accepted _____

_____

_____

_____

I, the undersigned, duly authorized representative of the installer, do hereby accept the soil subgrade surface conditions for installation of geosynthetic products. EDCI does not accept responsibility for compaction and earthwork in accordance with the contract documents, nor to maintain the condition of the surface. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

_____	_____	_____
Signature	Title	Date

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DAILY FIELD REPORT - CONSTRUCTION MANAGEMENT

JOB NAME: _____ DATE: _____

PROJECT #: _____

PROJECT LOCATION: _____ WEATHER: _____

OBSERVATIONS:

_____

CONTRACTOR COMMENTS _____

CONTRACTOR REPRESENTATIVE
(PLEASE PRINT)

EDCI REPRESENTATIVE
(PLEASE PRINT)

Signature Date

Signature Date

MATERIAL	PREVIOUS MHR	MHR TODAY	TOTAL MHR	PREV. SF	TODAY SF	TOTAL SF	SF/MHR
MIL							
MIL							
NET							
GTX							
GTX							
GCL							
SET UP							
OTHER							

May 15, 1995

ENVIRONMENTAL DESI[illegible] & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
205-551-0372

JOB NAME _____ JOB NUMBER _____

LOCATION _____ WEATHER _____

QA/QC _____ CONTRACTOR _____

DEFECT LOG

			LOCATION					EXTRUSION		VACUUM TEST		QA/QC
DEFECT NUMBER	PATCH BEAD	DATE	SEAM NUMBER	PANEL NUMBER	DATE OF REPAIR	WELD ID. OPER.	MACH. #	TEMP/ PRE-HEAT	DATE TESTED	TESTER ID	PASS FAIL	MONITOR PRESENT

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DESTRUCTIVE TEST LOG

JOB NAME: _____ PAGE: _____ OF _____

JOB NUMBER: _____ Ambient Temp. ____ a.m. MIN. PEEL: _____ ppl

LOCATION: _____ ____ p.m. MIN. SHEAR: _____ ppl

Q.A. TECHNICIAN: _____ SHEET THICKNESS: _____ ppl

Destr.Test Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/ Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass/ Fail
	/ /																	
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ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811
205-551-0372

JOB NAME _____ PROJECT # _____

LOCATION _____ WEATHER _____

QA/QC _____ DATE _____

GEOMEMBRANE SEAMING AND TEST RECORD

SEAM NUMBER	SEAMING RECORD				FUSION	EXTRUSION	PRESSURE TEST						DATE TESTED	VACUUM TEST		QA/Q MONI PRESI
	LENGTH WELD	TIME	WELD ID. OPER.	MACH. #	TEMP/ SPEED	TEMP/ PRE-HEAT	TIME START	TIME END	PRESSURE START	PRESSURE END	TEST ID	PASS FAIL		TESTER ID	PASS FAIL	

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JOB NAME _____ OWNER _____

LOCATION _____ CONTRACTOR _____

INVENTORIED BY _____ DATE _____

PAGE NUMBER _____

GEOSYNTHETIC INVENTORY CONTROL RECORD

ROLL NUMBER	ROLL DIMENSIONS			BLEND NUMBER	COMMENTS
	LENGTH	WIDTH	MIL		

5/15/95

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104 Wholesale Avenue, Huntsville, AL 35811 • Tel: (205) 551-0372 • Fax: (205) 551-0347

PROJECT NAME:_____ SHEET ____ OF ____

PROJECT #: _____

PROJECT LOCATION:_____ DATE:_____

PANEL PLACEMENT LOG

PANEL #	ROLL #	THICKNESS	LENGTH	WIDTH	SF
	TOTAL INSTALLED THIS PAGE				
	TOTAL INSTALLED PREV. PAGE				
	TOTAL INSTALLED TO DATE				

May 15, 1995

ENVIRONMENTAL DESIGN & CONSTRUCTION, INC.
104 WHOLESALE AVENUE, HUNTSVILLE, ALABAMA 35811

TRIAL WELD TEST LOG

JOB NAME: _____ PAGE: _____ OF _____

JOB NUMBER: _____ Ambient Temp. ____ a.m. MIN. PEEL: _____ ppi

LOCATION: _____ ____ p.m. MIN. SHEAR: _____ ppi

Q.A. TECHNICIAN: _____ SHEET THICKNESS: _____ ppi

Trial Weld Sample #	Date of Weld	Time of Weld	Location	Welding Technician	Machine Type & #	Machine Temp/Speed	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Pass/ Fail	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass Fal
	/ /																	
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APPENDIX I

FIELD TESTS

APPENDIX I
FIELD TESTS

INDEX

I-1 Testing Plan and Log

I-2 Field Compaction/Moisture Tests

I-1

Testing Plan and Log

TESTING PLAN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Site Preparation	Throughout tesk	EM 385-1-1, Section 21.1 and 25 (Safety and Health Requirements Manual, USACE 10/92)	MK	N/A	N/A	N/A	Refer to Work Plan
Backfill / Compaction of excavated areas	Every 500sf of material placed	ASTM Standards	SUB	07-09/19/97 08-09/19/97 18-09/26/97 19-09/26/97 20-09/26/97	Density per site specific requirements or design dpecs and drawings (95% compaction @ +or - 3% opt moisture)	102.3%@+0.5 pass 101.7%@+1.1 pass 102.5%@+0.6 pass 98.5%@+1.0 pass 97.5%@+2.4 pass	Document on Field Inspection Checklist (FIC) So-01 Refer to Work Plan, for other requirements
Characterization for off-site desposal	Per SWMU specific Work Plan sections	40 CFR, part 261 TCLP (volatiles, and metals) and 40 CFR Part 264.341 (paint filter test) (Additional tests may be required, refer to individual SWMUs)	LAB	N/A	Less than TCLP criterion. Paint filter test results as specified in 40 CFR Part 264.314.	N/A No off site disposal (only construstion of office debrie disposed of off site)	Refer to SWMU specific section of Work Plan

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Construct Decontamination Pad	One Per SWMU		SUB	N/A		Temp. Decon Pad constructed for econtamination of equipment and tools using plastic sheeting, material disposed of under cap	
Photographs	Daily		MK	N/A	N/A	Photographs taken through construction activities	
Environmental Report	One Per SWMU		MK	N/A	N/A	N/A	
Site Restoration	Throughout Activity		MK	N/A	Ensure that topsoil and vegetative cover are placed per Work Plan and technical specifications	Daily visual inspection of work process	Refer to Work Plan

TESTING AN AND LOG
CONTRAC. NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Cap foundation material specifications and placement	:Moisture and density tests: per lifts per 5000sf of material placed	Material specifications per specs and drawings Installation per speds and drawings	SUB	01-09/18/97	Per design drawing and technical specifications 95% compaction @ + to - 3% opt. moisture	100.7%@+1.7 pass	Refer to Work Plan, Document of FIC CAP-01 documented on Subcontractor Field Testing reports
				02-09/18/97		99.6%@+2.3 pass	
				03-09/18/97		92.3%@+3.8 fail	
				04-09/18/97		94.4%@+3.1 fail	
				05-09/19/97		95.0%@-5.3 fail	
				05rt-09/19/97		97.6%@-2.9 pass	
				06-09/19/97		96.5%@+1.9 pass	
				06rt-09/19/97		97.4%@+0.8 pass	
				01rt-09/19/97		102.0%@+2.2 pass	
				05rt-09/24/97		99.4%@+2.4 pass	
				09-09-24/97		92.7%@-4.7 fail	
				10-09/24/97		97.7%@+3.4 fail	
				11-09/24/97		96.0%@+2.3 pass	
				03rt-09/24/97		94.8%@+2.5 pass	
				04rt-09/24/97		102.6%@+2.0 pass	
				12-09/24/97		97.3%@+3.0 pass	
				13-09/24/97		86.2%@+4.6 fail	
				14-09/24/97		94.7%@-1.2 pass	
				15-09/25/97		96.4%@-2.2 pass	
				16-09/25/97		97.8%@-2.1 pass	
				11rt-09/26/97		96.3%@-3.0 pass	
				10rt-09/26/97		98.4%@-0.6 pass	
				09rt-09/26/97		96.9%@+2.8 pass	
				21-09/26/97		95.8%@+1.8 pass	
				22-09/26/97		100.7%@+1.4 pass	
				13rt-09/26/97		101.5%@+0.1 pass	
				23-09/26/97		98.4%@+1.8 pass	
				24-09/27/97		96.3%@+1.0 pass	
				25-09/27/97		97.0%@+0.2 pass	
				26-09/27/97		96.9%@-0.3 pass	
				27-09/27/97		100.0%@-0.8 pass	
				28-09/27/97		96.6%@-0.9 pass	
				29-09/29/97		97.4%@-0.9 pass	
				30-09/29/97		97.3%@-2.2 pass	

TESTING AN AND LOG
CONTRAC NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Cap foundation material specifications and placement	:Moisture and density tests: per lifts per 5000sf of material placed	Material specifications per specs and drawings Installation per speds and drawings	SUB	31-09/29/97	Per design drawing and technical specifications 95% compaction @ + to - 3% opt. moisture	92.4%@-1.8 fail	Refer to Work Plan, Document of FIC CAP-01 documented on Subcontractor Field Testing reports
				31rt-09/29/97		95.3%@-0.2 pass	
				32-09/29/97		91.0%@+0.4 fail	
				32rt-09/29/97		97.9%@-1.2 pass	
				33-09/29/97		96.8%@-2.9 pass	
				34-09/30/97		89.6%@-1.6 fail	
				35-09/30/97		94.9%@-0.3 pass	
				34rt-09/30/97		97.4%@+0.3 pass	
				36-09/30/97		94.1%@-1.1 fail	
				36rt-09/30/97		94.7%@-0.5 pass	
				37-09/30/97		95.6%@-1.7 pass	
				38-09/30/97		101.0%@-0.5 pass	
				39-09/30/97		95.6%@+0.5 pass	
				40-09/30/97		94.7%@+1.6 pass	
				41-09/30/97		98.9%@-1.8 pass	
				42-09/30/97		100.2%@-1.0 pass	
				43-09/30/97		101.4%@+0.3 pass	
				44-10/01/97		100.3%@-0.2 pass	
				45-10/01/97		102.3%@+0.3 pass	
				46-10/01/97		95.6%@+2.6 pass	
				47-10/01/97		96.5%@+0.4 pass	
				48-10/01/97		98.9%@+1.7 pass	
				49-10/01/97		99.7%@-0.2 pass	
				50-10/03/97		98.3%@+0.6 pass	
				51-10/03/97		99.3%@-1.0 pass	
				52-10/03/97		91.5%@-0.8 fail	
				52rt-10/03/97		95.0%@+0.3 pass	
				53-10/03/97		96.5%@-0.9 pass	
				54-10/07/97		90.1%@-1.6 fail	
				55-10/07/97		95.2%@-5.7 fail	
				56-10/07/97		97.1%@-2.6 pass	
				54rt-10/07/97		95.1%@-2.6 pass	
				55rt-10/07/97		99.4%@-2.1 pass	
				01-07/07/98		102.2%@-3.0 pass	
				02-07/07/98		100.6%@-2.5 pass	
				03-07/07/98		100.2%@-3.0 pass	

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Synthetic Clay Liner	As per requirements	Requirements for Hazardous Waste Landfill Design, Construction, and Closure.	MK	N/A Documented on Daily Inspection Reports	Per specification	Daily visual inspection of all seams	Document on FIC CAP-01 Document on Daily Inspection Report
Installation of geomembrane	AS per requirements	Construction Quality Management for RA and RD Waste Containment Systems EPA/540/R-92/073)	SUB	Trial welds 07/14/98 01-313-pre-weld 02-315-pre-weld 03-313-end-day 04-315-end-day 07/17/98 05-313-pre-weld 06-315-preweld 07-315-mid-day 08-313-mid-day 09-313-end-day 10-315-end-day 07/18/98 11-313-pre-weld 12-315-pre-weld 13-313-mid-day 14-315 end-day 15-313-end-day 07/19/98 16-315-pre-weld 17-313-pre-weld 18-315-end-day 19-313-end-day 07/20/98 20-315-pre-weld 21-313-pre-weld 22-313-end-day 23-315-end-day	Per specifications peel 70 psi shear 120 psi	All trial welds passing Documented on Trail Weld Test Log	Document on FIC CAP-01 Documented on Daily Inspect Report

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Installation of geomembrane	AS per requirements	Construction Quality Management for RA and RD Waste Containment Systems EPA/540/R-92/073)	SUB	Trial welds 07/21/98 24-316-pre-weld 25-286-pre-weld 26-316-end-day 27-286-end-day 07/22/98 28-313-pre-weld 29-313-end-day 30-286-pre-weld 31-286-end-day 07/23/98 32-313-pre-weld 33-313-end-day 34-286-pre-weld 35-286-end-day	Per specifications Trial Welds peel 70 psi shear 120 psi	All trial welds passing Documented on Trail Weld Test Log	Document on FIC CAP-01 Documented on Daily Inspect Report
				Air testing seams 07/14/98 1/2 1/3 1/4 3/4 3/5 4/5 07/17/78 5/6 5/7 6/7 6/8 7/8 8/9 9/10	Air testing seams to be pressurized to between 30 and 35psi held for 5 minutes with less then a 3 psi change in pressure	All air tested seaming passing Documented on Geomembrane seamaing and Test record	

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Installation of geomembrane	AS per requirements	Construction Quality anagement for RA and RD Waste Containment Systems EPA/540?R-92?073)	SUB	Air testing of seams 07/18/98 10/11 11/12 12/13 12/14 13/14 14/15 15/16 16/17 07/19/98 17/18 17/22 18/19 18/22 19/20 19/22 20/21 07/20/98 21/23 21/24 23/24 23/25 24/25 25/26 07/22/98 26/27 07/23/98 27/28 28/29 29/30	Per specifications Air testing seams to be pressurized to between 30 and 35psi held for 5 minutes with less then a 3 psi change in pressure	All air tested seaming passing Documented on Geomembrane seamaing and Test record	Document on FIC CAP-01 Documented on Daily Inspect Report

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Installation of geomembrane	AS per requirements	Construction Quality anagement for RA and RD Waste Containment Systems EPA/540/R-92/073)	SUB	Air testing of seams 07/18/98 10/11 11/12 12/13 12/14 13/14 14/15 15/16 16/17 07/19/98 17/18 17/22 18/19 18/22 19/20 19/22 20/21 07/20/98 21/23 21/24 23/24 23/25 24/25 25/26 07/22/98 26/27 07/23/98 27/28 28/29 29/30	Per specifications Air testing seams to be pressurized to between 30 and 35psi held for 5 minutes with less then a 3 psi change in pressure	All air tested seaming passing Documented on Geomembrane seamaing and Test record	Document on FIC CAP-01 Documented on Daily Inspect Report

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Installation of geomembrane	AS per requirements	Construction Quality Management for RA and RD Waste Containment Systems EPA/540/R-92/073)	SUB	Destructive test ds-1 07/14/98 ds-2 07/17/98 ds-3 07/17/98 ds-4 07/18/98 ds-5 07/18/98 ds-6 07/19/98 ds-7 07/19/98 ds-08 07/20/98 ds-09 07/23/98	Per Specifications Field Sample Destructive test peel 70 psi shear 120 psi	Both Field and Lab. Destructive test Passed	Documented on FIC CAP-01 Documented on Daily Inspection Report Samples archived for all Trial welds and Destructive seam test
Installation of drainage layer and biotic barrier layer	Thickness verifications one per 5000sf placed	Technical Specifications	SUB/MK	Sand drainage layer 10 random samples locations & As-Built Survey 07/28/98 Biotic Barrier Layer 16 random sample location & As-Built Survey 08/03/98	Per Specifications Nonminal 6 inches	Sand Drainage Layer 1-5.8"-pass 2-6.0"-pass 3-6.2"-pass 4-8.0"-pass 5-8.0"-pass 6-6.2"-pass 7-6.7"-pass 8-6.2"-pass 9-6.7"-pass 10-6.0"-pass Survey +/- 0.1'	Documented on FIC CAP-01 Documented on Daily Inspection Report

TESTING AN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Installation of drainage layer and biotic barrier layer	Thickness verifications one per 5000sf placed	Technical Specifications	SUB/MK	Sand drainage layer 10 random samples locations & As-Built Survey 07/28/98 Biotic Barrier Layer 16 random sample location & As-Built Survey 08/03/98	Per Specifications Nonminal 6 inches	Biotic Barrier Layer 1-4" -fail 1rt-5.5"-pass 2-8" -fail 2rt-7.0"-pass 3-4" fail 3rt-5.5"-pass 4-9" fail 4rt-7.0"-pass 5-10.5"-fail 5rt-7.0"-pass 6-6.5-pass 7-10.5-fail 7rt-7.25-pass 8-7.0"-pass 9-6.5"-pass 10-6.75"-pass 11-7.0"-pass 12-8.5"-fail 12rt-7.0"-pass 13-7.0"-pass 14-8.5"-fail 14rt-7.0"-pass 15-4.0"-fail 15rt-5.5"-pass 16-9.0"-fail 16rt-6.5"-pass survey +/- 0.1'	Documented on FIC CAP-01 Documented on Daily Inspection Report

TESTING AN AND LOG
CONTRAC. NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Testing of perimeter drain backfill	Thickness verification per lift every 5000sf of material placed	As per design drawings and specification or ASTM Standards	SUB	N/A	Design drawings	N/A	Perimeter drain nonexisting Drainage collection system installed in drainage/anchor trench depth min.1'
Placement of geotextile filter fabric		Manufacturers recommendations	MK	N/A	Per specifications provided by WES and Manufacture	Visual inspection	Document on FIC CAP-01 Daily Inspection Report

TESTING PLAN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Placement of cover soil	Per lift, moisture and density every 5000sf of material placed	Material specifications as per design drawing and specifications	SUB	08/07/98	Design drawing and specifications		Documented on FIC CAP-01
				1		105.9%@+2.1-P	
				2		96.7%@+3.8-F	
				3		95.5%@+4.6-F	Documented on Subcontractor Field Testing Report
					90% compaction @ 0 to +3% of opt moisture		
				08/11/98			
				4		96.7%@+2.1-P	
				5		96.2%@+1.4-P	
				6		101.1%@+1.1-P	
				2R		100.1%@+1.5-P	
				7		98.5%@ 0 -P	
				8		100.0%@+2.2-P	
				9		100.8%@+0.1-P	
				10		83.7%@+4.4-F	
				10R		95.1%@+2.2-P	
				3R		97.2%@+2.9-P	
				08/12/98			
				11		100.1%@ 0 -P	
				12		98.2%@+1.0-P	
				13		97.2%@+2.6-P	
				14		94.9%@+1.5-P	
				15		98.1%@+1.4-P	
				16		94.5%@+4.0-F	
				17		97.7%@+0.3-P	
				16R		99.2%@+0.9-P	
				08/13/98			
				18		93.3%@+3.2-F	
				19		91.8%@+1.7-P	
				20		92.4%@+3.0-P	
				18R		95.6%@+2.3-P	
				21		94.5%@+3.0-P	
				22		91.3%@+5.0-F	
				23		90.8%@+0.6-P	
				22R		99.6%@+0.7-P	

I-2

Field Compaction/Moisture Tests

TESTING PLAN AND LOG
CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO.: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled by	Sample of Test Number/Date	Acceptance Criteria	Results and/or Remarks	Comments
Placement of cover soil	Per lift, moisture nd density every 5000sf of material placed	Material specifications as per design drawing and specifications	SUB	08/13/98	Design drawing nd specifications		Documented on FIC CAP-01
				18		93.3%@+3.2-F	
				19		91.8%@+1.7-P	
				20		92.4%@+3.0-P	Documented on Subcontractor Field Testing Report
				18R	90% compaction @ 0 to +3% of opt moisture	95.6%@+2.3-P	
				21		94.5%@+3.0-P	
				22		91.3%@+5.0-F	
				23		90.8%@+0.6-P	
				22R		99.6%@+0.7-P	
				08/14/98			
				24		101.2%@ 0 -P	
				25		96.2%@+0.7-P	
				26		97.6%@+1.4-P	
				27		98.1%@+1.1-P	
				28		96.8%@+1.1-P	
				29		96.0%@+0.6-P	
				08/15/98			
				30		93.5%@+1.7-P	
				31		86.7%@+2.2-F	
				32		96.7%@+0.2-P	
				33		99.3%@+0.6-P	
				34		102.6%@ 0 -P	
				31R		97.1%@+0.6-P	
				08/20/98			
				35		100.2%@+0.5-P	
				36		88.0%@+2.0-F	
				37		90.8%@+2.0-P	
				38		92.0%@+1.3-P	
				36R		97.4%@ 0 -P	

PHILIP
ENVIRONMENTAL

Industrial Services Group
Midwest Region

RECEIVED
NOV 17 1998
MK-CRANE

November 11, 1998
Project 18328

Mr. W. D. "John" McCumbers
Contract Administrator
Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square One, Suite 211
North Charleston, South Carolina 29406

Dear Mr. McCumbers

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Submittal No. 086

The following submittal is being presented in accordance with the Bid Documents, dated; July 3, 1997, Section 01300 - Submittals,

Item No.	Description	Section No.
1-46	Density & Moisture Test Results	02200

These submittals have been reviewed and approved by Philip Services Corporation. If there is any questions concerning this submittal, please contact : Donald Flowers, Project Manager, Philip Environmental Services, 210 West Sand Bank Road, Columbia, Illinois 62236, (800) 733-7173, Ext. 7382, Fax (618) 281-6477

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Donald L. Flowers,
Project Manager

cc: D. Beall

MKCRANE			
4324-0009			
PROJECT MEMBER	ACT	INFO	INIT
PROJECT MANAGER		X	db
PROJECT ENGINEER			
GNL SUPT			
SAFETY AND HEALTH			
QA/QC			
PROJECT CONTROLS			
FIELD ENGINEERING			
MKC CHARLESTON			
K. Ohsick		X	R
FILE:			
FILE:			
FILE: 17-26-106			

Philip Environmental Services Corporation

Summary of Field Geotechnical Testing

Project: NSWC Crane
Location: Crane, IN
Specification: 90% of the maximum dry density as determined by a Standard Proctor (ASTM D698)

Comments/Notes: Retest Perfomed in Test Areas 61, 67, 69 and 73.
Initial tests indicate moisture content of soil not within specified range.

Laboratory Test Type:
A. Standard Proctor (ASTM D 698).
B. Modified Proctor (ASTM D 1557).
C. Maximum and Minimum Density (ASTM D 4253 and D 4254).

Definitions:
pcf Pounds per cubic foot.
ASTM American Society for Testing and Materials.

Test Numbering (Typical Format):
1.0 Initial field test.
RT1 Retest after reworking of the general area of the initial test.

			Laboratory Data					Field Data					
Date	Test Number	Location	Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Moisture Content (%)	Dry Density (pcf)	Measured Compaction (%)	Specified Compaction (%)	Pass or Fail	See Note Above (Moistures)
9/18/97	1	See Test Location Sketch	Lift No. 1	BS-6	A	115.9	13.4	19.5	107.6	92.8	95	Fail	
9/18/97	2	See Test Location Sketch	Lift No. 1	BS-6	A	115.9	13.4	20.1	106.5	91.9	95	Fail	
9/18/97	3	See Test Location Sketch	Lift No. 1	BS-6	A	115.9	13.4	21.7	98.7	85.2	95	Fail	
9/18/97	4	See Test Location Sketch	Lift No. 1	BS-6	A	115.9	13.4	20.9	100.9	87.1	95	Fail	
9/19/97	5	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	12.5	101.6	95.0	95	Fail	
9/19/97	RT5	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	14.9	104.3	97.6	95	Pass	
9/19/97	6	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	19.7	103.2	96.5	95	Pass	
9/19/97	RT6	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	18.6	104.1	97.4	95	Pass	
9/19/97	RT1	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	20.0	109.0	102.0	95	Pass	
9/19/97	7	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	18.3	109.4	102.3	95	Pass	
9/19/97	8	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	18.9	108.7	101.7	95	Pass	
9/24/97	RT2	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	20.2	106.3	99.4	95	Pass	
9/24/97	9	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	13.1	99.2	92.7	95	Fail	
9/24/97	10	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	21.6	104.3	97.6	95	Fail	
9/24/97	11	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	20.1	102.7	96.0	95	Pass	
9/24/97	RT3	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	20.3	101.4	94.8	95	Accept	
9/24/97	RT4	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	19.8	109.7	102.6	95	Pass	
9/24/97	12	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	20.8	104.1	97.3	95	Pass	
9/24/97	13	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	22.4	92.1	86.2	95	Fail	
9/24/97	14	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	16.6	101.3	94.7	95	Pass	
9/25/97	15	See Test Location Sketch	Lift No. 1	BS-11	A	101.5	20.0	17.8	97.8	96.4	95	Pass	
9/25/97	16	See Test Location Sketch	Lift No. 1	BS-11	A	101.5	20.0	17.9	99.3	97.8	95	Pass	
9/25/97	17	See Test Location Sketch	Lift No. 1	BS-11	A	101.5	20.0	17.0	96.3	94.9	95	Accept	
9/26/97	18	New Road Subbase	Subbase	BS-10	A	104.5	18.5	19.1	107.1	102.5	95	Pass	
9/26/97	19	New Road Subbase	Subbase	BS-10	A	104.5	18.5	19.5	103.0	98.5	95	Pass	
9/26/97	20	New Road Subbase	Subbase	BS-10	A	104.5	18.5	20.9	101.9	97.5	95	Pass	

Philip Environmental Services Corporation

Summary of Field Geotechnical Testing

Project: NSWC Crane
Location: Crane, IN
Specification: 90% of the maximum dry density as determined by a Standard Proctor (ASTM D698)

Comments/Notes: Retest Perfomed in Test Areas 61, 67, 69 and 73.
Initial tests indicate moisture content of soil not within specified range.

Laboratory Test Type:
A. Standard Proctor (ASTM D 698).
B. Modified Proctor (ASTM D 1557).
C. Maximum and Minimum Density (ASTM D 4253 and D 4254).

Definitions:
pcf Pounds per cubic foot.
ASTM American Society for Testing and Materials.

Test Numbering (Typical Format):
1.0 Initial field test.
RT1 Retest after reworking of the general area of the initial test.

			Laboratory Data					Field Data					
Date	Test Number	Location	Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Moisture Content (%)	Dry Density (pcf)	Measured Compaction (%)	Specified Compaction (%)	Pass or Fail	See Note Above (Moistures)
9/26/97	RT10	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	20.6	103.6	96.9	95	Pass	
9/26/97	RT9	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	19.6	102.5	95.8	95	Pass	
9/26/97	21	See Test Location Sketch	Lif t No. 2	PBS-2	A	106.9	17.8	19.2	107.6	100.7	95	Pass	
9/26/97	22	See Test Location Sketch	Lif t No. 2	PBS-2	A	106.9	17.8	17.9	108.5	101.5	95	Pass	
9/26/97	RT13	See Test Location Sketch	Lift No. 1	PBS-2	A	106.9	17.8	19.6	105.2	98.4	95	Pass	
9/26/97	23	See Test Location Sketch	Lif t No. 2	PBS-2	A	106.9	17.8	19.2	106.2	99.3	95	Pass	
9/27/97	24	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	19.4	101.9	96.4	95	Pass	
9/27/97	25	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.6	102.5	97.0	95	Pass	
9/27/97	26	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.1	102.5	97.0	95	Pass	
9/27/97	27	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	17.6	105.7	100.0	95	Pass	
9/27/97	28	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	17.5	102.2	96.6	95	Pass	
9/30/97	29	See Test Location Sketch	Lift No. 1	BS-12	A	105.7	18.4	16.8	94.8	89.6	95.0	Fail	
9/30/97	30	See Test Location Sketch	Lift No. 1	BS-12	A	105.7	18.4	18.1	100.4	95.0	95.0	Pass	
9/30/97	RT29	See Test Location Sketch	Lift No. 1	BS-12	A	105.7	18.4	18.7	103.0	97.4	95.0	Pass	
9/30/97	31	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	17.3	99.5	94.1	95.0	Fail	
9/30/97	RT31	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	17.9	100.1	94.7	95.0	Accept	
9/30/97	32	See Test Location Sketch	Lift No.2	BS-12	A	105.7	18.4	16.7	101.1	95.6	95.0	Pass	
9/30/97	33	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	17.9	106.8	101.0	95.0	Pass	
9/30/97	34	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	18.9	101.4	95.9	95.0	Pass	
9/30/97	35	See Test Location Sketch	Lift No. 4	BS-12	A	105.7	18.4	20.0	100.1	94.7	95.0	Accept	
9/30/97	36	See Test Location Sketch	Lift No. 4	BS-12	A	105.7	18.4	16.6	104.4	98.8	95.0	Pass	
9/30/97	37	See Test Location Sketch	Lift No. 4	BS-12	A	105.7	18.4	17.4	105.9	100.2	95.0	Pass	
9/30/97	38	See Test Location Sketch	Lift No. 5	BS-12	A	105.7	18.4	18.7	107.2	101.4	95.0	Pass	
10/1/97	39	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.2	106.1	100.3	95.0	Pass	
10/1/97	40	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.7	108.2	102.3	95.0	Pass	
10/1/97	41	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	21.0	101.1	95.6	95.0	Pass	

Philip Environmental Services Corporation

Summary of Field Geotechnical Testing

Project: NSWC Crane
Location: Crane, IN
Specification: 90% of the maximum dry density as determined by a Standard Proctor (ASTM D698)

Comments/Notes: Retest Perfomed in Test Areas 61, 67, 69 and 73.
Initial tests indicate moisture content of soil not within specified range.

Laboratory Test Type:
A. Standard Proctor (ASTM D 698).
B. Modified Proctor (ASTM D 1557).
C. Maximum and Minimum Density (ASTM D 4253 and D 4254).

Definitions:
pcf Pounds per cubic foot.
ASTM American Society for Testing and Materials.

Test Numbering (Typical Format):
1.0 Initial field test.
RT1 Retest after reworking of the general area of the initial test.

			Laboratory Data					Field Data					
Date	Test Number	Location	Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Moisture Content (%)	Dry Density (pcf)	Measured Compaction (%)	Specified Compaction (%)	Pass or Fail	See Note Above (Moistures)
10/1/97	42	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.8	102.1	96.5	95.0	Pass	
10/1/97	43	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	20.1	104.5	98.8	95.0	Pass	
10/1/97	44	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.2	105.4	99.7	95.0	Pass	
10/3/97	45	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	19.0	104.0	98.3	95.0	Pass	
10/3/97	46	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	17.4	105.0	99.3	95.0	Pass	
10/3/97	47	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	17.6	96.8	91.5	95.0	Fail	
10/3/97	RT47	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	18.7	100.5	95.0	95.0	Pass	
10/3/97	48	See Test Location Sketch	Lift No. 2	BS-12	A	105.7	18.4	17.5	102.1	96.5	95.0	Pass	
10/7/97	49	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	16.8	95.3	90.1	95.0	Fail	
10/7/97	50	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	12.7	100.7	95.2	95.0	Fail	
10/7/97	51	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	16.3	102.7	97.1	95.0	Pass	
10/7/97	RT-49	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	15.8	100.5	95.1	95.0	Pass	
10/7/97	RT-50	See Test Location Sketch	Lift No. 3	BS-12	A	105.7	18.4	16.3	105.2	99.5	95.0	Pass	
8/7/98	52	SeeTest Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	20.6	111.7	106.8	90.0	Pass	
8/7/98	53	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	22.3	101.1	96.7	90.0	Fail	
8/7/98	54	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	23.1	100.8	96.5	90.0	Fail	
8/11/98	55	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	20.6	101.1	96.7	90.0	Pass	
8/11/98	56	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	19.9	100.5	96.2	90.0	Pass	
8/11/98	57	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	19.6	105.6	101.1	90.0	Pass	
8/11/98	RT53	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	20.0	104.7	100.1	90.0	Pass	
8/11/98	58	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	18.5	102.9	98.5	90.0	Pass	
8/11/98	59	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	20.7	104.5	100.0	90.0	Pass	
8/11/98	60	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	18.6	105.4	100.8	90.0	Pass	
8/11/98	61	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	22.9	87.5	83.7	90.0	Fail	
8/11/98	RT61	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	20.7	99.4	95.1	90.0	Pass	
8/11/98	RT54	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	21.4	101.6	97.2	90.0	Pass	

Philip Environmental Services Corporation

Summary of Field Geotechnical Testing

Project: NSWC Crane
Location: Crane, IN
Specification: 90% of the maximum dry density as determined by a Standard Proctor (ASTM D698)

Comments/Notes: Retest Perfomed in Test Areas 61, 67, 69 and 73.
Initial tests indicate moisture content of soil not within specified range.

Laboratory Test Type:
A. Standard Proctor (ASTM D 698).
B. Modified Proctor (ASTM D 1557).
C. Maximum and Minimum Density (ASTM D 4253 and D 4254).

Definitions:
pcf Pounds per cubic foot.
ASTM American Society for Testing and Materials.

Test Numbering (Typical Format):
1.0 Initial field test.
RT1 Retest after reworking of the general area of the initial test.

			Laboratory Data					Field Data					
Date	Test Number	Location	Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Moisture Content (%)	Dry Density (pcf)	Measured Compaction (%)	Specified Compaction (%)	Pass or Fail	See Note Above (Moistures)
8/12/98	62	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	18.5	104.7	100.1	90.0	Pass	
8/12/98	63	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	19.5	102.7	98.2	90.0	Pass	
8/12/98	64	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	21.1	101.6	97.2	90.0	Pass	
8/12/98	65	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	20.0	99.2	94.9	90.0	Pass	
8/12/98	66	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	19.9	102.5	98.1	90.0	Pass	
8/12/98	67	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	22.5	98.7	94.5	90.0	Fail	
8/12/98	68	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	18.8	102.1	97.7	90.0	Pass	
8/12/98	RT67	See Test Location Sketch	Lift No. 1	BS-10	A	104.5	18.5	19.4	103.7	99.2	90.0	Pass	
8/13/98	69	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	21.7	97.5	93.3	90.0	Fail	
8/13/98	70	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	20.2	96.0	91.8	90.0	Pass	
8/13/98	71	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	21.5	96.6	92.4	90.0	Pass	
8/13/98	RT69	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	20.8	99.9	95.6	90.0	Pass	
8/13/98	72	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	21.5	98.8	94.5	90.0	Pass	
8/13/98	73	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	23.5	95.5	91.3	90.0	Fail	
8/13/98	74	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.1	94.9	90.8	90.0	Pass	
8/13/98	RT73	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.2	104.2	99.6	90.0	Pass	
8/14/98	75	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	18.5	105.8	101.2	90.0	Pass	
8/14/98	76	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.2	100.6	96.2	90.0	Pass	
8/14/98	77	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.9	102.1	97.6	90.0	Pass	
8/14/98	78	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.6	102.6	98.1	90.0	Pass	
8/14/98	79	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.6	101.2	96.8	90.0	Pass	
8/14/98	80	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.1	100.4	96.0	90.0	Pass	
8/15/98	81	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	20.2	97.8	93.5	90.0	Pass	
8/15/98	82	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	20.7	90.7	86.7	90.0	Fail	
8/15/98	83	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	18.7	100.8	96.4	90.0	Pass	
8/15/98	84	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.1	103.8	99.3	90.0	Pass	

Philip Environmental Services Corporation

Summary of Field Geotechnical Testing

Project: NSWC Crane
Location: Crane, IN
Specification: 90% of the maximum dry density as determined by a Standard Proctor (ASTM D698)

Comments/Notes: Retest Perfomed in Test Areas 61, 67, 69 and 73.
Initial tests indicate moisture content of soil not within specified range.

Laboratory Test Type:
A. Standard Proctor (ASTM D 698).
B. Modified Proctor (ASTM D 1557).
C. Maximum and Minimum Density (ASTM D 4253 and D 4254).

Definitions:
pcf Pounds per cubic foot.
ASTM American Society for Testing and Materials.

Test Numbering (Typical Format):
1.0 Initial field test.
RT1 Retest after reworking of the general area of the initial test.

			Laboratory Data					Field Data					
Date	Test Number	Location	Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Moisture Content (%)	Dry Density (pcf)	Measured Compaction (%)	Specified Compaction (%)	Pass or Fail	See Note Above (Moistures)
8/15/98	85	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	18.5	107.2	102.6	90.0	Pass	
8/15/98	RT82	See Test Location Sketch	Lift No. 2	BS-10	A	104.5	18.5	19.1	101.5	97.1	90.0	Pass	
8/20/98	86	See Test Location Sketch	Final Lift	BS-10	A	104.5	18.5	19.0	104.7	100.2	90.0	Pass	
8/20/98	87	See Test Location Sketch	Final Lift	BS-10	A	104.5	18.5	20.5	92.0	88.0	90.0	Fail	
8/20/98	88	See Test Location Sketch	Final Lift	BS-10	A	104.5	18.5	20.5	94.9	90.8	90.0	Pass	
8/20/98	89	See Test Location Sketch	Final Lift	BS-10	A	104.5	18.5	19.8	99.4	95.1	90.0	Pass	
8/20/98	RT84	See Test Location Sketch	Final Lift	BS-10	A	104.5	18.5	18.5	100.4	96.0	90.0	Pass	

MORRISON KNUDSEN CORPORATION
300 Highway 361, CTR-12
P.O. Box 310
Crane, IN 47522
(812) 854-6941
Fax: (812) 854-6944

September 8, 1997 4324-106-601

Philip Environmental Services
210 West Sand Bank Road
Columbia, IL 62236

Attn: Mr. Donald Flowers

Reference: Subcontract 4324-106, Philip letter DBC-14 dated August 21, 1997

Subject: Clarification on Compaction of First Lift of the Cap Foundation

The specification requires that the initial lift of cap foundation fill be placed and compacted to 90% of the soil maximum dry density within +/- 3% of the optimum moisture or as approved by MK. MK is aware of the problems which may arise in compacting soil over PPE, plastic sheeting, and unknown soil condition. MK expects Philip Environmental Services to conduct their field operation an a professional manner which would include spreading unsuitable material (e.g. PPE, etc.) in thin layers, assuring areas do not trap water, pumping water off an area prior to placement of fill, and using adequate equipment to achieve proper compaction and moisture. MK expects no action beyond that of a prudent contractor in achieving the required compaction.

Should there be an area within the cap footprint that compaction can not be achieved using ordinary construction practices and Philip Environmental Service has made normal efforts to achieve proper compaction, MK will then direct Philip Environmental Service.

Should you have any questions, please advise.

Sincerely,
MORRISON KNUDSEN CORPORATION

D Beall

Dave Beall
Project Manager

cc: D. Beall D. Albrethsen L. Bigley V. Logan
file: 13.050.22

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FIELD TESTING REPORT

PROJECT NSWC CRANE LOCATION _____
JOB NO. 18328.2000.77 DATE 8/7/98 CONTRACTOR PHILIP/MK WEATHER Cloudy/Showers TEMP 70-80 °F
SPECIFICATION 90% ASTM D698

Work Performed COMPACTION TESTING 6"

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
1	SEE LOCATION MAP	LIFT #1	B510	A	104.5	18.5	20.6	111.7	105.9	90	PASS	
2		↓	↓	↓	↓	↓	22.3	101.1	96.7	↓	FAIL	TOO WET
3		↓	↓	↓	↓	↓	23.1	100.8	95.5	↓	FAIL	TOO WET
												RETEST ON
												~~AND~~ TUESDAY
												8/11/98

Comments/Notes:

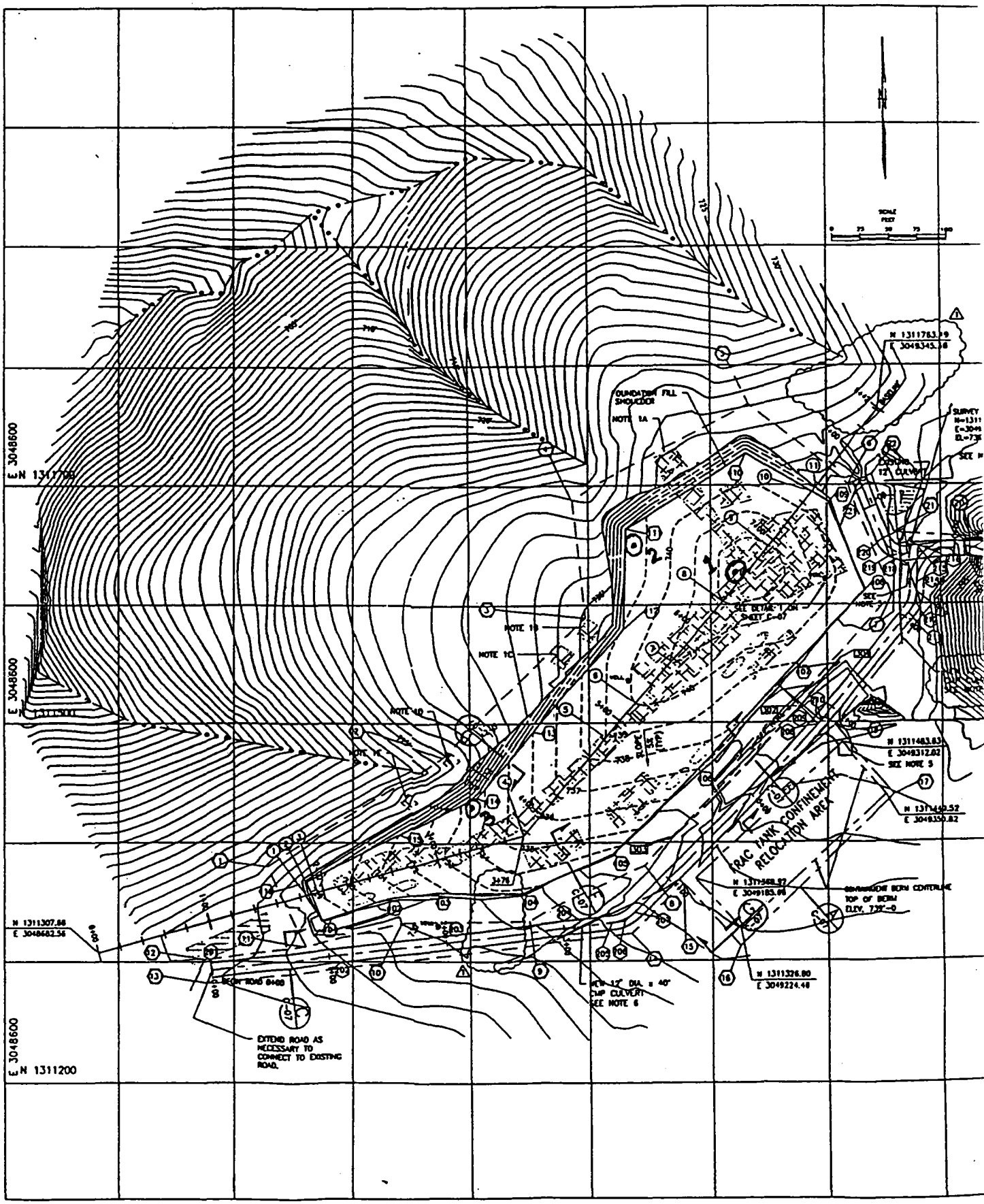
Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: _____

PF 88 (4/90)

C-03



E 3048600
N 1311700
E 3048600
N 1311500
E 3048600
N 1311200
N 1311763.19
E 3049345.38
FOUNDATION FILL SHOULDER
NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
SURVEY
N 1311483.83
E 3049312.02
SEE NOTE 5
N 1311440.52
E 3049350.82
FRAC TANK CONFINEMENT RELOCATION AREA
CONTAINMENT BERM CENTERLINE
TOP OF BERM
ELEV. 739'-0
N 1311326.80
E 3049224.48
NEW 12" DIA. x 40' CMP CULVERT
SEE NOTE 6
N 1311307.88
E 3048682.56
EXTEND ROAD AS NECESSARY TO CONNECT TO EXISTING ROAD.

