

LINER SYSTEM INFORMATION

Layfield Environmental Systems Ltd.

**Project Completion QA/QC Package
for**

Kugaaruk Fuel Storage Facility

Kugaaruk (Pelly Bay), Nunavut Territory

Installation of HDPE Liner

Prepared By: Josh Bagnall

Reviewed By: Fred Cross

Date Submitted: February 21, 2006





CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE SURFACE

PROJECT NAME: LANDFARM

PROJECT NUMBER: 046-057

OWNER: KUDLIK

LOCATION: CELL 4 BAY

I, the undersigned, a duly appointed representative of Layfield Plastics (1978) Ltd. (LPL), have visually observed the soil subgrade surface described below, and found it to be an acceptable surface on which to install geomembrane.

This certification is based on observations of the surface of the subgrade only. No subterranean inspections or tests have been performed by Layfield Plastics, and LPL makes no representations or warranties regarding conditions which may exist below the surface of the subgrade. Layfield Plastics accepts no responsibility for conformance of the subgrade to this project's specifications.

The soil subgrade surface accepted on this date refers to its present condition. Any changes in the subgrade condition that result from the effects of inclement weather and/or other forces beyond the control of Layfield Plastics and remedial work to correct the resulting deficiencies, will be the direct responsibility of the General Contractor.

Area Being Accepted: 70' GOING ECT FROM WEST TOP OF BERM
FOR THE FULL WIDTH OF CELL.

LAYFIELD PLASTICS REPRESENTATIVE:

Date: SEPTEMBER 12, 2004

Signature: [Signature]

Name: MARC DENNIS

Title: SUPERVISOR

OWNERS REPRESENTATIVE

Date: _____

Name: _____

Signature: [Signature]

Title: _____

Company: _____

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE SURFACE

PROJECT NAME: LAWSON
PROJECT NUMBER: 04C-057
OWNER: KUULIK
LOCATION: KUGAARUK, NUNAVUT

I, the undersigned, a duly appointed representative of Layfield Plastics (1978) Ltd. (LPL), have visually observed the soil subgrade surface described below, and found it to be an acceptable surface on which to install geomembrane.

This certification is based on observations of the surface of the subgrade only. No subterranean inspections or tests have been performed by Layfield Plastics, and LPL makes no representations or warranties regarding conditions which may exist below the surface of the subgrade. Layfield Plastics accepts no responsibility for conformance of the subgrade to this project's specifications.

The soil subgrade surface accepted on this date refers to its present condition. Any changes in the subgrade condition that result from the effects of inclement weather and/or other forces beyond the control of Layfield Plastics and remedial work to correct the resulting deficiencies, will be the direct responsibility of the General Contractor.

Area Being Accepted: 55' ADDITIONAL FEET GOING EAST FOR
THE FULL WIDTH OF CELL.

LAYFIELD PLASTICS REPRESENTATIVE:

Date: SEPTEMBER 13, 2004
Signature: [Signature]
Name: MARC DENNIS
Title: SUPERVISOR

OWNERS REPRESENTATIVE

Date: _____
Name: _____
Signature: [Signature]
Title: _____
Company: _____

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE SURFACE

PROJECT NAME: LALID FARM
PROJECT NUMBER: 04C-057
OWNER: KUSLIK
LOCATION: KUGAAROK, NUNAVUT

I, the undersigned, a duly appointed representative of Layfield Plastics (1978) Ltd. (LPL), have visually observed the soil subgrade surface described below, and found it to be an acceptable surface on which to install geomembrane.

This certification is based on observations of the surface of the subgrade only. No subterranean inspections or tests have been performed by Layfield Plastics, and LPL makes no representations or warranties regarding conditions which may exist below the surface of the subgrade. Layfield Plastics accepts no responsibility for conformance of the subgrade to this projects's specifications.

The soil subgrade surface accepted on this date refers to its present condition. Any changes in the subgrade condition that result from the effects of inclement weather and/or other forces beyond the control of Layfield Plastics and remedial work to correct the resulting deficiencies, will be the direct responsibility of the General Contractor.

Area Being Accepted: ADDITIONAL 70 FEET IN THE FULL WIDTH
OF CELL GOING EAST.

LAYFIELD PLASTICS REPRESENTATIVE :

Date: SEPTEMBER 14, 2004
Signature: [Signature]
Name: MARC DEMERS
Title: SUPERVISOR

OWNERS REPRESENTATIVE

Date: _____
Name: _____
Signature: [Signature]
Title: _____
Company: _____

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE SURFACE

PROJECT NAME: LAND FARM
PROJECT NUMBER: 046-057
OWNER: KUDLIK
LOCATION: KUGAARUK, UNNAVUT

I, the undersigned, a duly appointed representative of Layfield Plastics (1978) Ltd. (LPL), have visually observed the soil subgrade surface described below, and found it to be an acceptable surface on which to install geomembrane.

This certification is based on observations of the surface of the subgrade only. No subterranean inspections or tests have been performed by Layfield Plastics, and LPL makes no representations or warranties regarding conditions which may exist below the surface of the subgrade. Layfield Plastics accepts no responsibility for conformance of the subgrade to this projects's specifications.

The soil subgrade surface accepted on this date refers to its present condition. Any changes in the subgrade condition that result from the effects of inclement weather and/or other forces beyond the control of Layfield Plastics and remedial work to correct the resulting deficiencies, will be the direct responsibility of the General Contractor.

Area Being Accepted: ADDITIONAL 115 FEET GOING EAST FOR THE
FULL WIDTH, EXCEPT THE ACCESS ROAD.

LAYFIELD PLASTICS REPRESENTATIVE :

Date: SEPT. 16, 2004
Signature: [Signature]
Name: MARC HENKES
Title: SUPERVISOR

OWNERS REPRESENTATIVE

Date: _____
Name: _____
Signature: [Signature]
Title: _____
Company: _____

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE SURFACE

PROJECT NAME: LANDFARM
PROJECT NUMBER: 04C-957
OWNER: KULIK
LOCATION: KUGAARUK, Nunavut

I, the undersigned, a duly appointed representative of Layfield Plastics (1978) Ltd. (LPL), have visually observed the soil subgrade surface described below, and found it to be an acceptable surface on which to install geomembrane.

This certification is based on observations of the surface of the subgrade only. No subterranean inspections or tests have been performed by Layfield Plastics, and LPL makes no representations or warranties regarding conditions which may exist below the surface of the subgrade. Layfield Plastics accepts no responsibility for conformance of the subgrade to this project's specifications.

The soil subgrade surface accepted on this date refers to its present condition. Any changes in the subgrade condition that result from the effects of inclement weather and/or other forces beyond the control of Layfield Plastics and remedial work to correct the resulting deficiencies, will be the direct responsibility of the General Contractor.

Area Being Accepted: THE CELL IN ITS ENTIRETY

LAYFIELD PLASTICS REPRESENTATIVE :

Date: SEPTEMBER 17, 2004
Signature: [Signature]
Name: MARC DENNIS
Title: SUPERVISOR

OWNERS REPRESENTATIVE

Date: _____
Name: _____
Signature: [Signature]
Title: _____
Company: _____

CERTIFICATE OF FINAL INSPECTION AND ACCEPTANCE

PROJECT NAME: LANDFARM
PROJECT NUMBER: 042-057
OWNER: KUDLIK DATE: SEPT. 19, 2004
LOCATION: KUGAARUK, NUNAVUT

Scope of