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FIELD TESTING REPORT

PROJECT NSWC CRANE LOCATION _____

JOB NO. 18328.2000.77 DATE 8/7/98 CONTRACTOR PHILIP/MK WEATHER Cloudy/Showers TEMP 70-80 °F

SPECIFICATION 90% ASTM D698

Work Performed COMPACTION TESTING 6"

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
1	SEE LOCATION MAP	LIFT #1	B510	A	104.5	18.5	20.6	111.7	105.9	90	PASS	
2		↓	↓	↓	↓	↓	22.3	101.1	96.7	↓	FAIL	TOO WET
3		↓	↓	↓	↓	↓	23.1	100.8	95.5	↓	FAIL	TOO WET
												RETEST ON
												~~AND~~ TUESDAY
												8/11/98

Comments/Notes:

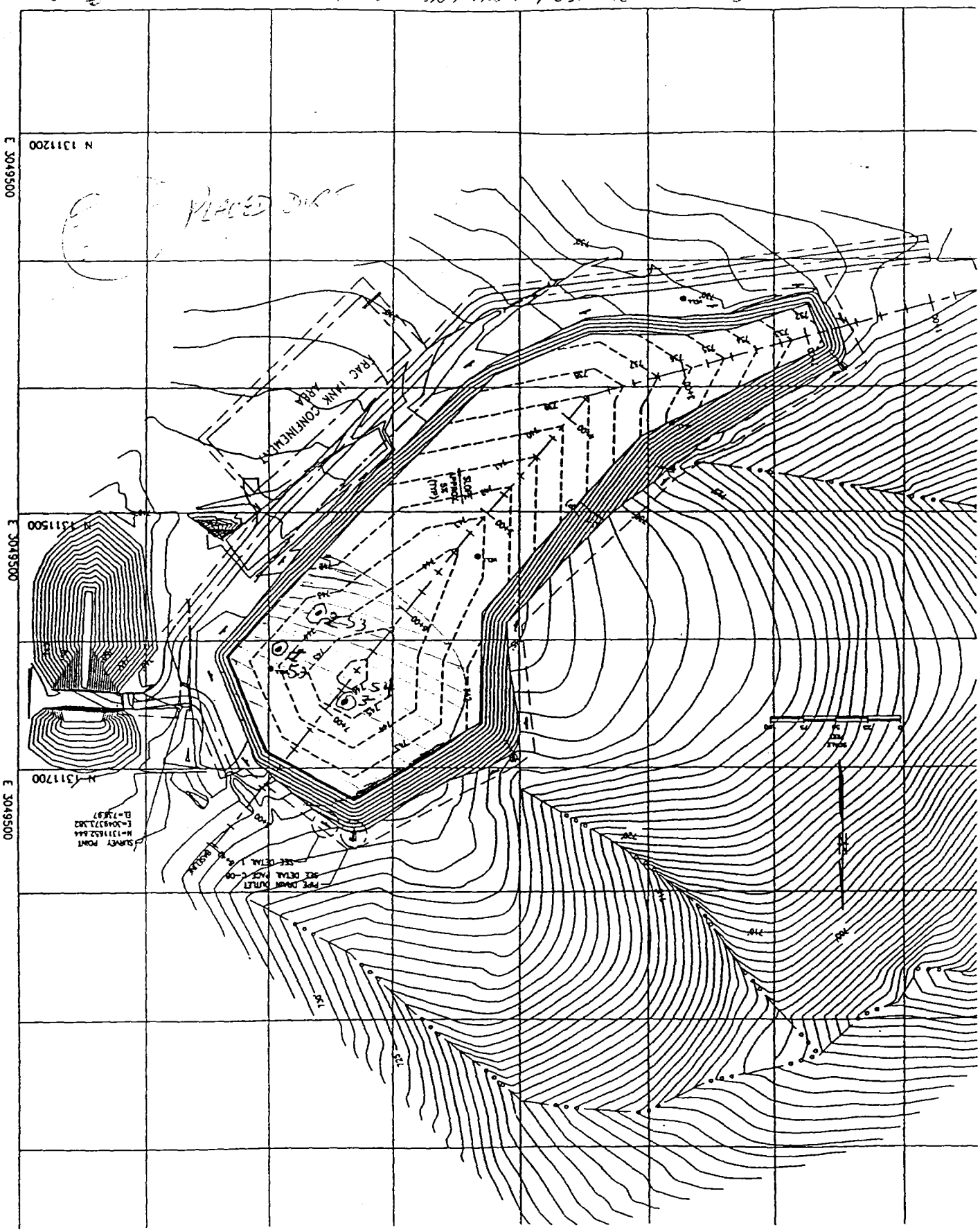
Laboratory Test Type
- A. Standard Proctor ASTM D-698
- B. Modified Proctor ASTM D-1557
- C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
- 1: Initial Field Test
- RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: _____

PE-88 (4/95)

8-7-98 FIRST LIFT PLACEMENT AND TEST LOCATIONS



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FIELD TESTING REPORT

PROJECT NSWC CRANE - DYE BURIAL GROUND CAP LOCATION CRANE, INDIANA

JOB NO. 18323-2000-77 DATE 8/11/98 CONTRACTOR PHILIP/MK WEATHER SUNNY/WARM TEMP 72-86

SPECIFICATION ASTM D698 90%

Work Performed Compaction testing on soil placed on top of landfill cap drainage layer

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
4 55	SEE LOCATION MAP	LIFT #1.	BS10	A	104.5	18.5	20.6	101.1	96.7	90%	P	
5 56	↓	↓	↓	↓	↓	↓	19.9	100.5	96.2	↓	P	
6 57							19.6	105.6	101.1		P	
2R B53							20.0	104.7	100.1		P	RETEST
7 58							18.5	102.9	98.5		P	
8 59							18.7	104.5	100.0		P	
9 60							18.6	105.4	100.8		P	
10 61							22.9	87.5	83.7		F	
10R B60	↓	↓	↓	↓	↓	↓	20.7	99.4	95.1	↓	P	RETEST

Comments/Notes: R = RETEST

LOC 3 B54	SEE LOCATION MAP	LIFT #1	BS10	A	104.5	18.5	21.4	101.6	97.2	90%	PASS

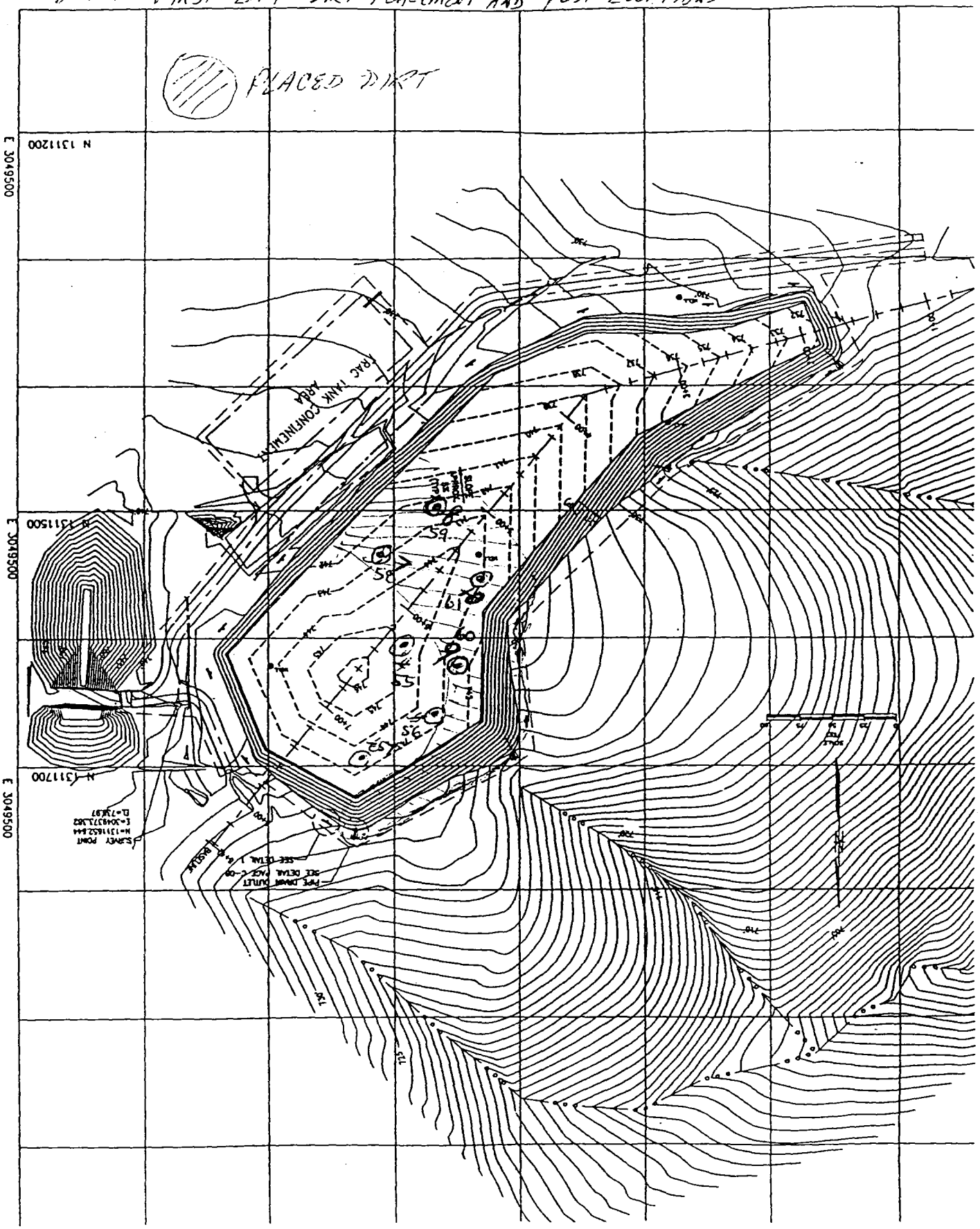
Laboratory Test Type
- A. Standard Proctor ASTM D-698
- B. Modified Proctor ASTM D-1557
- C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
- I: Initial Field Test
- RT I: Retest After Reworking General Area Of Initial Field Test

Signature: David B Martin

PE-RI

8-11-98 FIRST LIFT DIRT PLACEMENT AND TEST LOCATIONS



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FIELD TESTING REPORT

PROJECT NSWC CRANE : DYE BURIAL GROUNDS CAP LOCATION CRANE, INDIANA
JOB NO. 18328-2000-77 DATE 8/12/98 CONTRACTOR PHILIP/MK WEATHER SUNNY/WARM TEMP 70-84 °F
SPECIFICATION ASTM D698 90%

Work Performed COMPACTION TESTING ON FIRST LIFT

Test Number	Location	Laboratory Data: Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Field Data: Moisture Content %	Dry Density (pcf)	% Compaction	Specified % Comp.	Pass/Fail	See Note
11 62	SEE LOCATION MAP	LIFT #1	BS10	A	104.5	18.5	18.5	104.7	100.1	90%	PASS	
12 63		↓	↓	↓	↓	↓	19.5	102.7	98.2	↓	PASS	
13 64							21.1	101.6	97.2		PASS	
14 65							20.0	99.2	94.9		PASS	
15 66							19.9	102.5	98.1		PASS	
16 67							22.5	98.7	94.5		FAIL	HIGH MOISTURE
17 68							18.8	102.1	97.7		PASS	
67 16R		↓	↓	↓	↓	↓	19.4	103.7	99.2	↓	PASS	

Comments/Notes: R = RETEST
HAD OPERATOR ROLL AN ADDITIONAL 3 PASSES ON LOCATION 16 AREA (APPROXIMATELY 4000 FT²) THEN RETESTED

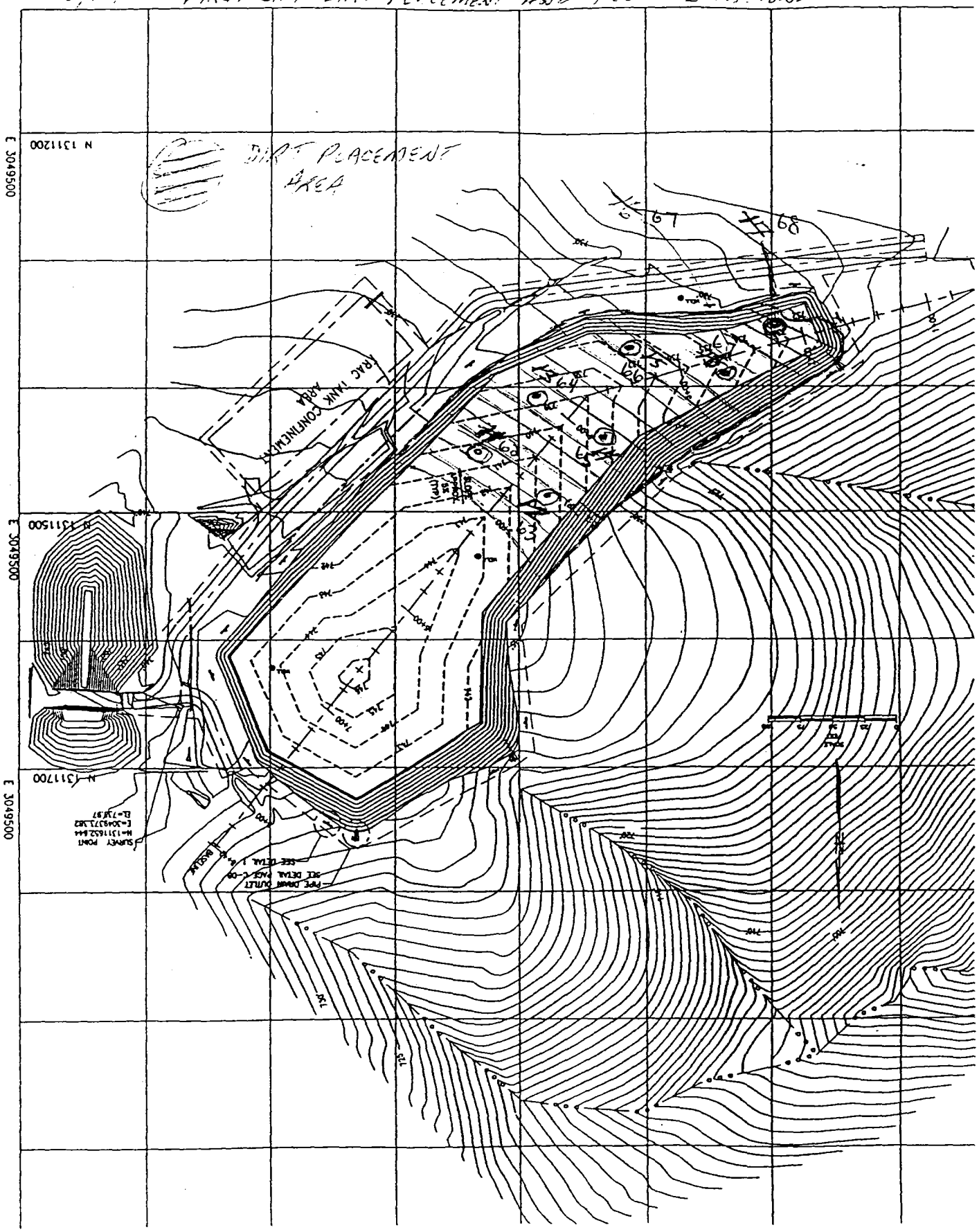
Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David A. Martin

PE-88 (4/95)

8/12/92 FIRST LIFT DIRT PLACEMENT AND TEST LOCATIONS



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PROJECT NSWC CRANE DYE BURIAL GROUND CAP LOCATION CRANE, INDIANA

JOB NO. 18328-2000-77 DATE 8/13/98 CONTRACTOR PHILIP / MK WEATHER SUNNY/WARM TEMP 65-85 °F

SPECIFICATION ASTM D698

Work Performed COMPACTION TESTING ON START OF SECOND LIFT

	Test Number	Location	Laboratory Data: Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Field Data: Moisture Content %	Dry Density (pcf)	% Compaction	Specified % Comp.	Pass/ Fail	See Note
69	18	SEE TEST LOCATION MAP	LIFT 2	BS10	A	108.5	13.5	21.7	97.5	93.3	90%	FAIL	REROLL
70	19							20.2	96.0	91.8		PASS	
71	20							21.5	96.6	92.4		PASS	
AT69	18R							20.8	99.9	95.6		PASS	
72	21							21.5	98.8	94.5		PASS	
73	22							23.5	95.5	91.3		FAIL	REROLL
74	23							19.1	94.9	90.8		PASS	
AT73	22R							19.2	104.2	99.6		PASS	

Comments/Notes: R = RETEST
18 & 22: TESTING SHOWED MOISTURE TOO HIGH WHILE COMPACTION WAS IN THE MID 90% RANGE, I THEN HAD THE AREAS ROLLED AN ADDITIONAL 2-3 PASSES AND THE COMPACTION AND MOISTURE PASSED DBM

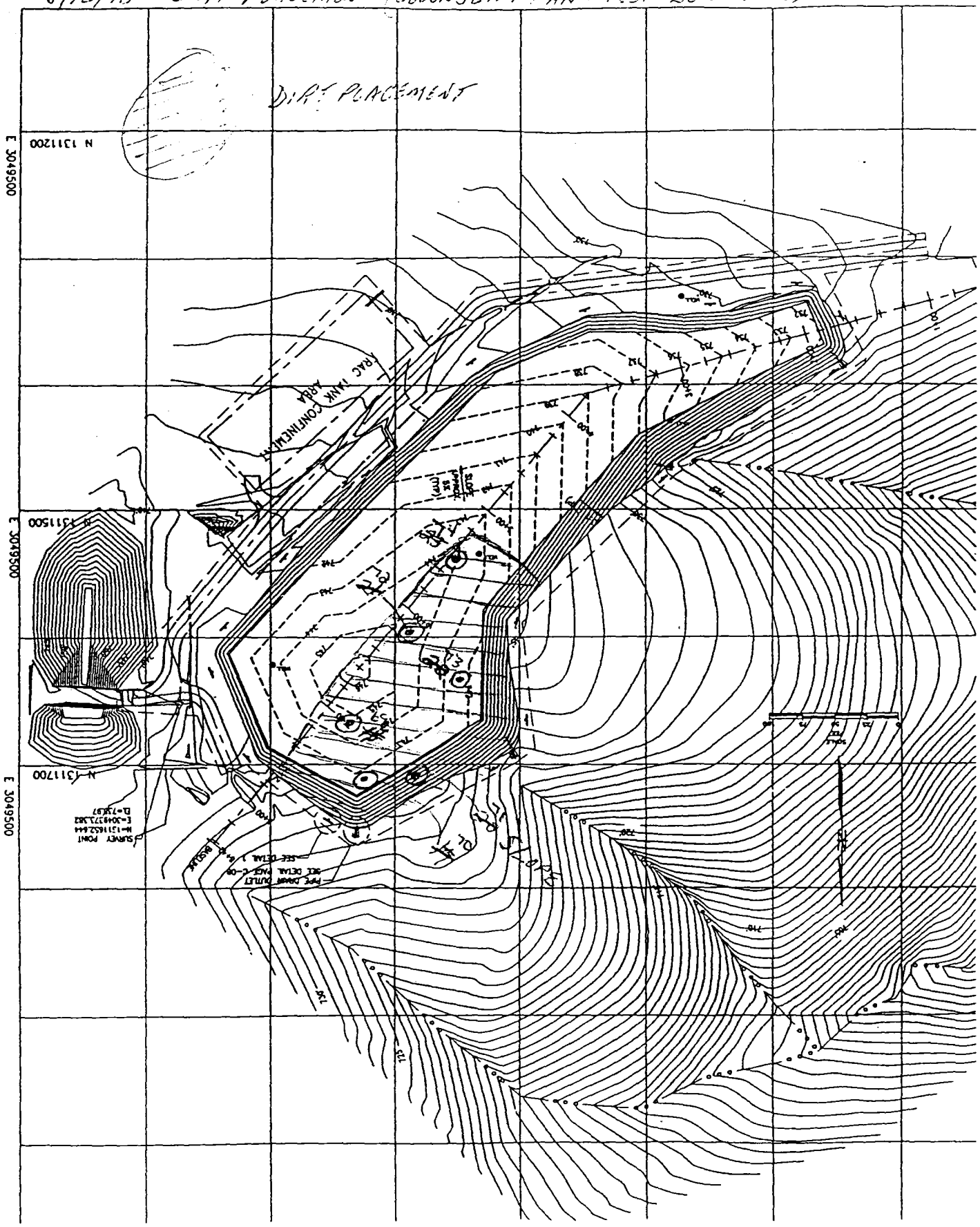
Laboratory Test Type
- A. Standard Proctor ASTM D-698
- B. Modified Proctor ASTM D-1557
- C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
- 1: Initial Field Test
- RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David B. Martin

PE-88 (4/95)

8/13/98 DIRT PLACEMENT (SECOND LIFT) AND TEST LOCATIONS



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FIELD TESTING REPORT

PROJECT NSWC CRANE LOCATION CRANE INDIANA
JOB NO. 18228-2000-77 DATE 8/4/99 CONTRACTOR PHILIP/MK WEATHER SUNNY WARM TEMP 66-85 °F
SPECIFICATION ASTM D698 90%

Work Performed COMPACTION TESTING ON SECOND LIFT

Test Number	Location	Laboratory Data: Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Field Data: Moisture Content %	Dry Density (pcf)	% Compaction	Specified % Comp.	Pass/Fail	See Note
24 75	SEE TEST LOCATION MAP	LIFT 2	B510	A	104.5	18.5	18.5	105.8	101.2	90%	PASS	
25 76	↓	↓	↓	↓	↓	↓	19.2	100.6	96.2	↓	PASS	
26 77							19.9	102.1	97.6		PASS	
27 78							19.6	102.6	98.1		PASS	
28 79							19.6	101.2	96.8		PASS	
29 80	↓	↓	↓	↓	↓	↓	19.1	100.4	96.0	↓	PASS	

Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

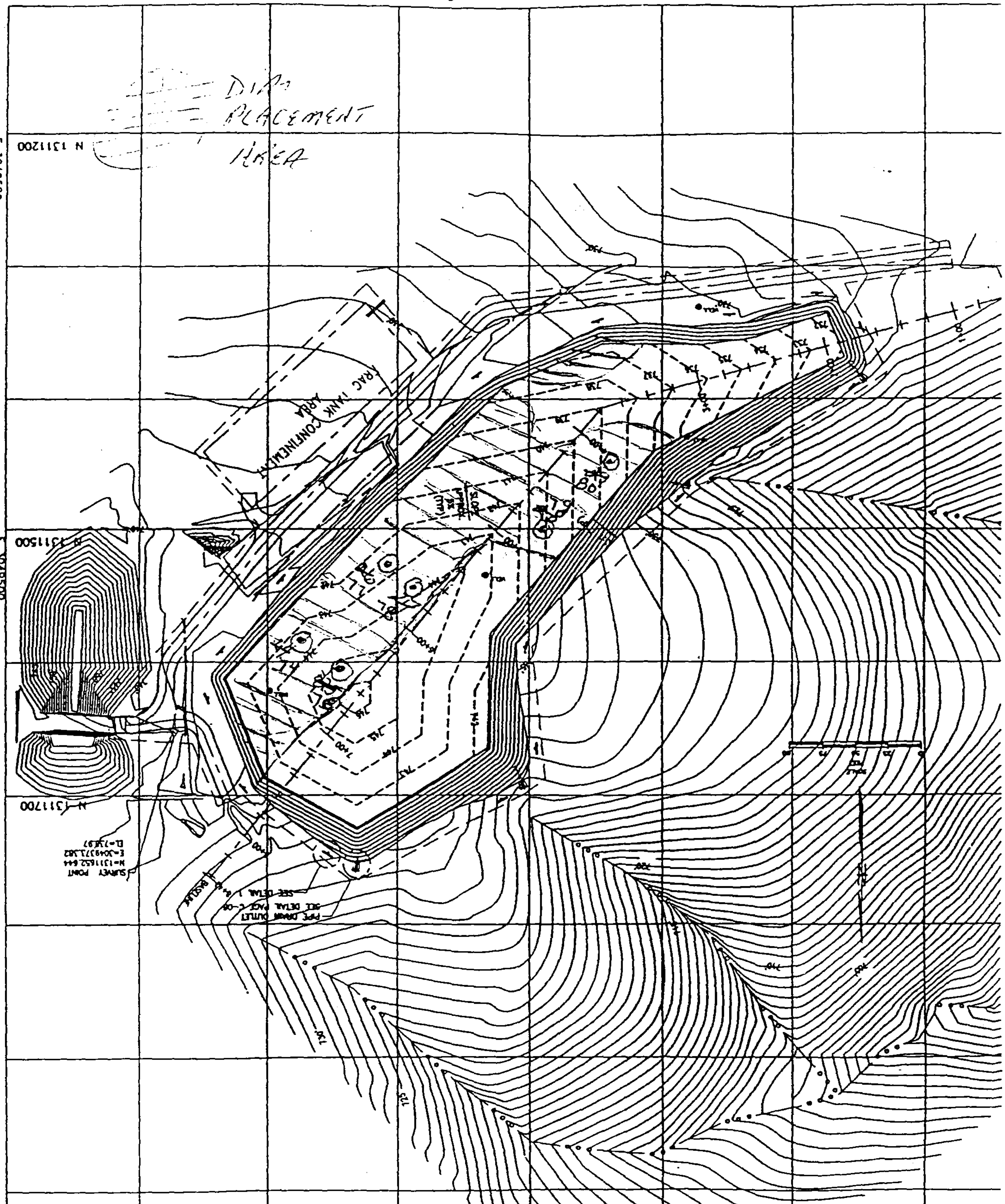
Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David G. Martin

PE-88 (4/95)

6/12 '93

LIFT #2 PLACEMENT AREA AND TEST LOCATIONS



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FIELD TESTING REPORT

PROJECT NSWC CRANE DYE BURIAL GROUNDS CAP LOCATION CRANE, INDIANA
JOB NO. 18328-2000-77 DATE 8/15/98 CONTRACTOR PHILIP/MK WEATHER SUNNY/WARM TEMP 68-86 °F
SPECIFICATION ASTM D-698 90%

Work Performed COMPACTION TESTING ON SECOND LIFT OF CLAY CAP

	Test Number	Location	Laboratory Data: Depth or Elevation	Laboratory Data: Soil I.D. Number	Laboratory Data: Test Type	Laboratory Data: Maximum Dry Density (pcf)	Laboratory Data: Optimum Moisture Content %	Field Data: Moisture Content %	Field Data: Dry Density (pcf)	Field Data: % Compaction	Specified % Comp.	Pass/ Fail	See Note
B1	30	SEE TEST LOCATION MAP	LIFT #2	BS10	A	104.5	18.5	20.2	97.8	93.5	90%	PASS	
B2	31	↓	↓	↓	↓	↓	↓	20.7	90.7	86.7	↓	FAIL	REROLL/RETEST
B3	32	↓	↓	↓	↓	↓	↓	18.7	100.8	96.4	↓	PASS	
B4	33	↓	↓	↓	↓	↓	↓	19.1	103.8	99.3	↓	PASS	
B5	34	↓	↓	↓	↓	↓	↓	18.5	107.2	102.6	↓	PASS	
RTB2	31R	↓	↓	↓	↓	↓	↓	19.1	101.5	97.1	↓	PASS	

Comments/Notes: RE RETEST

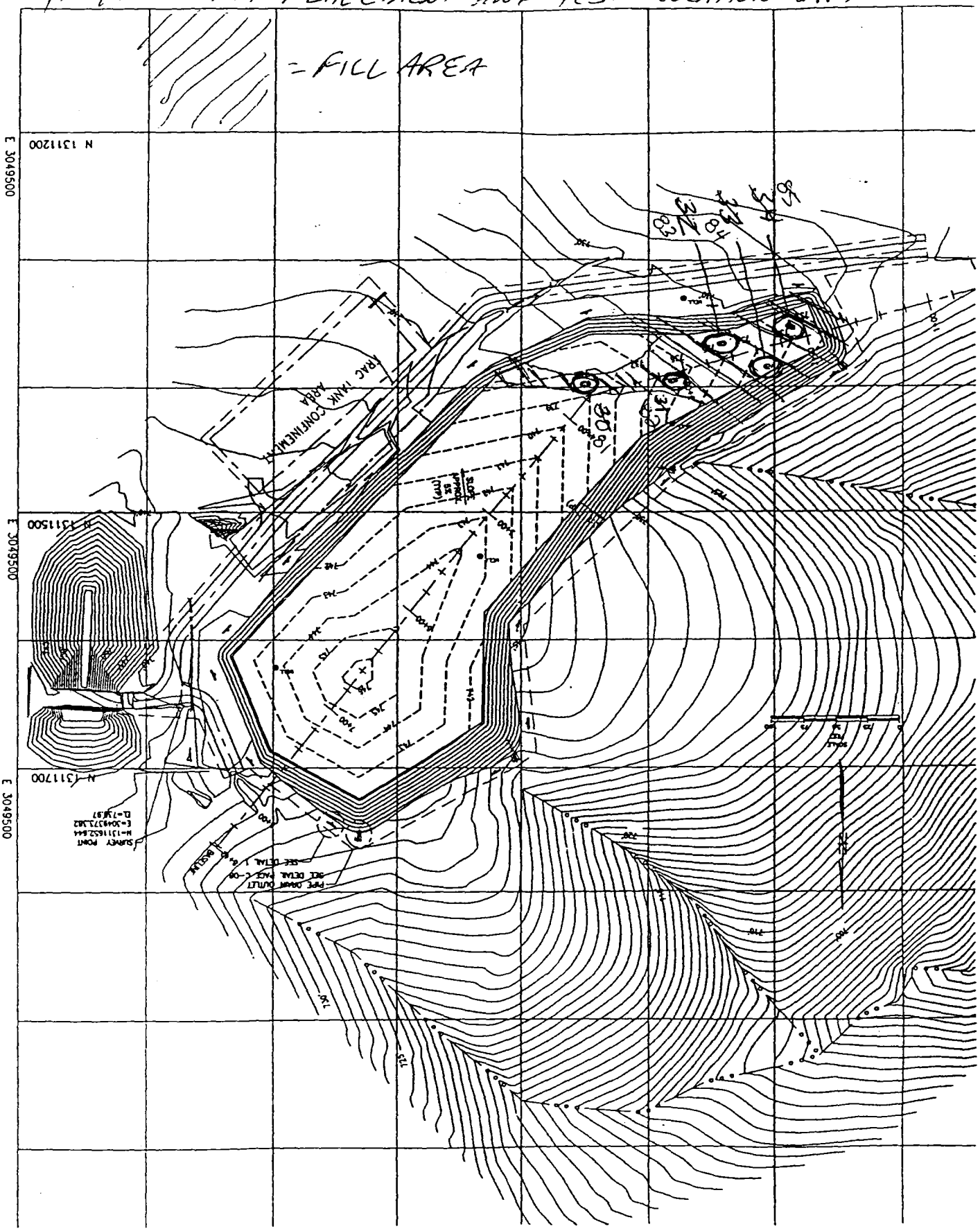
Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David B. Martin

PE-88 (4/95)

8/15/98 DIRT PLACEMENT AND TEST LOCATION MAP



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FIELD TESTING REPORT

PROJECT NSWC CRANE LOCATION _____
JOB NO. 28328-2000-77 DATE 8/20/98 CONTRACTOR _____ WEATHER _____ TEMP _____
SPECIFICATION ASTM D698 90%

Work Performed COMPACTION TESTING ON FINISH GRADE AREAS THAT REQUIRED > 6" LIFT TO REACH GRADE

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
35	SEE TEST LOCATION MAP	FINAL LIFT	BS10	A	104.5	18.5	19.0	104.7	100.2	90%	PASS	
36		↓	↓	↓	↓	↓	20.5	92.0	88.0	↓	FAIL	
37							20.5	94.9	90.8		PASS	
38							19.8	99.4	92.0		PASS	
36R							18.5	100.4	97.4		PASS	

Comments/Notes: R = RETEST AFTER ADDITIONAL COMPACTION

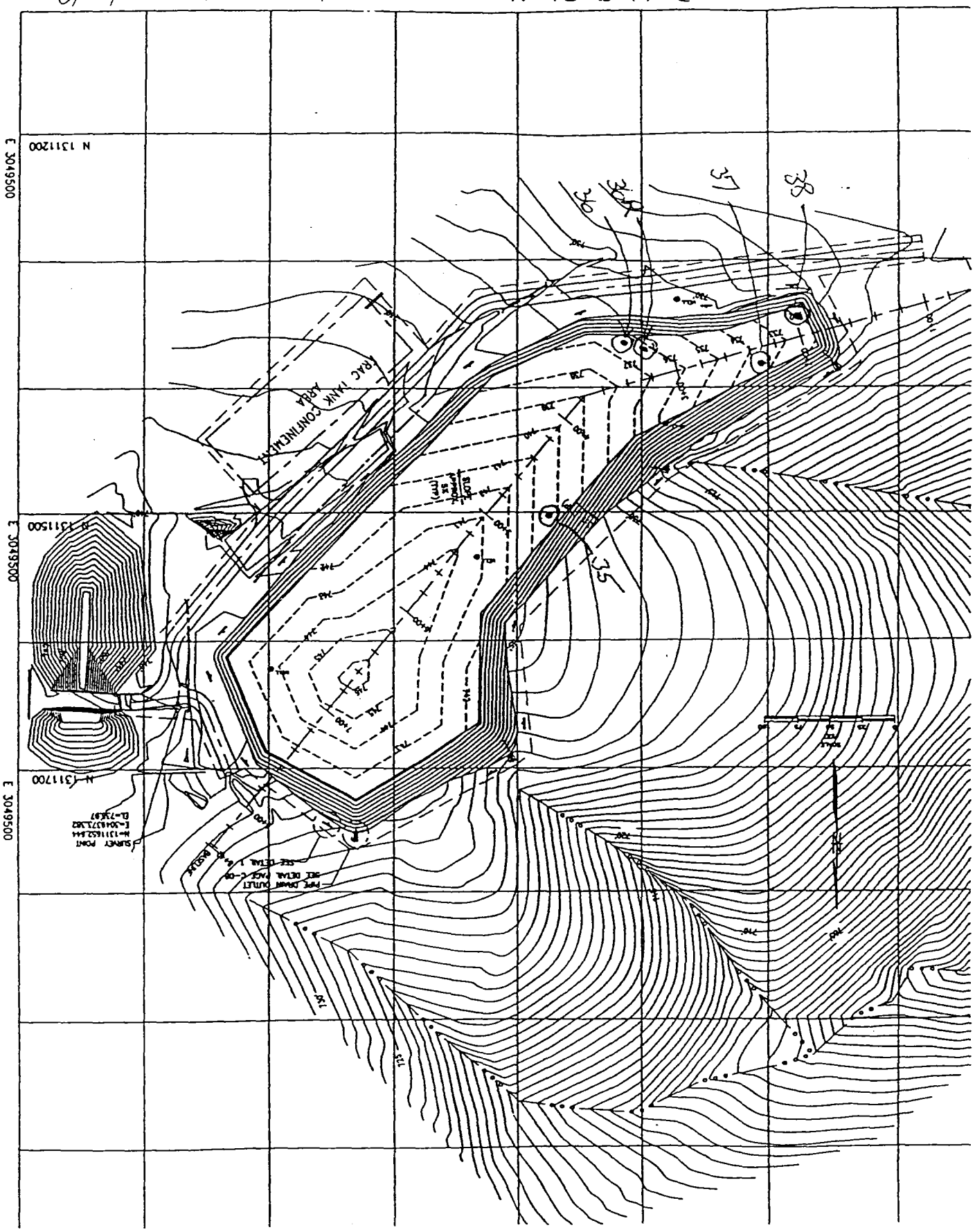
Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. [illegible]tive Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David B. Martin

PE-88

8/20/98 TEST LOCATIONS ON FINAL GRADE



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618/281-5120 FAX

TO Don Flowers

DATE	JOB NO.
9-18-97	18328
PROJECT: Dye Burial Grounds	
LOCATION: Crane, In.	
CONTRACTOR: Philip	OWNER:
WEATHER: Clear	TEMP. °at AM °at PM
PRESENT AT SITE: Dave M. - Scaper	

THE FOLLOWING WAS NOTED:

@ 7:00 Philip on site. I went to the main gate to get a photo I.D. made. The people at the gate did not have my name sent in by the contractor so they could not make me a I.D. but gave me a one day pass.

@ 8:30 I met with Lois and went over the work plan as to what she needed to see in my paper work. She told me that a total of 47 density test should be taken to complete the cap that Philip is installing. Lois allso said that the density test could only be + or - 3% on the moisture

@ 9:00 I started to head out to the fill area when the MKC safty man stopped me and asked for the paper work on the density gauge and Me. I gave him all the paper work that I had. He then asked for the owners manule for the safty procedure in case their was a accident. I then gave him the papers we keep in the trucks when transpacting them. He was satisfied with the safty procedures but then asked if we notified the state of Indiana that we would be using this gauge in their state. Dave Martin & I could not give him that answer so Dave Martin called the office to see if Don Flowers or Mark Conder had sent a letter to the State.

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DATE	JOB NO.
9-18-97	18328
PROJECT: ~~Die~~ Dye Burial Grounds	
LOCATION: Crane, IL	
CONTRACTOR: Philip	OWNER:
WEATHER: Clear	TEMP. ° at AM ° at PM
PRESENT AT SITE	

TO Don Flowers

THE FOLLOWING WAS NOTED:

@ 1:00 Dave Martin informed me that it is ok to use the density guage on site. I then ran 4 test on the first lift. All of the test had a moisture content above the allowed limits. I checked some of the soil from the trucks and noticed the fill material had alot of moisture in it. I checked the copies of the procture that Lois gave me and no where on the copies did it ~~gave~~ say what the natural moisture contente was. I then asked Lois if she knew if they ran any test to find out what the nature moisture contents on the stockpile She said that the testing lab did not run any natural moisture content on any of the soil. I then informed Don Flowers that if the stockpile has to much moisture in soil, we are then wasting our time trying to compact the soil because the moisture content is to high. Dave Martin suggested to take samples of the stockpiles back with us tomorrow and find out what the natural moisture is on soil. The workers continued to install the fill over the site but did not use the roller to compact the fill inplace.

@ 7:00 Philip departed the site

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FIELD TESTING REPORT

PROJECT ~~Crane N W Dye~~ Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-18-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F

SPECIFICATION 1st Lift 90% of the maximum dry density as determined by a STANDARD Proctor compaction test D698

Work Performed

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
01	See test Location Map	1st Lift	BS-6	A	115.9	13.4	19.5	107.6	92.8	95%	Fail	
02	↓	↓	↓	↓	↓	↓	20.1	106.5	91.9	↓	Fail	
03	↓	↓	↓	↓	↓	↓	21.7	98.7	85.2	↓	Fail	
04	↓	↓	↓	↓	↓	↓	20.9	100.9	87.0	↓	Fail	

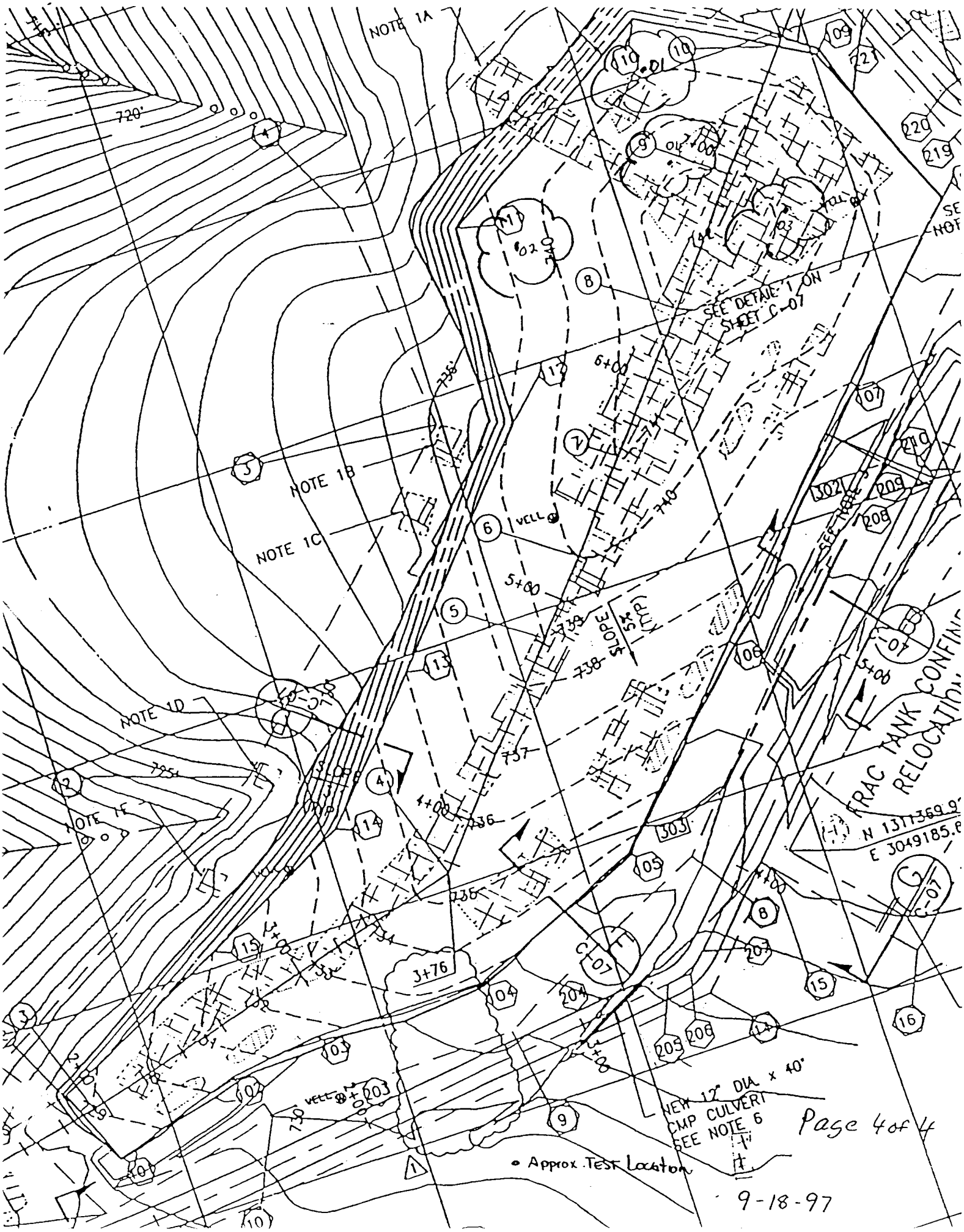
Comments/Notes:

Laboratory Test Type
- A. Standard Proctor ASTM D-698
- B. Modified Proctor ASTM D-1557
- C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
- 1: Initial Field Test
- RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: Tim M May

PE-88 (4/95)


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
720'
SEE DETAIL 1 ON SHEET C-07
SLOPE
FRAC TANK CONFIN
RELOCATION
N 1311369.9
E 3049185.
NEW 12" DIA. x 40' CMP CULVERT SEE NOTE 6
• Approx. Test Location
9-18-97
Page 4 of 4

PHILIP ENVIRONMENTAL

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FIELD TESTING REPORT

PROJECT Die Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-19-97 CONTRACTOR Philip WEATHER Clear TEMP _____ °F

SPECIFICATION _____

Work Performed _____

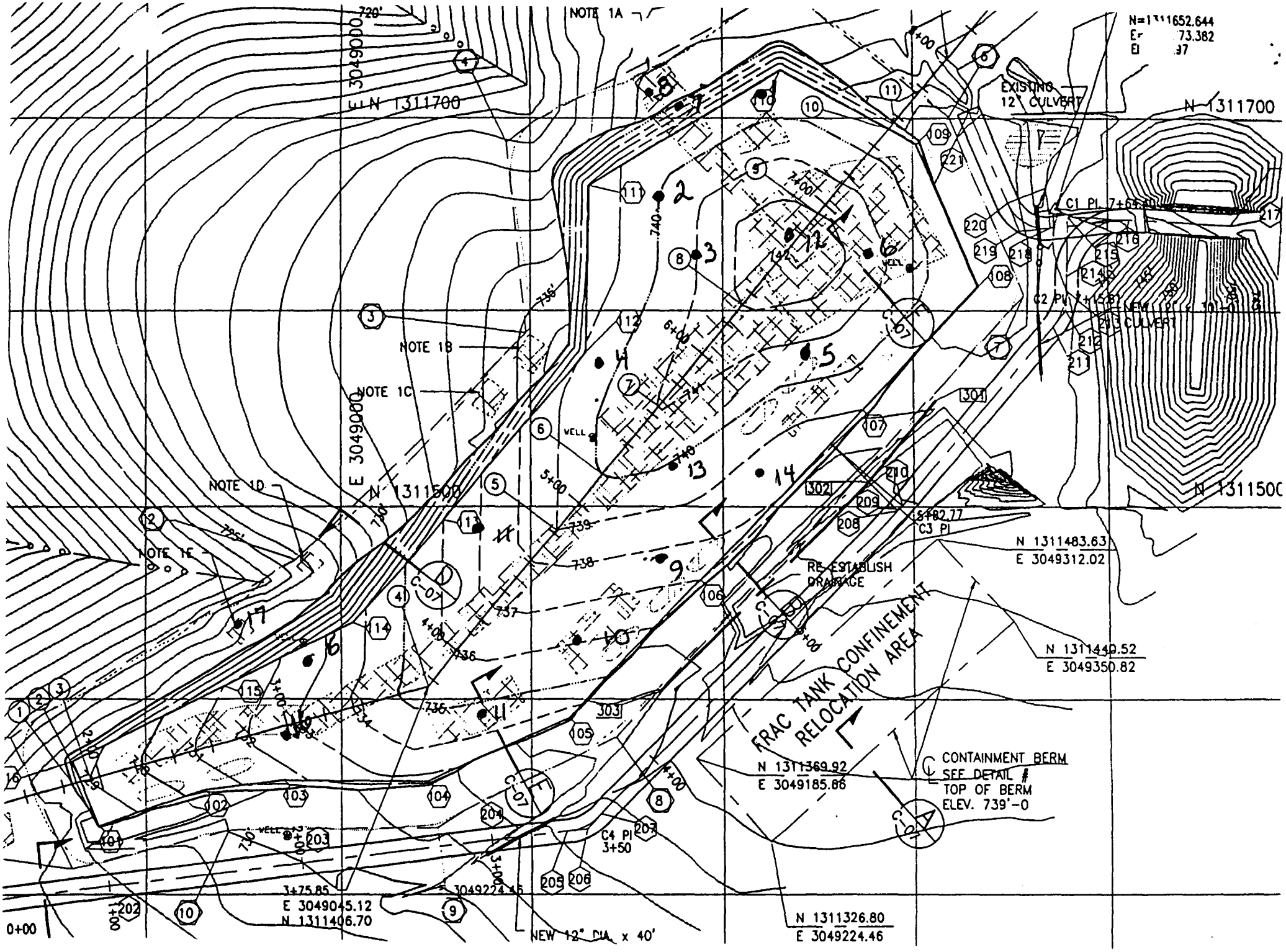
Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
05	see Test Location Map	1st Lift	PBS-2	A	106.9	17.8	12.5	101.6	95.0	95	Fail	
05RT	↓	↓	↓	↓	↓	↓	14.9	104.3	97.6	↓	Pass	cap foundation
06	↓	↓	↓	↓	↓	↓	19.7	103.2	96.5	↓	Pass	cap foundation
06 RT	↓	↓	↓	↓	↓	↓	18.6	104.1	97.4	↓	Pass	cap foundation
01 RT	↓	↓	↓	↓	↓	↓	20.0	109.0	102.0	↓	Pass	cap foundation
07	↓	↓	↓	↓	↓	↓	18.3	109.4	102.3	↓	Pass	area 1a
08	↓	↓	↓	↓	↓	↓	18.9	108.7	101.7	↓	Pass	area 1a

Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modif[illegible] [illegible]ctor ASTM D-1557
C. Relativ[illegible] [illegible]ensity ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking Genera[illegible]
Area Of Initial Field Test

Signature: _____



NOTE 1A
N=1311652.644
E= 73.382
EXISTING 12" CULVERT
N 1311700
E 3049000
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
N 1311500
C1 PI 7+64.40
C2 PI 7+15.81
NEW 12" x 30'-0 CULVERT
5+82.77
C3 PI
N 1311483.63
E 3049312.02
RE-ESTABLISH DRAINAGE
N 1311440.52
E 3049350.82
FRAC TANK CONFINEMENT RELOCATION AREA
N 1311369.92
E 3049185.66
CONTAINMENT BERM
SEE DETAIL #
TOP OF BERM
ELEV. 739'-0
C4 PI
3+50
3+75.85
E 3049045.12
N 1311406.70
3049224.46
NEW 12" DIA. x 40'
N 1311326.80
E 3049224.46
0+00

PHILIP

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P.O. Box 230
Columbia, IL 62236-0230
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TO Mark Conder

DATE	JOB NO.
9-24-97	18328
PROJECT: Dic Burial Grounds	
LOCATION: Crane, In	
CONTRACTOR: Philip	OWNER: Navy
WEATHER: Overcast	TEMP. °at AM °at PM
PRESENT AT SITE: Dave Martin - Supv.	

THE FOLLOWING WAS NOTED:

@7:00 philip on site. I rained all day yederday and some lastnight. Workes were able to get all of the first lift installed over the plastic. The soil is very wet from the rain. Dave said that they will not place any soil on the Cap today. Workers are going to cut down some trees and remove the stumpts. Dave hopes the sune will come out today and dry out the soil. @9:00 I called Philip Lab to get the resa of the procture test. The first sample was 106.0 on the dry density with a moisture of 17.5. And the second one was 106.9 on the dry density with a moisture of 17.8. I then tested four area on the first lift. I had two test pass and two that failed. The two that failed were because the mosture was to high or to low. I was using the procture of 106.9/17.8. Dave had me retest and check some more area to get a section of the first lift to pass. After retesting and some new test I was able to get 1/3 of the cap's first lift to pass. This section is next to the Bunker.

@4:30 Philip departed the site

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FIELD REPORT

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FIELD TESTING REPORT

PROJECT Die Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-24-97 CONTRACTOR Philip WEATHER Overcast TEMP ____ °F

SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
~~05~~ 02 RT	See Test Location Map	1st Lift	PBS-2	A	106.9	17.8	20.2	106.3	99.4	95	Pass	
09	↓	↓	↓	↓			13.1	99.2	92.7	↓	Fail	
10	↓	↓	↓	↓			21.6	104.3	97.7	↓	Fail	
11	↓	↓	↓	↓			20.1	102.7	96.0	↓	Pass	
03 RT	↓	↓	↓	↓			20.3	101.4	94.8	↓	Pass	
04 RT	↓	↓	↓	↓			19.8	109.7	102.6	↓	Pass	
12	↓	↓	↓	↓			20.8	104.1	97.3	↓	Pass	
13	↓	↓	↓	↓			22.4	92.1	86.2	↓	Fail	
14	↓	↓	↓	↓			16.6	101.3	94.7	↓	Pass	

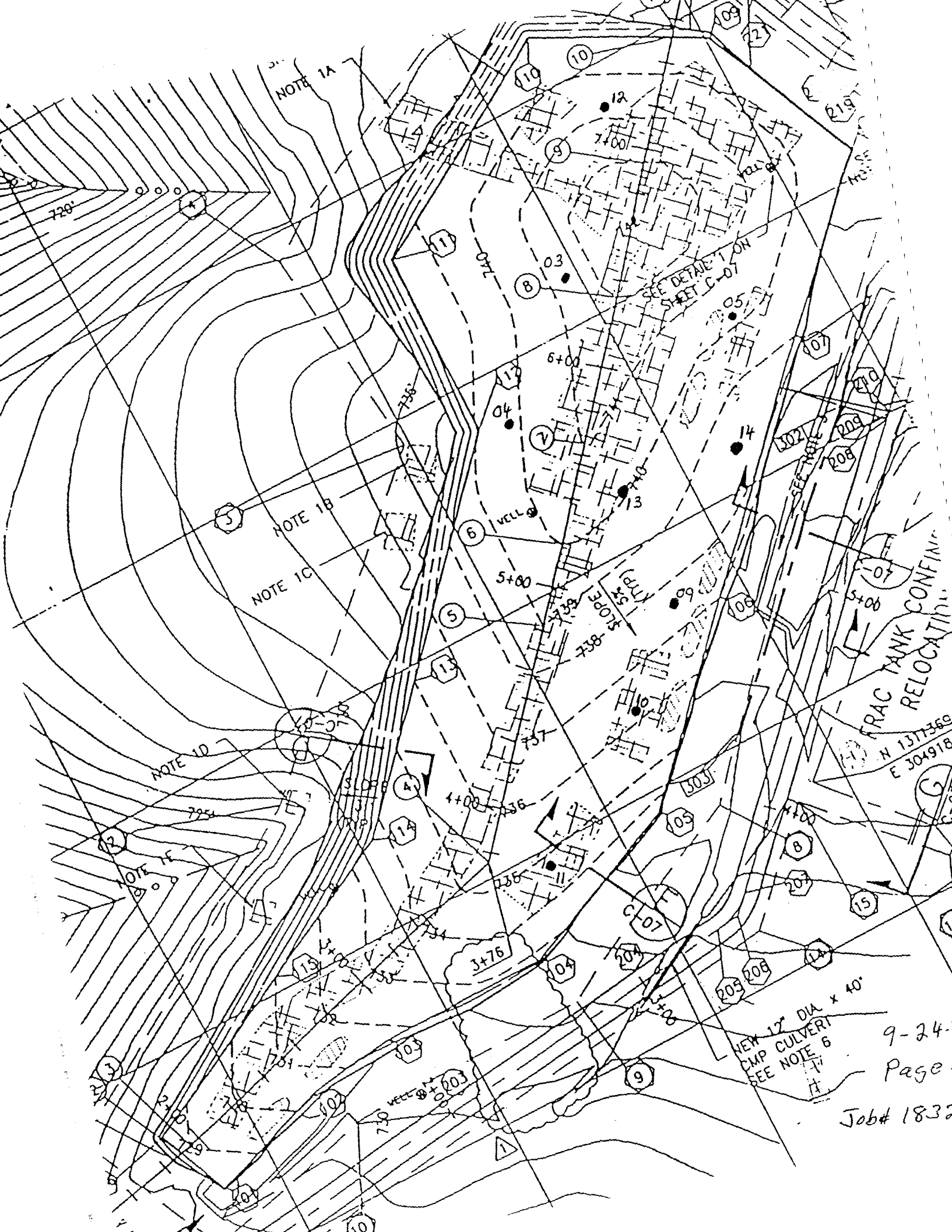
Comments/Notes:

Laboratory Test Type
- A. Standard Proctor ASTM D-698
- B. Modified Proctor ASTM D-1557
- C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
- 1: Initial Field Test
- RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: Terri M. May

PE-88 (4/95)


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
SEE NOTE 3
FRAC TANK CONFIN
RELOCATION
N 1311369
E 304918
NEW 12" DIA x 40'
CMP CULVERT
SEE NOTE 6
SLOPE 3 (TYP)
VELL
720'
736'
740
737
738
739
7+00
6+00
5+00
4+00
3+76
C-07
9-24-
Page
Job# 1832

PHILIP

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umbia, IL 62236-0230
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800-733-7173
314-241-1785
618/281-5120 FAX

TO
Mark Conder

DATE	JOB NO.
9-25-97	18328
PROJECT: Dye Burial Grounds	
LOCATION: Crane, In	
CONTRACTOR: Philip	OWNER: Navy
WEATHER: Clear	TEMP. ° at AM ° at PM
PRESENT AT SITE: Dave Martin - Supv.	

THE FOLLOWING WAS NOTED:

@ 9:30 Philip on site. The surveyers did not show up today to survey the cap to tell Philip if they needed to add or take out some of the first lift to bring it to finnal grade. @ 11:00 Truck started to haul in fill material to complet the last part of the first lift. After the fill material was installed and then rolled, I tested the compaction. All three test passed and I informed Dave M. of the test results @ 5:30 Philip departed the site

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FIELD TESTING REPORT

PROJECT Dye Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-25-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F

SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
15	See Test Location Map	1st Lift	BS-11	A	101.5	20.0	17.8	97.8	96.4	95	Pass	
16	↓	↓	↓	↓	↓	↓	17.9	99.3	97.8	↓	Pass	
17	↓	↓	↓	↓	↓	↓	17.0	96.3	94.9	↓	Pass	

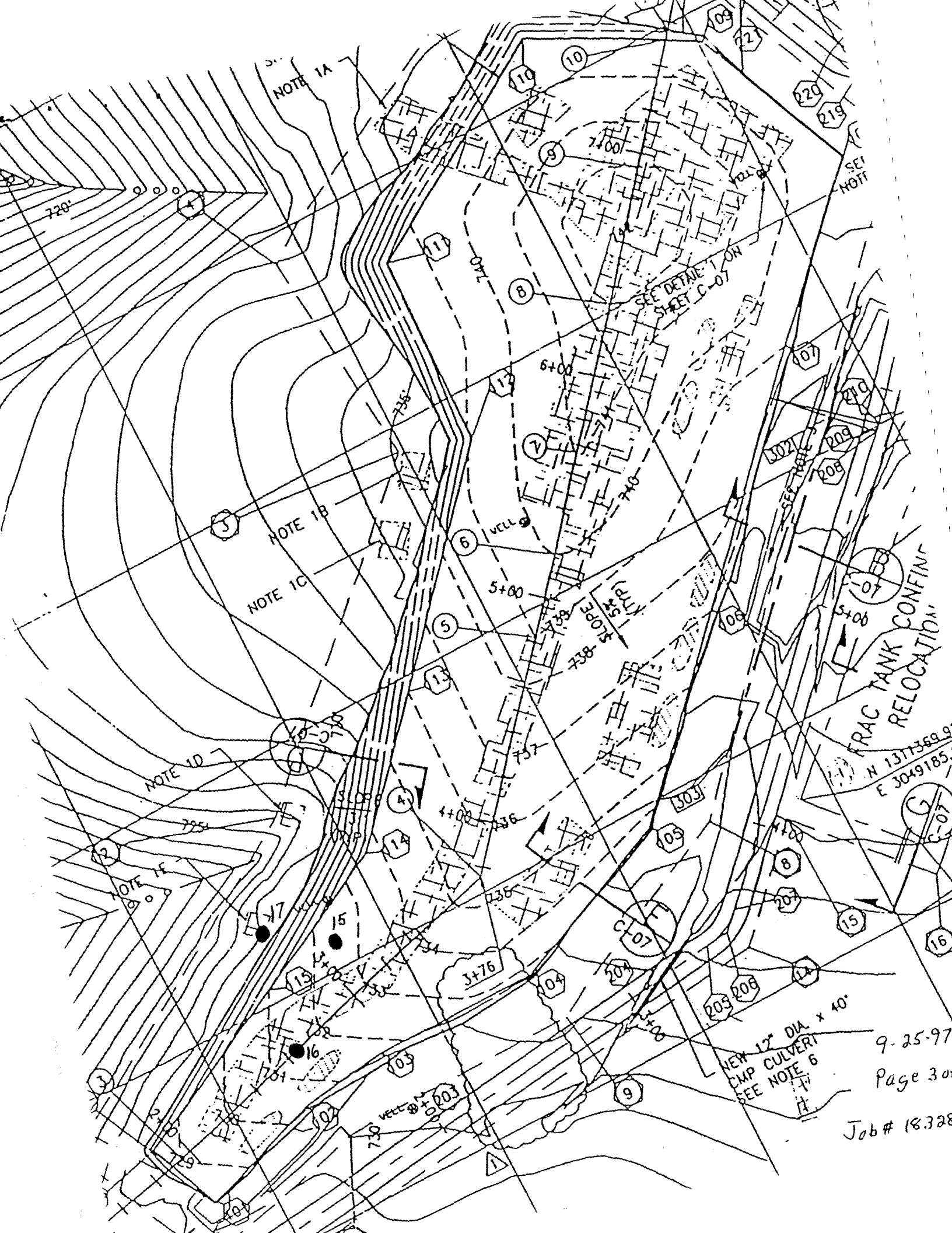
Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: Tim M. May

PE-80 (4/95)


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
SEE NOTE 3
FRAC TANK CONFINE RELOCATION
N 1311369.9
E 3049185.
NEW 12" DIA. x 40' CMP CULVERT SEE NOTE 6
SLOPE 5% (TYP)
VELL
720'
740
735
738
737
736
735
734
733
732
731
730
7+00
6+00
5+00
4+00
3+76
3+00
C-07
17
15
16
9-25-97
Page 30
Job # 18.328

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FIELD TESTING REPORT

PROJECT Dye Burial Grounds LOCATION Crane, In
JOB NO. 18328 DATE 9-26-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F
SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data: Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Field Data: Moisture Content %	Dry Density (pcf)	% Compaction	Specified % Comp.	Pass/Fail	See Note
18	See Sketch on Report	Sub Base	BS-10	A	104.5	18.5	19.1	107.1	102.5	95	Pass	
19	↓	↓	↓	↓	↓	↓	19.5	103.0	98.5	↓	Pass	
20	↓	↓	↓	↓	↓	↓	20.9	101.9	97.5	↓	Pass	
11RT	See Test Location Map	1st Lift	PBS-2	↓	106.9	17.8	17.2	105.2	98.4	↓	Pass	1311390, 3049065
10RT	↓	↓	↓	↓	↓	↓	20.6	103.6	96.9	↓	Pass	1311440, 3049125
09RT	↓	↓	↓	↓	↓	↓	19.6	102.5	95.8	↓	Pass	1311470, 3049165
21	↓	↓	↓	↓	↓	↓	19.2	107.6	100.7	↓	Pass	1311495, 3049095
22	↓	↓	↓	↓	↓	↓	17.9	108.5	101.5	↓	Pass	1311450, 3049145
13RT	↓	↓	↓	↓	↓	↓	19.6	105.2	98.4	↓	Pass	1311125, 3049170

Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative D[illegible]y ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: Terri M. May

PE-88 (4/95)

OCT-06-1998 13:53 MK CORP 9918128546944 P.09

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FIELD TESTING REPORT

PROJECT Dye Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-26-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F

SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
23	See Test Location Map	2nd Lift	BS-12	A	105.7	18.4	19.2	106.2	100.5	95	Pass	1211640, 30049375

Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative D[illegible]ty ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: [illegible] M. May

PE-88 (4/95)

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FIELD TESTING REPORT

PROJECT: NSWC CRANE LOCATION: CRANE, IN
JOB NO.: 18328-2000-77 DATE: 9/26/98 CONTRACTOR: PHILIP/MK WEATHER: _____ TEMP: _____ °F
SPECIFICATION: ASTM D698 95%

Work Performed: _____

Test Number	Location	Laboratory Data: Depth or Elevation	Laboratory Data: Soil I.D. Number	Laboratory Data: Test Type	Laboratory Data: Maximum Dry Density (pcf)	Laboratory Data: Optimum Moisture Content %	Field Data: Moisture Content %	Field Data: Dry Density (pcf)	Field Data: % Compaction	Specified % Comp.	Pass/Fail	See Note
18	NEW ROAD SUBBASE		BS-10	A	104.5	18.5	19.1	107.1	102.5	95%	PASS	
19	↓		↓	↓	↓	↓	19.5	103.0	98.5	↓	PASS	
20	↓		↓	↓	↓	↓	20.9	101.9	97.5	↓	PASS	
11RT	SEE LOCATION MAP		PBS-2	A	106.9	17.8	17.2	105.2	98.4	↓	PASS	
10RT	↓		↓	↓	↓	↓	20.6	103.6	96.9	↓	PASS	
9RT	↓		↓	↓	↓	↓	19.6	102.5	95.8	↓	PASS	
21	↓		↓	↓	↓	↓	19.2	107.6	100.7	↓	PASS	
22	↓		↓	↓	↓	↓	17.9	108.5	101.5	↓	PASS	
13RT	↓		↓	↓	↓	↓	19.6	105.2	98.4	↓	PASS	
23	SEE LOCATION MAP		PBS-2	A	106.9	17.8	19.2	106.2	99.3%	95%	PASS	

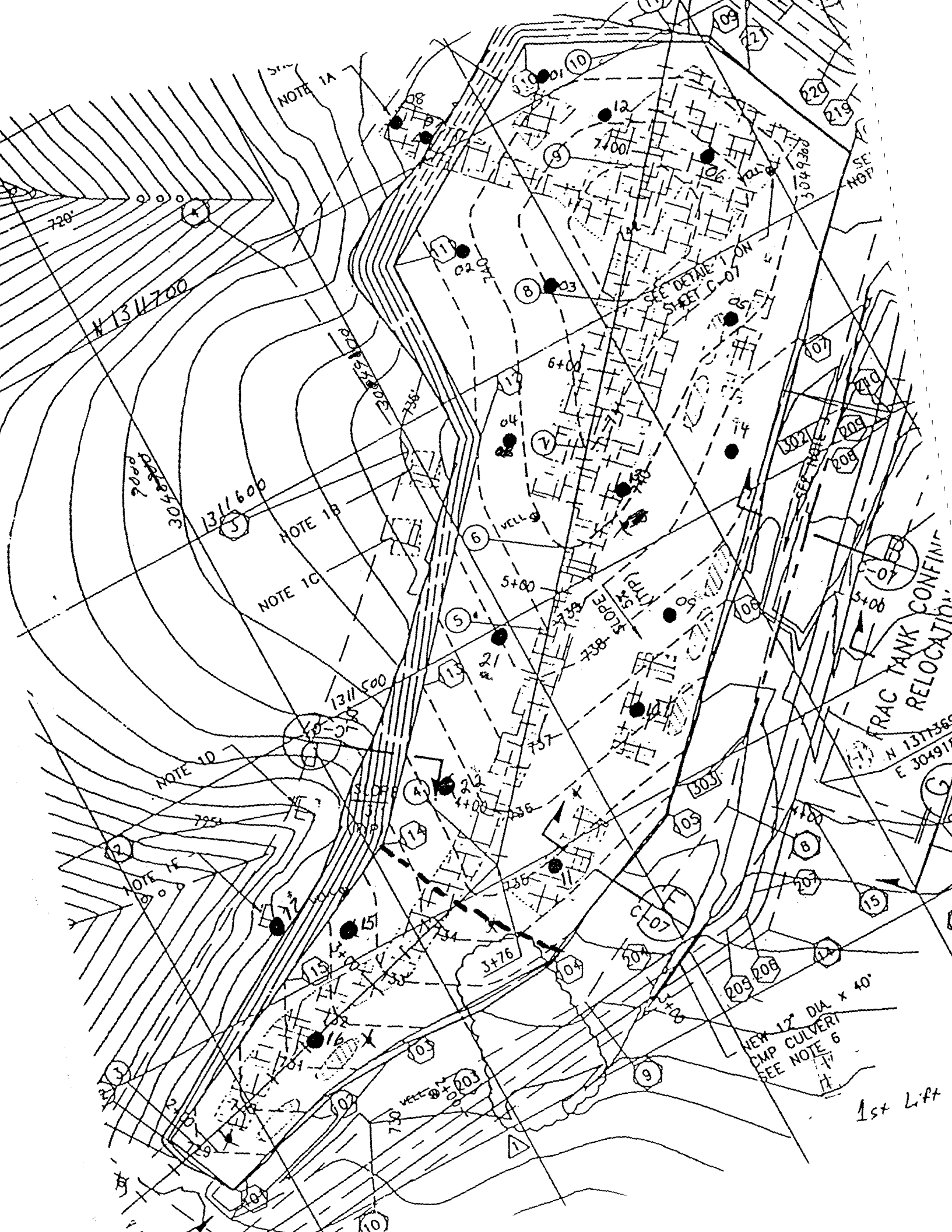
Comments/Notes:

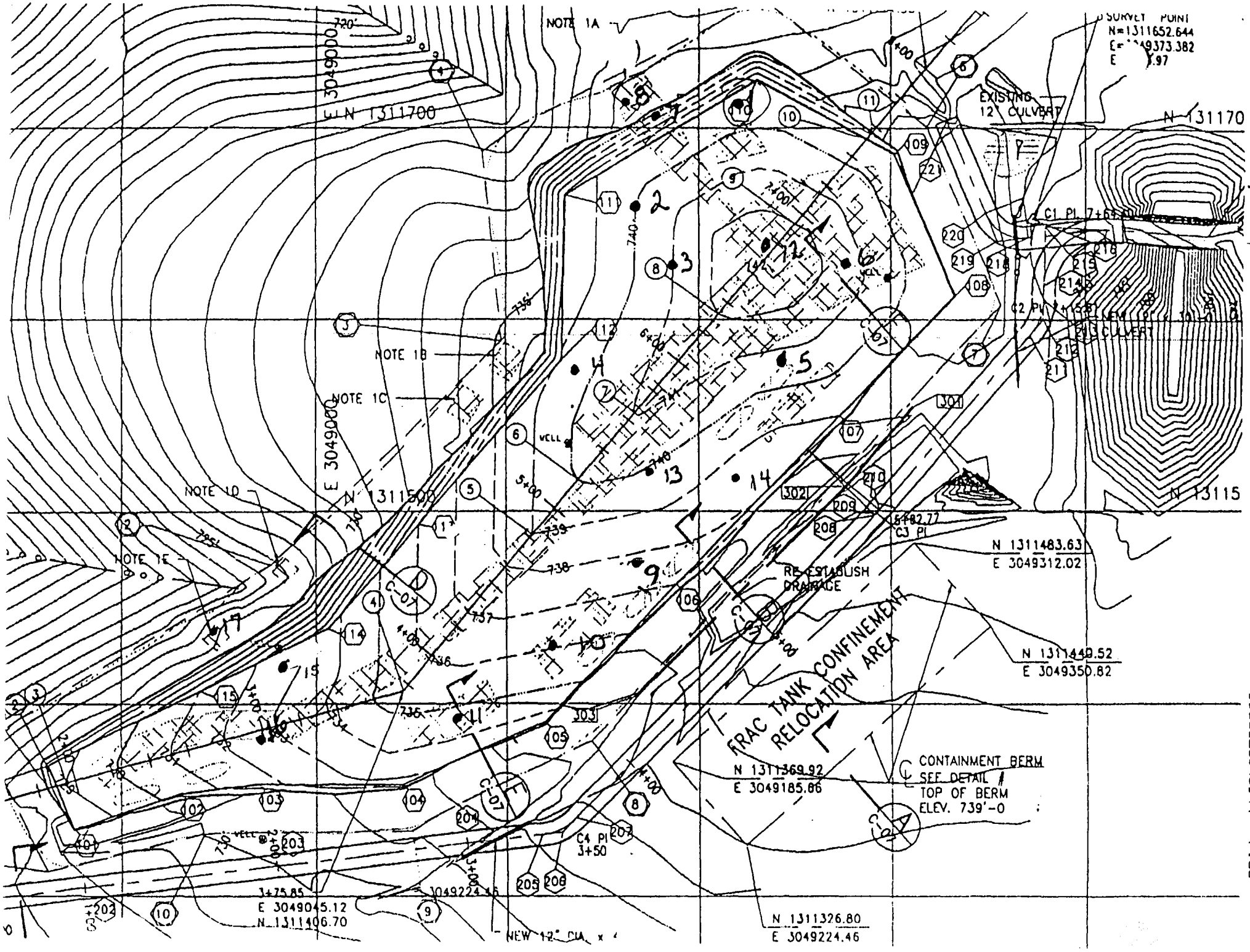
Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: _____

PE-88 (4/95)


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
N 1311700
1311600
1311500
720'
SEE DETAIL 1 ON SHEET C-07
SLOPE 5% (TYP)
FRAC TANK CONFINE RELOCATION
NEW 12" DIA. x 40' CMP CULVERT SEE NOTE 6
1st Lift


NOTE 1A
SURVEY POINT
N=1311652.644
EXISTING 12" CULVERT
N 1311700
N 131170
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
E 3049000
N 1311500
N 13115
C1 PI 7+64.40
C2 PI
C3 PI
N 1311483.63
E 3049312.02
RE-ESTABLISH DRAINAGE
FRAC TANK CONFINEMENT RELOCATION AREA
N 1311449.52
E 3049350.82
N 1311369.92
E 3049185.86
CONTAINMENT BERM
SEE DETAIL
TOP OF BERM
ELEV. 739'-0
C4 PI 3+50
3+75.85
E 3049045.12
N 1311406.70
3049224.46
N 1311326.80
E 3049224.46
NEW 12" DIA.

PHILIP

210 West Sand Bank Road
P.O. Box 230
Columbia, IL 62236-0230
618/281-7173
800-733-7173
314-241-1785
618/281-5120 FAX

DATE 9-27-97	JOB NO. 18328
PROJECT Dye Burial Grounds	
LOCATION Crane, In	
CONTRACTOR Philip	OWNER Navy
WEATHER Clear	TEMP. °at AM °at PM
PRESENT AT SITE Dave Martin	

TO Mark Conder

THE FOLLOWING WAS NOTED:

@ 10:00 Philip on site. Workers are installing the second lift to the cap of the landfill. As workers would get a area installed and then roll it, I would then check the compaction. Workers were installing about 8 inch thick lift. I tested ~~area~~ five different areas of the second lift and all five were above the required 95% compac

@ 3:30 Workers stop for today and I was able to test all of the area of the fill installed today and pass them for compaction. Philip depar the site

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FIELD REPORT

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FIELD TESTING REPORT

PROJECT Dyc Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-27-97 CONTRACTOR Philip WEATHER _____ TEMP _____ °F

SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
24	See Test Location Map	2nd Lift	BS-12	A	105.7	18.4	19.4	101.9	96.3	95	Pass	1311585, 3049280
25	↓	↓	↓	↓	↓	↓	18.6	102.5	97.0	↓	Pass	1311605, 3049240
26							18.1	102.5	96.9		Pass	1311580, 3049165
27							17.6	105.7	100.0		Pass	1311615, 3049190
28							17.5	102.2	96.6		Pass	1311680, 3049255

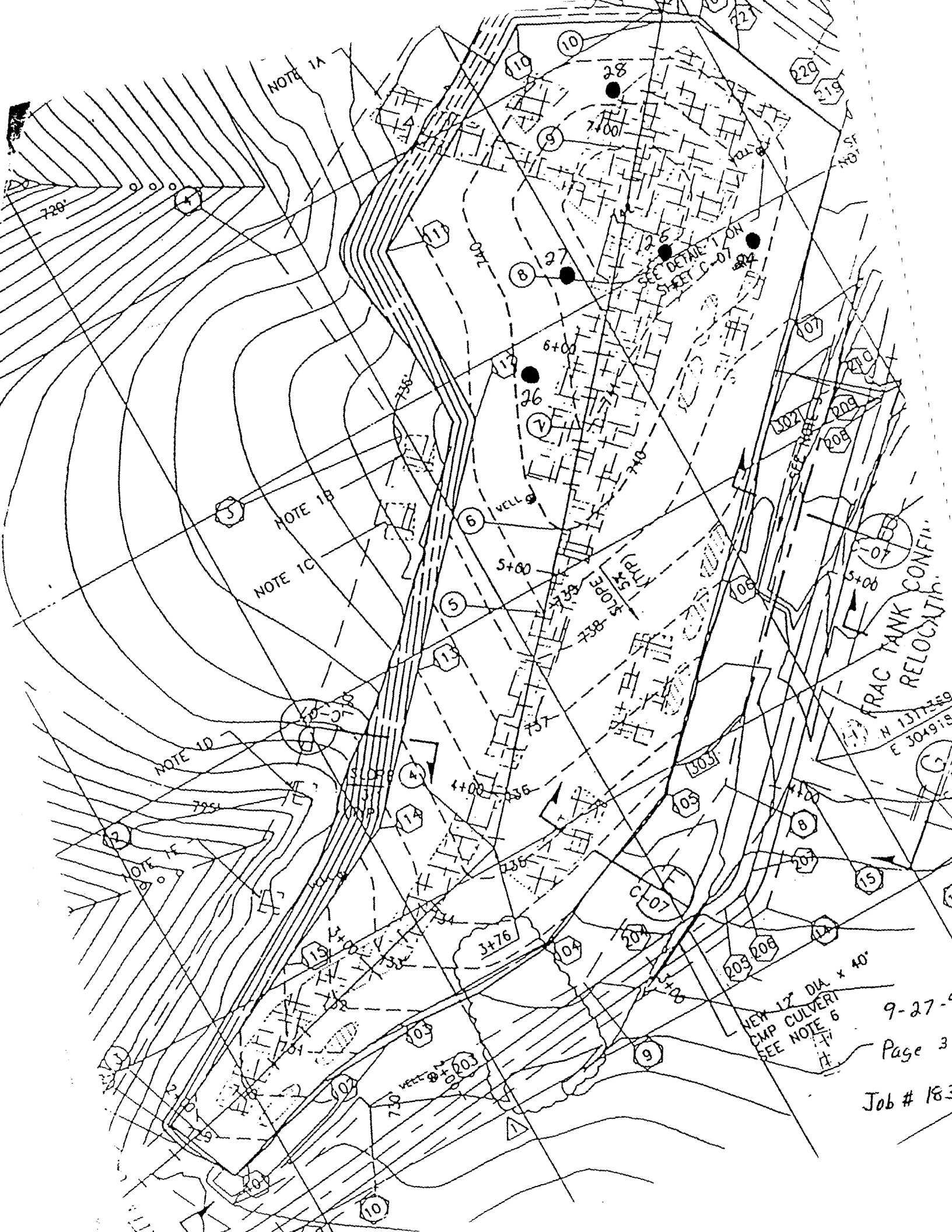
Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: Lisa M. May

PE-88 (4/95)


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
720'
725'
SEE DETAIL 1 ON SHEET C-07
SLOPE 5% (TYP)
FRAC TANK CONFI
RELOCATIO
N 1311359
E 304918
NEW 12" DIA. x 40'
CMP CULVERT
SEE NOTE 6
3+76
4+00
5+00
6+00
7+00
28
27
26
24
C-07
VELL
9-27-
Page 3
Job # 183

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FIELD TESTING REPORT

PROJECT Dye Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-29-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F

SPECIFICATION _____

Work Performed _____

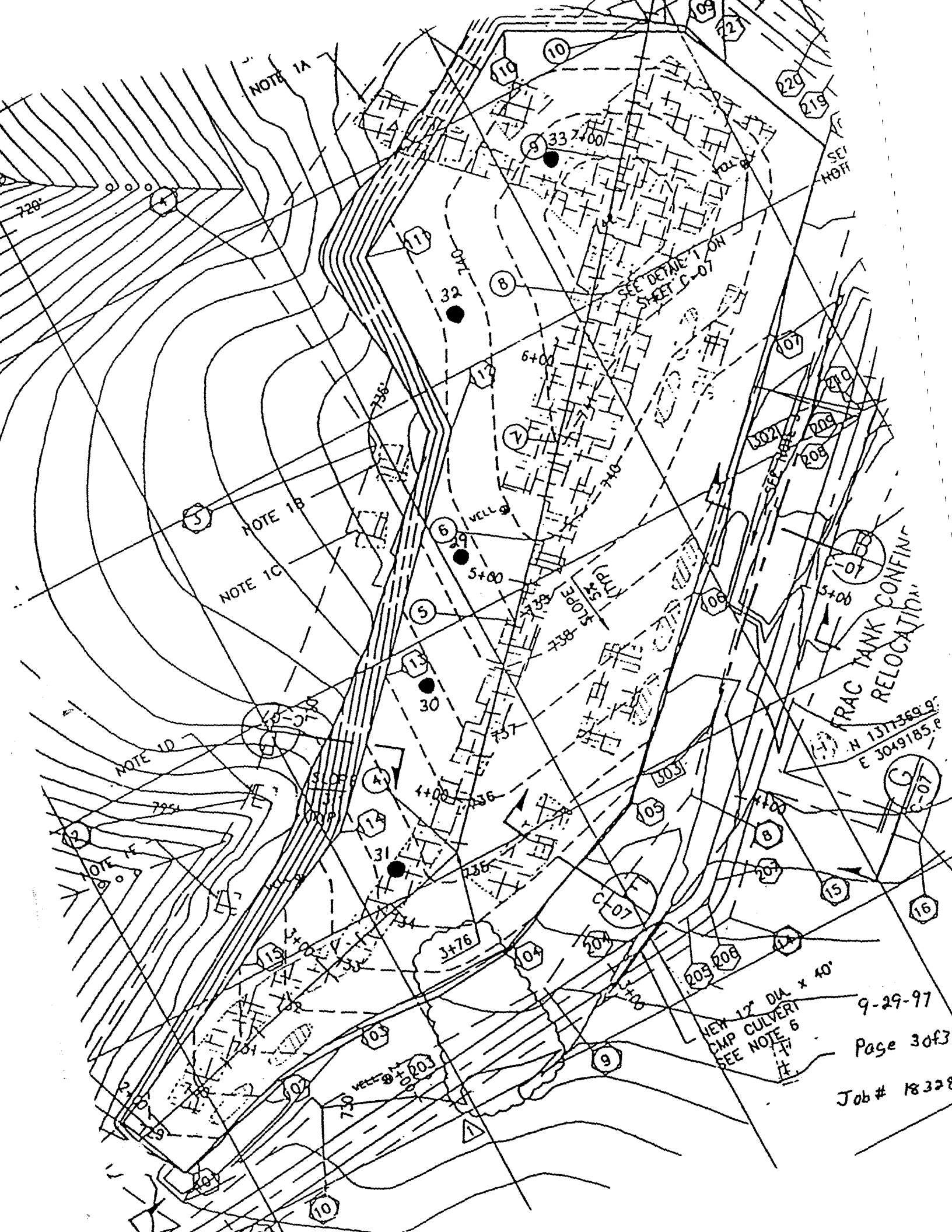
Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
29	See Test Location Map	2nd Lift	BS-12	A	105.7	18.4	17.5	103.0	97.4	95	Pass	1311525, 3049110
30	↓	↓	↓	↓	↓	↓	16.2	102.9	97.3	↓	Pass	1311480, 3049065
31	↓	↓	↓	↓	↓	↓	16.6	97.7	92.4	↓	Fail	1311415, 3049015
31 RT	↓	↓	↓	↓	↓	↓	18.2	100.8	95.3	↓	Pass	" "
32	↓	↓	↓	↓	↓	↓	18.8	96.2	91.0	↓	Fail	1311625, 3049150
32 RT	↓	↓	↓	↓	↓	↓	17.2	103.5	97.9	↓	Pass	" "
33	↓	↓	↓	↓	↓	↓	15.5	102.4	96.8	↓	Pass	1311675, 3049220

Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative D[illegible]y ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: [illegible]


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
SLOPE 5% (TYP)
FRAC TANK CONFINE RELOCATION
N 1311369.9
E 3049185.8
NEW 12" DIA. x 40' CMP CULVERT SEE NOTE 6
9-29-97
Page 3 of 3
Job # 18328

PHILIP

210 West Sand Bank Road
P.O. Box 230
Columbia, IL 62236-0230
618/281-7173
800-733-7173
314-241-1785
618/281-5120 FAX

DATE: 9-30-97	JOB NO.: 18328
PROJECT: Dye Burial Grounds	
LOCATION: Crane, In	
CONTRACTOR: Philip	OWNER: Navy
WEATHER: Clear	TEMP. ° at AM ° at PM
PRESENT AT SITE: Dave Martin - Supv.	

TO: Mark Conder

THE FOLLOWING WAS NOTED:

@ 8:00 Philip on site. Workers continue to build up the land fill cap to bring it to the required height. I check each lift that is installed for compaction. Some test have been below the required 95% compaction. So I have had the workers reroll the failed area and then retest the area. ~~[illegible]~~ All retested area have then pass the 95%. Workers are ~~[illegible]~~ a working on the north east section of the landfill cap.

@ 4:30 All area of fill placement pass the required 95% compaction Philip departed the site

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FIELD TESTING REPORT

PROJECT Dye Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-30-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F

SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
34	See Test Location Map	1st Lift	BS-12	A	105.7	18.4	16.8	94.8	89.6	95	Fail	1311650, 3049130
35							18.1	100.4	94.9		Pass	1311565, 3049080
34 RT							18.7	103.0	97.4		Pass	1311650, 3049120
36		3rd Lift					17.3	99.5	94.1		Fail	1311710, 3049250
36 RT		"					17.9	100.1	94.7		Pass	" "
37		2nd					16.7	101.1	95.6		Pass	1311625, 3049135
38		3rd					17.9	106.8	101.0		Pass	1311650, 3049180
39		"					18.9	101.4	95.6		Pass	1311660, 3049150
40		4th					20.0	100.1	94.7		Pass	1311585, 3049205

Comments/Notes:

Laboratory Test Type
- A. Standard Proctor ASTM D-698
- B. Modified Proctor ASTM D-1557
- C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
- I: Initial Field Test
- RT I: Retest After Reworking General Area Of Initial Field Test

Signature: Tim M. May

PE-88 (4/95)

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FIELD TESTING REPORT

PROJECT Dye Burial Grounds LOCATION Crane, In

JOB NO. 18328 DATE 9-30-97 CONTRACTOR Philip WEATHER Clear TEMP ____ °F

SPECIFICATION _____

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
4230	See Test Location Map	4th Lift	BS-12	A	105.7	18.4	16.6	104.4	98.8	95	Pass	1311645, 3049250
4237	↓ ↓	"	↓	↓	↓	↓	17.4	105.9	100.2	↓	Pass	1311650, 3049140
4238	↓ ↓	5th	↓	↓	↓	↓	18.7	107.2	101.4	↓	Pass	1311660, 3049130

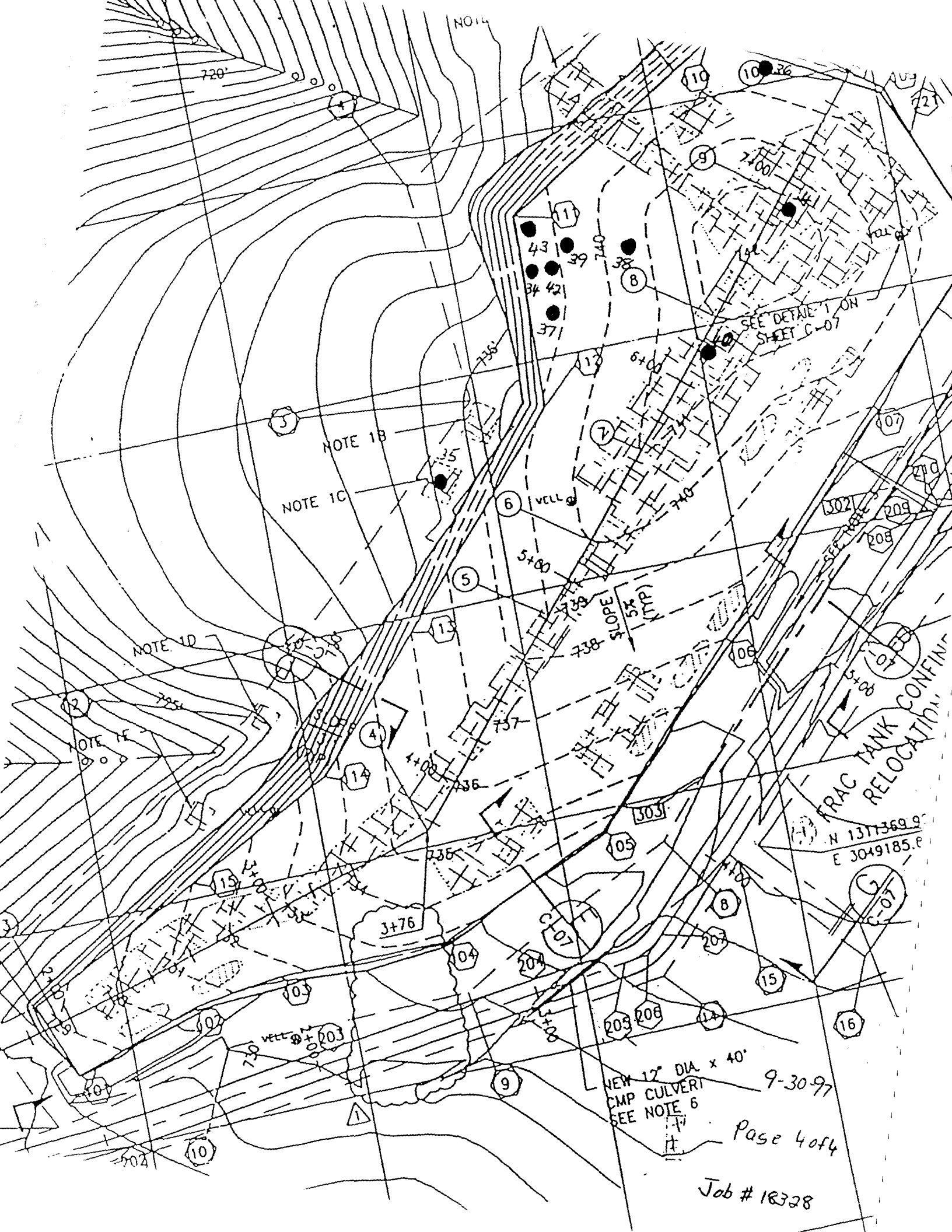
Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: Dan M. May

PE-88 (4/95)


NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
SLOPE 5:1 (MIN)
FRAC TANK CONFIN
RELOCATION
N 1311369.9
E 3049185.8
NEW 12" DIA x 40' CMP CULVERT SEE NOTE 6
9-30-97
Page 4 of 4
Job # 18328

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FIELD TESTING REPORT

PROJECT DYE BURIAL GROUNDS LOCATION CRANE IN
JOB NO. 18328 DATE 10-1-97 CONTRACTOR PHILIP WEATHER CLEAR/COOL TEMP 50-70 °F
SPECIFICATION ASTM D698

Work Performed _____

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
4439	SEE TEST LOCATION MAP	5TH LIFT	BS-12	A	105.7	18.4	18.2	106.1	100.3	95%	PASS	
4540	↓	5TH LIFT	↓	↓	↓	↓	18.7	108.2	102.3	↓	PASS	
4641		3RD LIFT					21.0	101.1	95.6		PASS	
4742		3RD LIFT					18.8	102.1	96.5		PASS	
4843		2ND LIFT					20.1	104.5	98.9		PASS	
4844		2ND LIFT					18.2	105.4	99.7		PASS	

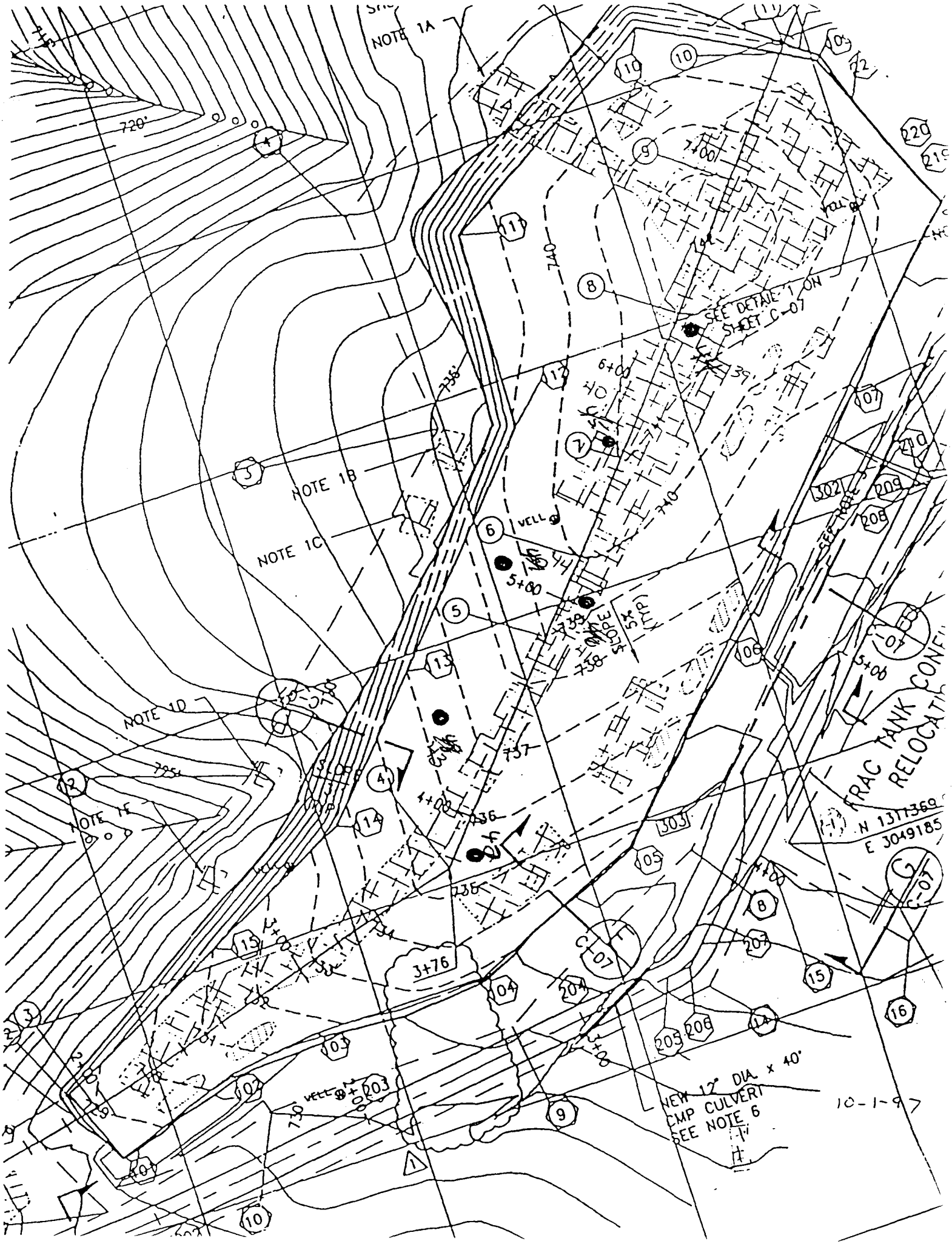
Comments/Notes:

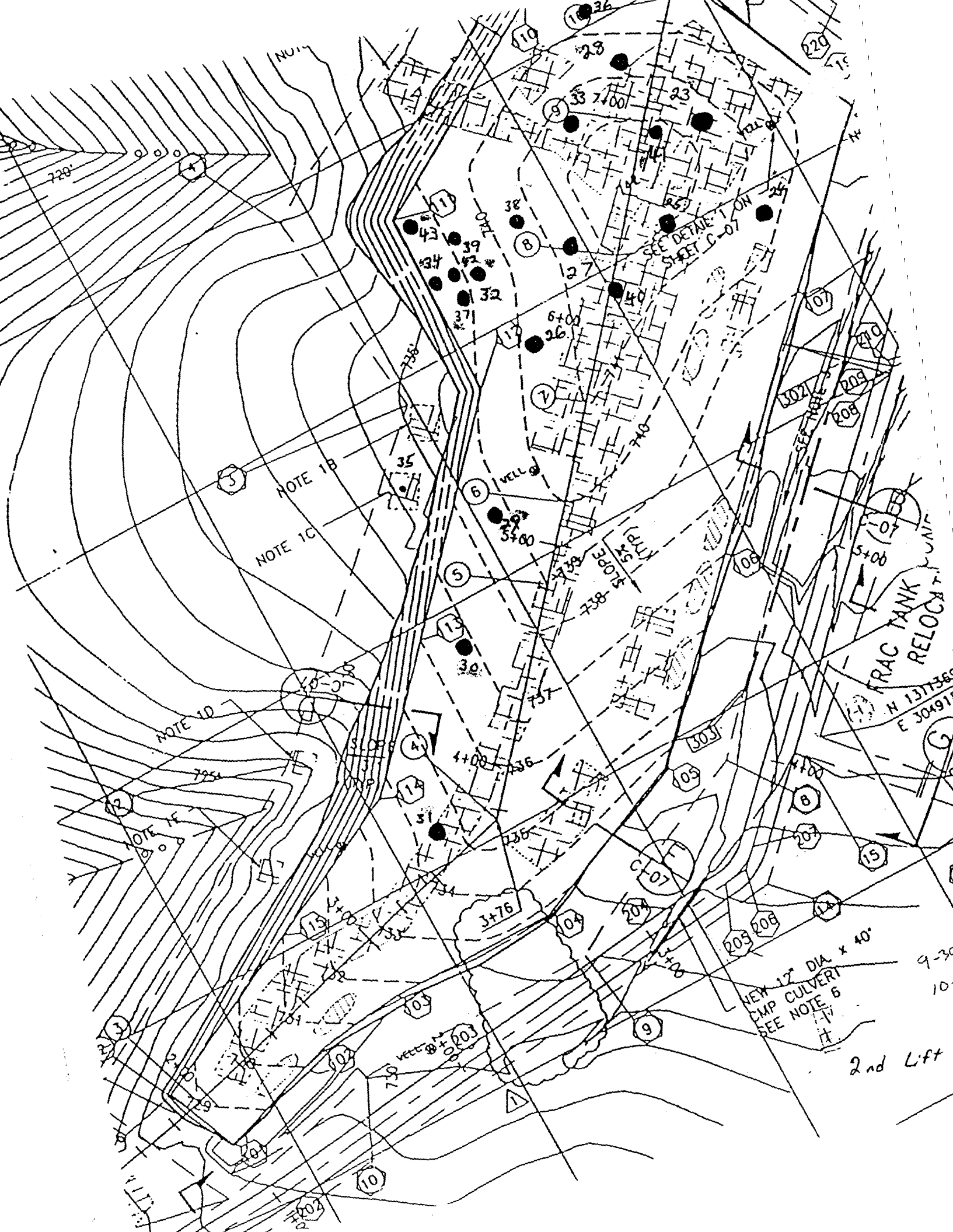
Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David B. Martin

PE-88 (4/95)


NOTE 1A
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
720'
740
736
737
738
739
SEE DETAIL 1 ON SHEET C-07
VELL
SLOPE 5% (TYP)
FRAC TANK CONFI
RELOCATI
N 1311369
E 3049185
NEW 12" DIA. x 40'
CMP CULVERT
SEE NOTE 6
3+76
10-1-97



NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
FRAC TANK RELOCATION
NEW 12" DIA. x 40' CMP CULVERT SEE NOTE 6
2nd Lift
SLOPE 5% (TYP)
SLOPE 3% (TYP)
3+76
4+00
5+00
6+00
7+00
720'

ENVIRONMENTAL

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FIELD TESTING REPORT

PROJECT: CRANE DYE BURIAL GROUND CAP LOCATION: CRANE NAVAL BASE
JOB NO. 18328 DATE 10-3-97 CONTRACTOR PHILIP WEATHER SUNNY TEMP 55-84 °F
SPECIFICATION _____

Work Performed: COMPACTION TESTING OF FILL DIRT FOR FOUNDATION CAP

Test Number	Location	Laboratory Data					Field Data			Specified % Comp.	Pass/ Fail	See Note
		Depth or Elevation	Soil I.D. Number	Test Type	Maximum Dry Density (pcf)	Optimum Moisture Content %	Moisture Content %	Dry Density (pcf)	% Compaction			
5045	SEE TEST LOCATION MAP	LIFT #3	AS 12	A	105.7	18.4	19.0	104.0	98.3	95%	PASS	
5146	↓	LIFT #2	↓	↓	↓	↓	17.4	105.0	99.3	↓	PASS	
5247	↓	LIFT #2	↓	↓	↓	↓	17.6	96.8	91.5	↓	FAIL	
52R	↓	LIFT #2	↓	↓	↓	↓	18.7	100.5	95.0	↓	PASS	
5348	↓	LIFT #2	↓	↓	↓	↓	17.5	102.1	96.5	↓	PASS	

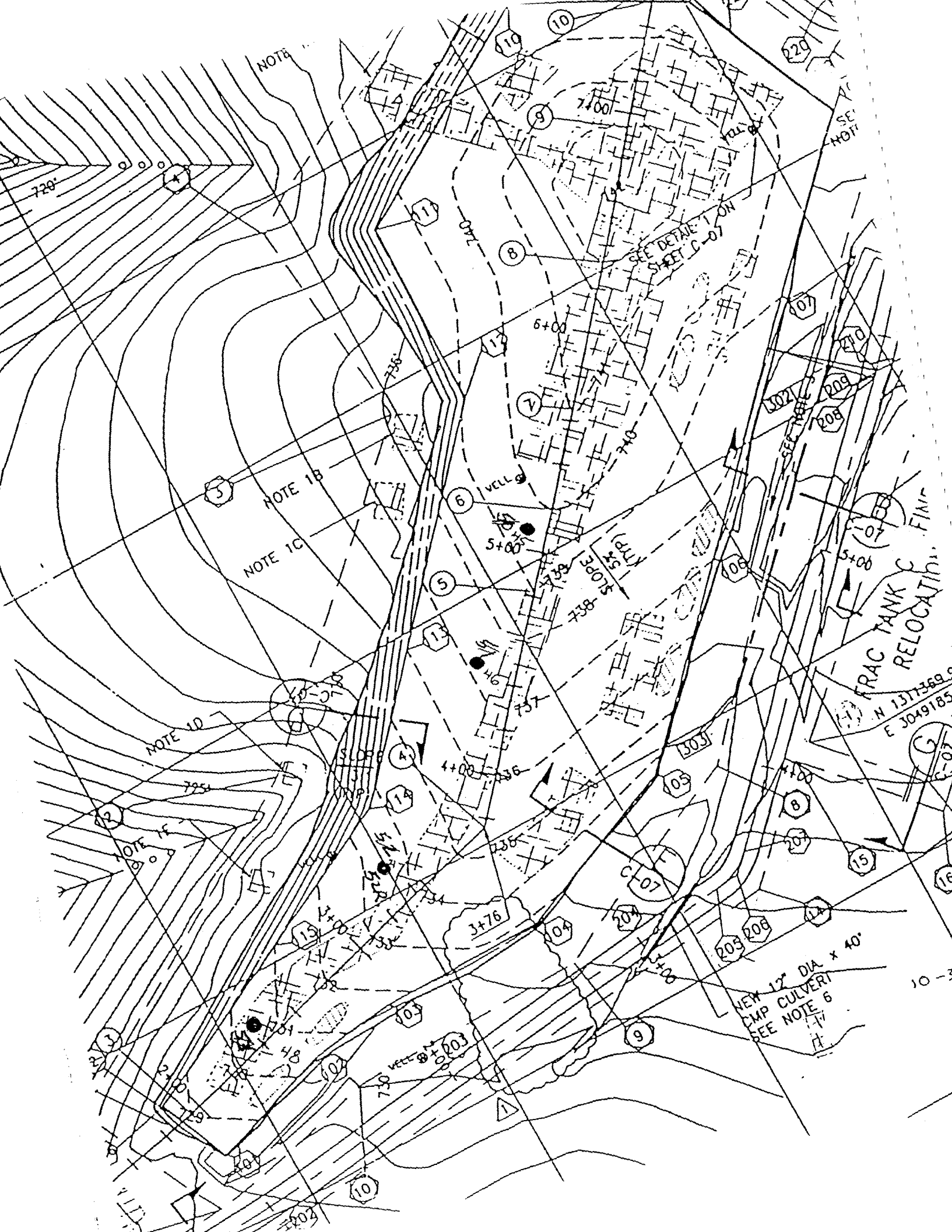
Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David B. Martin

PE-88 (4/95)



NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
SLOPE 5% (TYP)
FRAC TANK C RELOCATION
N 1311369
E 3049185
NEW 12" DIA x 40' CMP CULVERT SEE NOTE 6
3+76
4+00
5+00
6+00
7+00
720'

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FIELD TESTING REPORT

PROJECT CRANE DYE BURIAL GROUND CAP LOCATION CRANE, INDIANA

JOB NO. 18328 DATE 10/7/97 CONTRACTOR PHILIP WEATHER SUNNY TEMP 60-80 °F

SPECIFICATION ASTM D 698

Work Performed placement and compaction of fill dirt

	Test Number	Location	Laboratory Data: Depth or Elevation	Laboratory Data: Soil I.D. Number	Laboratory Data: Test Type	Laboratory Data: Maximum Dry Density (pcf)	Laboratory Data: Optimum Moisture Content %	Field Data: Moisture Content %	Field Data: Dry Density (pcf)	Field Data: % Compaction	Specified % Comp.	Pass/Fail	See Note
49	54	SEE TEST LOCATION MAP		BS 12	A	105.7	18.4	16.8	95.3	90.1	95%	FAIL	
50	55	↓		↓	↓	↓	↓	12.7	100.7	95.2	↓	FAIL	
51	56	↓		↓	↓	↓	↓	16.3	102.7	97.1	↓	PASS	
49	54R	↓		↓	↓	↓	↓	15.8	100.5	95.1	↓	PASS	
50	55R	↓		↓	↓	↓	↓	16.3	105.2	99.4	↓	PASS	

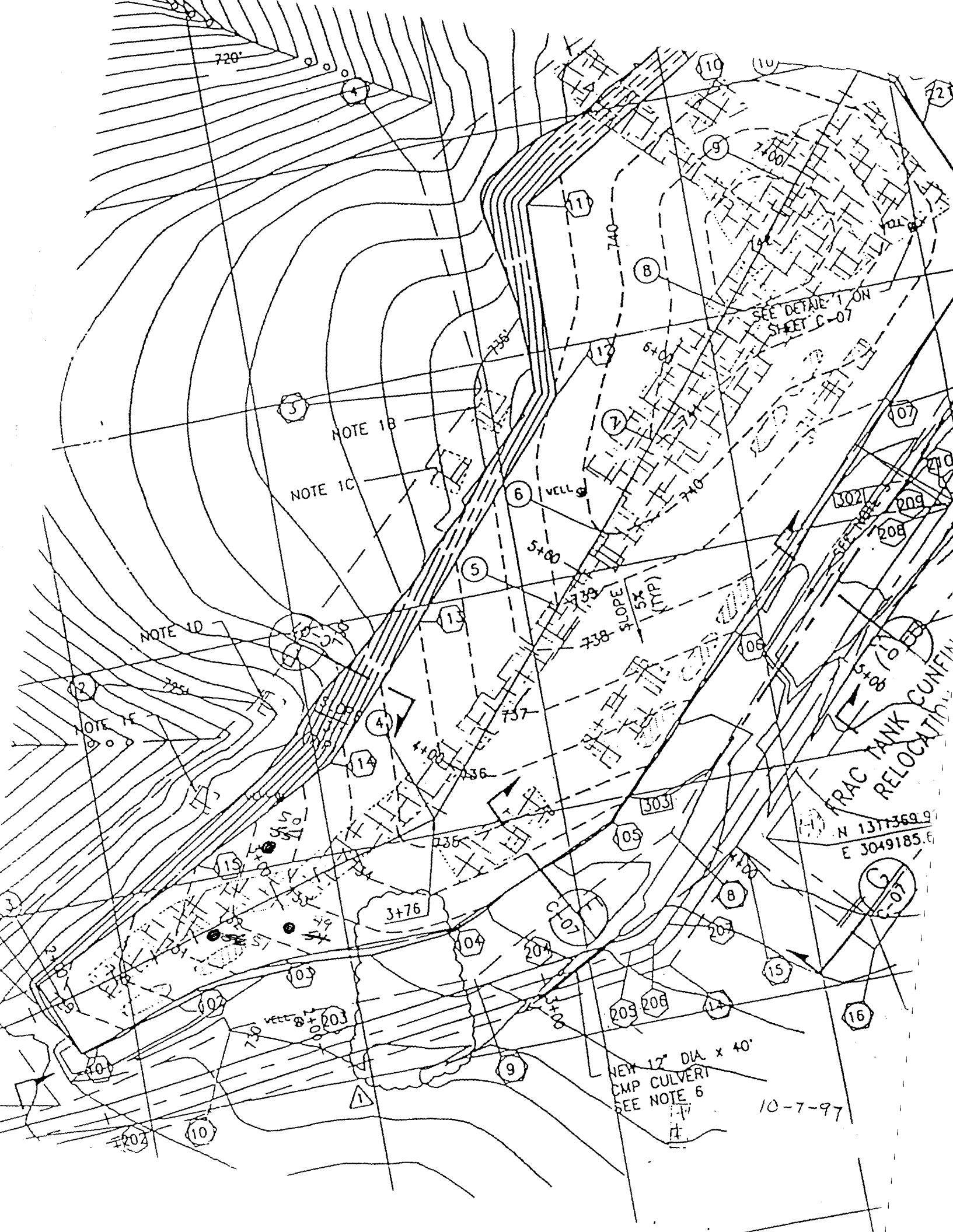
Comments/Notes:

Laboratory Test Type
A. Standard Proctor ASTM D-698
B. Modified Proctor ASTM D-1557
C. Relative Density ASTM D-4253 and 4254.

Test Number (Typical Format)
1: Initial Field Test
RT 1: Retest After Reworking General Area Of Initial Field Test

Signature: David S. Martin

PE-88 (4/95)



720'
NOTE 1B
NOTE 1C
NOTE 1D
NOTE 1E
SEE DETAIL 1 ON SHEET C-07
VELL
SLOPE 5% (TYP)
FRAC TANK CONFIN
RELOCATION
N 1311369.9
E 3049185.6
3+76
NEW 12" DIA. x 40' CMP CULVERT SEE NOTE 6
10-7-97

APPENDIX J

FIELD INSPECTIONS

APPENDIX J
FIELD INSPECTIONS

INDEX

J-1	Field Inspections
J-2	Field Inspection Checklists
J-3	Site Conditions Inspection Checklists

J-1

Field Inspections

CONTRACTOR APPROVAL FORM
NSWC CRANE
DYE BURIAL GROUND
INTERIM MEASURES CAP

SUBCONTRACTOR NOTICE OF PREPARATION

Area/Item
(ready to be inspected/approved): CAP - foundation - subgrade
Date: 7/10/98
Comments: incomplete surface prep - density compaction testing completed.

Subcontractor's Signature

Site Supervisor
Title

CONTRACTOR APPROVAL/DISAPPROVAL

☒ Approved ☐ Disapproved

Date: 07-10-98

Comments: Cap Foundation complete excluding surface prep.

Additional Work Items:

07/10/98
Contractor Signature/Date

Acknowledged — OICC Signature — 7/14/98 Date

Acknowledged — EPD Signature — 7/9/98 Date

J-2

Field Inspection Checklists

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-01	NOV 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	PREPARATORY INSPECTION			
1	Conduct preparatory phase meeting prior to initiating work items for site clearing, stripping, and cutting.	Accept		L. Bigley 08/28/97
2	Verify submittals required by Vendor Data Schedule have been approved and signed.	Reject Accept	Sub. For Application of herbcide has not been submitted	(1) L. Bigley 09/12/97
3	Conduct on-ground examination of areas to be cleared and identify items or existing features, including plant life, to be undisturbed and protected. Resolve discrepancies prior to commencement of work.	Accept	FRAC Confinement Area has been relocated to avoid Indiana Bat potential Roosting trees	L. Bigley 08/28/97
4	Ensure that a Decontamination Plan has been developed and approved.	N/A	PART of WORK PLAN	—
5	Verify that a review of Safety requirements is performed as a part of the preparatory inspection.	Accept	PART OF PREP. PHASE MEETING	L. Bigley 08/28/97
	INITIAL PHASE CONTROL			
1	Protection of items not to be removed or disturbed has been provided, as necessary.	Accept		L. Bigley 08/29/97
2	Verify that dust control measures are available and effective.	Accept	NO VISIBLE DUST DURING TREE FALLING OPERATION AT DBG	L. Bigley 08/29/97
3	Verify run-on/run-off controls are ready to implement.	Accept	Silt Fence in Place at DBG FROM PREVIOUS CONSTRUCTION ACTIVITIES AT DBG	L. Bigley 08/29/97
4	Confirm work areas have been located with the limits of work clearly established (stakes, lines, monuments).	Accept		L. Bigley 08/29/97

ADDITIONAL NOTES OR COMMENTS

(1) Application of herbcide to stumps is not to proceed until submittals for herbcide and applicators hn. have been approved (Scheduled Sep 9, 1997)

Specific Item Identification or Location, as applicable:

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - Crane, Indiana	0009, Statement of Work #007	SITE PREPARATORY WORK, Dye Burial Ground DBP-01	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-02	NOV 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	FOLLOW-UP PHASE CONTROL			
1	Verify ground surface vegetation indicated for removal, has been close cut to the ground, and clippings removed from construction limits.	Accept	09/08 EAST CONFINE. 09/24 South of CAP	YB 11-04-~~98~~ 97
2	Verify ~~grubbing to remove stumps~~ STUMPS CUT FLUSH YS, roots, debris, or other deleterious materials not suitable for reuse, HAVE BE REMOVED	Accept	09/08 EAST CONFINE 09/10 WEST CONFINE 09/24 SOUTH CAP ①	YB 09-26-97
3	Verify final removal and disposal of cleared and grubbed wastes in an approved manner.		BORROW AREA ONLY	
4	Verify stripping of topsoil and stockpiled for final restoration of the ~~site around the Dye Burial Cap~~ YB. BORROW AREA	Accept	REUSE OF STRIPPED MATERIAL - LITTLE TO NO TOPSOIL AT Borrow	YB 09-26-97
5	Verify removal of excessive grass and other vegetation from topsoil.	Accept	BORROW AREA CAP area	YB 09-23-97
6	Verify topsoil around the trenches are stockpiled and protected from erosion hazards.	Accept	BORROW AREA	YB 09-23-97
7	Verify standing (ponded) water within the construction area has been properly removed prior to work activities.	Accept	~~09/22~~ on GOING PROCESS	YB 07-08-98
8	Verify the required grades and dimensions of the completed site preparation by survey.	Accept	Survey by MSE	YB 06-30-98
9	Note exposed contaminated materials during grading activities for the possibilities of equipment/personnel contamination.	Accept	MATERIAL covered WITH SOIL OF PLASTIC daily	YB 10-02-97
10	Verify completion of the site clearing activities is complete and in accordance with the approved work plan.	Accept		YB 11-04-~~98~~ 97
11	See that corrective measures have been performed, verified, and documented if applicable.	Accept	Completion with grass grass	YB 09-15-98

ADDITIONAL NOTES OR COMMENTS
① 09/27 NE area CAP (EXCEPT STUMPS)
09/30 N edge of CAP

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - Crane, Indiana	0009, Statement of Work #007	SITE PREPARATORY WORK, Dye Burial Ground DBP-02	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
RUN ON/RUN OFF CONTROL Dye Burial Ground	DBRR-01	Nov. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Preparatory Inspection			
1	Schedule preparatory phase meeting to ensure run on/run off control measures are understood and effective.	Accept		L Bigley 09-09-97
2	Ensure that a Run on/Run off Control Plan has been developed and approved by the Project Manager.	Accept		L Bigley 09-09-97
3	Review work areas requiring either permanent or temporary protection from water run on and erosion control.	Accept		L Bigley 09-09-97
4	Verify that adequate control products such as bales, silt fences, and 6 mil. plastic, are available and in adequate quantities to provide effective protection..	Accept	10 mil plastic	L Bigley 09-09-97
	Initial Inspections			
1	Upon commencement of site activities, ensure that adequate physical protection is provided to prevent uncontrolled run on/run off.	Accept		L Bigley 09-09-97
2	Monitor open excavations to ensure that physical protection is provided to prevent storm water entry to the excavation.	Accept	Exc of Area a1	L Bigley 09-15-97
3	Ensure initial compliance with the provisions of the plans discussed in the preparatory phase.	Accept		L Bigley 09-15-97

ADDITIONAL NOTES OR COMMENTS:

Specific Item Identification or Location, as applicable:

MK Project	Delivery Order Number	Checklist Title	
NSWC - Crane, Indiana	0009, Statement of Work #007	Run On/Run Off Control DBRR -01	Page 1 of 1

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
RUN ON/RUN OFF CONTROL Dye Burial Ground	DBRR-02	Nov. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Follow-up Inspection			
1	Verify that all excavated materials planned for re-use are properly stockpiled and protected from erosion.	Accept		LJB 07-20-98
2	Ensure on-going compliance with stormwater prevention plan for Run-on Run-off controls as discussed in the Preparatory and Initial Phases.		1-Def-rework - Def-DBG-001 Corrected when weather permitted.	
3	Verify the readiness and effectiveness of temporary erosion measures, by adequate use of berms and perimeter ditches.	Accept		LJB 07-20-98
4	Verify 6 mil. plastic is on hand to be used as covering to prevent erosion of cap layers during construction.	Accept	10mil. and 6mil.	LJBigley 07-20-98
5	Ensure that water removed from excavated areas is properly characterized prior to disposal.	N/A	ALL Exc water placed in FRAC tank - disposal by Others	—

ADDITIONAL NOTES OR COMMENTS:

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist: Title	Checklist Number	Revision Date	Checklist
Soils Layering Backfill and Compaction Dye Burial Ground	DBF-01	NOV 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Preparatory Inspection			
1	Confirm an appropriate proctor (i.e., ASTM D698) of the soil around the Dye Burial Trench to be used as fill/backfill has been performed and approved.	Accept	3 proctors for Bio Facility Spoils Pile 4 proctors for 141/822 PART OF BORROW INVESTIGATION	LJB/ 09-16-97
2	Confirm an appropriate proctor of any necessary designated borrow source has been performed and approved.	Accept	Borrow site investigation completed by MK	LJB/ 08-29-97
3	Confirm work areas have been located with the limits of work clearly established (stakes, lines, monuments) and that the lines and grades called for on the drawings are understood.	Accept	MSE set cap Foundation shoulder limits – Survey ongoing as need to SET LIMITS	LJB/ 09-12-97
4	Verify that proper equipment is on hand and appropriate for placement, grading, and wetting and compacting soils.	Accept	Compactor Ingersoll Rand SD-40D SHEEPFOOT COMPACTOR	LJB/ 09-16-97
5	Verify precautions are taken to prevent/contain the spillage of gas, oil, slurry, etc. to assure compliance with the base spill plan.	Accept	S	LJB/ 09-16-97
6	Verify preconstruction elevation survey to be used for measurement of earthwork, if applicable, is available for and prior to conducting earthwork in a given area.	Accept	Pre Const Topo performed by MK using MSE	LJB/ 09-16-97
7	Verify that earthwork is performed in accordance with the drawings and within established bounds.	Accept		LJB/ 09-16-97

ADDITIONAL NOTES OR COMMENTS

Excavation of area 1a deeper than anticipated – lower lift are to be verified using compactive effort upper lifts are to be density and moisture tested to ensure adiquate compaction.

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Soils and Layering Backfill and Compaction Dye Burial and Compaction DBF-01	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SOILS LAYERING BACKFILL AND COMPACTION Dye Burial Ground	DBF-02	NOV 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Initial Phase Control			
1	Verify that the equipment selected is unlikely to rut or disturb the graded area, especially over the trenches.	LJB Accept	Soil to be spread ① with LGP Dozer.	09/16/97 LJB
2	Verify the likelihood of exposure to contaminated materials during the cover construction.	Accept	Clean fill being spread ① with dozer of contaminate fill MIN 6" Thickness @ all times	09/17/96 LJB
3	If no contaminated materials have been noted, modify decontamination procedures appropriately.	Accept	Contaminate Excavation ① with Mud box sluge removal	—
4	Verify the prepared surface for cover placement has been inspected for debris, roots, sharp objects, and large particles.	Accept ~~N/A~~	Inspected by PSG EDCI MK acceptance of subgrade by EDCI	07-10-98 LJB
5	Verify that the cover materials delivered to the site have appropriate certifications (i.e. geosynthetics).	Accept		06-30-98 LJB
6	Verify cover materials (sand, biotic barrier, and topsoil) have been approved and meet the requirements.	Accept		06-30-98 LJB
7	Verify the delivered cover materials are documented to be in conformance with the drawings and specifications.	Accept		06-30-98 LJB
8	Ensure protection from the elements of cover materials at the temporary site storage area.	Accept		06-30-98 LJB

ADDITIONAL NOTES OR COMMENTS

① Cap Foundation Fill

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Soils and Layering Backfill and Compaction Dye Burial and Compaction DBF-02	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SOILS LAYERING BACKFILL AND COMPACTION Dye Burial Ground	DBF-003	NOV 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	ACCEPT/ REJECT	REMARKS	VERIFIED BY/ DATE
	Follow-up Inspection			
1	Verify grades are in accordance in the drawings and specifications.	Accept	MSE-	LJB 06/30/98
2	Verify adequate proofrolling and compaction of existing subgrade, including thorough and uniform coverage by compactor, compactor performance, and desired results in conformance with specifications Section 02200.	Accept	Proofrolled 6 Wheel Polaris ATV on 12' centers	LJB 07/10/98
3	Verify that offsite borrow source materials are acceptable in conformance with specification Section 02200.	Accept	Borrow Soil 161/BZL Borrow	LJB 08/29/97
4	Verify adequate compaction of new general fill and regraded subgrade, including thorough and uniform coverage by compactor, compactor performance, and desired results in conformance with specifications Section 02200.	Accept	Spoil Pile CAP Found 161/BZL Borrow	LJB 08/29/97
5	Verify as-built grade of regraded subgrade and new general fill forming the base of landfill cover by instrument survey on approved survey point system.	Accept	MSE	LJB 06/30/98
6	Verify material for granular drainage is 23-24 sand from Rogers Groups, Greene County.	Accept		LJB 07-23-98
7	Confirm that placement of granular layer does not cause excessive shifting of or damage to the underlying geosynthetics.	Accept		LJB 07-24-98
8	Verify densification of granular drainage layer by light compaction. Confirm that layer deflection is minimal during compaction.	Accept	WITH DOZER	LJB 07-24-98
9	Verify nominal thickness by random gauging or probing, taking into account anticipated densification and volume reduction after ~~rolling~~. compaction	Accept	10 RANDOM checks	LJB 07-28-98
10	Verify final thickness of granular drainage layer is at least the minimum design thickness specified on the drawings.	Accept	MSE Surveyed 07-28	As-built by Instrument Survey
11	Verify materials for topsoil cover layer appear to comply with materials specified.	Accept		LJB 08-18-98
12	Confirm that placement of topsoil cover layer does not cause excessive shifting of or damage to the geotextile.	Accept		LJB 08-11-98
13	Verify nominal thickness by random gauging or probing, taking into account anticipated densification and volume reduction after rolling.	Accept	16 Random Spot Checks	LJB 08-28-98
14	Verify densification of topsoil cover layer. Confirm that layer deflection is acceptable during compaction.	Accept	1"	LJB 08-28-98
15	See that corrective action measures have been performed where required, verified, and documented.	Accept		LJB 08-31-98

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project	Delivery Order Number	Checklist Title Soils and Layering Backfill and Compaction Dye Burial and Compaction DBF-03	
NSWC - Crane	0009, Statement of Work #007		Page 1 of 1

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOSYNTHETIC CLAY LINER INSTALLATION Dye Burial Ground	GCL-01	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Initial Phase Control			
1	Verify that outer layer of GCL rolls are in acceptable condition with no excess hydration of deformation of clay.	Accept	Wrapper rolls	LB 06-23-98
2	Verify GCL rolls are labeled or tagged with Manufacturers Name and Production ID.	Accept	40 rolls	LB 06-23-98
3	Verify each roll is marked with continuous 'match line' at each edge to ensure proper lap.	Accept		LJ Bigley 07-14-98
4	Verify that panels are not damaged as they are deployed, nor show excessive damage in the rolls or along edges.	Accept	Panel cut into small pieces for handling	LJ Bigley 07/14/98
5	Verify that initial panel placement is reasonably straight and free of irregularities.	Accept		LJB 07/14/98
6	Verify that minimum observed overlay is according to specifications or manufacturers design.	Accept	each roll is marked with a continuous 'match line'	LJB 07/14/98
7	Verify that damaged portions of the rolls are removed and patched with like material.	Accept		LJB 07/14/98

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GCL-01	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOSYNTHETIC CLAY LINER INSTALLATION Dye Burial Ground	GCL-02	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Follow-up Control			
1	Verify continued minimum overlapping of panels in conformance with the specifications Section 02253.	Accept	10" vert ~~8"~~ 12" Horz	LJ Bigley 07/19/98
2	Verify seaming method (overlap only, heat tack, bentonite seal, or other) is performed 100 percent of seam lengths.	Accept	1/4 lb grandular bentonite per 1f of seam Through 07-23	LJ Bigley 07/19/98
3	Verify deficient overlaps and seams are repaired by placing additional capping strip, as required by the specifications.	N/A	Material was placed To spec. or excess overlap	LJB 07/23/98
4	Verify repairs to tears, rips, or other damage are made with appropriate coverage and overlap of patches in conformance with specifications.	Accept	12" overlap - beyon repair	LJB 07/23/98
5	Verify that GCL does not exhibit hydration as evidenced by excess thickness, softness, deformation or extrusion of clay at edges.	Accept	No sign of hydration were noticed - GCL was kept under water proof tarp untill placed	LJB 07/23/98
6	Verify hydrated GCL as removed and replaced or overlain with new GCL, as appropriate.	N/A	edge beyond anchor trench became hydrated but this is anticipated	LJB 07/23/98
7	Verify GCL extends into anchor trench.	Accept	Min of 2' beyon anchor trench	LJB 07/23/98
8	See that corrective action measures have been performed where required, verified, and documented.	Accept	Non - noted	LJB 07/23/98

ADDITIONAL NOTES OR COMMENTS

GCL was inspected daily for overlap - damage - signs of hydration. Lois J. Bigley

Placement of GCL, Bentofix, July 14, 1998 Through July ~~24~~ 23, 1998 LJB

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GCL-02	PAGE 1 OF 1

CUSHION.

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FILTER FABRIC AND CUSHION INSTALLATION Dye Burial Ground	GEOTEX-01	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Preparatory Phase Control			
1	Conduct preparatory phase meeting prior to initiating work items for geotextile installation. Verify preconstruction submittals have been submitted and approved.	Accept		LJB 06-18-98
2	Confirm that installer has approved subgrade conditions prior to placement of geotextiles.	Accept	Subgrade Acceptance by ERCI documented of Acceptance form	LJB 07/11/98
3	Confirm work areas and patterns of panel installation have been established and are in conformance to the approved panel layout drawing. Verify any noted changes or discrepancies. Resolve discrepancies prior to commencement of work.	Accept	Pannel Layout Approve 1997	LJB 07-08-98
4	Confirm installer has proper equipment and trained personnel for handling and installing materials without damage to the materials or previously completed construction items.	Accept		LJB 07-11-98
5	Verify storage methods are adequate to protect geotextile rolls from damage due to moisture, UV degradation or contamination.	Accept	Material stored on site	LJB 07-08-98
	Initial Phase Control			
5	Verify geotextile rolls are in acceptable condition without excessive damage. Verify that damaged portions of rolls are removed as necessary.	Accept		LJB 07-11-98
6	Verify that panels are not damaged as they are deployed, nor show excessive damage on the rolls or along edges.	Accept		LJB 07-11-98 07-12-98
7	Verify that initial panel placement is reasonably straight, adequately overlapped for seaming and free of irregularities. Verify that minimum observed overlap is according to specifications.	Accept	3" overlap	LJB 07-11-98

ADDITIONAL NOTES OR COMMENTS

Type 2 Cushion

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-01	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FABRIC INSTALLATION Dye Burial Ground	GEOTEX-02	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Follow-up Phase Control			
1	Verify continued minimum overlapping of panels in conformance with the Specifications Section 02249.	Accept		LJB 07-12-98
2	Verify approved seaming method (overlap only, heat tack, stitching, or other) is performed 100 percent of seam lengths.	Accept		LJB 07-12-98
3	Verify deficient overlaps (if sole method of adjoining panels) are repaired by placing additional capping strips or stitched together, as required by the specifications.	Accept		LJB 07-12-98
4	Verify repairs to tears, rips or other damage are made with appropriate coverage and overlap of patches in conformance with specifications.	Accept		LJB 07-12-98
5	See that corrective action measures have been performed where required, verified, and documented.	Accept	2-Def - One corrected Def-DBG-002 One Use as Is Def-DBG-003	LJ Bigley 07-14-98
6	Verify subcontractors QC documentation prior to subsequent layering.	Accept	QC and Conformation Result in	LJ Bigley 07-14-98

ADDITIONAL NOTES OR COMMENTS

Type 2 cushion

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-02	PAGE 1 OF 1

Sand

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FILTER FABRIC AND CUSHION INSTALLATION Dye Burial Ground	GEOTEX-01	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Preparatory Phase Control			
1	Conduct preparatory phase meeting prior to initiating work items for geotextile installation. Verify preconstruction submittals have been submitted and approved.	Accept	~~[illegible]~~	GB 06-18-98
2	Confirm that installer has approved subgrade conditions prior to placement of geotextiles.	Accept	Sand layer	GB 07-28-98
3	Confirm work areas and patterns of panel installation have been established and are in conformance to the approved panel layout drawing. Verify any noted changes or discrepancies. Resolve discrepancies prior to commencement of work.	Accept	SUBMITTAL	GB 07-28-98
4	Confirm installer has proper equipment and trained personnel for handling and installing materials without damage to the materials or previously completed construction items.	Accept		GB 07-28-98
5	Verify storage methods are adequate to protect geotextile rolls from damage due to moisture, UV degradation or contamination.	Accept		GB 07-08-98
	Initial Phase Control			
5	Verify geotextile rolls are in acceptable condition without excessive damage. Verify that damaged portions of rolls are removed as necessary.	Accept	37 rolls stored on site	GB 07-28-98
6	Verify that panels are not damaged as they are deployed, nor show excessive damage on the rolls or along edges.	Accept	PLACEMENT 07-28-98 THROUGH 07-30-98	GB 07-28-98
7	Verify that initial panel placement is reasonably straight, adequately overlapped for seaming and free of irregularities. Verify that minimum observed overlap is according to specifications.	Accept	OVERLAP/SEWN	GB 07-28-98

ADDITIONAL NOTES OR COMMENTS

Type 1 Sand

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-01	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FABRIC INSTALLATION Dye Burial Ground	GEOTEX-02	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Follow-up Phase Control			
1	Verify continued minimum overlapping of panels in conformance with the Specifications Section 02249.	Accept	SEWN	LJB 07-30-98
2	Verify approved seaming method (overlap only, heat tack, stitching, or other) is performed 100 percent of seam lengths.	Accept	Heat ~~Tack~~ Bonding was also approved however Sewing was used	LJB 07-30-98
3	Verify deficient overlaps (if sole method of adjoining panels) are repaired by placing additional capping strips or stitched together, as required by the specifications.	Accept	all panels sewn together	LJB 07-30-98
4	Verify repairs to tears, rips or other damage are made with appropriate coverage and overlap of patches in conformance with specifications.	Accept		LJB 07-30-98
5	See that corrective action measures have been performed where required, verified, and documented.	N/A	ALL REPAIRS MADE THE SAME DAY	—
6	Verify subcontractors QC documentation prior to subsequent layering.	Accept	* Awaiting As-Built Drawing. ALL OTHER DOC IN.	LJB 07-30-98

ADDITIONAL NOTES OR COMMENTS

Typical Sand

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-02	PAGE 1 OF 1

Biotic

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FILTER FABRIC AND CUSHION INSTALLATION Dye Burial Ground	GEOTEX-01	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Preparatory Phase Control			
1	Conduct preparatory phase meeting prior to initiating work items for geotextile installation. Verify preconstruction submittals have been submitted and approved.	Accept		LJB 06-18-98
2	Confirm that installer has approved subgrade conditions prior to placement of geotextiles.	Accept	Biotic stone layer	Ball 8/4/98
3	Confirm work areas and patterns of panel installation have been established and are in conformance to the approved panel layout drawing. Verify any noted changes or discrepancies. Resolve discrepancies prior to commencement of work.	Accept		LJB 08-03-98
4	Confirm installer has proper equipment and trained personnel for handling and installing materials without damage to the materials or previously completed construction items.	Accept		LJB 08-03-98
5	Verify storage methods are adequate to protect geotextile rolls from damage due to moisture, UV degradation or contamination.	Accept		LJB 07-08-98
	Initial Phase Control			
5	Verify geotextile rolls are in acceptable condition without excessive damage. Verify that damaged portions of rolls are removed as necessary.	Accept		Ball 8/4/98
6	Verify that panels are not damaged as they are deployed, nor show excessive damage on the rolls or along edges.	Accept		Ball 8/4/98
7	Verify that initial panel placement is reasonably straight, adequately overlapped for seaming and free of irregularities. Verify that minimum observed overlap is according to specifications.	Accept		Ball 8/4/98

ADDITIONAL NOTES OR COMMENTS

Type 1 Biotic

Morrison Knudsen Project	Delivery Order Number	Checklist Title	
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-01	PAGE 1 OF 1

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FABRIC INSTALLATION Dye Burial Ground	GEOTEX-02	NOV. 95	Page 1 of 1

ITEM NO.	ITEM CHECKED	Accept/ Reject	REMARKS	VERIFIED BY/ DATE
	Follow-up Phase Control			
1	Verify continued minimum overlapping of panels in conformance with the Specifications Section 02249.	Accept		Beall 8/5/98
2	Verify approved seaming method (overlap only, heat tack, stitching, or other) is performed 100 percent of seam lengths.	Accept		Beall 8/5/98
3	Verify deficient overlaps (if sole method of adjoining panels) are repaired by placing additional capping strips or stitched together, as required by the specifications.	NA		Beall 8/5/98
4	Verify repairs to tears, rips or other damage are made with appropriate coverage and overlap of patches in conformance with specifications.	Accept	See deficiency report DBG-DEF-005	Beall 8/5/98
5	See that corrective action measures have been performed where required, verified, and documented.	Accept	See deficiency report DBG-DEF-005	Beall 8/5/98
6	Verify subcontractors QC documentation prior to subsequent layering.	Accept		Beall 8/5/98

ADDITIONAL NOTES OR COMMENTS

Type 1 Biotic

Morrison Knudsen Project	Delivery Order Number	Checklist Title	PAGE 1 OF 1
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-02	

J-3

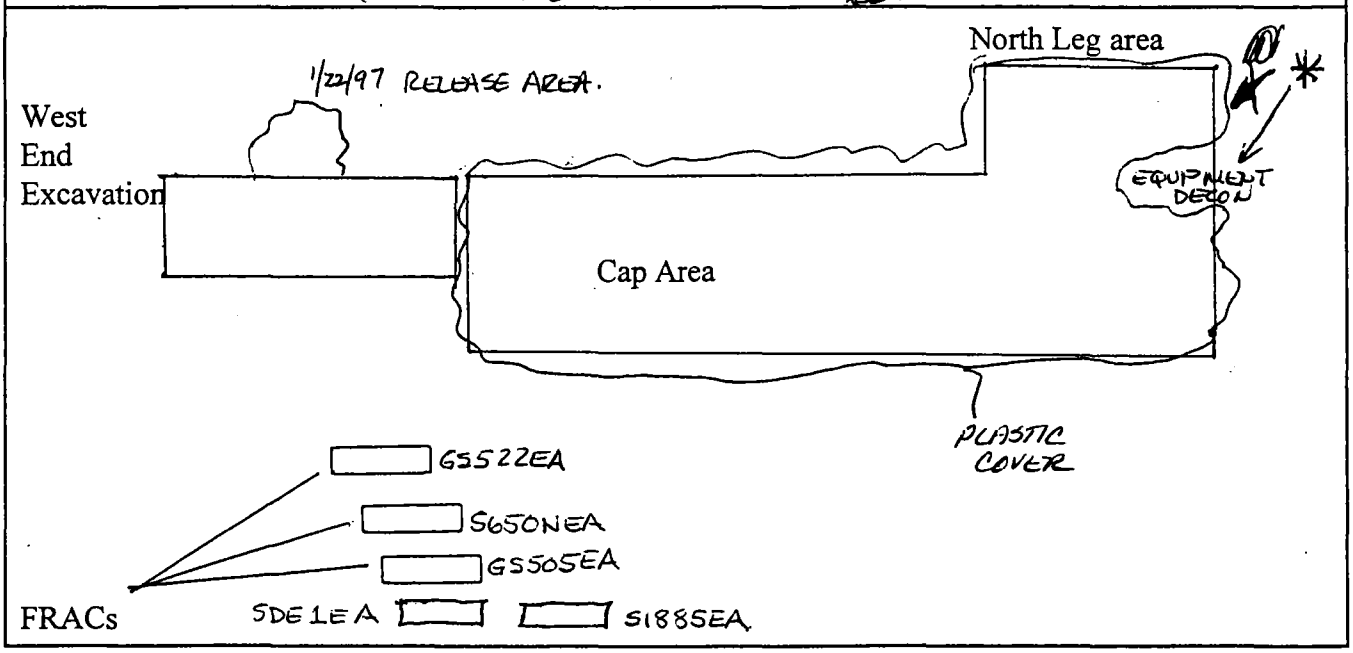
Site Conditions Inspection Checklists

SITE CONDITIONS INSPECTION CHECKLIST
SWMU 02/11 Dye Burial Ground

Morrison Knudsen Corporation NSWC-Crane, IN 4324-0009

ATTRIBUTE	DATE/TIME	VERIFIED BY
1. FRACs valves/ports free of visible leakage	1/24/97 21:25	
2. West excavation water level below top of berm	1/24/97 21:20	
3. West excavation berms free of visible breaches	1/24/97 21:20	
4. No visible colored waters outside containment areas	1/24/97 21:15	
5. Cap area water level below top of berms	1/24/97 21:25	
6. Cap area berms free of visible breaches	1/24/97 21:45	
7. No visible colored water outside cap area berm	1/24/97 21:45	
8. Water level in North leg area below top of berm	1/24/97 20:55	
9. North leg berm free of visible breaches	1/24/97 21:00	
10. No visible colored waters outside north leg berm area	1/24/97 20:55	SEE COMMENTS
11. Record weather conditions: Temperature 31°F Snow Rain Fog Clear (Overcast) (circle which applies)	1/24/97 21:50	
	—	—

COMMENTS: * 3 small puddles of green water found @ 20:55. S/C PUSHED "CLEAN" SOILS INTO/OVER AREA, developed bermed AREA WITH PLASTIC COVER w/ RUN-OFF TROUGH @ NORTH. END. BRIEFED T. BRENT (ON-SITE) ON SITUATION.

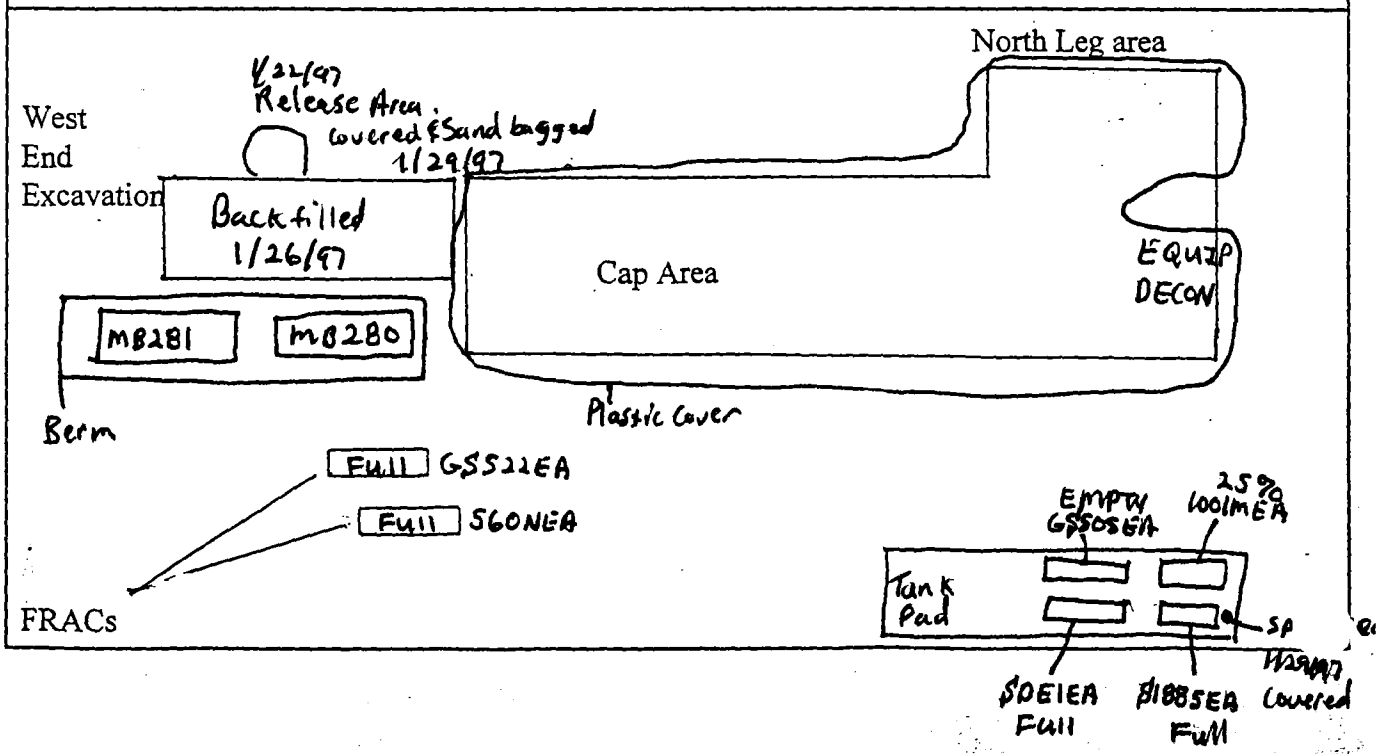


SITE CONDITIONS INSPECTION CHECKLIST
SWMU 02/11 Dye Burial Ground

Morrison Knudsen Corporation NSWC-Crane, IN 4324-0009

ATTRIBUTE	DATE/TIME	VERIFIED BY
1. FRACs valves/ports free of visible leakage	1/30/97 1810	JL
2. West excavation water level below top of berm	N/A	N/A
3. West excavation berms free of visible breaches	N/A	N/A
4. No visible colored waters outside containment areas	1/30/97 1850	Ja
5. Cap area water level below top of berms	1/30/97 1850	Ja
6. Cap area berms free of visible breaches	1/30/97 1850	Ja
7. No visible colored water outside cap area berm	1/30/97 1850	Ja
8. Water level in North leg area below top of berm	1/30/97 1840	Ja
9. North leg berm free of visible breaches	1/30/97 1840	Ja
10. No visible colored waters outside north leg berm area	1/30/97 1840	Ja
11. Record weather conditions: Temperature 29°F Snow Rain Fog Clear (Overcast) (circle which applies)	1/30/97 1855	Ja

COMMENTS:



SITE CONDITIONS INSPECTION CHECKLIST
SWMU 02/11: Dye Burial Ground

DATE/TIME: 2/5/97 07:35/15:00

ATTRIBUTE	RESULTS	VERIFIED BY
1. FRACs/Mud boxes valves/ports free of leakage. 0745/1500	ACC/REJ	
2. FRACs/Mud boxes free of visible cracks or punctures 1505	ACC/REJ	
3. Record FRAC freeboard (inches/feet): FRAC 1001MEA: 8'-4" FRAC S1885EA: 15" FRAC SDE1EA: 19" FRAC GS505EA: 19" FRAC S650NEA: 12" FRAC GS522EA: 9'-7" 07:40	ACC/REJ	
4. FRACs/mud boxes free of noticeable bulging 07:40/15:00	ACC/REJ	
5. Uncoated portions of welds free of obvious visual defects 15:00	ACC/REJ	
6. FRACs free of noticeable tilt/excess settling 15:00	ACC/REJ	
7. No visible colored water outside north leg plastic covered areas 15:10	ACC/REJ	
8. No visible breaches in north leg berms 15:10	ACC/REJ	
9. No visible colored water outside plastic covered cap areas 15:05	ACC/REJ	
10. No visible breaches in cap area berms 15:05	ACC/REJ	
11. No visible colored water outside 1/22/97 impact area, incl. stream 15:07	ACC/REJ	
12. No visible dye observed outside controlled areas 15:14	ACC/REJ	
13. No visible tears or openings in plastic covers 15:14	ACC/REJ	
14. Site barricades and signage intact * 0750/15:15	ACC/REJ	
15. Record Weather Conditions: Temperature 32 F 15:15 Snow Rain Fog Clear Overcast (circle which applies)	N/A	

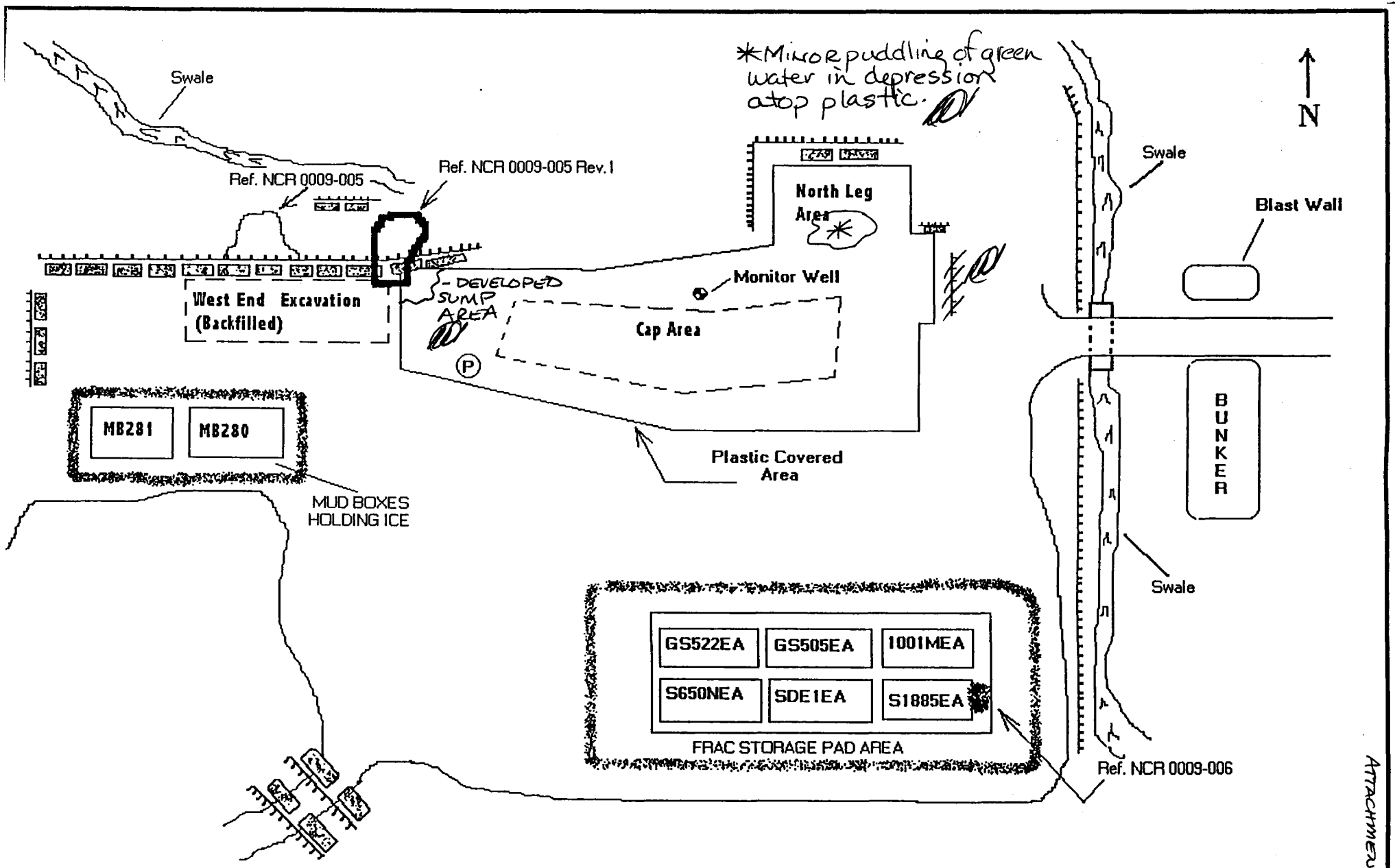
COMMENTS (incl. corrective actions taken): **Reference site map on reverse side**

*Additional signage being placed under direction.

VERIFIED FRAC LABELS & ACCUMULATION LOGS IN PLACE @1500.

PER S/C, office trailer to remain @ site.

NO VISIBLE DISCOLORED WATER IN SWALE NORTH OF SITE.



EARTHEN BERM

HAY BALE

P POLYTANK

SILT FENCING

DRAWING IS NOT TO SCALE

SWMU 02/11
DYE BURIAL GROUND
NSWC-Crane, IN

04FEB97

ATTACHMENT TO 2/5/97

SITE CONDITIONS INSPECTION CHECKLIST
SWMU 02/11: Dye Burial Ground

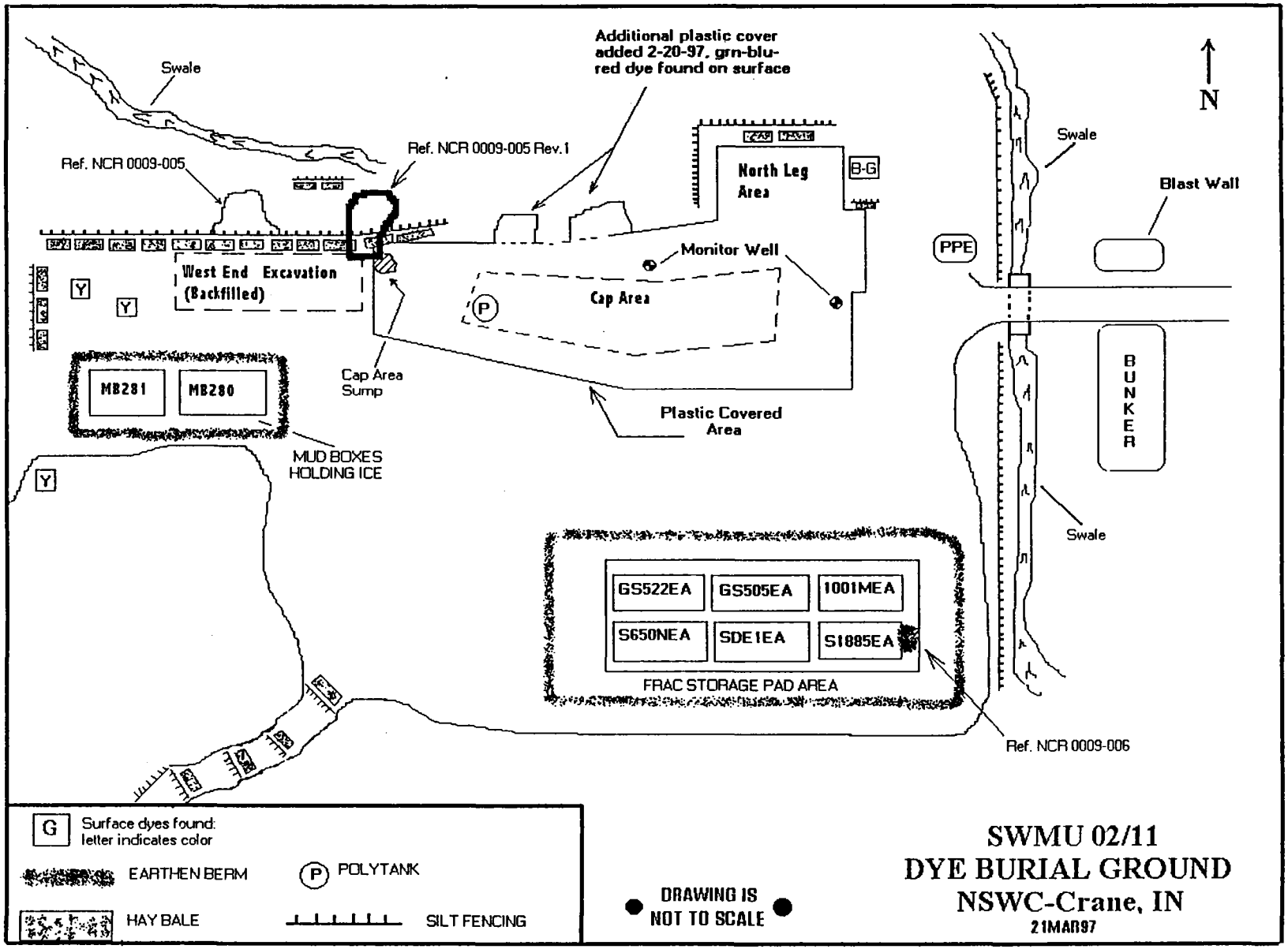
DATE/TIME: **22MAR97 at 08:05**

ATTRIBUTE	RESULTS	VERIFIED BY
1. FRACs/Mud boxes valves/ports free of leakage.	ACC/REJ	
2. FRACs/Mud boxes free of visible cracks or punctures	ACC/REJ	
3. Record FRAC freeboard (inches/feet): FRAC 1001MEA: 14" FRAC S1885EA: 11" FRAC SDE1EA: 15" FRAC GS505EA: 11" FRAC S650NEA: *** FRAC GS522EA: 3'-4"	ACC/REJ	
4. FRACs/mud boxes free of noticeable bulging SEE COMMENT.	ACC/REJ	
5. Uncoated portions of welds free of obvious visual defects	ACC/REJ	
6. FRACs free of noticeable tilt/excess settling	ACC/REJ	
7. No visible colored water outside north leg plastic covered areas	ACC/REJ	
8. No visible breaches in north leg berms	ACC/REJ	
9. No visible colored water outside plastic covered cap areas	ACC/REJ	
10. No visible breaches in cap area berms	ACC/REJ	
11. No visible colored water outside 1/22/97 impact area, incl. stream	ACC/REJ	
12. No visible dye observed outside controlled areas	ACC/REJ	
13. No visible tears or openings in plastic covers SEE COMMENT.	ACC/REJ	
14. Site barricades and signage intact	ACC/REJ	
15. Record Weather Conditions: Temperature: **44 F** Snow Rain Fog Clear Overcast (circle which applies)	N/A	

COMMENTS (incl. corrective actions taken): **Reference site map on reverse side**

***FRAC level not measured due to broken ladder; no leakage observed.

* No animal tracks observed on plastic covered areas.
* No visible dye materials tracked from site area to office trailer.
* Plastic cover over used PPE storage area blown off; replaced during inspection.
* No increase in MB280 sidewall deflection.



ATTACHMENT 10
3/22/97

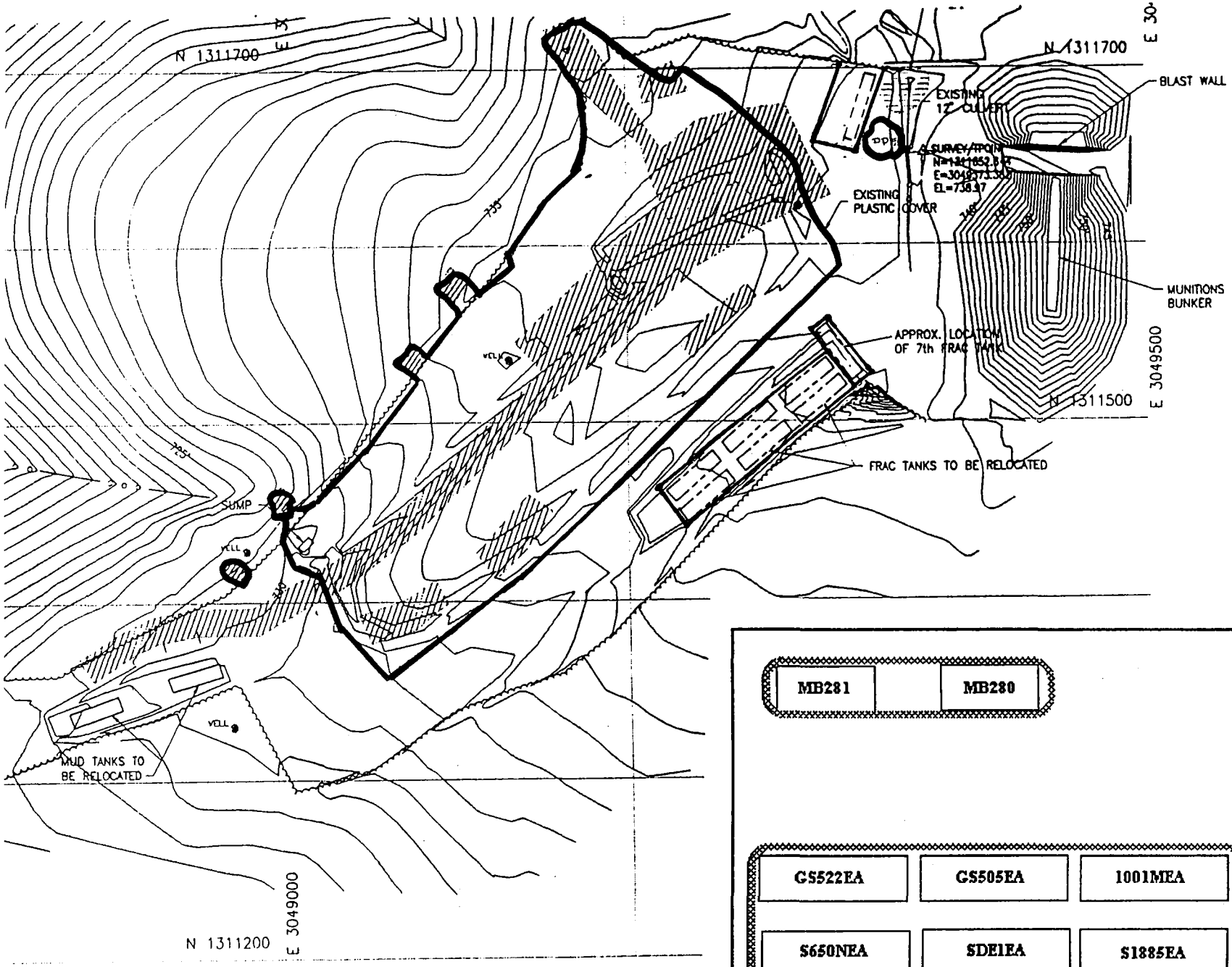
SITE CONDITIONS INSPECTION CHECKLIST
SWMU 02/11: Dye Burial Ground

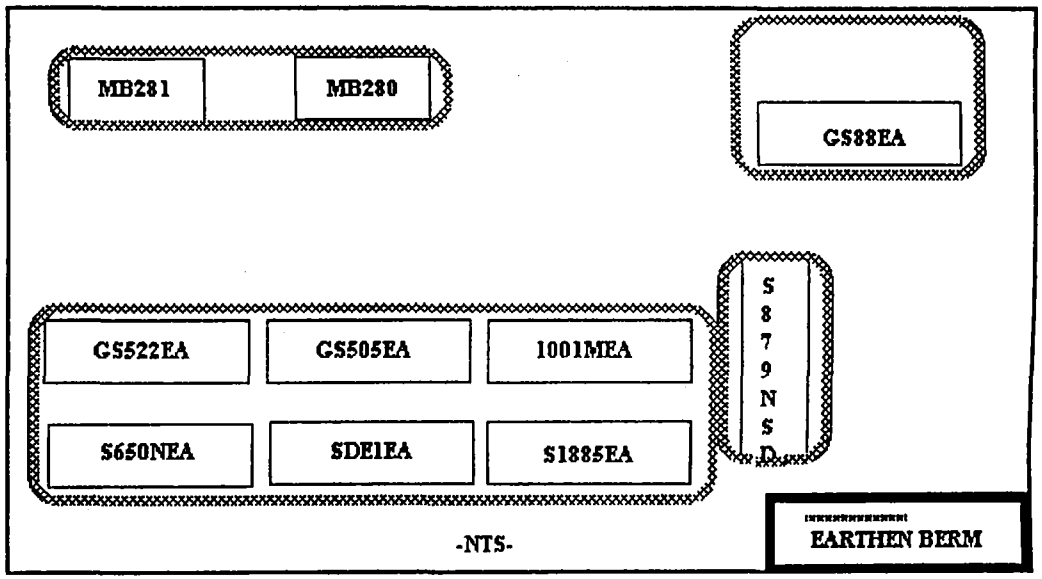
DATE/TIME: 3 Jul 97 at 0915

ATTRIBUTE	RESULTS	VERIFIED BY
1. FRACs/Mud boxes valves/ports free of leakage.	ACC/REJ	JLM
2. FRACs/Mud boxes free of visible cracks or punctures	ACC/REJ	JLM
3. Record FRAC freeboard (inches/feet): FRAC 1001MEA:____ FRAC S1885EA:_____ FRAC SDE1EA: ____ FRAC GS505EA:_____ FRAC S650NEA:____ FRAC GS 522EA:_____ FRAC S879NSD:____ FRAC GS 88EA :_____ MB280: ____ MB281: _____	ACC/REJ	
4. FRACs/mud boxes free of noticeable bulging. **See comments.**	ACC/REJ	JLM
5. Uncoated portions of welds free of obvious visual defects	ACC/REJ	JLM
6. FRACs free of noticeable tilt/excess settling	ACC/REJ	JLM
7. No visible colored water outside north leg plastic covered areas	ACC/REJ	JLM
8. No visible breaches in north leg berms	ACC/REJ	JLM
9. No visible colored water outside plastic covered cap areas	ACC/REJ	JLM
10. No visible breaches in cap area berms	ACC/REJ	JLM
11. No visible colored water outside 1/22/97 impact area, incl. stream	ACC/REJ	JLM
12. No visible dye observed outside controlled areas	ACC/REJ	JLM
13. No visible tears or openings in plastic covers.	ACC/REJ	JLM
14. Site barricades and signage intact	ACC/REJ	JLM
15. Record Weather Conditions: Temperature 72 F Snow Rain Fog Clear Overcast (circle which applies)	N/A	

COMMENTS (incl. corrective actions taken): Martin, Judy L

No increases in mudwall sidewall bulges previously reported.
No noticeable animal tracks on plastic covered areas.
No visible dyes on work surface from work zones to site trailer.





MUD BOX AND FRAC TANK DETAIL

ATTACHMENT TO 7/3/97

APPENDIX K

REWORK ITEMS LIST AND FINAL PROJECT PUNCH LIST

APPENDIX K
REWORK ITEMS LIST AND FINAL PROJECT PUNCH LIST

INDEX

K-1 Rework Items List

K-2 Final Project Punch List

K-1

Rework Items List

REWORK ITEMS LIST/DEFICIENCY TRACKING SYSTEM

CONTRACT NO./TITLE: MK SOUTHDIV ERAC- Dye Burial Ground SWMU 02/11

DELIVERY ORDER NO: NSWC Crane - Delivery Order 0009

Crane, Indiana

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para. No.; Drwg. No., etc.)	Action Taken	Resolution	Date Completed	Remarks
DBG DEF 001	06/16/98	Silt fence on West side of cap improperly installed	Section 02200 -3.1(B)	Informed Sub (PSG) of Condition issued Deficiency	Repair/ Replace Silt fence	06-26-98	Closed
DBG DEF 003	07/13/98	Geotextile Panel GT-49 does not extend 2' beyond drainage trench	Drawing C-07	Reviewed condition with design engineer - Concured Use-as-is	Use-as-is	07/14/98	closed

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para. No.; Drwg. No., etc.)	Action Taken	Resolution	Date Completed	Remarks
DBG DEF 002	07/~~14~~ 13/98	Patch @ seam GT 18/19 inadequate	02249 -3.2(D)	Informed sub (PSG/EDCI) of Condition Issued Deficiency	Repair	07/14/98	Closed
DBG DEF 004	07/13/98	Soil Clods Under fabric in ditch line	Drawing C-07	Informed Sub (PSG) of Condition Issued Deficiency	Removed Clods and check entire trench	07/14/98	Closed
DBG DEF 005	08/06/98	5 areas of inadequate seaming	02249 -3.2(D) 3	Review Condition with design engineer Issued deficiency	Repair by Patching areas	08/06/98	Closed
DBG DEF 006	09/04/98	Area outside of cap was seed but not mulched the same day	02936 3.3(C)	~~Completed~~ Issued deficiency	Complete Mulching Use-as-is	09/05/98	Closed

Morrison Knudsen Corporation NSWC-Crane, IN 4324-	DEFICIENCY REPORT	
S/C: 4324-0106 / Philip Service Group	Area No.: SWMU 02/11	DR No. DBG-DEF-001

ITEM AFFECTED: DBG Erosion Control - Silt Fence

REQUIREMENT: Section 02200-3.1(B) ... Provide straw bales and/or silt fences as necessary to control erosion and sediment transport off site

DEFICIENCY:

Silt fence on west side of the north end of the cap is improperly installed. Fabric is backwards and bottom is not buried.

Reported By: Lois J. Bigley Date: 06/16/98

DISPOSITION

☐ USE-AS-IS ☒ REWORK ☐ Scrap

Install a new section of silt fence on west side of cap.

Disposition By: Lois J. Bigley Date: 06/16/98 Reviewed By: Lois J. Bigley Date: 06-16-98

Disposition Verified By: Lois J. Bigley Date: 06/26/98

Comments: PSG replaced silt fence - work was delayed due to wet site conditions

Morrison Knudsen Corporation NSWC-Crane, IN 4324-	DEFICIENCY REPORT	
S/C: 4324-0106 / Philip Service Group	Area No.: SWMU 02/11	DR No. DBG-DEF 002

ITEM AFFECTED: Geotextile Cushion

REQUIREMENT: 02249-3.2 (D)

DEFICIENCY: A patch a seam GT 18/19 of the geotextile cushion, were the sewing machine was cut ~~of~~ out was improperly patched using two 3" pieces to cover the hole.

Reported By: Lois J. Bigley Date: 07/13/98

DISPOSITION

☐ USE-AS-IS ☒ REWORK/repair ☐ Scrap

Patch hole @ GT 18/19 of the geotextile cushion using a single piece of like geotextile material with proper overlap.

Disposition By: Lois J. Bigley Date: 07/14/98	Reviewed By: Lois J. Bigley Date: 07/14/98

Disposition Verified By: Lois J. Bigley Date: 07/14/98

Comments: FDC / repair hole @ GT 18/19

Morrison Knudsen Corporation NSWC-Crane, IN 4324-	DEFICIENCY REPORT	
S/C: 4324-0106 / PSG	Area No.: 02/11	DR No. OBG-DEF-003

ITEM AFFECTED: Geotextile Cushion

REQUIREMENT: Drawing C-07
Cushion to extend 2' beyond outside drainage / anchor trench

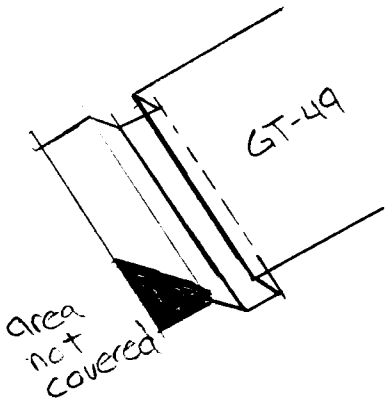
DEFICIENCY:

A portion of panel GT-49 of the geotextile cushion, on the east end, does not extend 2 feet beyond the drainage/anchor trench.

Reported By: Lois J. Bigley Date: 07/13/98

DISPOSITION

☒ USE-AS-IS ☐ REWORK ☐ Scrap



Aprox 2' wide section of the area beyond the trench not covered - purpose for extend section to provide adquate area to anchor geotextile - section missing will have no adverse effect on the cap or geotextile installation - Use-as-is.

Disposition By: Lois J. Bigley Date: 07/14/98 Reviewed By: Lois J. Bigley Date: 07/14/98

Disposition Verified By: Lois J. Bigley Date: 07/14/98

Comments: Project design engineer C. Waite concurs - with Use-as-is disposition - C. Waite visiting the site.

Morrison Knudsen Corporation NSWC-Crane, IN 4324-	DEFICIENCY REPORT	
S/C: 4324-0106 1 PSG	Area No.: SWMU 02/11	DR No. DBG-DEF-004

ITEM AFFECTED: Drainage Collection System.

REQUIREMENT: C-07 Trench cross-section

DEFICIENCY:
Soil Clods from the side wall of the trench have fallen into the trench line

Reported By: Lois J. Bigley Date: 07/13/98

DISPOSITION

☐ USE-AS-IS ☒ REWORK ☐ Scrap

Remove clods from trench-line to ensure proper drainage and grade of drainage trench.

Disposition By: Lois J. Bigley Date: 07/13/98 Reviewed By: Lois J. Bigley Date: 07/13/98

Disposition Verified By: Lois J. Bigley Date: 07/14/98

Comments: PSG pulled back geotextile cushion from ditch line and removed soil clods from the ditch. Walked trench to ensure proper grade retained.

Morrison Knudsen Corporation NSWC-Crane, IN 4324-	DEFICIENCY REPORT	
S/C: 4324-0106 /	Area No.: DBG	DR No. DBG-DEF-005

ITEM AFFECTED: Type I Geotextile - Biotic Layer

REQUIREMENT: Stitching is complete 100% of seam length.

02249-3.2(D).3

DEFICIENCY: There were minor deficiencies in seam stitching in 5 places in the geotextile fabric covering the biotic layer.

1. Stitching very close to end of fabric between P-9 & P-11 at one spot for about 3 inches
2. Stitching very close to end of fabric between P-11 & P-12 for about 3 inches near seam with P-13.
3. Hole in fabric around well extension in P-25 slighty oversized.
4. Stitching fails to seal both panels for a 2" length between P-27 & P-28 near the well extension @ P-25
5. Incomplete seaming at junction of P-47, P-48, & P49

Reported By: D Beall Date: 8/6/98

DISPOSITION

☒ USE-AS-IS ☒ REWORK ☐ Scrap

Per discussion with Clair Waite (Boise design) place an Overlay 3'x3' section of Geotextile fabric over the defect. Secure with clay fill to hold in place. Over lay section will keep clay fill from leaking into biotic layer at the defects.

Disposition By: D Beall Date: 8/6/98 Reviewed By: Lois J. Bigley Date: 08/11/98

Disposition Verified By: D Beall Date: 8/6/98

Comments:

8/4/98

P5 1833 45' | 7' wide | P6 1833 45'

P3 1874 130' | P4 1833 31'

P2 1874 178'

P-1 1833 184'

P8 1868 148' | P7 1833 33'

P9 1868 136' | P10 1948 64'

P11 1948 175'

P13 1868 57' | P-12 2160 156'

P14 2160 144' | P15 1860 79'

P16 1860 220'

P17 1987 197'

P-18(B) 1987 105' | P-18(A) 2130 110'

P19 2130 187' | P20 2160 27'

P-21 1873 186'

P22 1873 114' | P23 2181 57'

P24 2181 173'

● P25 2181 124' | P26 1913 57'

P27 1913 160'

P-28 1913 93' | P29 1847 67'

P30 1847 155'

P31 1847 78' | P32 1897 80'

P33 1331 ~~190~~ 153'

P34 1897 89' | P35 1898 32'

P36 1898 140'

8/4 ↑

P37 1898 130'

8/5 ↓

P38 1900 136'

P39 1900 133'

P41 3498 100' | P40 1900 40'

P-42 3498 130'

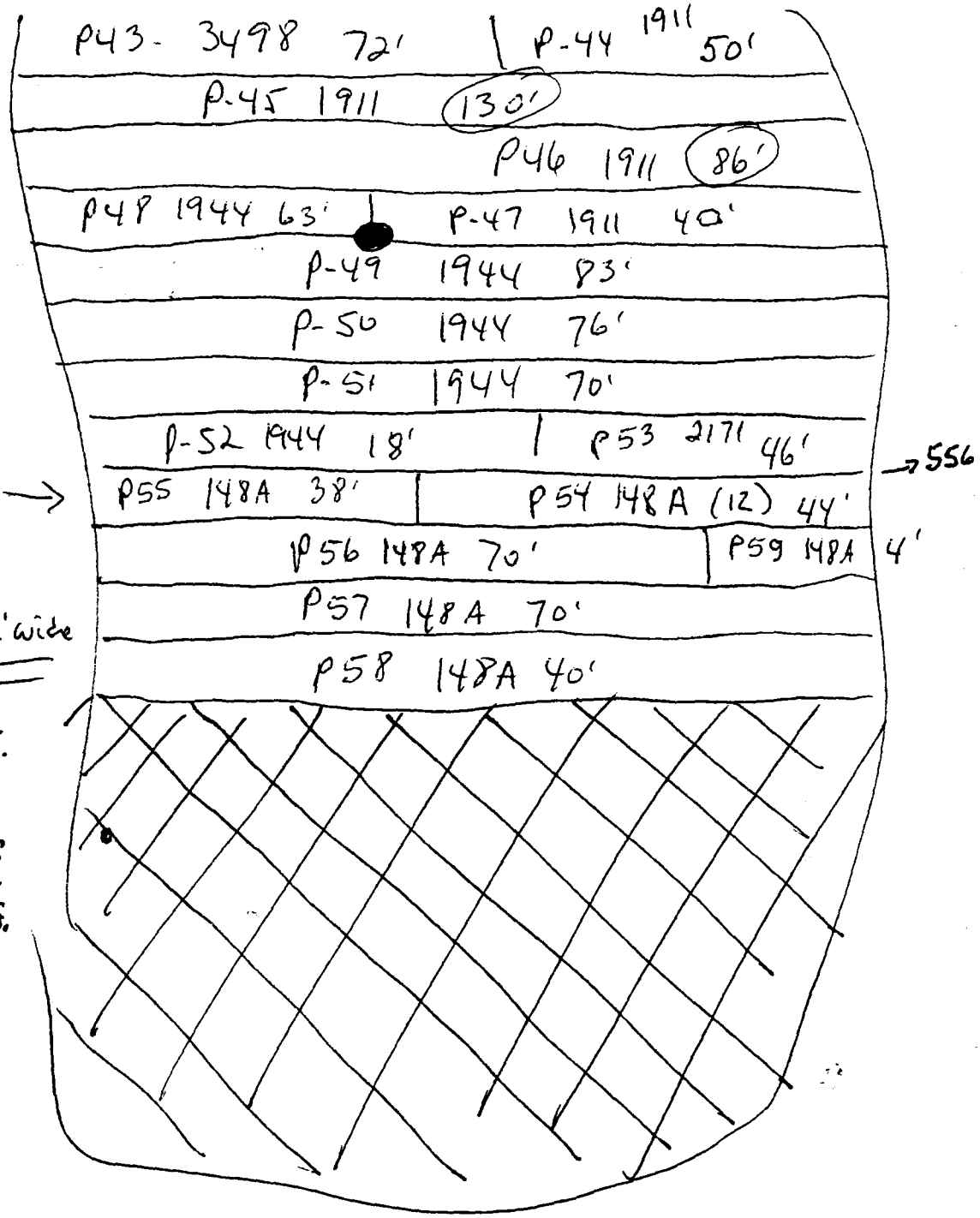
● overlay cover 5 places

4833 L.F.

~~81158~~

83,963 s.f.

15'



heavy fabric

7½' wide

266 L.F.

266 x 7.5 = 1995

5567 x 15 = 83,505

85,500 s.f.

Morrison Knudsen Corporation NSWC-Crane, IN 4324-	DEFICIENCY REPORT	
S/C: 4324-0/06 1	Area No.: SWMU 02/11	DR No. DBG-DEF-06

ITEM AFFECTED: Seeding

REQUIREMENT: Section 02936 3.3(C) Subcontractor shall not seed areas more than that which can be mulched on the same day.

DEFICIENCY:
The disturbed area outside the cap area was seeded and fertilized, but not mulched.

Reported By: Lois J. Bigley Date: 09/04/98

DISPOSITION

☒ USE-AS-IS ☐ REWORK ☐ Scrap

Complete mulching and use-as-is, provided seed germinates and vegetation is established or else the subcontractor re-seed area at no additional cost to the contractor

Disposition By: Lois J. Bigley	Date: 09/04/98	Reviewed By: Lois J Bigley	Date: 09/04/98

Disposition Verified By: Lois J Bigley Date: 09/05/98

Comments: Mulch completed - Woodland Farm Nursery 09/05/98

K-2

Final Project Punch List

DBG
PUNCH LIST
DEVELOPED 8/27/98

AREA	ITEM	DESCRIPTION	DATE COMPLETED	DATE VERIFIED
A		NORTHEAST ENTRANCE		
K.G.	1.	Repair CMP to drain at extension	8/29/98	8/31/98 LJB
K.G.	2.	Grade ditch to provide drainage of area	8/28/98	8/29/98 LJB
K.G.	3.	Remove silt fence and debris	8/28/98	8/29/98 LJB
K.G.	4.	Blend grade to existing topography; remove gravel from tree trunks	9-2-98	LJB 09-2-98
K.G.	5.	Install silt fence down gradient from disturbed area	9-2-98	LJB 09-03-98
K.G.	6.	Grade to eliminate ponding and match surrounding grade a) Bench mark area b) North/side of entrance to magazine c) South/side of entrance to magazine	8/29/98	09-02-98 LJB
B.		BETWEEN MAGAZINE AND ROAD SOUTH OF AREA A		
K.G.	7.	Un-block CMP/grade to drain	8/28/98	8/28/98 LJB
K.G.	8.	Grade area to drain/blend with existing topography	8/28/98	8/28/98 LJB
K.G.	9.	Remove silt fence	8/28/98	8/28/98 LJB
K.G.	10.	Remove trash and debris	8/28/98	LJB 8/29/98
K.G.	11.	Remove trash and soil from stack of logs, and root balls	8/28/98	LJB 8/28/98
K.G.	12.	Remove soil from tree trunks	8/28/98	LJB 8/28/98
C.		BETWEEN ROAD AND TREE SOUTH OF AREA B TO THE FRAC TANK STORAGE AREA		
K.G.	13.	Blend side slope of demolished FRAC tank storage area in to existing topography	8/28/98	8/29/98 LJB
K.G.	14.	Remove soil from tree trucks at old stockpile area	9-1-98	LJB 09-01-98
K.G.	15.	Grade old stockpile area to drain	9-1-98	LJB 09-01-98
K.G.	16.	Remove trash	9-2-98	LJB 09-02-98
K.G.	17.	Remove clay or add topsoil	9-2-98	LJB 09-02-98

AREA	ITEM	DESCRIPTION	DATE COMPLETED	DATE VERIFIED
D.		AREA BETWEEN ROAD AND EAST FRAC TANK STORAGE AREA		
K.G.	18.	Repair NW corner of east FRAC tank storage area berm	9-2-98	LJB 09-02-98
K.G.	19.	Grade area to drain and blend with existing topography	9-2-98	LJB 09-02-98
K.G.	20.	Grade bank area <4:1 or prepare to mat	9-1-98	LJB 09-02-98
K.G.	21.	Remove loose soil from tree trunks	8/28/98	8/28/98 LJB
K.G.	22.	Remove trash	9-1-98	LJB 09-02-98
	23.	Demobilize equipment and tools		LJB 09-09-98
K.G.	24.	Remove stockpile of topsoil	9-2-98	LJB 09-03-98
E		DRAINAGE DITCH AND AREA BETWEEN ROAD AND THE CAP ALONG THE LENGTH OF AREA A, B, C, AND D		
K.G.	25.	Un-block CMP	9-1-98	LJB 09-01-98
K.G.	26.	Remove deteriorated hay bales from ditchline	9-1-98	LJB 09-01-98
K.G.	27.	Remove improperly installed and sediment laden silt fence	9-1-98	LJB 09-01-98
K.G.	28.	Install a single row of silt fence down gradient from disturbed area	9-2-98	LJB 09-04-98
K.G.	29.	Un-plug ditchline	9-1-98	LJB 09-04-98
K.G.	30.	Cut and grade in swale between cap and road	8/28/98	8/29/98 LJB
F.		AREA AROUND WEST FRAC TANK STORAGE AREA		
K.G.	31.	Repair tire ruts; grade to drain	9-1-98	09-01-98
K.G.	32.	Repair berm	8/28/98	8/29/98
K.G.	33.	Till in low area by turn around; grade to drain	8-31-98	09-01-98
K.G.	34.	Blend excess soil in tree line	9-1-98	09-03-98
K.G.	35.	Remove trash	9-1-98	09-03-98
K.G.	36.	Add topsoil near road in non-gravel area	9-1-98	09-03-98

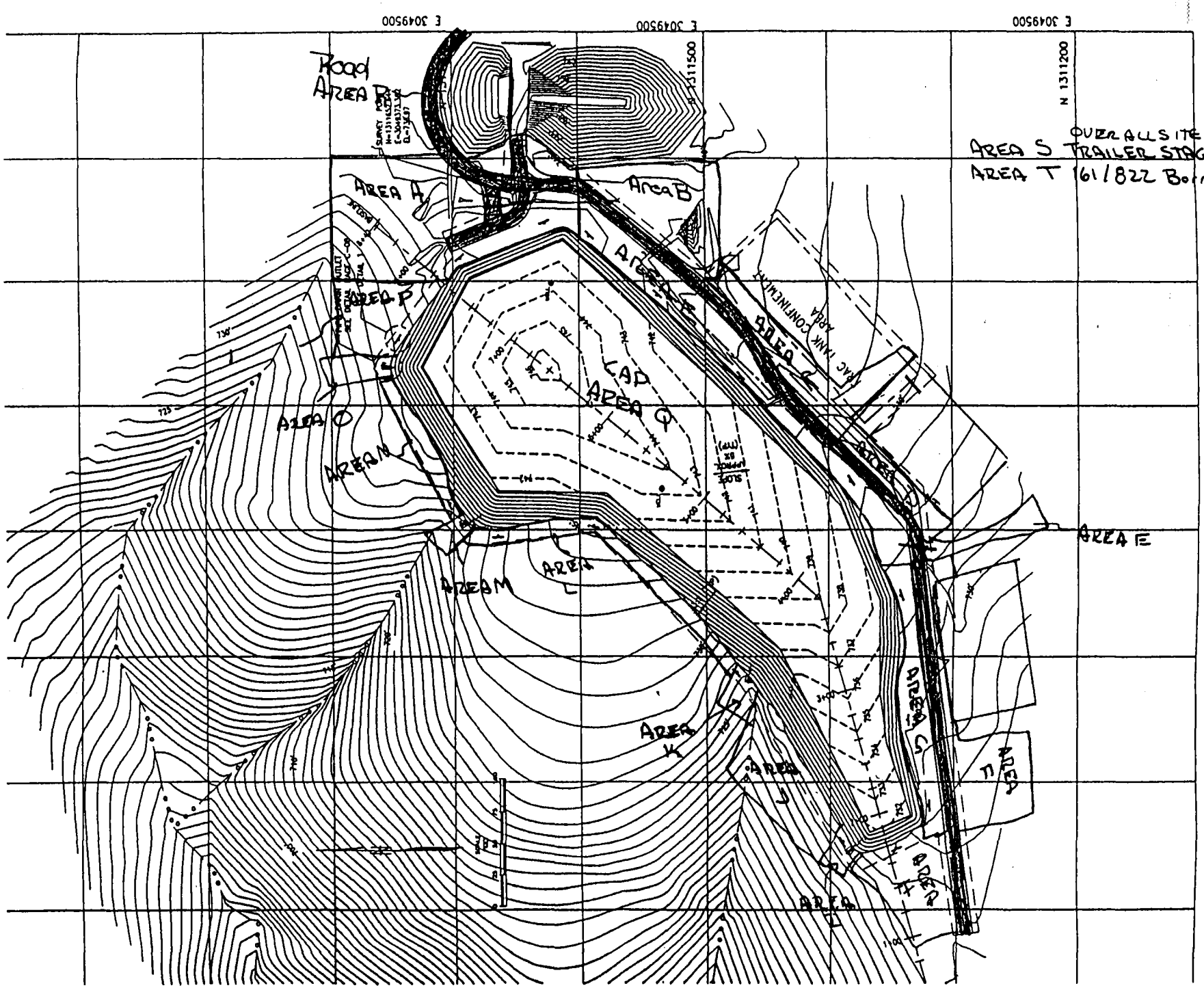
AREA	ITEM	DESCRIPTION	DATE COMPLETED	DATE VERIFIED
G		AREA BETWEEN CAP AND ROAD SOUTH OF CMP		
K.G.	37.	Remove construction debris from around the well	8/31/98	9/1/98 LJB
K.G.	38.	Grade area to drain	8/31/98	9/1/98 LJB
K.G.	39.	Add topsoil	9/1/98	09-02-98 LJB
H		AREA AT SW END OF CAP		
K.G.	40.	Remove clay stockpile	9-1-98	LJB 09-01-98
K.G.	41.	Grade to blend to existing topography and to drain	9-1-98	LJB 09-01-98
K.G.	42.	Add topsoil	9-1-98	LJB 09-01-98
I		AREA OF SW OUTLET		
K.G.	43.	Repair cut	9/1/98	9/1/98 LJB
K.G.	44.	Grade area to drain	8/28/98	8/28/98 LJB
K.G.	45.	Install silt fence down gradient	8/29/98	8/31/98 LJB
K.G.	46.	Install screen	9-3-98	LJB 09-03-98
J		AREA FROM THE TOE OF THE CAP TO THE TREE LINE BETWEEN THE SW OUTLET AND CENTRAL SW OUTLET		
K.G.	47.	Grade area to drain and blend to existing topography	8/31/98	9/1/98 LJB
K.G.	48.	Add topsoil	9/1/98	9/1/98 LJB
K.G.	49.	Install silt fence down gradient	8/29/98	8/31/98 LJB
K.G.	50.	Fill in low (pending) spot	9/1/98	9/1/98 LJB
K		AREA OF CENTRAL SW OUTLET		
K.G.	51.	Repair outlet	8/31/98	8/31/98 LJB
K.G.	52.	Install screen	9-3-98	09-03-98

AREA	ITEM	DESCRIPTION	DATE COMPLETED	DATE VERIFIED
L		AREA BETWEEN CENTRAL SW OUTLET AND CENTRAL NW OUTLET		
K.G.	53.	Grade area to blend with existing topography	8/31/98	8/31/98 LJB
K.G.	54.	Add topsoil	9/1/98	9/1/98 LJB
M		AREA OF CENTRAL NW OUTLET		
K.G.	55.	Repair outlet	9/1/98	9/1/98 LJB
K.G.	56.	Grade area to blend with existing topography	8/31/98	8/31/98 LJB
K.G.	57.	Install screen	9-3-98	LJB 09-03-98
N		AREA BETWEEN CENTRAL NW AND NW OUTLET		
K.G.	58.	Remove trash	8/31/98	8/31/98 LJB
K.G.	59.	Grade to blend with existing topography	8/31/98	8/31/98 LJB
K.G.	60.	Add topsoil	9/1/98	9/1/98 LJB
O		AREA OF NW OUTLET		
K.G.	61.	Repair outlet	9/1/98	9/1/98 LJB
K.G.	62.	Install screen	9-3-98	LJB 09-03-98
P		NW SIDE OF NE END		
K.G.	63.	Grade loose material	9-2-98	LJB 09-03-98
K.G.	64.	Blend to existing topography	9-2-98	LJB 09-03-98
K.G.	65.	Add topsoil	9-2-98	LJB 09-03-98
K.G.	66.	Spread gravel stockpiles	9-2-98	LJB 09-03-98
Q		CAP AREA		
K.G.	67.	Remove access ramp	8/28/98	8/28/98 LJB
K.G	68.	Complete topsoil	8/28/98	8/28/98 LJB

AREA	ITEM	DESCRIPTION	DATE COMPLETED	DATE VERIFIED
K.G.	69.	As-built top of cover material	8/28/98 LJB	8/28/98 LJB
	70.	Install warning signs		09-03-98 LJB
	71.	Prepare cap for seeding		09-03-98 LJB
	72.	Seed, mulch, fertilize cap		09-03-98 LJB
	73.	Erosion mat all areas greater than 4:1 slope		09-04-98 LJB
	74.	Touch up paint on well casings		09-04-98 LJB
R		ROAD WAY		
K.G.	75.	Re-grade and repair access road	9-2-98	09-02-98 LJB
K.G.	76.	Re-grade entrance road	9-2-98	09-02-98 LJB
K.G.	77.	Re-gravel roads	9-2-98	09-02-98 LJB
S		OVERALL SITE AND TRAILER STAGING AREA		
K.G.	78.	Repair ruts in ditchline outside magazine	9-2-98	09-02-98 LJB
K.G.	79.	Spread sand pile	9-2-98	09-02-98 LJB
K.G.	80.	Remove fencing/flagging from magazine	9-1-98	09-02-98 LJB
	81.	Demobilize equipment		09-09-98 LJB
	82.	Demobilize trailer, etc.		09-04-98 LJB
	83.	Site as-built site		11-06-98 KLO FOR DB
	84.	Seed, mulch, and fertilize		09-05-98 LJB
	85.	Establish vegetation		11-06-98 KLO FOR DB
T		161/822 BORROW AREA		
K.G.	86.	Add silt fence to out fall midway	8/31/98	8/31/98 LJB
K.G.	87.	Remove hay bales and silt fence from culvert	~~8/31/98~~ 09-02-98	~~8/31/98~~ 09-02-98
K.G.	88.	Re-grade area to drain and blend to existing topography	8/31/98	8/31/98 LJB
K.G.	89.	Prepare area to seed	8/31/98	8/31/98 LJB

AREA	ITEM	DESCRIPTION	DATE COMPLETED	DATE VERIFIED
	90.	Seed, mulch and fertilize		LB 09-02-98
	91.	Establish vegetation growth		11-06-98 KLO FOR DB

COMPLETE REQ SUBMITTALS



E 3049500
E 3049500
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N 1311500
N 1311200
Road
AREA R
AREA A
Area B
AREA P
AREA O
AREA N
AREA M
AREA L
AREA K
AREA J
AREA H
AREA G
AREA F
AREA E
CAP
AREA Q
AREA S
OVERALL SITE and
TRAILER STAGING
AREA T 161/822 Borrow Area.

APPENDIX L

ROICC AND EPD SIGN-OFF/ACCEPTANCE LETTER

MORRISON KNUDSEN CORPORATION
300 Highway 361, CTR-12
P.O. Box 310
Crane, IN 47522
(812) 854-6941
Fax: (812) 854-6944

MEMO

To: File

From: Dave Beall

Subject: Final Inspection and Acceptance of SWMU 02/11

Date: 6 November 1998

Correspondence No.: 0009-028

This memo documents the final inspection for the Solid Waste Management Unit Interim Measures Cleanup for the physical work completed at SWMU 02/11 Dye Burial Ground Interim Measures Cap.

MORRISON KNUDSEN CORPORATION

Signature D. Beall Date 11/6/98
Dave Beall

ROICC

Signature [signature] Date 11/12/98
Brent Robertson

EPD

Signature Thomas J. Bent Date 11/12/98
Chris Freeman

The completion and acceptance of the Interim Measures Report will complete this closure at a later date.

cc: PMO ROICC EPD
File: 11-1.2-0009 17-10-0009

PHILIP
ENVIRONMENTAL

Industrial Services Group
Midwest Region

RECEIVED
NOV 12 1998
MK-CRANE

DBC – 62
November 12 1998
Project 18328

NSWC - CRANE			
4324-0009			
PROJECT MEMBER	ACT	INFO	INST
PROJECT MANAGER		X	
PROJECT ENGINEER			
GNL SUPT			
SAFETY AND HEALTH			
CA/QC			
PROJECT CONTROLS			
FIELD ENGINEERING			
FMO-CHARLESTON			
FILE:			
FILE:			
FILE:			

Mr. David Beall
Project Manager
Morrison Knudsen Corporation
300 Highway 361
NSWC – CTR 12
Crane, Indiana 47522

Dear Mr. Beall

Project: **Dye Burial Grounds Cap**
NSWC Crane, Indiana
Project No.: **Subcontract 4324-106**
Contractor: **Philip Services Corporation**
210 West Sand Bank Road
Columbia, Illinois 62236-0230

Philip is requesting that Morrison Knudsen accept the site restoration portion of this project. During a site visit on October 21, 1998, the vegetation was inspected and found to be established and meets the requirements of the Contract Specifications. Please notify the Contract Administrator, John McCumbers, confirming the site restoration has been completed. If you have any questions regarding this matter, please call me at (800) 733-7173.

Sincerely,

PHILIP ENVIRONMENTAL SERVICES CORPORATION

Don Flowers

Donald L. Flowers,
Project Manager

cc: W.D. "John" McCumbers

PHILIP ENVIRONMENTAL SERVICES CORPORATION
210 West Sand Bank Road • P.O. Box 230 • Columbia, IL 62236-0230
(618) 281-7173 • (800) 733-7173 • Fax (618) 281-5120

APPENDIX M

PROPOSAL FOR DISPOSAL OF DYE-IMPACTED WATER

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Frank O'Bannon
Governor

John M. Hamilton
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
(317) 232-8603
(800) 451-6027
www.ai.org/idem

September 15, 1998

Mr. James M. Hunsicker, Director
Environmental Protection Department
Crane Division, Naval Surface Warfare Center
300 Highway 361
Crane, Indiana 47522-5000

Dear Mr. Hunsicker:

Re: NPDES Permit IN0021539
Dye Burial Grounds (DBG)

This is written in response to your letter dated July 17, 1998, concerning the disposal of 150,000 gallons of stormwater collected from the DBG. The proposal for disposal is to pump the stormwater from the holding tanks to the wastewater collection system.

Upon review of the lab analysis taken from the holding tanks, and toxicological information on the dyes, it has been determined the water is nontoxic. Based on these results the permit does not need to be modified to include additional monitoring. As you are aware, the discharge has the potential to violate the minimum surface water quality standard (327 IAC 2-1-6(a)(C)) that prohibits any discharge that produces color or conditions that create a nuisance. The permittee needs to monitor the discharge from Outfall 001 to ensure that the discharge does not violate any water quality standards.

If you have any questions please contact Gary Pavich, of my staff at 317/232-8479.

Sincerely,

Steven K. Roush

Steven K. Roush
Section Chief
Industrial NPDES Permit Section
Office of Water Management

GMP/gmp
cc: Tom Brant, Crane Division, Naval Surface Warfare Center

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE INDIANA 47522-5000

RECEIVED
DEC 08 1998
MK-CRANE

5090 IN REPLY REFER TO
Ser 095/8137

17 JUL 1998

Indiana Department of Environmental Management
Office of Water Management
Industrial Permit Section
Attn: Mr. Steve Roush
PO Box 6015
Indianapolis, IN 46206-6015

Dear Mr. Roush:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) is managing a Resources Conservation Recovery Act (RCRA) solid waste management unit consisting of a site (approx. 1.0 acre) where military specification dyes were buried starting in the 1940's and ending in the 1960's. The site is known as Dye Burial Grounds (DBG). As an interim measure to prevent transport of the dye into the ground water a clay cap was applied over the area. During the process of capping the site, dyes in the soil were exposed to rainfall. Runoff from the DBG turned green. The runoff water was contained and pumped into holding tanks brought to the site. A total of 150,000 gallons of water was pumped into the tanks in January and September of 1997.

In December 1997 the tanks were sampled and the samples were taken to our own Navy lab for analysis. Enclosure (1) is a summary of the results. As can be seen from the results, the green color of the water is due to a combination of a green dye and a blue dye. Toxicological information about the dyes is included in enclosure (2).

Now that the analyses have been completed and the dyes have been identified we need to decide how to dispose of the 150,000 gallons of water. We need to accomplish disposal as quickly as possible to avoid additional tank rental charges. To date, the Navy has accrued $164,000 in tank rental charges. The U.S. Environmental Protection Agency (EPA) has requested a disposal plan from the Navy and has expressed their desire that disposal be accomplished prior to the onset of cold weather conditions.

095
Ser 095/8137

Our proposal for disposing of the water is provided in enclosure (3). We would like to have your recommendation on disposal of this water.

NAVSURFWARCENDIV Crane point of contact is Mr. Phil Keith, Code 0957, telephone 812-854-6157.

Sincerely,

JAMES M. HUNSICKER
Director, Environmental Protection Department
By direction of
the Commander

Encl:
(1) Results of Dye Water Analysis
(2) Toxicological Information
(3) Dye Water Disposal Proposal

Copy to:
U.S. EPA Region V (C. Witt-Smith)
OICC (B. Robertson) (w/o encls)

DEC-10-1998 09:36 MK CORP NSWC CRANE P.04

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5001

IN REPLY REFER TO

8000/5
Ser 4052/8088
16 JUL 1998

MEMORANDUM

From: 4052
To: 095 (T. Brent)

Subj: **FINAL ANALYSIS REPORT OF DYES FROM THE CRANE DYE BURIAL GROUNDS, OED/C-98-045**

Ref: (a) QUALITY ASSURANCE PROJECT PLANT (QAPP)
(b) Equipment Operating Procedures of Explosive Sciences Branch

Encl: (1) Results of Dye Water Analysis OED/C-98-045

1. Code 4052 was requested by Code 095 to perform the analysis on nine tanks containing dye water from the Dye Burial Grounds (DGB) at Crane. The samples were assigned the Explosive Sciences Branch Sample Numbers N98-2001 to N98-2075.

2. The samples from the tanks were subjected to the analytical tests described in reference (a). The procedures defined in reference (b) were used as guidelines. A full detailed analysis complete with data sheets is attached as enclosure (1).

3. Code 40 points of contact are Mr. Maroof Qurashi and Mr. Steve Weddle, Code 4052, extensions 4230 and 6049 respectively.

Nancey J. Maegerlein
NANCEY J. MAEGERLEIN

Copy to:
40211

RESULTS OF DYE WATER ANALYSIS
FOR
CODE 095

14 July 1998

by

Maroof H. Qurashi
Steven C. Weddle

OED/C 98-045

Approved by:

Nancey J. Maegerlein

Nancey J. Maegerlein
Explosive Sciences Branch
Test and Evaluation Department
Ordnance Engineering Directorate
Naval Surface Warfare Center
Crane Division
Crane, Indiana 47522-5001

Enclosure (1)

b. Explosives analysis for Octogen (HMX), Cyclonite (RDX), 2,4,6-Trinitrotoluene (TNT), Nitroglycerin (NG), Nitroguanidine (NQ), 2-Amino-4,6-dinitro toluene (2-Am-DNT), 1,3-Dinitrobenzene (1,3-DNB), 2,4-Dinitrotoluene (2,4-DNT), Nitrobenzene (NB), 1,3,5-Trinitrobenzene (1,3,5-TNB), 4-Amino-2,6-Dinitrotoluene (4-Am-DNT), 2,6-Dinitrotoluene (2,6-DNT), 2-Nitrotoluene (2-NT), 3-Nitrotoluene (3-NT), 4-Nitrotoluene (4-NT), and Tetryl using High Pressure Liquid Chromatography (HPLC) EPA Method 8330.

c. Analysis for Disodium Fluorescein(Uranine) using HPLC.

d. Total Suspended Solids (TSS) using EPA Method 160.2.

e. Anions analysis using Ion Exchange Chromatography (IEC).

f. Ammonia-Nitrogen analysis determined. potentiometrically using an Ion Selective Electrode per EPA Method 350.3.

g. Total Organic Carbon (TOC) analyzed using Dohrmann DC-80 TOC system using EPA Method 415.2.

h. Volatile Organic Compounds (VOC) using EPA Method 8240.

i. Evaporite analysis using Fourier Transform/Infrared Spectroscopy (FTIR).

j. Blue dye analysis using UltraViolet/Visible (UV/Vis) Spectrophotometer.

k. Thin Layer Chromatography (TLC).

l. Scanning Electron Microscopy (SEM) Energy Dispersive X-Ray Analysis of the evaporite.

See references (a) and (b) for further details on each of the methods. This report contains information on the types of analyses performed, results of the work done on the dyes, and interpretation of the results.

3. ANALYTICAL TEST PROCEDURES

The following paragraphs contain the types of analytical evaluations performed and a summary of the procedure performed on each sample:

a. <u>Toxicity/Microtox:</u> This test is performed using the Microbics-M-500 Analyzer per ASTM D-5660-95. This procedure assesses the Microbial Detoxification of chemically contaminated Water and Soil. In this procedure living organisms are exposed to a chemical, substance or sample under controlled conditions to determine if exposure causes any effect to the organisms. Toxic responses are the consequences of interference with biochemical reactions. The light produced by the organism is tied to the metabolism of the cell. Some toxicants can enter the cell membrane faster than others. This toxicity test uses Luminescent Marine Bacterium. Toxicity is measured as toxic inhibition of bacterial light output. The results are reported in terms of inhibitory concentration (IC) or effective concentration (EC). It is the calculated concentration of sample required to produce a specific quantitative and qualitative inhibition. EC50 is where gamma=1 or light loss/light remaining 50/50=1.

b. <u>**Explosives in Dye Water**</u>: High Pressure Liquid Chromatography (HPLC) Method 8330 of EPA manual SW-846 is used to

analysis:

Mobile phase: 0.038 Molar Borate-Gluconate mixture with 50 milliliters Acetonitrile and 20 milliliters of Butyl Alcohol per liter.

Sample/standard filtration: 0.45um particulate filters and then prewashed with a Sep Pack C18.

Pump: Waters 590

Detector: Waters 430 Conductivity

Injection unit: Shimadzu SIL 9 Auto Injector

Test Data: Maxima Software.

f. AMMONIA-NITROGEN: Ammonia-nitrogen was analyzed using EPA Method 350.3, Nitrogen, Ammonia (Potentiometric, Ion Selective Electrode). This method of analysis is applicable to the measurement of ammonia-nitrogen in drinking, surface and saline waters in addition to domestic and industrial wastes. The procedure covers the range from 0.03 to 1400 mg NH3-N/L. Color and turbidity have no effect on the measurements, thus, distillation may not be necessary. Ammonia is determined potentiometrically using an ion selective ammonia electrode anode and a pH meter having an expanded millivolt scale or a specific ion meter. The ammonia electrode uses a hydrophobic gas-permeable membrane to separate the sample solution from an ammonium chloride internal solution. Ammonia in the sample diffuses through the membrane and alters the pH of the internal solution, which is sensed by a pH electrode. There was no special sample preparation involved. One hundred milliliters of sample was used to get readings from the electrometer.

g. TOTAL ORGANIC CARBON (TOC): TOC analysis of the dye water samples was performed using EPA Method 415.2 Organic Carbon, Total (low level) (UV promoted, persulfate oxidation). This method covers the determination of total organic carbon in drinking water and other water containing carbonaceous matter which is either soluble or has a particle size of 0.2 mm or less or a non-homogenized sample. The Dohrmann DC-80 TOC System was used to analyze for TOCs in the Dye water samples. The samples were filtered, adjusted to pH 2-3 and then analyzed. Homogenizing the sample can cause loss of purgeable organic carbon, thus yielding low results. The total organic carbon measured by this procedure is the sum of the purgeable organic carbon and the nonpurgeable organic carbon.

h. VOLATILE ORGANIC Compounds (VOC): The method used was EPA method 8240. An inert gas is bubbled through a 5 milliliter water sample contained in a specially designed purging chamber at ambient temperature. The purgeables are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a solvent trap where the purgeables are trapped. After purging is completed, the trap is heated and backflushed with the inert gas to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are them detected with a mass

a. **Microtox/Toxicity:** All samples were tested as received and were found to be Non-Toxic. EC50 was used as an expression of toxicity. A 100 ppm Phenol standard shows 17.4924 ppm EC50 value at a 95% confidence level. A standard containing 3.5 ppm of blue dye showed no toxicity. Another standard containing 7.5 ppm of Disodium Fluorescein (Uranine) showed no toxicity. The EC50 value was higher than the concentration value of the standards. Also, the EC50 value was higher than the highest concentration of the samples. The sample was concentrated until some toxicity was determined. Nine hundred milliliters of sample concentrated to 10 milliliters (factor of 90:1) gave an EC50 value to be 0.22 ppm, a concentration factor of 450:1 gave a 3.4 ppm EC50 value.

b. **Explosives in Dye Water:** Appendix A contains the details of explosives analyzed. All samples showed explosives below detection limit, 0.001 ppm.

c. **Disodium Fluorescein in Dye Water:** Disodium Fluorescein (Uranine) Dye was found to be below the detection limits of 10 ppb for the HPLC. A spiked sample showed 1 ppm and a composite spike detected 1.5 ppm. Appendix A shows the results of Disodium Fluorescein found in the Dye Water samples.

d. **Total Suspended Solids:** Appendix A contains the results of all tanks. This method followed EPA Method number 160.2. The analysis showed all samples to be less than 4 ppm with the exception of sample DBGFT 8 121797 (Tank # S1885 Composite). This sample contained 8.50 ppm suspended solids.

Spiked sample	87.8 percent recovery
NPDES permit	10.0 ppm monthly ave. (For TSS)

e. **Ion Exchange Chromatography:** Ion Exchange Chromatography was used to test for seven anions. IEC analysis showed chloride in the range 0.9 to 6.9 ppm and sulfate in the range 24 to 178 ppm present in the water samples. Spiked recoveries for each anion were calculated for each spiked sample. Unfortunately, the Fluoride spike peak was obscured by the injection peak. But, at a concentration of Fluoride above 1.5 ppm, interference is insignificant (ref. CR4052 EOP 0010). Here is a list of the spike recoveries.

Anion	Ave. Spike Recovery (percent)
Chloride	82.5
Nitrite	89.8
Bromide	91.9
Nitrate	95.6
Phosphate	77.3
Sulfate	89.6

f. **Ammonia-Nitrogen:** The results of the Ammonia-Nitrogen

5. RESULTS AND DISCUSSION PER TANK
Appendices B and C are attached for reference.

Tank # 1001MEA: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # GS505EA: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # GS522EA: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # GS650NEA: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # GS88EA: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # S1647SD: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # 1885EA: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations and chemical analyses(HPLC Explosives, HPLC Uranine Dye, TSS, IEC, Ammonia-Nitrogen, TOC, FT/IR, UV/VIS Blue Dye, and SEM), the tank could be processed through waste treatment (i.e. carbon tower).

Tank # S47ST: In summary, analysis for heavy metals and toxicity determined the water to be non-toxic. Based on EPA regulations

DATA GRAPHS

Spike and Spike Recovery Data for Blue Dye

Tank number	Spiked sample PPM in Solution	Percent recovery
GS88EA(TOP)	0.16	74.37
GS505EA(TOP)	0.19	
GS505EA(BOT)	0.17	
GS650NEA(COMP)	0.23	124.2

Spike Sample Recovery Data for Total Suspended Solids (TSS)

Spike Sample	recovery
composite	87.8%

Toxicity values in concentrated sample

Concentrated sample 0.22 EC Value
concentrated 3.4 EC Value
composite sample

Spike Sample Recovery Data for Explosives in Dye water

composite spike sample 90.0%
recovery

Spike Sample Recovery Data for Disodium fuorescein in Dye water

spike sample	1 PPM	86 % recovery
Composite sample spike	1.5 PPM	75 % recovery

Total Organic Carbon Background Analysis (5-28-98)

Total Organic Carbon (TOC) Analysis of Dye Burial Ground Background sample (N98-2075, collected 5-22-98, NSWC02/11-09, Turkey Creek Tributary on H-58)

Calibration Adjusted Average 9.990

Standard #1 TOC 9.743

Calibration Adjusted Average 9.996

Standard #2 TOC 10.10

Sample	TOC (ppm)
N98-2075 #1	1.846
N98-2075 #2	1.961
N98-2075 spiked at (5 ppm)	5.540
Blank	0.535

Average of two N98-2075 samples = 1.904 ppm for TOC

TANK # GS522EA

All units measured in parts per million (ppm)

TESTS	TOP	BOTTOM	COMP
TOC	2.4	2.7	
VOC	N/A	N/A	
AMMONIA	0.034	0.032	
IEC - FLUORIDE	BDL	BDL	
IEC - CHLORIDE	3.3	3.3	
IEC - NITRITE	BDL	BDL	
IEC - BROMIDE	BDL	BDL	
IEC - NITRATE	BDL	BDL	
IEC - PHOSPHATE	BDL	BDL	
IEC - SULPHATE	103	104	
HPLC - HMX	BDL	BDL	
HPLC - RDX	BDL	BDL	
HPLC -TNT	BDL	BDL	
HPLC - FLUORESCEIN	BDL	BDL	
TSS	<4.0	<4.0	
FT/IR	CALCIUM SULFATE	CALCIUM SULFATE	
SEM	Na, Mg, Al, Si, Cl, Ca, S, O	Na, Mg, Al, Si, Cl, Fe, Ca, S, O	
TLC	N/A	N/A	
UV MIL-D-16627 (BLUE DYE)	0.24	0.22	0.23 (AVE)
VISUAL	GREEN	GREEN	
TOXICITY	NON-TOXIC	NON-TOXIC	

TANK # GS650NEA

All units measured in parts per million (ppm)

TESTS	TOP	BOTTOM	COMP
TOC			2.497
VOC			N/A
AMMONIA			0.031
IEC - FLUORIDE			BDL
IEC - CHLORIDE			3.5
IEC - NITRITE			BDL
IEC - BROMIDE			BDL
IEC - NITRATE			BDL
IEC - PHOSPHATE			BDL
IEC - SULPHATE			162
HPLC - HMX			BDL
HPLC - RDX			BDL
HPLC -TNT			BDL
HPLC - FLUORESCEIN			BDL
TSS			<4.0
FT/IR			CALCIUM SULFATE
SEM			Mg, Al, Si, Cl, Ca, S, O
TLC			N/A
UV MIL-D-16627 (BLUE DYE)			0.19
VISUAL			GREEN
TOXICITY			NON-TOXIC

TANK # S1885EA

All units measured in parts per million (ppm)

TESTS	TOP	BOTTOM	COMP
TOC			3.096
VOC			N/A
AMMONIA			0.037
IEC - FLUORIDE			BDL
IEC - CHLORIDE			3.3
IEC - NITRITE			BDL
IEC - BROMIDE			BDL
IEC - NITRATE			BDL
IEC - PHOSPHATE			BDL
IEC - SULPHATE			119
HPLC - HMX			BDL
HPLC - RDX			BDL
HPLC -TNT			BDL
HPLC - FLUORESCEIN			BDL
TSS			8.5
FT/IR			CALCIUM SULFATE
SEM			Na, Mg, Al, Si, Cl, Fe, Ca, S, O
TLC			N/A
UV MIL-D-16627 (BLUE DYE)			0.15
VISUAL			GREEN
TOXICITY			NON-TOXIC

TANK # S47ST

All units measured in parts per million (ppm)

TESTS	TOP	BOTTOM	COMP
TOC	3.7	4.1	
VOC	N/A	N/A	
AMMONIA	0.034	0.036	
IEC - FLUORIDE	BDL	BDL	
IEC - CHLORIDE	5.7	5.7	
IEC - NITRITE	BDL	BDL	
IEC - BROMIDE	BDL	BDL	
IEC - NITRATE	BDL	BDL	
IEC - PHOSPHATE	BDL	BDL	
IEC - SULPHATE	168	172	
HPLC - HMX	BDL	BDL	
HPLC - RDX	BDL	BDL	
HPLC -TNT	BDL	BDL	
HPLC - FLUORESCEIN	BDL	BDL	
TSS	<4.0	<4.0	
FT/IR	CALCIUM SULFATE	CALCIUM SULFATE	
SEM	Na, Mg, Si, Cl, Al, Ca, S, O	Na, Mg, Al, Si, Cl, Ca, S, O	
TLC	N/A	N/A	
UV MIL-D-16627 (BLUE DYE)	0.24	0.21	0.23 (AVE)
VISUAL	GREEN	GREEN	
TOXICITY	NON-TOXIC	NON-TOXIC	

TANK CONVERSION TABLE FOR DYE BURIAL GROUND SAMPLES
12/15-17/97

Sample #	Lab Sample	Tank #
DBGFT-1-121597	N98-2025	S1647SD
DBGFT-1-121597	N98-2025D	S1647SD
DBGFT-2-121597	N98-2026	1001MEA
DBGFT-2-121597	N98-2026D	1001MEA
DBGFT-1-121697	N98-2027	S47ST(Top)
DBGFT-2-121697	N98-2028	S47ST(Bottom)
DBGFT-3-121697	N98-2029	GS88EA(Top)
DBGFT-4-121697	N98-2030	GS88EA(Bottom)
DBGFT-4-121697	N98-2030D	GS88EA(Bottom)
DBGFT-1-121797	N98-2056	GS522EA(Top)
DBGFT-2-121797	N98-2057	GS522EA(Bottom)
DBGFT-3-121797	N98-2058	S679NSD(Top)
DBGFT-4-121797	N98-2059	S679NSD(Bottom)
DBGFT-5-121797	N98-2060	GS650NEA(comp)
DBGFT-5-121797	N98-2060D	GS650NEA(Dup)
DBGFT-6-121797	N98-2061	GS505EA(Top)
DBGFT-7-121797	N98-2062	GS505EA(Bottom)
DBGFT-8-121797	N98-2063	S1885EA(comp)

TLE BLUE DYE SPIKE OF SAMPLES 3-16-98 Book No.

rom Page No. 3-13-98 (900 MLS) ~~to~~ 10 MLS TRY SPIKING AROUND 10 T

GET ON SCALE

SPIKE with 5.6 mls of 3.55 ppm = 3.55 ppm × X

19B 2031 MS 5.6 mls × (3.55 ~~[illegible]~~ in H2O) ✓ 3-16-98 X = 5.6 mls 19.

20B 2031 MSD 5.6 mls × (3.55 ppm in H2O) ✓ 3-16-98 19.88 ppm SPIKE

(50% of 7.1 ppm) SCW ~2.00 ppm

21B 2062 MS 5.6 mls × (3.55 Actual in H2O) (Blue Dye) ✓ 3-16-98 19.88 ppm

22B 2074 MSD 11.2 mls (1.775 Act ppm in H2O) blue dye ✓ 3-16-98 19.88 ppm

23B 2072 MS (Bottle Frozen and Broken 3-16-98) (6 1650 HSA MS)

24B 2072 MSD Frozen (6S 650 NEA MSD) Thaw and Spike 900 MLS (7.1 ppm Actual × 3 mls) ✓ 3-17-98 21.3 ppm

14B 2060 Dup (6S 650 NEA Dup) Already has blue dye 900 MLS

15B 2060 Dup (6S 650 NEA Dup) Already has blue dye 900 MLS (Actual 7.1 ppm × 3 MLS Spk in H2O) ✓ 3-16-98 21.3 ppm ~2.1 ppm

Sol

FINAL SOLUTION 10 M

SAMPLES AND STANDARDS IN 10 MILLILITERS METHANOL AS OF 3-30-98

21.3 ppm in 1 ml

∴ 2.13 ppm in 10 mls

SCW

To Page N

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	

Page No.

BLUE DYE STANDARD Dodie

.0071g per 100mls $\frac{.0071g}{100mls} \cdot \frac{10^6 ug}{g} = 71$ ppm Blue Dye

71 ppm SCW

Mil-D-16627 is only 50% Blue Dye so Actual ppm is 71 ppm * .5 = 35.5 ppm SCW

STOCK 35.5 ppm SCW

QAPP CALLS FOR 15 ppm (ppb) Spike Blue Dye (Sect 7, p16 of 23)

~~20 mls X 71 ppm ÷ 100 = 14.2 ppm~~ SCW

20 mls * 35.5 ppm ÷ = 7.1 ppm SCW

Then Spike 1 ML INTO EACH 90 ML SAMPLE

QAPP CALLS FOR 3 ppm for Blue Dye Spike (Sect 7 p17 of 23)

~~5 mls X 71 ppm ÷ 100 mls = 3.55 ppm Blue Dye~~ SCW

5 mls * 35.5 ppm ÷ 100 mls = ~~1.78 ppm Blue Dye~~ (1.775) SCW

1-16-98 Dye Samples EXTRACTED AND IN METHANOL

SPIKED SAMPLES STILL EXTRACTING 2031MS, 2031MSD, 2062MS, 2074MS, 2072MS, 2072MSD

1-21, 22, 26-98 Solids Analyzed on FTIR

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date

42 [illegible] Book No._____ TITLE SPIKED BLUE DYE RECHECK [illegible]

From Page No.___ P&E 552 UV/VIS AT 408 [illegible]

2:00 PM Air to MeOH - 1053

bdspk49E

	STANDARDS (ppm)	ABS	
	BLANK	0	
	0.7		
	1.78		
	3.55		
~~14.2~~	7.1	0.055	
~~19.88~~	9.94	0.080	
~~28.4~~	14.2	0.122	0.127 After Auto Zero After Samples
~~35.6~~	17.5	0.160	(0.167 After Samples) (0.165 ")
~~70~~	35	0.331	
~~105~~	52.5	0.494	
~~133~~	66.5	0.636	
~~175~~	87.5	0.814	
SAMPLES SKW	14B	0.173	
	15B	0.192	
	19B	0.128	
	20B	0.119	
	21B	0.154	
	22B	0.140	
	24B	0.194	
	[illegible]	0.208 After [illegible]	

To Page

Witnessed & Understood by me. | Date | Invented by | Date

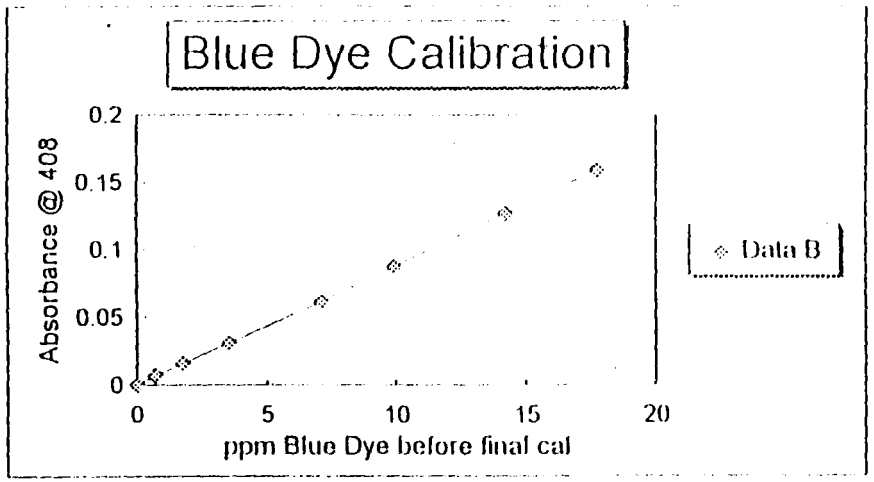
Recorded by | [illegible] Air to MeOH

Blue Dye In Dye Burial Ground Water sampled Dec 15,16,17, 1997
Report 3-13-98 revised 7-13-98 Samples concentrated from 900 mls to 10 mls

Blue Dye Standard	Absorbance	Regression
0	0	0
0.71	0.007	0.006
1.78	0.016	0.016
3.55	0.031	0.031
7.1	0.061	0.063
9.94	0.088	0.088
14.2	0.127	0.127
17.75	0.159	0.158

Regression Output:

Constant		-0.00034
Std Err of Y Est		0.00107
R Squared		0.99972
No. of Observations		8.00000
Degrees of Freedom		6.00000
X Coefficient(s)	0.0089354	
Std Err of Coef.	0.0000613	



Sample #	Lab Sample#	Tank #	Abs @408	soln conc ppm blue d	Dil Factor	Conc Factor	Final ppm blue dye
1	N98-2025	S1647SD	0.065	7.312419	3	90	0.24375
2	N98-2025D	S1647SD	0.063	7.08859	4	90	0.31505
3	N98-2026	1001MEA	0.062	6.976675	2	90	0.15504
4	N98-2026D	1001MEA	0.083	9.326881	3	90	0.31090
5	N98-2027	S47ST (Top)	0.064	7.200504	3	90	0.24002
6	N98-2028	S47ST(Bot)	0.084	9.438796	2	90	0.20975

MICROTOX DATA REPORT FOR DEPARTMENT OF DEFENSE
Basic Test

FILE: N98-2025.K15
DYE SAMPLES FROM BURIAL GROUND AT CRANE

Test Time: 15 minutes Osmotic Adjustment:X

NUMBER	IO/IT	CONC.	CR/GAMMA
Control	95.76/ 75.40	0.0	0.7874 #
1	93.52/ 76.73	5.6250	-0.040 *
2	96.31/ 76.96	11.2500	-0.015 *
3	92.42/ 76.20	22.5000	-0.045 *
4	90.91/ 70.61	45.0000	0.014 *

CR = Control Ratio CORRECTION FACTOR = 0.7874
* Invalid data or controls

EC50 IS GREATER THAN HIGHEST CONCENTRATION

Signature _____ TEST DATE: 3/18/98
TIME: _____

N98-2025 is S1647SD.

MICROTOX DATA REPORT FOR DEPARTMENT OF DEFENSE
Basic Test

FILE: PHENOL-M.K5
PHENOL STD USING 0.0104 GMS/100ML

Test Time: 5 minutes

Osmotic Adjustment:oas

NUMBER	IO/IT	CONC.	CR/GAMMA
Control	95.61/ 80.04	0.0	0.8372 #
Control	87.32/ 70.52	0.0	0.8076 #
Control	104.73/ 76.56	0.0	0.7310 *
Control	93.57/ 74.35	0.0	0.7946 #
1	92.43/ 75.47	0.3516	-0.004 *
2	86.74/ 68.79	0.3516	0.025 *
3	90.48/ 71.72	0.7031	0.026 *
4	90.01/ 68.08	0.7031	0.075
5	89.65/ 70.36	1.4063	0.036 *
6	90.47/ 67.85	1.4063	0.084
7	92.15/ 67.83	2.8125	0.105
8	83.73/ 61.04	2.8125	0.115
9	88.17/ 53.67	5.6250	0.336
10	88.54/ 55.13	5.6250	0.306 #
11	91.21/ 43.87	11.2500	0.691 #
12	88.59/ 39.21	11.2500	0.837 #
13	86.08/ 27.38	22.5000	1.556 #
14	84.20/ 27.22	22.5000	1.515 #
15	86.45/ 15.81	45.0000	3.446 #
16	90.76/ 20.76	45.0000	2.555

CR = Control Ratio
# Used for calculations

CORRECTION FACTOR = 0.8131
* Invalid data or controls

EC50 15.0939 mg/l (95% CONFIDENCE RANGE: 13.8226 TO 16.4821)

Signature _____

TEST DATE: 3/19/98
TIME: _____

CONTINUED TO NEXT PAGE...

Mixture
SPIKE

MICROTOX DATA REPORT FOR DEPARTMENT OF DEFENSE
Basic Test

FILE: 23-CONC.K15
CONCENTRATED DYE SAMPLE. 1000ML CONC TO 10 ML VOLUME

Test Time: 15 minutes Osmotic Adjustment:oas

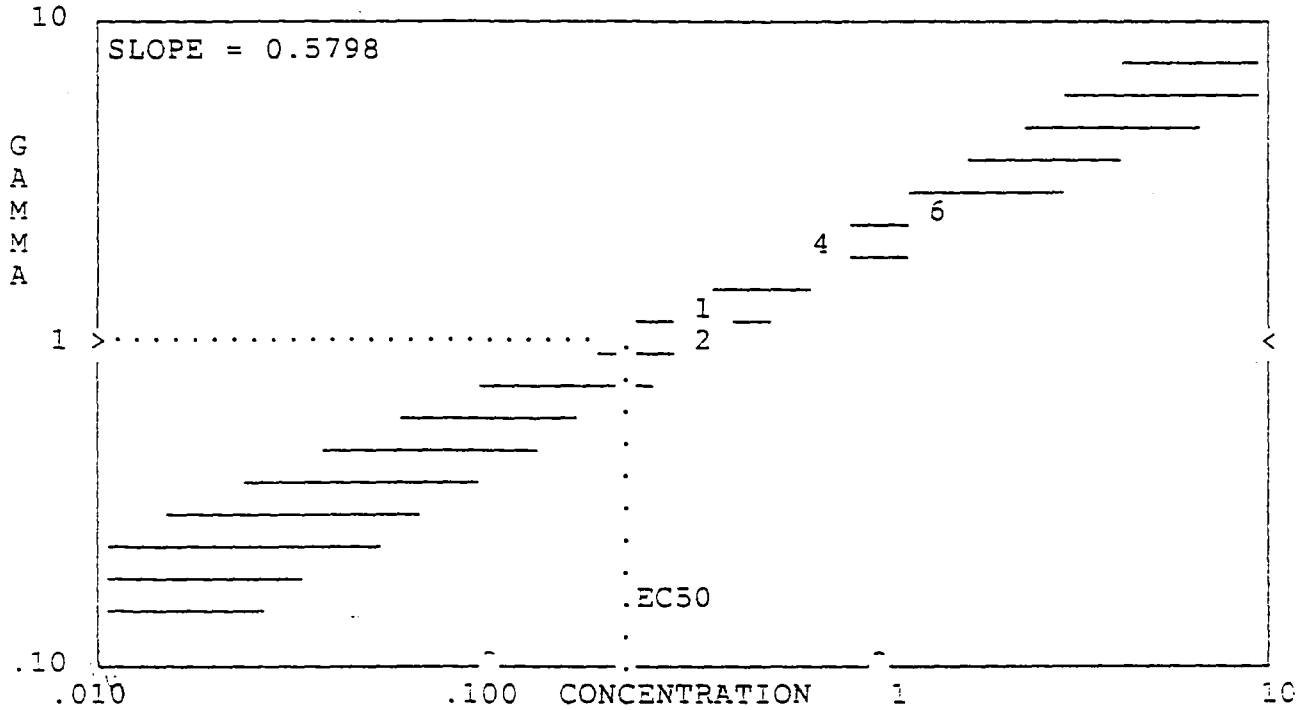
NUMBER	I0/IT	CONC.	CR/GAMMA
Control	95.03/ 36.54	0.0	0.3845 #
Control	96.14/ 37.97	0.0	0.3949 #
Control	98.86/ 39.52	0.0	0.3998 #
Control	98.50/ 38.57	0.0	0.3916 #
1	90.88/ 14.91	0.35	1.394 #
2	105.79/ 18.94	0.35	1.193 #
3	99.42/ 11.57	0.70	2.374 #
4	101.65/ 12.73	0.70	2.136 #
5	108.60/ 10.64	1.41	3.008 #
6	102.53/ 10.71	1.41	2.759 #
7	100.50/ 6.56	2.81	5.016
8	104.85/ 7.67	2.81	4.368
9	107.27/ 4.56	5.63	8.238
10	107.27/ 13.99	5.63	2.011
11	95.14/ 1.44	11.25	24.945
12	44.00/ 0.94	11.25	17.382
13	33.42/ 0.08	22.50	163.049 *
14	42.48/ 0.06	22.50	277.029 *
15	31.22/ 0.06	45.00	203.333 *
16	43.04/ 0.06	45.00	280.694 *

CR = Control Ratio CORRECTION FACTOR = 0.3927
* Invalid data or controls

EC50 0.23 % (95% CONFIDENCE RANGE: 0.14 TO 0.38)

Signature _____ TEST DATE: 3/18/98
TIME: _____

CONTINUED TO NEXT PAGE...



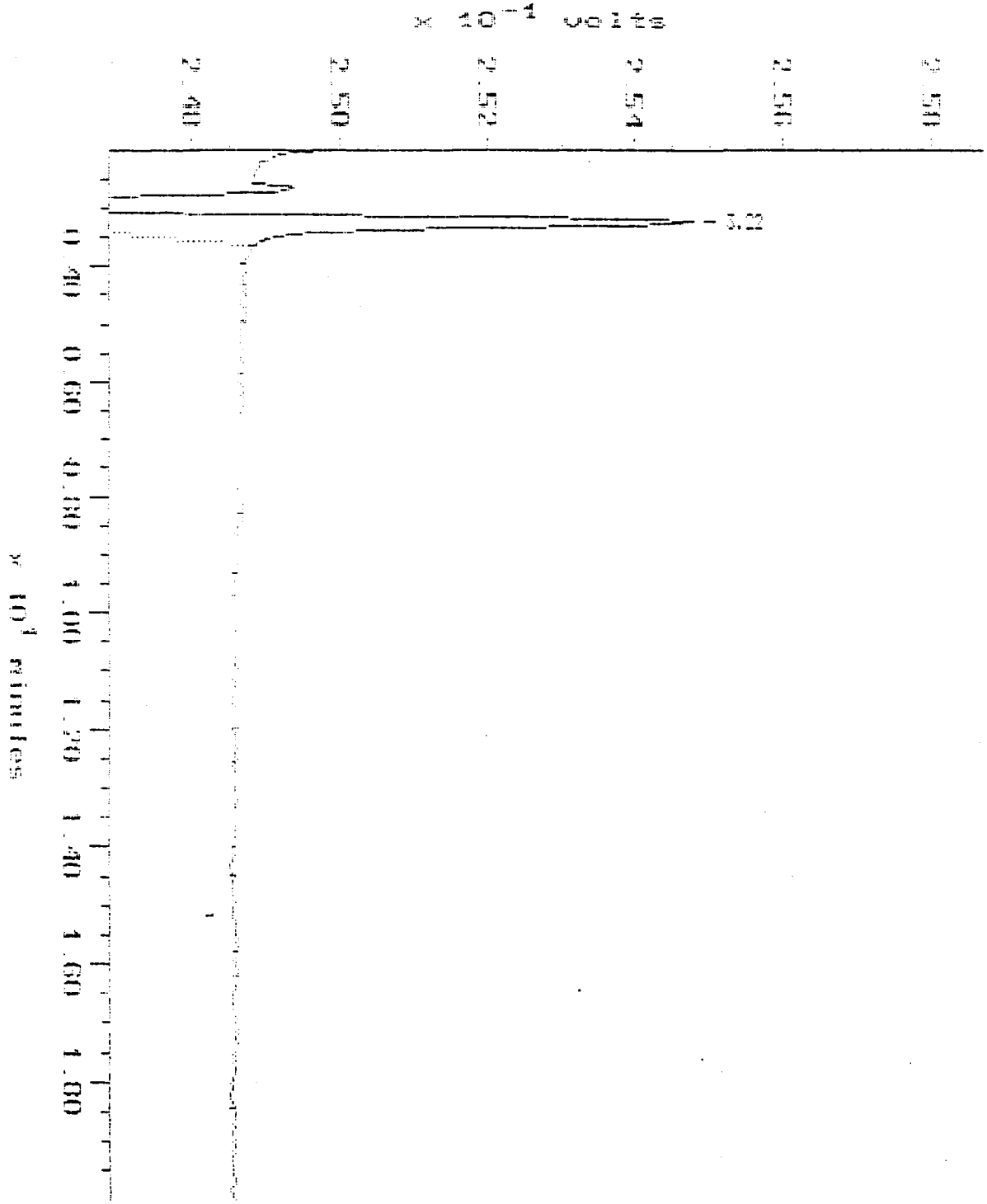
ESTIMATING EQUATION: LOG C = 1.5925 x LOG Γ -0.6427
95% CONFIDENCE FACTOR: 1.64957 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.92339

GS 1885 EA.

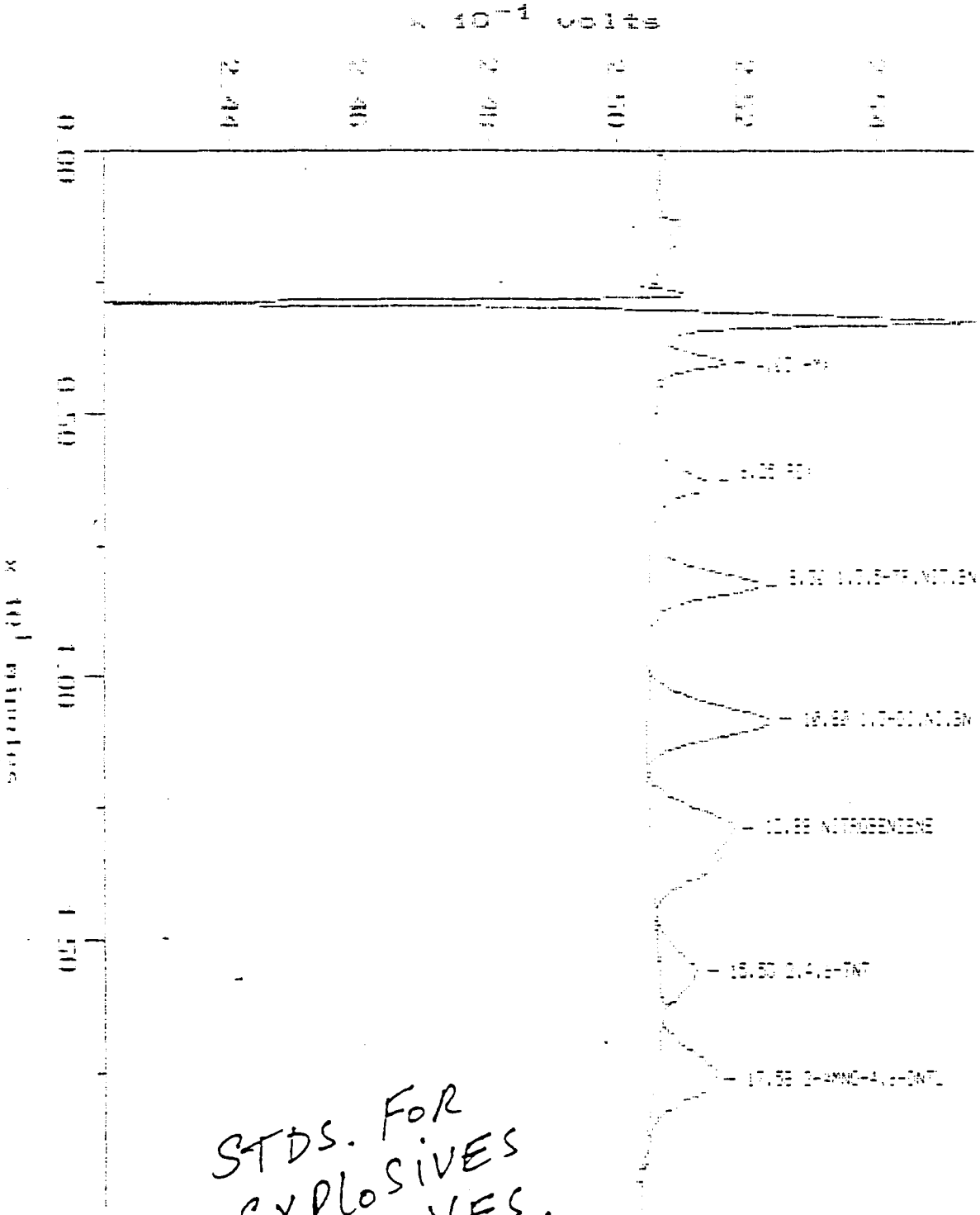
Sample: DYE SAMPLE
Acquired: 14-JAN-99 12:04
Inj Vol: 20.00

Channel: detector 1
Method: C:\MAX\DATA1\DYESAMPL

Filename: N99-2063
Operator: MF



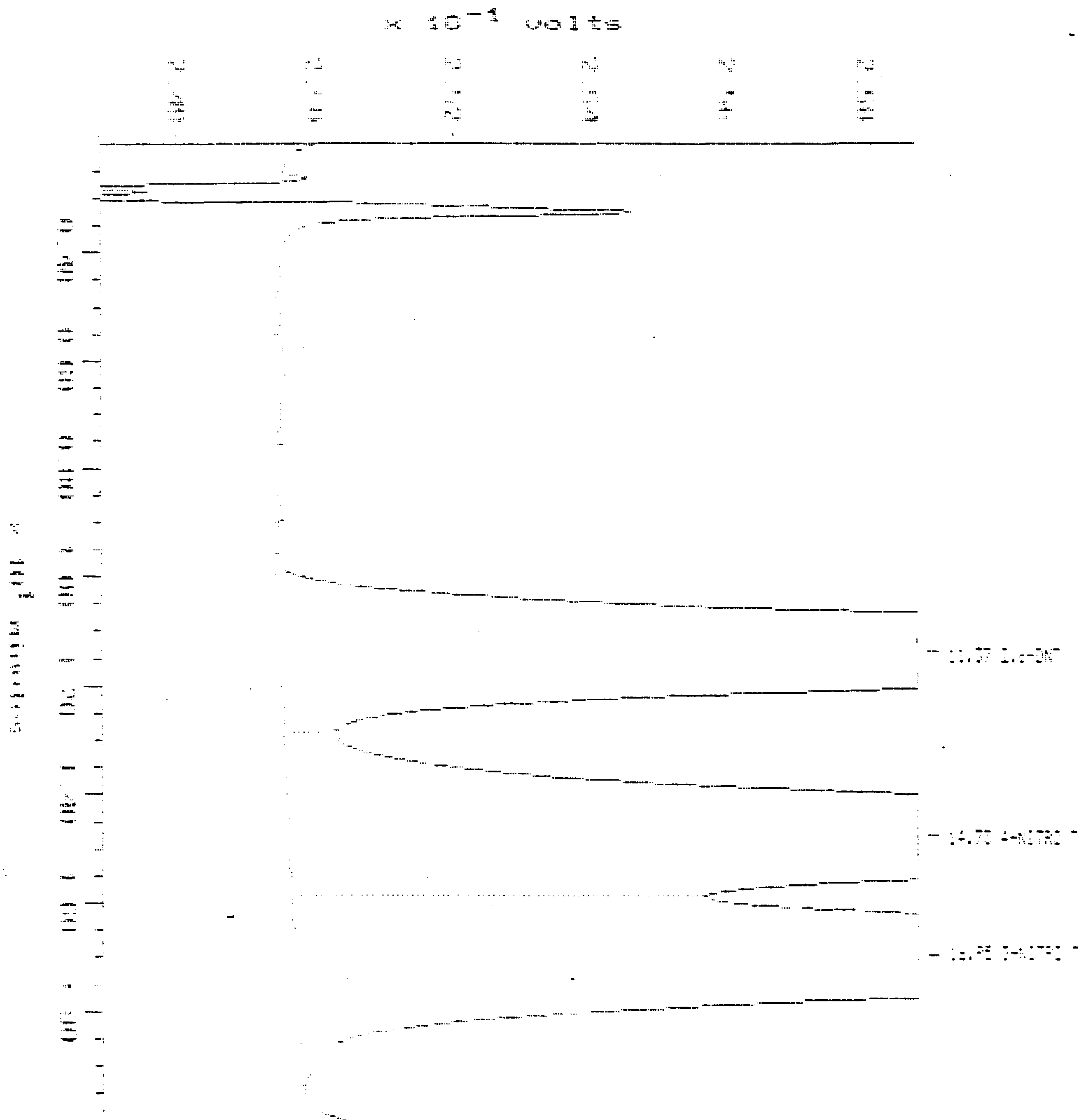
Sample: 3-12-98 STD-4 Channel: detector 1 Filename: STD1
Acquired: 12-MAR-98 13:03 Method: C:\MAX\DATA1\PARABENS Operator: MHD
Inj Vol: 20.00

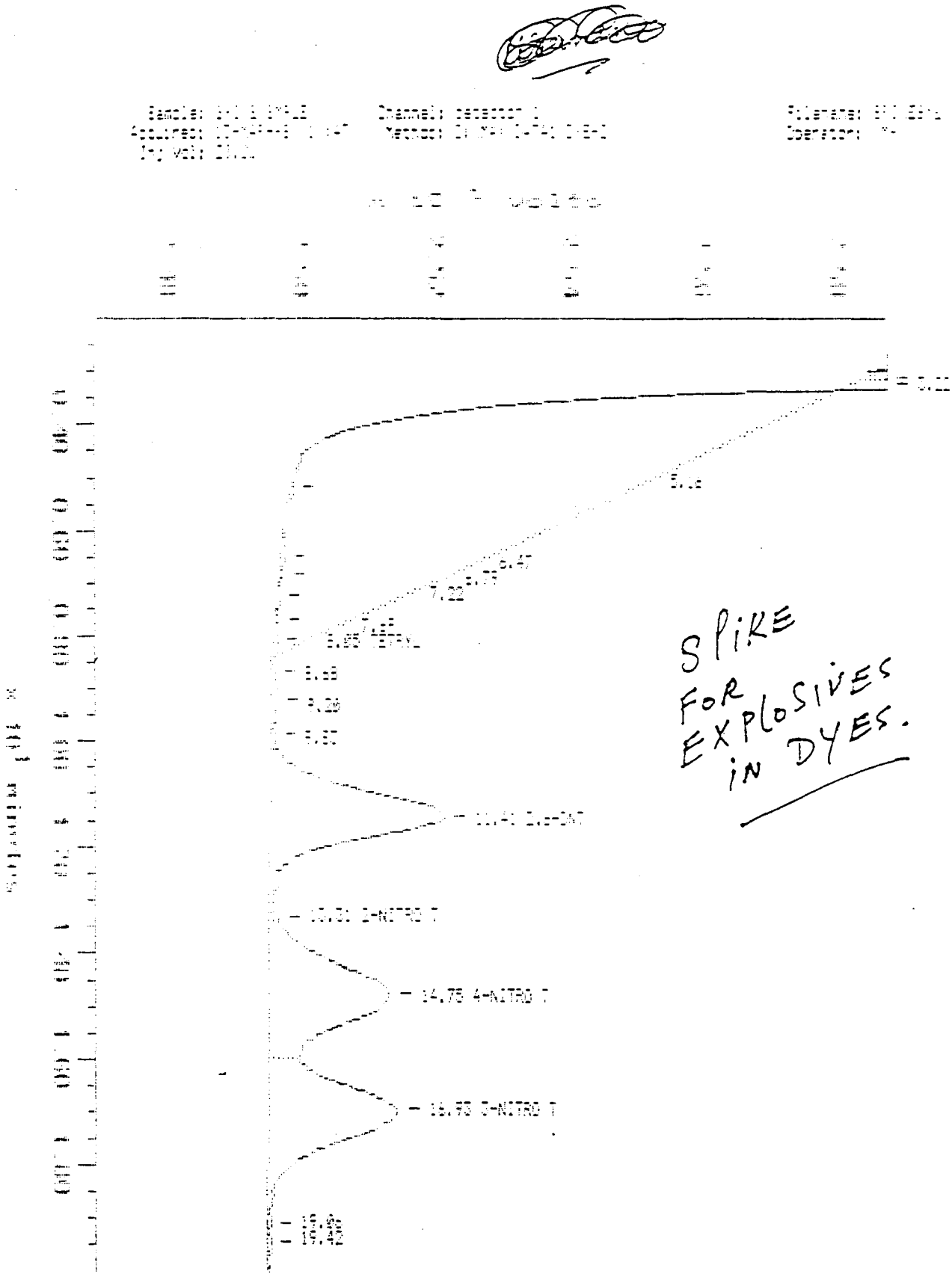


STDS. FOR EXPLOSIVES IN DYES.

Sample: [illegible] Channel: [illegible]
Acquired: [illegible] Method: [illegible]
Inj Vol: [illegible]

Filename: [illegible]
Operator: [illegible]





SPIKE
FOR
EXPLOSIVES
IN DYES.

Project No._____ Book No._____ TITLE 2-4-98 SAMPLE SPIKES

From Page No.___ (900 MCS SAMPLE CONC TO 10 MCS)

		TANK	SPIKE		Date Spiked
2031	MS	GS88 EA	.2 mls	A	
2031	MSD	GS88 EA	.2 mls	B	
2072	MS	GS650 NEA	.2 mls	A	
2072	MSD	GS650 NEA	.2 mls	B	
2062	MS	GS505 EA	.2 mls	A	
2074	MSD	GS505 EA	.2 mls	B	
A check std	10 mls	Acetonitrile	.2 mls	A	2-4-98 SCW ✓
B check std	10 mls	Acetonitrile	.2 mls	B	2-4-98 SCW ✓

Final Volume 10 mls

100 µg/ml X .2 ml = 20 µg/10 mls 2 µg/ml 2 PPM 100 µg/ml

100 µg/ml

RADIAN ERE-011

RADIAN ERE-0

8330 STD A 100 µg/ml each component

8330 STD B 100 µg/ml each Compo

2 Amino-4,6-Dinitrotoluene

1,3 Dinitrotoluene

2,4-Dinitrotoluene

HMX

Nitrobenzene

RDX

1,3,5-Trinitrobenzene

4-Amino-2,6-Dinitrotoluene

2,6-Dinitrotoluene

2-Nitrotoluene

3-Nitrotoluene

4-Nitrotoluene

Tetryl

To Page N

Witnessed & Understood by me,	Date	Invented by	Date
2,4,6-Trinitrotoluene (TNT)		Recorded by	

RADIAN INTERNATIONAL LLC

Certificate of Analysis

Radian International LLC certifies that this material meets or exceeds the specifications stated in this data sheet. Accuracy is ensured by exhaustive purity determinations and gravimetric preparation calibrated with NIST traceable weights. Precision is guaranteed by multiple weighings and comparison to existing standards (when available). Finally, homogeneity is demonstrated by random analysis of the ampuled standards.

AUTHORIZED SIGNATURE: R.A. Chandler, Product Manager

STANDARD NAME: METHOD 8330 CALIBRATION MIX B

COMPOUND DATA

COMPOUND	CAS NO.	CHEMICAL FORMULA	MOLECULAR WEIGHT	LOT NO.	CHEMICAL PURITY (%)
4-Amino-2,6-dinitrotoluene	1946-51-0	$C_7H_5N_3O_4$	197.15	CAP-27980-27	99
2,6-Dinitrotoluene	606-20-2	$C_7H_6N_2O_4$	182.14	EB-0210	99
2-Nitrotoluene	88-72-2	$C_7H_7NO_2$	137.14	EB-0209	99
3-Nitrotoluene	99-08-1	$C_7H_7NO_2$	137.14	EB-0203	99
4-Nitrotoluene	99-99-0	$C_7H_7NO_2$	137.14	ASZ-29703-02C	99
Tetryl	479-45-8	$C_7H_5N_5O_8$	287.10	ASZ-29703-01E	99

STANDARD SOLUTION DATA

Catalog Number:	ERE-012
Solution Lot Number:	30311-95
Concentration:	100 µg/mL of each analyte
Solvent:	Acetonitrile
Amount per Ampule:	1.2 mL
Storage:	Freezer. Protect from light.
Expiration Date:	September 1999

8501 N. Mopac Blvd./P.O. Box 201088/Austin, TX 78720-1088/(512)454-4797/(800)848-7837(US & Canada)

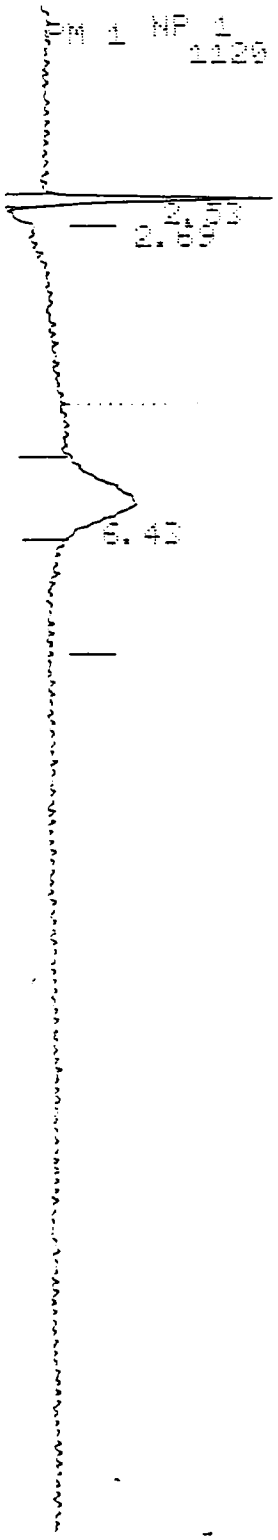
HPLC SCANS.

G5522 (N98-2056 TOP)

(N98-2057 - BOTTOM)

SPIKE

CHANNEL A INJECT 02/18/98 10:49:44



All the Sample were Diluted to 5 mL Volume & NOT 10 mL

Spike Sample For URANINE DYE.

2/18/98.

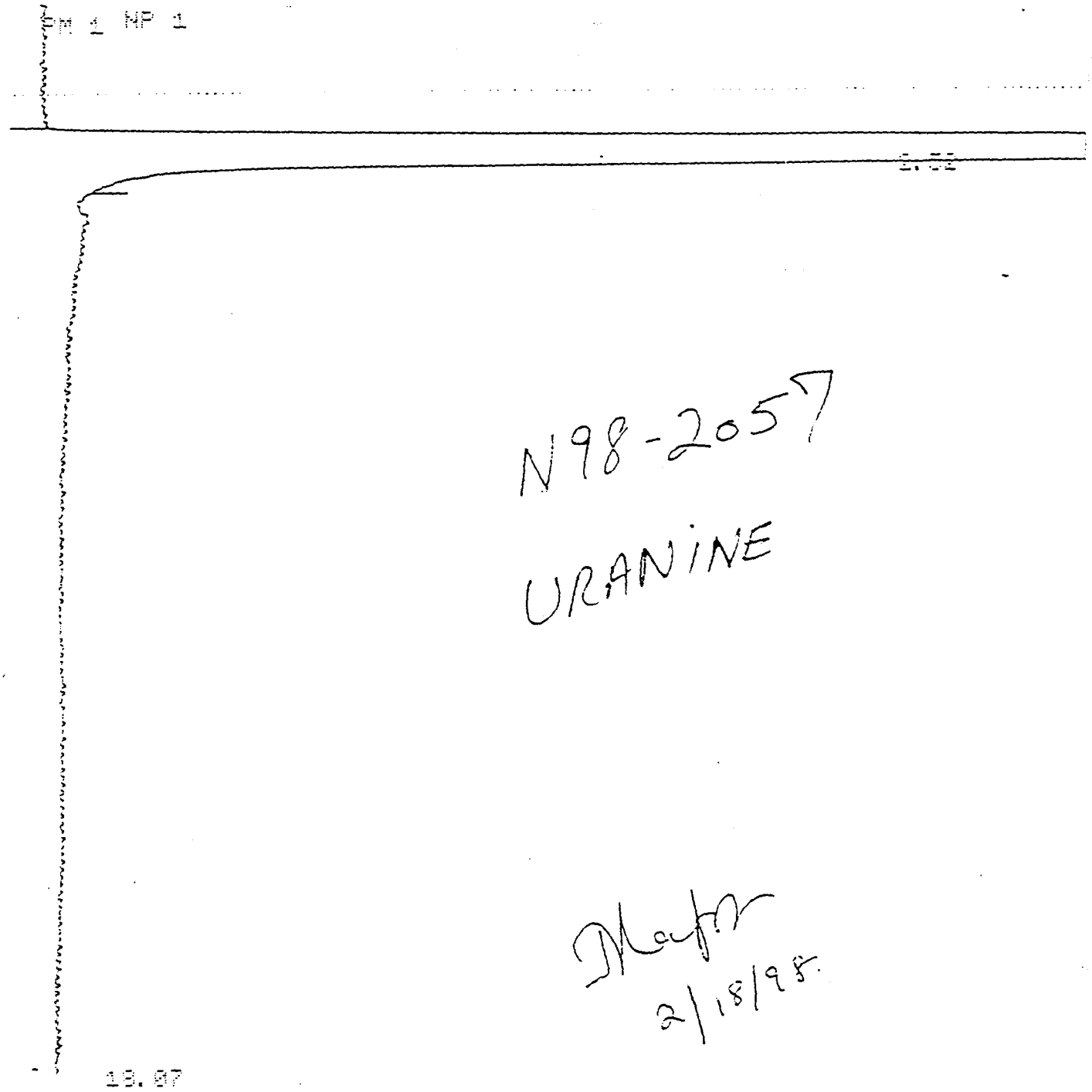
OVERSAMPLES 02/18/98 10:49:44 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 20 INDEX 20

PEAK#	AREA%	RT	AREA	BC
1	24.061	2.53	69371	02
2	10.889	2.69	31393	03
3	65.05	6.43	187547	03
TOTAL	100.		288311	

62

CHANNEL A INJECT 02/18/98 13:48:08



N98-2057

URANINE

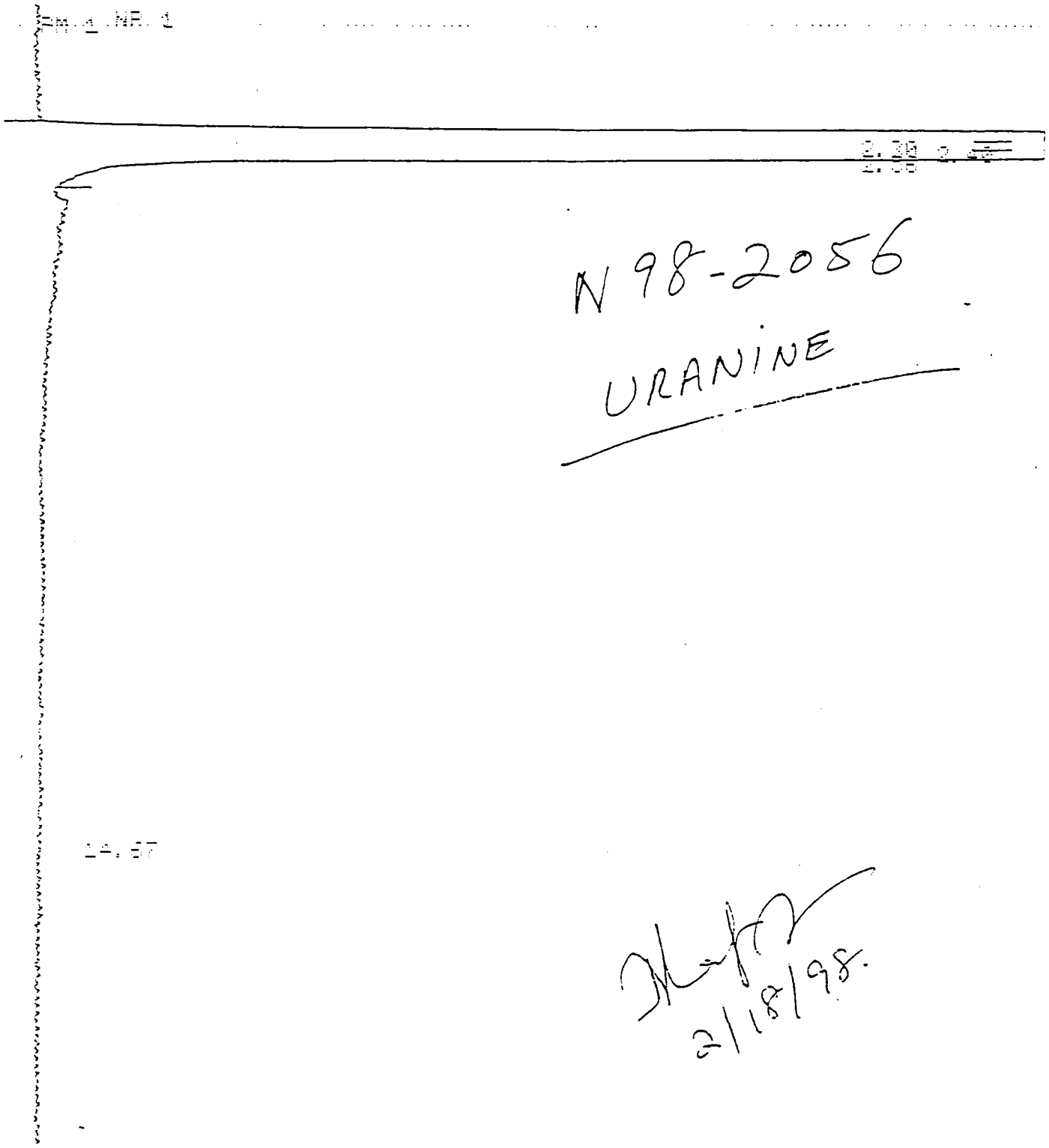
2/18/98

DYEPSAMPLES 02/18/98 13:48:08 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 27 INDEX 27

PEAK#	AREA%	RT	AREA	BC
1	100.	2.52	9007248	01
TOTAL	100.		9007248	

CHANNEL A INJECT 02/18/98 13:25:37



2/18/98.

DYEPSAMPLES 02/18/98 13:25:37. CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 26 INDEX 26

PEAK#	AREA%	RT	AREA	BC
1	36.446	2.3	2542600	02
2	31.024	2.4	2164321	02
3	32.53	2.56	2269423	03
TOTAL	100.		6976344	

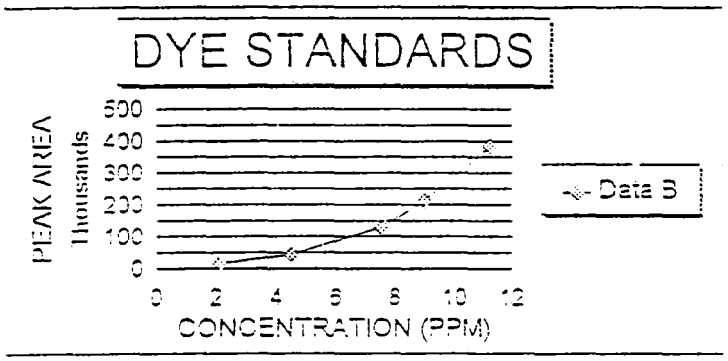
2-12-98

INJECTION TIME	PEAK AREA	CONCENTRATION PPM	TIME	PEAK AREA STDS NOT FILTERED
2.58	21944	2.1	6.22	15454
2.54	29993	4.5	6.09	44740
2.54	36167	7.5	6.13	129075
2.51	56544	9	6.15	211611
2.47	118813	11.25	6.08	385749

Regression Output:

Constant	-109929.8593964
Std Err of Y Est	55654.97120825
R Squared	0.8952674662415
No. of Observations	5
Degrees of Freedom	3

X Coefficient(s)	38901.84
Std Err of Coef.	7681.994



URANINE

FLOW RATE 1.0 ML/MIN

SOLVENT 50/50 Methanol/Water
with one bottle Tetra butyl Ammonium Phosphate
per liter

Project No._____
Book No._____ TITLE URANINE STDS (SCAN) 2-11-98

Page No.___

NEED 5 STANDARDS TO BLANKET RANGE

HAVE 11.25 ppm and 75 ppm STOCK URANINE

75 ppm X 5 mls IN SEMI VOL FLASK = 7.5 ppm Uranine

Make Up in MeOH/water 50/50

75 ppm X 6 mls in 50 mls Vol Flask = 9.0 ppm

75 ppm X 3 mls in 50 mls Vol Flask = 4.5 ppm

75 ppm X 1.5 mls in 50 mls Vol Flask = 2.10

2.1 4.5 7.5 9.0 11.25

To Page No.___

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by	

Project No.
8 Book No. TITLE DYE STANDARD 1-13-98

From Page No.

URANINE FISHER

0.0075 gms / 100 mls DI Water

$\frac{.0075\ g}{100\ ml} \cdot \frac{10^6\ \mu g}{g} = 75.\ \frac{\mu g}{ml}$ or ppm Uranine

MADE UP 11.25 ppm from 75 ppm

15 mls X 75 ppm ÷ 100 mls (MeOH/H2O)

11.25 ppm

Peak OBSERVED ≈ 5.65 min 50/50 MeOH/H2O w/ [illegible] Phosphate Flow Rate 1.0 ml/min

1-15-98

URANINE SPIKE

SPIKE 900 MS & MSD's with 1 ML 75 ppm URANINE

* QAPP Says 25 ppm Use 3 mls × 11.25 ppm Instead to SPIKE 900

(ppb) Sect 7 (6 of 23) for Oxidium Fluorescein

✓ THAT WILL GIVE 33.75 ppm or 3.375 in 10 MLS

	URANINE SPIKE 33.75 ppm	BLUE DYE ~~[illegible]~~ 3.55 ppm
2031 MS	✓	✓
2031 MSD	✓	✓
2062 MS	✓	✓
2074 MSD	✓	✓

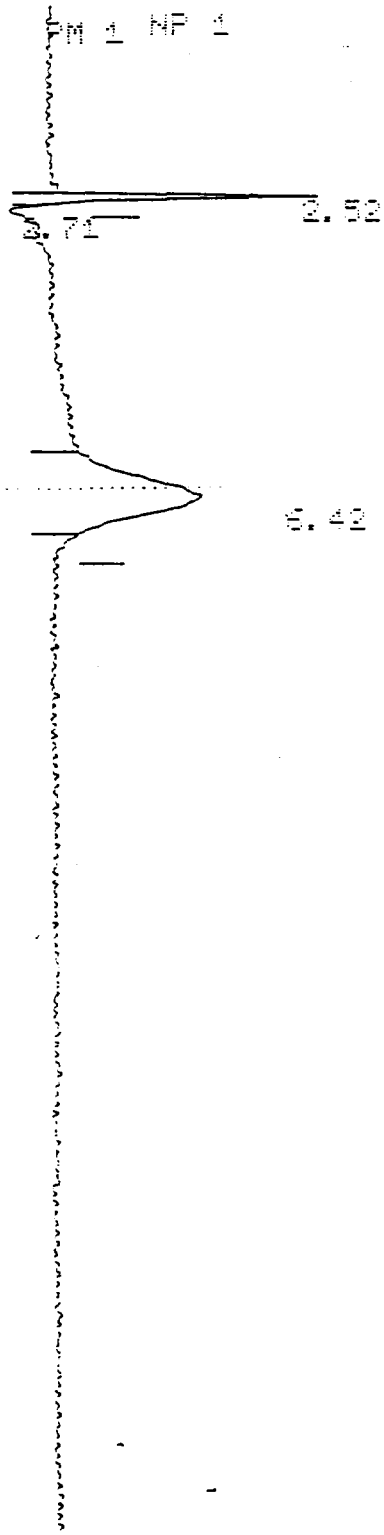
To Page No.

Witnessed & Understood by me. Date Invented by ✓ Date

2072 MS ✓

7.5

CHANNEL A INJECT 02/18/98 11:12:38



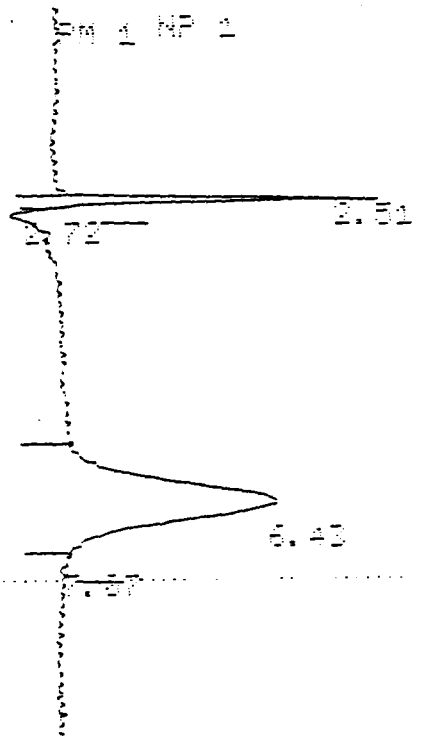
STANDARD
URANINE
DYES.

DVEPSAMPLES 02/18/98 11:12:38 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 21 INDEX 21

PEAK#	AREA%	RT	AREA BC
1	18.122	2.52	78123 02
2	4.171	2.71	17981 03
3	77.707	6.42	334984 03
TOTAL	100.		431088

CHANNEL A INJECT 02/13/98 11:55:35



STANDARD
URANINE

DYEPSAMPLES 02/13/98 11:55:35 CH= "A" PS= 1.

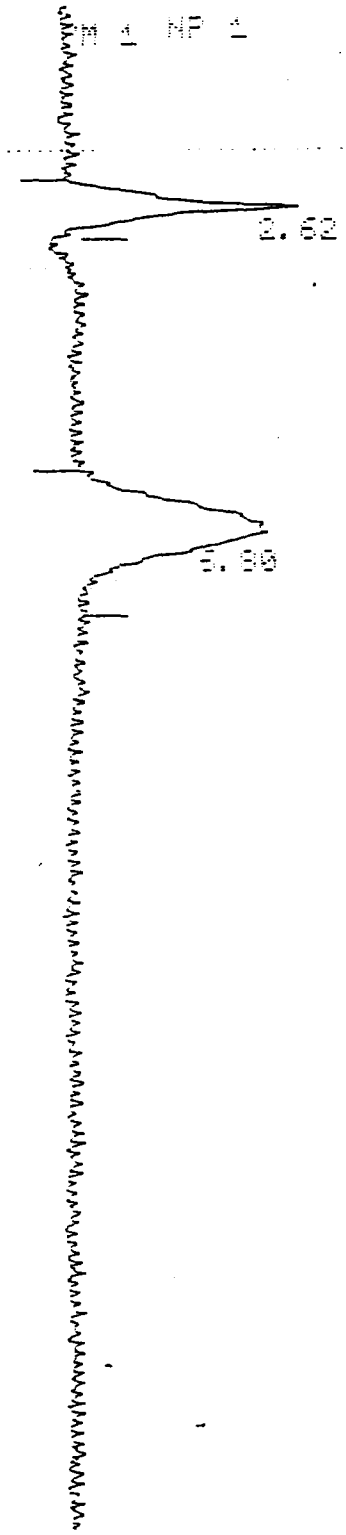
FILE 1. METHOD 0. RUN 22 INDEX 22

PEAK#	AREA%	RT	AREA SD
1	13.195	2.51	97353 02
2	3.207	2.72	23206 03
3	83.398	6.43	606103 03
TOTAL	100.		726762

STD 1

CHANNEL A INJECT 02/22/98 15:54:22

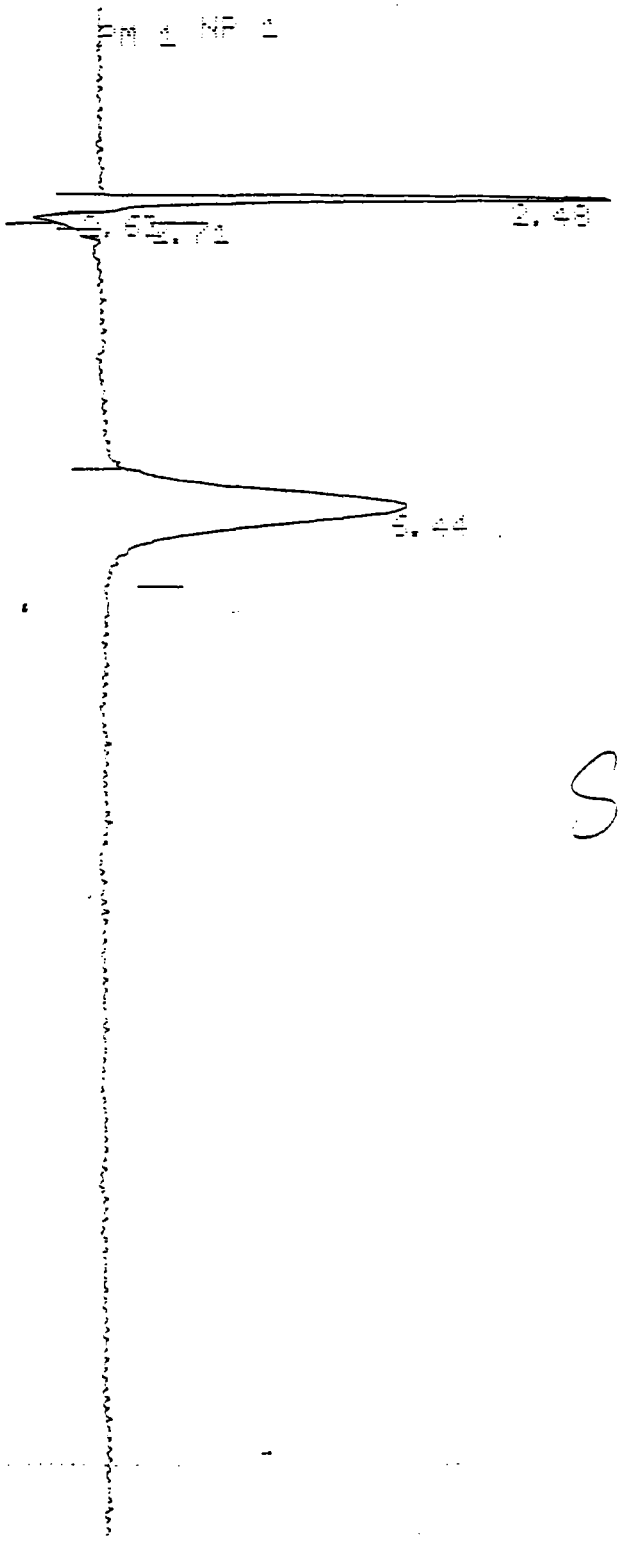
m 1 NP 1



070

11.25

CHANNEL A INJECT 02/18/98 12:06:00



STANDARD.
URANINE

DYEPSAMPLES 02/18/98 12:06:00 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 23 INDEX 23

PEAK#	AREA%	RT	AREA BC
1	19.325	2.48	177388 02
2	0.123	2.63	1125 02
3	1.992	2.71	18[illegible] 03

TOXICITY DATA

INTRODUCTION

Although not typically part of a QAPP, EPA requested that toxicological information be provided on the dyes anticipated to be found at the site under investigation. This Appendix provides the available information readily obtainable within the TOMES database. The available information is reported for the three dyes of concern and consists of: Substance Identification; Synonyms/Trade Names; Health Hazard Data and; References, when available.

Topic: Fluorescein, disodium salt

1.0 SUBSTANCE IDENTIFICATION

RTECS NUMBER: LM5425000
CHEMICAL NAME: Fluorescein, disodium salt
CAS NUMBER: 518-47-8
MOLECULAR FORMULA: C20-H10-O5.2Na
MOLECULAR WEIGHT: 376.28
WISWESSER NOTATION: T C666 BO EVJ IR BVQ& MQ &-NA- 2

2.0 SYNONYM(S) / TRADE NAME(S)

1. Aizen uranine
2. Calcocid uranine B4315
3. 9-o-Carboxyphenyl-6-hydroxy-3-isoxanthone, disodium salt
4. Certiqual fluoresceine
5. C.I. 766
6. C.I. Acid Yellow 73
7. C.I. 45350 disodium salt
8. C.I. 45350 sodium salt
9. D&C Yellow No. 8
10. Disodium 6-hydroxy-3-oxo-9-xanthene-o-benzoate
11. Fluorescein sodium
12. Fluorescein sodium B.P
13. Fluorescein, soluble
14. Fluor-I-strip A.T.
15. Ful-Glo
16. Funduscein
17. Furanium
18. Hidacid uranine
19. NCI-C54706
20. Resorcinol phthalein sodium
21. Sodium fluorescein
22. Sodium fluoresceinate
23. Sodium salt of hydroxy-o-carboxy-phenyl-fluorone
24. Soluble fluorescein
25. Soluble fluoresceine
26. Spiro(isobenzofuran-1(3H),9'-(9H)xanthen)-3-one, 3',6'-dihydroxy-, disodium salt
27. Uranin

2. LD50; ROUTE: Intravenous; DOSE: 1 gm/kg; REFERENCE: Toxicology and Applied Pharmacology 29:97, 1974.

C. DOG

1. LD50; ROUTE: Intravenous; DOSE: 1 gm/kg; TOXIC EFFECTS: GASTROINTESTINAL - Changes in structure or function of salivary glands; REFERENCE: Toxicology and Applied Pharmacology 29:97, 1974.

3.3 REPRODUCTIVE EFFECTS

A. RABBIT

1. ROUTE: Intravenous; DOSE: 933 mg/kg; DURATION: female 5-8D of pregnancy; TOXIC EFFECTS: MATERNAL EFFECTS - Postpartum; EFFECTS ON NEWBORN - Viability index; REFERENCE: American Journal of Ophthalmology 84:847, 1977.

3.4 GENETIC EFFECTS

3.4.1 DNA ADDUCT

A. BACTERIA - E COLI

1. DOSE: 15 umol/L; REFERENCE: Mutation Research 89:95, 1981.

3.4.2 MUTATIONS IN MAMMALIAN SOMATIC CELLS

A. MOUSE

1. CELL TYPE: lymphocyte; DOSE: 200 mg/L; REFERENCE: Science 236:933, 1987.

3.4.3 SISTER CHROMATID EXCHANGE

A. HAMSTER

1. CELL TYPE: ovary; DOSE: 50100 ug/L; REFERENCE: Science 236:933, 1987.

3.5 TUMORIGENIC EFFECTS

A. RAT

1. ROUTE: Subcutaneous; DOSE: 19 gm/kg/79W-I; TOXIC EFFECTS: TUMORIGENIC - Equivocal tumorigenic agent by RTECS criteria; TUMORIGENIC - Tumors at site of application; REFERENCE: Gann. Japanese Journal of Cancer Research 45:446, 1954.

2. ROUTE: Subcutaneous; DOSE: 16 gm/kg/1Y-I; TOXIC EFFECTS: TUMORIGENIC - Equivocal tumorigenic agent by RTECS criteria; SKIN AND APPENDAGES - Tumors; TUMORIGENIC - Tumors at site of application; REFERENCE: Gann. Japanese Journal of Cancer Research 47:51, 1956.

3.6 OTHER MULTIPLE DOSE TOXICITY DATA

A. RAT

Topic: Ammonium, ethyl(4-(p-(ethyl(m-sulfobenzyl)amino)-alpha-(o-sulfophenyl) benzylidene)2,5-cyclohexadien- 1-ylidene)(m-sulfobenzyl)-, hydroxide, inner salt, diammonium salt

1.0 SUBSTANCE IDENTIFICATION

RTECS NUMBER: BQ4550000
CHEMICAL NAME: Ammonium, ethyl(4-(p-(ethyl(m-sulfobenzyl)amino)-alpha-(o-sulfophenyl)benzylidene)2,5-cyclohexadien-1-ylidene) (m-sulfobenzyl)-, hydroxide, inner salt, diammonium salt
CAS NUMBER: 2650-18-2
MOLECULAR FORMULA: C37-H36-N2-O9-S3.2H3-N
MOLECULAR WEIGHT: 783.01
WISWESSER NOTATION: L6Y DYJ AUYR BSWQ&R DN2&1R CSWQ&& DUK2&1R CSWQ &Q &ZH 2

2.0 SYNONYM(S) / TRADE NAME(S)

1. Acid Blue 9
2. Acilan Turquoise Blue AE
3. A.F. Blue No. 1
4. Aizen Brilliant Blue FCF
5. Alphazurine
6. Alphazurine FG
7. Alphazurine FGND
8. Alphazurine (indicator)
9. Amacid Blue FG Conc
10. Bleu Brilliant FCF
11. 11388 Blue
12. Brilliant Blue
13. Brilliant Blue FCF
14. Bucacid Azure Blue
15. Calcocid Blue EG
16. Calcocid Blue 2 G
17. C.I. 671
18. C.I. 42090
19. C.I. Acid Blue 9
20. C.I. Acid Blue 9, diammonium salt
21. C.I. Direct Brown 78
22. C.I. Direct Brown 78, diammonium salt
23. C.I. Food Blue 2
24. D and C Blue No. 4
25. Disulphine Lake Blue EG
26. Edicol Supra Blue E6
27. Erioglaucine
28. Erioglaucine A
29. Erioglaucine E
30. Eriosky Blue

1. CELL TYPE: fibroblast; DOSE: 5 gm/L; REFERENCE: Food and Chemical Toxicology 22:623, 1984.

3.3 TUMORIGENIC EFFECTS

A. RAT

1. ROUTE: Subcutaneous; DOSE: 10 gm/kg/77W-I; TOXIC EFFECTS: TUMORIGENIC - Neoplastic by RTECS criteria; TUMORIGENIC - Tumors at site of application; REFERENCE: Toxicology and Applied Pharmacology 8:29, 1966.

35. Solar Violet 5BN
36. Tertracid Brilliant Violet 6B
37. Violet 6B
38. Violet No 1
39. Wool Violet 4BN
40. Wool Violet 5BN

3.0 HEALTH HAZARD DATA

3.1 TOXICITY VALUES

IARC Summary and Evaluation:

1. No data are available in humans. Sufficient evidence of carcinogenicity in animals. OVERALL EVALUATION: Group 2B:The agent is possibly carcinogenic to humans. REFERENCE: [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer,1972-PRESENT. (Multivolume work).,p. S7 58 (1987)

3.2 TOXICITY EXCERPTS

Human Toxicity Excerpts:

1. There is little concern with the acute and subchronic toxicity of the food colors currently in use, but there is considerable concern in some groups about their chronic toxicity. Several of the colors approved for use by the Color Amendments have been delisted since 1971, including .. Violet 1. Their delisting occurred owing to concerns over their chronic toxicity, especially carcinogenicity.REFERENCE: [Amdur, M.O., J. Doull, C.D. Klaasen (eds). Casarett and Doull's Toxicology. 4th ed. New York, NY: Pergamon Press, 1991. 839

2. In..patients, iv admin of /fast acid violet..used/ to aid diagnosis & study of pathology of ocular fundus by vital staining..to differentiate pathologic from normal.. No toxicity to ocular structures..as a result..of dyes. REFERENCE: [Grant, W. M. Toxicology of the Eye. 2nd ed. Springfield, Illinois: Charles C. Thomas, 1974. 440

3.2 NON-HUMAN TOXICITY EXCERPTS:

1. Groups of 20 male or 20 female sprague-dawley rats..7-wk old fed diet containing 5% benzyl violet 4b (89.1% pure)..364 days. Nine of 18 treated female rats that survived more than 70 days developed tumors: 5 mammary carcinomas between 138 and 345 days. In 10 untreated control females, 1 mammary fibroadenoma was seen at day 338; no tumors were observed in 15 treated and 10 control males that survived more than 70 days. The average survival times were 187 (males) and 210 (females) days in the treated groups and 228 (males) and 315 (females) days in control groups. REFERENCE: [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work).,p. V16 157 (1978)

8. Arylmethane dyes were tested in the Salmonella/mammalian microsome mutagenicity assay. The food color Benzyl Violet 4B CI 42640, was mutagenic in frameshift mutation detector strains TA1538 and required metabolic activation. Most of these compounds gave weak mutagenic responses with Salmonella and only within narrow dose ranges. Since conflicting results were obtained using dyes from different sources, mino. dye components may have been responsible for their mutagenicity.
REFERENCE: [Bonin AM et al; Mutat Res 89 (1): 21-34 (1981)

MIL-D-16627(BuOrd)
19 September 1951

SUPERSEDING
*Navy-51D28(Ord)
5 April 1946

MILITARY SPECIFICATION

DYES, PROJECTILE-SPOTTING

1. SCOPE

1.1 This specification covers one grade of projectile-spotting dyes, to be furnished in different colors.

1.2 Colors.- Dyes for projectile-spotting shall be furnished in the following colors (see sec. 6).

Blue
Green
Red
Orange

2. APPLICABLE SPECIFICATIONS AND PUBLICATIONS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification.

SPECIFICATIONS

FEDERAL

RR-S-366 Sieves; Standard, Testing

MILITARY

NAVY DEPARTMENT

General Specifications for Inspection of Material.

PUBLICATIONS

BUREAU OF SUPPLIES AND ACCOUNTS

Navy Shipment Marking Handbook

*Superseded O.S. 1678

each primary sample thoroughly and place a 1-ounce portion in a rubber-stoppered bottle so labeled that the container from which it was taken can be easily identified. The remaining portions of the primary samples shall be mixed together thoroughly and quartered until a composite sample of approximately 4-ounces is obtained. The composite sample shall be placed in a rubber-stoppered bottle and labeled so as to show the name of the material, manufacturer, plant, contract or order number, number of pounds in the lot and the lot number. All acceptance tests shall be made on the composite sample representative of the lot. The primary samples shall be held for possible future examination should the composite sample fail to meet the requirements of this specification.

4.2 Inspection.- Inspection shall be made at the place of manufacture, unless otherwise specified.

4.3 Tests.- The following tests shall be made at the Naval Powder Factory, Indian Head, Md., unless otherwise specified.

4.3.1 Color.- Determine by visual inspection.

4.3.2 Uniformity.- Place approximately 1 gram of the material on a piece of white paper and mix well using a spatula. Press down on the dye with the spatula so as to break up any lumps or aggregates. The appearance of streaks of different colors indicates non-uniformity due to poorly mixed components.

4.3.3 Concentration.-

4.3.3.1 Test Solutions.- Prepare solutions of the standard dye (6.2) and the sample dye in the following concentrations, using recently boiled distilled water:

Color	Weight of dye, gram	Volume of solution, ml.
Blue	0.1000	1000
Green	0.1000	1000
Red	0.1000	1000
Orange	0.6250	250

4.3.3.2 Apparatus.- The instrument used shall be a photoelectric colorimeter, Lumetron Colorimeter Model 400 or equivalent. Filters used shall be as follows:

Color of Dye	Filter
Blue	Green
Green	Orange
Red	Orange
Orange	Orange

6. NOTES

6.1 Ordering data.- Procurement documents should specify the following:

Title, number, and date of this specification.
Color of projectile-spotting dye required (see 1.2).

6.2 Composition of standard dyes.- Portions of the standard dyes maintained at the Naval Powder Factory, Indian Head, Md., will not be distributed. The following compositions are offered as a guide for approximating the standards:

Color	Ingredient	C.I.No.*	Percent
Blue	Alphazurine B Conc.	---	30.0
	Acid fast Violet BG Conc. 200 percent of normal	699	20.0
	Naccosol A (Wetting Agent)	---	2.0
	Granular Sugar	---	48.0
Green	Wool Yellow Extra Conc.	640	80.0
	Alphazurine 2G	712	20.0
Red	National Fast Crimson "R" Conc. 167 percent of normal	---	80.0
	Wool Yellow Extra Conc.	640	20.0
Orange	Wool Orange 2G Crystals	27	100.0

*Society of Dyers and Colourists - Colour Index

Notice: When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished or in any way supplied said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may be in any way related thereto.

Information Handling Services, DODSTD Issue DW9702

DYE WATER DISPOSAL PROPOSAL
FOR
NAVSURFWARCENDIV CRANE

July 1998

BACKGROUND

Information about the Dye Burial Grounds (DBG) can be found on the IDEM web page at www.state.in.us/idem/oer/cran396.html. The DBG is solid waste management unit SWMU #02/11.

As noted in the enclosure (1) analytical report, there is approximately 150,000 gallons of dye water contained within twelve tanks at the DBG. Each tank has a volume of 20,000 gallons.

PROPOSAL

Our proposal for disposal is to pump the dye water from the DBG tanks and haul it to a discharge point at an outlying manhole on our wastewater collection system. The dye water will be diluted as it blends with the normal 400,000 gallon per day flow that is processed through our sewage treatment plant. Discharge from our sewage treatment plant is allowed by NPDES permit IN0021539. The rationale for this proposal is presented below.

RATIONALE

The contaminant of concern in the dye water is the MIL-D-16627 blue dye (green dye was below detectable level of 10 ppb). The blue dye (CAS# 2650-18-2) is a compound made up of 30% alphazurine B, 20% acid fast violet BG, 48% sugar, 2% naccosol A (wetting agent). One of the listed uses for this dye is as a food coloring agent. The dye can be generally described as a polynuclear aromatic hydrocarbon (PAH). PAH compounds are considered to be Clean Water Act, Section 307, toxic pollutants.

Part II, Sec. C, paragraph 7a (pg. 30 of 31) in our NPDES permit Requires that we notify the Commissioner of any Section 307 toxic pollutant discharge that will exceed one hundred micrograms per liter. For this case, we interpret this paragraph to mean that 100 μg/l of blue dye is the maximum daily discharge limit.

From the analytical results shown in enclosure (1) we know that the maximum concentration of any tank sample is 280 μg/l (tank

#S1647SD). If we assume maximum concentration for all 150,000 gallons of dye water and determine the total mass of blue dye in the 150,000 gallons we find that there would be 0.35 lbs. If we then assume that the 0.35 lbs. of blue dye is mixed with 550,000 gallons of wastewater (400,000 gal. normal flow + 150,000 gal. dye water) and calculate the concentration of blue dye in the sewage treatment plant discharge, we find it to be 76.4 μg/l. ***The calculated concentration is an overestimate but is still less than the 100 μg/l limit***. Also, the calculation is based on an assumption that 150,000 gallons will be discharged into the collection facility in one day. We expect that it will take several days to pump and haul the 150,000 gallons.

Another issue that we have considered is the color that the dye imparts to the water. Our sewage treatment plant discharges into Boggs Creek, which is normally a clear, low-flow stream. One of the Indiana water quality standards (327 IAC 2-1-6) states that all waters will meet a minimum condition of being free of substances that are attributable to industrial discharges and that produce color in such degree as to create a nuisance. By introducing the dye water at a remote location on the collection facility over several days we believe that the sewage treatment plant discharge will not discolor Boggs Creek. We will conduct dilution tests in the Navy laboratory to estimate a dilution ratio that will be needed to obtain a clear discharge.

APPENDIX N

DYE-IMPACTED WATER DISPOSAL RECORDS
AND
RESIDUAL SEDIMENTS ANALYTICAL DATA

APPENDIX N
DYE-IMPACTED WATER DISPOSAL RECORDS
AND
RESIDUAL SEDIMENTS ANALYTICAL DATA

INDEX

N-1 Dye-Impacted Water Disposal Records

N-2 Residual Sediments Analytical Data

N-1

Dye-Impacted Water Disposal Records

DBG WATER DISPOSAL RECORD

RAINWATER ACCUMULATED IN MUD BOXES

MUD BOX ~~FRAC TANK~~ NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
M280	10/21/98	1	USED GRADUATED	PORTABLE POLY.	1000	1000	RICK DAYHOFF
			TANKS				
	10/23/98	2			525	1525	JAMES HAUSER

DECON WATER QUANTITY

MUD BOX ~~FRAC TANK~~ NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
M280	10/22	125	50	25	200	☑	☐	USED GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE AMOUNT
						☐	☐	OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: JEFF DAYHOFF
(PRINTED NAME)

(SIGNED NAME)

DATE: 22 Oct 98

WATER TRUCK # 7133 - HERTZ RENTAL

DECON

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME

DECON WATER QUANTITY

WATER TRUCK ~~FRAC TANK~~ NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
7133	11/3/98	642	576	483	1701	☒	☐	DECON INCLUDED HOSES USED TO
						☐	☐	DISCHARGE WATER FROM TANK.
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DUGAL
(PRINTED NAME)

(SIGNED NAME)

DATE: 11/3/98

WATER TRUCK # 8174 - HERTZ RENTAL

DECON

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME

DECON WATER QUANTITY

WATER TRUCK ~~FRAC TANK~~ NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
8174	11/3/98	620	574	464	1658	☒	☐	DECON INCLUDES ALL HOSES USED
						☐	☐	TO DISCHARGE WATER FROM TRUCK
						☐	☐	ALSO, DECON OF PUMP MOUNTED
						☐	☐	TO TRUCK FOR FILLING TANK.
						☐	☐	

TANK INSPECTED BY: THOMAS D. DOCAL
(PRINTED NAME)

(SIGNED NAME)

DATE: 11/3/98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S879NSD	10/27/98	1	72445	73955	1510	1510	J. H.
S879NSD	10/27/98	2	73955	75795	1840	3350	J. H.
S879NSD	10/27/98	3	75795	77660	1865	5215	J. H.
S879NSD	10/27/98	4	77660	79495	1835	7050	J. H.
S879NSD	10/28/98	5	79495	81365	1870	8920	[illegible]
S879NSD	10/28/98	6	83205	85055	1850	10770	[illegible]
S879NSD	10/28/98	7	86945	88810	1865	12635	[illegible]

TOTAL - BOTH SHEETS - 16690

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
S879NSD	11/3/98	293	197	177	667	☒	☐	FLOW TOTALIZER USED TO MEASURE
						☐	☐	GALLONS OF WATER PER RINSE.
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DOGAL
(PRINTED NAME)

(SIGNED NAME)

DATE: 11/3/98

L.F
TRUCK

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S879NSD	Oct 28	1	81365	83200	1845	1845	J. H.
S879NSD	OCT 28-98	2	85055	86945	1890	3735	J. H.
S879NSD	OCT 28-98	3	88810	89130	320	4055	J H.

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 of 2 _____ (PRINTED NAME) _____ (SIGNED NAME)

DATE: _____

MUD BOX M281 DECON

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
NO WATER IN MUD BOX							
		TDD					

DECON WATER QUANTITY

MUD BOX ~~FRAC TANK~~ NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
M281	11/4/98	150	108	80	338	☒	☐	USED GRADUATED POTABLE WATER
						☐	☐	TANK TO DETERMINE AMOUNT OF
						☐	☐	DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: Thomas Dogal (PRINTED NAME) THOMAS D. DOGAL (SIGNED NAME)

DATE: 11/4/98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S16475D	10/20/98	1	1750	3370	1620	1620	James Hawk
S16475D	10/20/98	2	3370	5285	1915	3535	James Hawk
S16475D	10/21/98	3	5285	7110	1825	5360	James Hawk
S16475D	10/21/98	4	7110	8975	1865	7225	[illegible] 9:40 to 10:45
S16475D	10/21/98	5	8975	10812	1869	9092	[illegible] 10:4 - 11:55
S16475D	10/21/98	6	10812	12780	1968	11060	JLH
S16475D	10/21/98	7	12780	14600	1820	12880	JRH - 1:00
S16475D	10/21/98	8	[illegible]	16365	1665	14545	[illegible]
S16475D	10/21/98	9	16365	18265	1900	16445	JRH 3:20 - 4:15

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
S16475D	11/5/98	800	400	200	1400	☒	☐	USED GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE AMOUNT
						☐	☐	OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: [signature] (PRINTED NAME) THOMAS D DOGAL (SIGNED NAME)

DATE: 11/5/98

(2)

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S47ST	10/22/98	1	18265	20155	1890	1890	DH
S47ST	10/22/98	2	20155	22000	1895	3785	DH
S47ST	10/22/98	3	22000	23920	1920	5705	DH
S47ST	10/22/98	4	23920	25810	1890	7595	DH
S47ST	10/22/98	5	25810	27685	1875	9470	DH
S47ST	10/22/98	6	27685	29575	1890	11360	DH
S47ST	10/22/98	7	29575	31475	1900	13260	DH

TOTAL GALLONS ALL 3 SHEETS – 17665

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
S47ST	11/6/98	1100	500	350	1950	☒	☐	USED GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE AMOUNT
						☐	☐	OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DOGAL (PRINTED NAME) Thomas D. Dogal (SIGNED NAME)

DATE: 11/6/98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
5475T	Oct 23	1	31475	33355	1880	1880	DONNA HAUSER
5475T	OCT. 23	2	33355	35245	1910	3790	DONNA HAUSER

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 of 3 _____
(PRINTED NAME) (SIGNED NAME)

DATE: _____

TCN TRUCK

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
5475T	10-23-98	1	35245	35860	615	615	JAMES HAUSER

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 of 3 _____
(PRINTED NAME) (SIGNED NAME)

DATE: _____

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
1001 MEA	10/28/98	1	89130	91990	1860	1860	DKH
1001 MEA	10/28/98	2	92600	94450	1850	3710	DKH
1001 MEA	10/28/98	3	96350	98200	1850	5560	DKH
1001 MEA	10/29/98	4	100100	101935	1835	7395	DKH
1001 MEA	10/29/98	5	103805	105605	1800	9195	DKH

TOTAL FROM BOTH SHEETS 16635

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
1001 MEA	11/6/98	950	300	200	1450 GAL	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE
						☐	☐	AMOUNT OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DOGAL
(PRINTED NAME)

(SIGNED NAME)

DATE: 11/6/98

OK
TRUCK

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
1001MEA	10/28/98	1	91990	92600	610	610	J.H.
1001MEA	10/28/99	2	94450	96350	1900	2510	J.H.
1001MEA	10/28/98	3	98200	100100	1900	4410	J.H.
1001MEA	10/29/98	4	101935	103800	1865	6275	J.H.
1001MEA	10/29/98	5	105605	106770	1165	7440	J.H.

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 OF 2 _____
(PRINTED NAME) (SIGNED NAME)

DATE: _____

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S1885EA	10/29/98	1	107455	109260	1805	1805	
S1885EA	10/29/98	2	111160	113000	1840	3645	
S1885EA	10/29/98	3	114910	116750	1840	5485	
				TOTAL FROM BOTH SHEETS		11750	

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
S1885EA	11/6/98	900	450	250	1600	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE AMOUNT
						☐	☐	OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: JEFF DAYHOFF
(PRINTED NAME)

(SIGNED NAME)

DATE: 6 NOV 98

OK
TRUCK

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S1885EA	10/28/98	1	106770	107455	685	6085	J. H.
S1885EA	10/28/98	2	109260	111160	1900	2585	[illegible]
S1885EA	10/28/98	3	113000	114910	1910	4495	[illegible]
S1885EA	10/28/98	4	116750	118525	1770	6265	[illegible]

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 OF 2 _____
(PRINTED NAME) (SIGNED NAME)

DATE: _____

T&N TRUCK

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
GS 88 EA	10-23-98	1	37845	38830	985	985	J Hanson
GS 88 EA	10-23-98	2	40730	41735	1005	1990	J Hanson
			TOTAL GALLONS - ALL SHEETS			17479	

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
GS 88 EA	11/6/98	1000	500	200	1700	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE AMOUNT
						☐	☐	OF DECON WATER.
						☐	☐	
						☐	☐	

TANK INSPECTED BY: Jeff Dayhoff
(PRINTED NAME)

(SIGNED NAME)

DATE: 6/10/98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
G 588 EA	10/23/98	1	35960	37845	1885	DRH	1885
G 588 EA	10/23/98	2	38835	40730	1889	DRH	3774
G 588 EA	10/23/98	3	41745	43625	TDD ~~1480~~ 1880	J.H.	~~5754~~ 5654
G 588 EA	10/24/98	4	43625	45480	1855	J.H.	~~7609~~ 7509
G 588 EA	10/24/98	5	45480	47375	1895	J.H.	~~9504~~ 9404
G 588 EA	10/24/98	6	47375	49310	1935	J.H.	~~11439~~ 11339
G 588 EA	10/24/98	7	49310	51165	1855	J.H.	~~13294~~ 13194
G 588 EA	10/24/98	8	51165	53025	1860	JRH	~~15154~~ 15054
G 588 EA	10/24/98	9	53025	53460	435	J.H.	TDD ~~15589~~ 15489

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 OF 2 _____ (PRINTED NAME) _____ (SIGNED NAME)

DATE: _____

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
GS522EA	10/26/98	1	53460	55310	1850	1850	J. H.
GS522EA	10/26/98	2	55310	57160	1850	3700	J. H.
GS522EA	10/26/98	3	57160	58985	1825	5525	J. H.
GS522EA	10/26/98	4	58985	60840	1855	7380	J. H.
GS522EA	10/26/98	5	60840	62720	1880	9260	J. H.
GS522EA	10/26/98	6	62720	64570	1850	11110	J. H.
GS522EA	10/26/98	7	64570	66415	1845	12955	J. H.
GS522EA	10/27/98	8	66415	68305	1890	14845	J. H.

TOTAL FROM BOTH SHEETS 18985

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
GS522EA	11/9/98	650	250	150	1050	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE
						☐	☐	AMOUNT OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: JEFF DAYHOFF (PRINTED NAME) (SIGNED NAME)

DATE: 9 NOV 98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
G5522EA	10/27/98	9	68305	70200	1895	1895	[illegible]
G5522EA	10/27/98	10	70200	72100	1900	3795	[illegible]
G5522EA	10/27/98	11	72100	72445	345	4140	[illegible]

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 OF 2 _____
(PRINTED NAME) (SIGNED NAME)

DATE: _____

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
GS 505 EA	10/29/98	1	118525	120350	1825	1825	[illegible]
Trip GS 505 EA	10/30/98	2	122010	123810	1800	3625	[illegible]
GS 505 EA	10/30/98	3	125620	127450	1830	5455	[illegible]
GS 505 EA	10/30/98	4	129315	131135	1820	7275	[illegible]
GS 505 EA	10/30/98	5	133010	134640	1630	8905	DRH

TOTAL FROM BOTH SHEETS 16105

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
GS 505 EA	11/9/98	800	300	200	1300	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE
						☐	☐	AMOUNT OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: JEFF DAYHOFF (PRINTED NAME) [signature] (SIGNED NAME)

DATE: 9 Nov 98

OK
TRUCK

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
GS505EA	10/~~28~~ 29/98	1	120350	122010	1660	1660	[illegible]
GS505EA	10/~~29~~ 30/98	2	123810	125620	1810	3470	[illegible]
GS505EA	10/~~29~~ 30/98	3	122450	129315	1865	5335	[illegible]
GS505EA	10/~~29~~ 30/98	4	131140	133005	1865	7200	J.H.

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 OF 2 _____
(PRINTED NAME) (SIGNED NAME)

DATE: _____

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
SDE1EA	Oct 30 '98	TOOK 2	136440	138270	1830	1830	DH
SDE 1 EA	OCT 30, 98	TOO 2 1	134640	136440	1800	3630	JH
					TOTAL	3630	

THIS TANK HAD A PIN HOLE, SO IT WAS USED FOR EMERGENCY BACK UP. PIN HOLE LOCATED AT TOP OF TANK WALL.

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
SDE1EA	11/9/98	300	150	100	550	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE
						☐	☐	AMOUNT OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DOGAL
(PRINTED NAME)

(SIGNED NAME)

DATE: 11/9/98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S650NEA	10/30/98	1	140060	141900	1840	1840	D.H.
S650NEA	11/2/98	2	141900	143705	1805	3645	J.H.
S650NEA	11/2/98	3	143705	145505	1800	5445	J.H.
S650NEA	11/2/98	4	145505	147310	1805	7250	J.H.
S650NEA	11/2/98	5	147310	149110	1800	9050	J.H.
S650NEA	11/2/98	6	149110	150855	1745	10795	J.H.
S650NEA	11/2/98	7	150855	152610	1755	12550	J.H.
S650NEA	11/2/98	8	152610	154410	1800	14350	J.H.

TOTAL FROM BOTH SHEETS 16337

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
S650NEA	11/9/98	700	200	120	1020	☒	☐	USED A GRADUATED PORTABLE
						☐	☐	WATER TANK TO DETERMINE
						☐	☐	AMOUNT OF DECON WATER
						☐	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DIXIAL (PRINTED NAME) [signature] (SIGNED NAME)

DATE: 11/9/98

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME
S 650 NEA	10/3/98	1	138270	140060	1790	1790	J. HAUSER
S 650 NEA	11/3/98	2	154416	154607	197	1987	D. HAUSER

DECON WATER QUANTITY

FRAC TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	
						☐	☐	

TANK INSPECTED BY: SEE SHEET 1 of 2 _____ (PRINTED NAME) _____ (SIGNED NAME)

DATE: _____

PORTABLE WATER TANK AND PUMPS/HOSES

DBG WATER DISPOSAL RECORD

FRAC TANK NO.	DATE	LOAD NO.	TOTALIZER BEGINNING READING	TOTALIZER END READING	GALLONS DISCHARGED	ACCUMULATIVE GALLONS	TRUCK DRIVER'S NAME

DECON WATER QUANTITY

WATER ~~FRAC~~ TANK NO.	DATE	GALLONS OF WATER USED PER RINSE			TOTAL GALLONS	DECON RESULTS		COMMENTS
		RINSE 1	RINSE 2	RINSE 3		ACC	UNACC	
PT-2	11/10/98	500	300	200	1000	☒	☐	DECON INCLUDED INTAKE AND
PT-3	11/10/98	550	250	100	900	☒	☐	DISCHARGE HOSES
2" PUMP	11/10/98	40	30	20	90	☒	☐	
POLY TANK-260CU	11/16/98	90	60	50	200	☒	☐	
						☐	☐	

TANK INSPECTED BY: THOMAS D. DOGAL
(PRINTED NAME)

Thomas D. Dogal
(SIGNED NAME)

DATE: 11/16/98

DEPARTMENT OF THE NAVY
OFFICER IN CHARGE OF
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACTS
CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
BUILDING 2516
CRANE, INDIANA 47522-5082

RECEIVED
JUN 6 1997
MK-CRANE

4330
OICC
06 Jun 97

Morrison Knudsen Corp.
P.O. Box 310
Crane Village, IN 47522

Subj: Contract N62467-93-D-1106, ENVIRONMENTAL RAC CONTRACT
Delivery Order 0009 NSWC-CRANE

Gentlemen:

This letter is to serve as technical direction for the following actions related to Dye Burial Grounds Cap:

1) Provide 1 additional frac tank to facilitate movement of the mud boxes and other frac tanks. Please provide a sketch showing location and all applicable certifications prior to bringing tank on site.

You shall proceed promptly with the performance of this technical direction. You are to provide a budgetary impact of this direction to the Contracting Officer within 5 days of its issuance. If in your opinion, this direction falls within any of the categories defined in paragraph (b) of the clause G8, Technical Direction, of your contract, you shall promptly notify the Contracting Officer in writing. You shall take no action until the Contracting Officer has issued a modification to the delivery order or otherwise resolved the issue.

If you have any questions, contact myself at 812-854-3318.

Brent Robertson
Navy Technical Representative

cc: Tom Brent; NSWC Code 095
Jimmy Jones; SDIV Code 18011
Adrienne T. Wilson; SDIV Code 1864
Bob Hess; SDIV Code 0232
OICC Tim Sears
File

MORRISON KNUDSEN CORPORATION
300 Highway 361, CTR-12
P.O. Box 310
Crane, IN 47522
(812) 854-6941
Fax: (812) 854-6944

June 6, 1997 4324-524

Mr. Brent Robertson
Resident Officer in Charge of Construction
Crane Division, NSWC
Building 2516
Crane, IN 47522

Subject: Additional FRAC Tank

Ref: OICC Letter 4330 dated 06/06/97
Contract N62467-93-D-1106, ENVIRONMENTAL RAC CONTRACT NSWC-CRANE

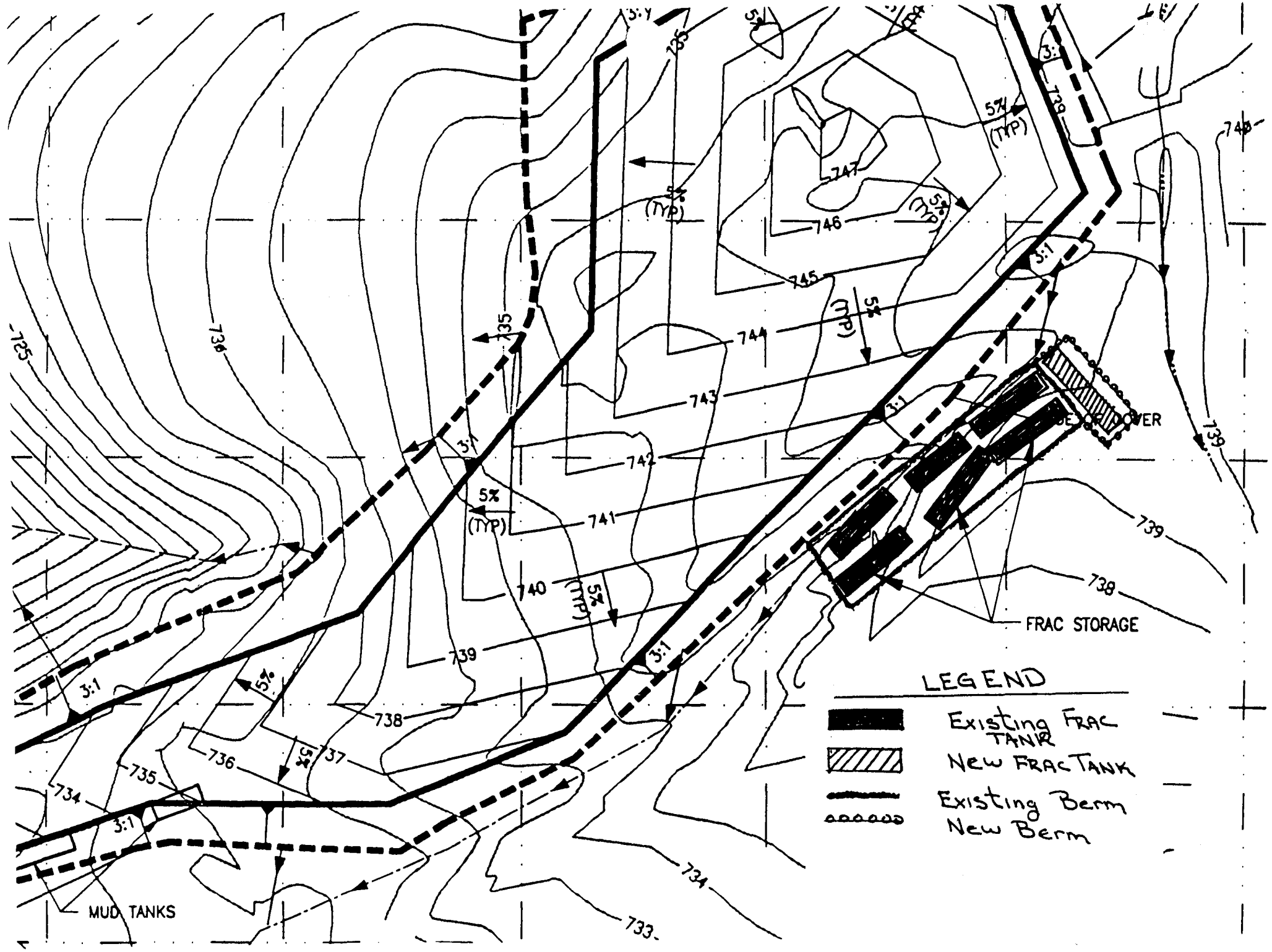
Dear Mr. Robertson:

Morrison Knudsen is taking steps to relieve the immediate problem of there being only minimal freeboard in the existing Frac tanks on site at the Dye Burial Grounds. The attached Frac Tank Status report shows there being less than 10,000 gallons of available storage space in both the Frac Tanks and Mud Boxes; 3,000 gallons of this is needed for possible water expansion due to warming temperature and unleveled tanks. Starting June 06, 1997, Morrison Knudsen constructed a temporary secondary containment area east of the existing Frac tanks (see attached sketch for approximate location) for the seventh Frac tank. Due to the need for this tank, a temporary graveled access road was built to permit the setting of the FRAC tank beside the six existing tanks. The seventh Frac tank was set on June 07, 1997 and is operational as needed to prevent a release. A copy of the tank's certification will follow in the daily construction report.

Should you have any questions or need additional information please contact Lois Bigley or the undersigned.

Sincerely,
D Beall
Dave Beall
Project Manager

cc: R. Hlavacek M. Wilson A. Wilson J. Hunsicker T. Brent
C. Freeman L. Bigley T. Dogal file: 11.021.F


LEGEND
Existing FRAC TANK
New FRAC TANK
Existing Berm
New Berm
FRAC STORAGE
MUD TANKS
5% (TYP)
3:1
747
746
745
744
743
742
741
740
739
738
737
736
735
734
733
725

Tank Number	Approx Freeboard *ft-in*	Maximum Volume *Gallons*	Approx. Current volume *Gallons*	Available volume *Gallons*
GS505EA	0' - 4"	21,279	20896	383
S1885EA	0' - 4.5"	21,279	20849	430
SDE1EA	0' - 10"	21,279	20179	957
S650NEA	0 - 3"	21,279	20322	287
GS522EA	0' - 4"	21,279	20992	383
101MEA	0' - 7"	21,279	20896	670
MUD TANK 1	2' - 0"	10,771	7171	3600
MUD TANK 2	2' - 0"	10,771	7171	3600
TOTALS		149,216	138906	10,310

As of 02 June 97

Weekend pumping reduced Freeboard by 1,195 gallons
all tank are at critical levels

Tank Number	Approx Freeboard *ft-in*	Maximum Volume *Gallons*	Approx. Current volume *Gallons*	Available volume *Gallons*
GS505EA	0' - 4"	21,279	20896	383
S1885EA	0' - 4.5"	21,279	20849	430
SDE1EA	0' - 8.5"	21,279	20179	957
S650NEA	0 - 2.5"	21,279	20322	287
GS522EA	0' - 3"	21,279	20992	383
1001MEA	0' - 7"	21,279	20896	670
MUD TANK 1	2' - 0"	10,771	7171	3600
MUD TANK 2	2' - 0"	10,771	7171	3600
TOTALS		149,216	140,007	9,209

As of 05 June 97

all tank are at critical levels

TANK CERTIFICATION REPORT
SWMU 02/11: Dye Burial Ground

BAKER TANK No.	ARRIVAL DATE	BAKER TEST REPORT(S) RECEIVED	ONSITE INSPECTION (signature/date)	COMMENTS
GS505EA (F)	10JAN97	Level I dated 1-10-97	R. Smith/1-10-97	
S1885EA (F)	24JAN97	Level I dated 8-16-95	R. Staub/1-24-97	Level II dated 4-5-95
SDE1EA (F)	23JAN97	Level I dated 1-23-97	R. Staub/1-23-97	
S650NEA (F)	10JAN97	Level III dated 10-19-94 *	R. Smith/1-10-97	* Level I dated 1-10-97
GS522EA (F)	10JAN97	Level I dated 1-10-97	R. Smith/1-10-97	
1001MEA (F)	25JAN97	Level I dated 11-14-96	R. Smith/1-25-97	No distinguishable odors
MB280 (M)	26JAN97	Level II dated 1-24-97	R. Staub/1-26-97	
MB281 (M)	25JAN97	Level II dated 1-24-97	R. Smith/1-25-97	No interior sheens or distinguishable odors

Morrison Knudsen Corporation
NSWC-Crane. IN 4324-0009

Note 1. (F) = FRAC Tank
(M) = Mud box

Note 2. Onsite inspection verified general appearance, noticeable damages, free of residual products.

Note 3. Refer MK Daily Reports for daily inspection results.

TANK CERTIFICATION REPORT
SWMU 02/11: Dye Burial Ground

BAKER TANK No.	ARRIVAL DATE	BAKER TEST REPORT(S) RECEIVED	ONSITE INSPECTION (signature/date)	COMMENTS
GS505EA (F)	10JAN97	Level I dated 1-10-97	1/10/97	
S1885EA (F)	24JAN97	LEVEL I DATED 8-16-95 LEVEL II DATED 4-5-95	1/24/97	
SDE1EA (F)	23JAN97		1/23/97	
S650NEA (F)	10JAN97	Level III dated 11-9-94 *	1/10/97	* Level I dated 1-10-97
GS522EA (F)	10JAN97	Level I dated 1-10-97	1/10/97	
1001MEA (F)	25JAN97	LEVEL I DATED 11-14-96	1/25/97	No distinguishable odors
MB280 (M)	26JAN97	Level II dated 1-24-97	1/26/97	
MB281 (M)	25JAN97	Level II dated 1-24-97	1/25/97	No interior sheens or distinguishable odors

Morrison Knudsen Corporation
NSWC-Crane. IN 4324-0009

Note 1. (F) = FRAC Tank
(M) = Mud box

Note 2. Onsite inspection verified general appearance, noticeable damages, free of residual products.

Note 3. Refer MK Daily Reports for daily inspection results.

RECEIVED
JUN 9 1997
MK-CRANE

RECEIVED
JUN 05 1997
MK CORP

5090
Code 18011
4 June 97
NAV/MKC-362

Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square 1 Suite 211
North Charleston, SC 29406

Subj: CONTRACT N62467-93-D-1106, DELIVERY ORDER 27, RESPONSE ACTION CONTRACT, NSWC CRANE, IN

Gentlemen:

This letter is to serve as technical direction for the following actions at SWMU 16/16:

Take the necessary action to remove, sample and dispose of sediments in both sumps.

You shall proceed promptly with the performance of this technical direction. You are to provide a budgetary impact of this direction to the Contracting Officer within 5 days of its issuance. If in your opinion, this direction falls within any of the categories defined in paragraph (b) of clause G8, Technical Direction, of your contract, you shall promptly notify the Contracting Officer in writing. You shall take no action until the Contracting Officer has issued a modification to the delivery order or otherwise resolved the issue.

If you have any questions, contact Jimmy Jones, Code 18011, at 803-820-5544 or DSN 583-5544.

J. F. Jones
J. F. Jones
COTR RAC II

Copy to:
Code 0232RH
Code 1864
Code 0514
Brent Robertson- NTR NSWC Crane

NSWC - CRANE
NTR NSWC Crane

PROJECT MEMBER	ACT	INFO	INIT
PROJECT MANAGER		X	
PROJECT ENGINEER			
GNL SUPT		X	
SAFETY AND HEALTH			
QA/QC		X	
PROJECT CONTROLS			
FIELD ENGINEERING			
PMO-CHARLESTON			
T. Dogal	X		
R. Spurgeon	X		
FILE: S. Cory	X		
FILE:			
FILE: 11.012 F			

4324

DIST	1	A	R
PM	✓		
PjM	✓		
PCM	✓		
CAM	✓		
BM			
PURCH			
OCM			
SAFETY			
BEAU	✓		
MUNSON	✓		
File	11-2.27 11-0		

N-2

Residual Sediments Analytical Data

TOLTEST, INC.

300 Highway 361, P.O. Box 629
Crane, Indiana
Phone: (812) 854-6941; FAX: (812) 854-6944

Date: 4/13/99

Attention: Kimball Ohsick	FAX No: 208/386-6669
Company:	Phone No:
From: Peter Chevalier	Project No:
Re:	☐ *Check here if hard copy to be mailed*

DBG Mud box composite sample

• *Toledo* • *Detroit* • *Plymouth* • *Monroe* • *Pittsburgh*
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MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

CoC # 147

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 4394-0009-07-30

Project Name: NSWC Crane

Samplers: (Signature)

Sampler: (Print) Peter J. Chabalier Peter J. Chabalier

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Spill Samples Yes	Spill Samples No	RCRA Metals	Base Scan	Remarks
Soil	From mud box decon (in 4 drums) composite	11/13/98	0946	NSWC-02/11-10		✓	✓	✓	Dye Burial Grounds

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

Seal #s 4816, 4917

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SWC021110

Lab Name: SWL-TULSA Contract: NSWC CRANE

Lab Code: SWOK Case No.: MKF-OH SAS No.: SDG No.: 36420

Matrix: (soil/water) SOIL Lab Sample ID: 36420.01

Sample wt/vol: 31.7 (g/mL) G Lab File ID: V24123.D

Level: (low/med) LOW Date Received: 11/17/98

% Moisture: not dec. 14 dec. Date Extracted: 11/17/98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 11/19/98

Concentrated Extract Volume: 1000(uL)

GPC Cleanup: (Y/N) N pH: 6.8 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	360	U
111-44-4	bis(2-Chloroethyl)ether	360	U
95-57-8	2-Chlorophenol	360	U
541-73-1	1,3-Dichlorobenzene	360	U
106-46-7	1,4-Dichlorobenzene	360	U
100-51-6	Benzyl alcohol	360	U
95-50-1	1,2-Dichlorobenzene	360	U
95-48-7	2-Methylphenol	360	U
108-60-1	bis(2-Chloroisopropyl)ether	360	U
106-44-5	4-Methylphenol	360	U
621-64-7	N-Nitroso-di-n-propylamine	360	U
67-72-1	Hexachloroethane	360	U
98-95-3	Nitrobenzene	360	U
78-59-1	Isophorone	360	U
88-75-5	2-Nitrophenol	360	U
105-67-9	2,4-Dimethylphenol	360	U
65-85-0	Benzoic Acid	1800	U
111-91-1	bis(2-Chloroethoxy)methane	360	U
120-83-2	2,4-Dichlorophenol	360	U
120-82-1	1,2,4-Trichlorobenzene	360	U
91-20-3	Naphthalene	65	J
106-47-8	4-Chloroaniline	360	U
87-68-3	Hexachlorobutadiene	360	U
59-50-7	4-Chloro-3-methylphenol	360	U
91-57-6	2-Methylnaphthalene	360	U
77-47-4	Hexachlorocyclopentadiene	360	U
88-06-2	2,4,6-Trichlorophenol	360	U
95-95-4	2,4,5-Trichlorophenol	1800	U
91-58-7	2-Chloronaphthalene	360	U
88-74-4	2-Nitroaniline	1800	U
131-11-3	Dimethylphthalate	360	U
208-96-8	Acenaphthylene	290	J
606-20-2	2,6-Dinitrotoluene	360	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SWC021110

Lab Name: SWL-TULSA Contract: NSWC CRANE

Lab Code: SWOK Case No.: MKF-OH SAS No.: SDG No.: 36420

Matrix: (soil/water) SOIL Lab Sample ID: 36420.01

Sample wt/vol: 31.7 (g/mL) G Lab File ID: V24123.D

Level: (low/med) LOW Date Received: 11/17/98

% Moisture: not dec. 14 dec. Date Extracted: 11/17/98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 11/19/98

Concentrated Extract Volume: 1000(uL)

GPC Cleanup: (Y/N) N pH: 6.8 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
99-09-2	3-Nitroaniline	1800	U	
83-32-9	Acenaphthene	360	U	
121-14-2	2,4-Dinitrotoluene	360	U	
51-28-5	2,4-Dinitrophenol	1800	U	
100-02-7	4-Nitrophenol	1800	U	
132-64-9	Dibenzofuran	360	U	
84-66-2	Diethylphthalate	360	U	
7005-72-3	4-Chlorophenyl-phenylether	360	U	
86-73-7	Fluorene	37	J	
100-01-6	4-Nitroaniline	1800	U	
534-52-1	4,6-Dinitro-2-methylphenol	1800	U	
86-30-6	N-Nitrosodiphenylamine (1)	360	U	
101-55-3	4-Bromophenylphenylether	360	U	
118-74-1	Hexachlorobenzene	360	U	
87-86-5	Pentachlorophenol	1800	U	
85-01-8	Phenanthrene	570		660
120-12-7	Anthracene	150	J	
84-74-2	Di-n-butylphthalate	360	U	
206-44-0	Fluoranthene	810		1,600,000
129-00-0	Pyrene	1300		1,200,000
85-68-7	Butylbenzylphthalate	360	U	
91-94-1	3,3'-Dichlorobenzidine	730	U	
56-55-3	Benzo(a)anthracene	350	J	
218-01-9	Chrysene	390		800
117-81-7	bis(2-Ethylhexyl)phthalate	86	J	
117-84-0	Di-n-octylphthalate	340	J	
205-99-2	Benzo(b)fluoranthene	340	J	
207-08-9	Benzo(k)fluoranthene	380		660
50-32-8	Benzo(a)pyrene	510		660
193-39-5	Indeno(1,2,3-cd)pyrene	210	J	
53-70-3	Dibenz(a,h)anthracene	360	U	
191-24-2	Benzo(g,h,i)perylene	350	J	

(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1
INORGANIC ANALYSES DATA SHEET

CLIENT SAMPLE ID

NSWC021110

Lab Name: SOUTHWEST_LAB_OF_OK Contract: MKF-OH
Lab Code: SWOK Case No.: 36420 SAS No.: SDG No.: 36420
Matrix (soil/water): SOIL Lab Sample ID: 36420.01
Level (low/med): LOW Date Received: 11/17/98
% Solids: 85.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7440-38-2	Arsenic	7.7			P	0.97
7440-39-3	Barium	106			P	—
7440-43-9	Cadmium	0.24	B		P	39.0
7440-47-3	Chromium	112			P	990.0
7439-92-1	Lead	333			P	500.0
7439-97-6	Mercury	0.04	U		AV	23.0
7782-49-2	Selenium	1.1			P	390.0
7440-22-4	Silver	0.14	U		P	390.0

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: Artifacts:

Comments:
CLIENT_ID= NSWC-02/11-10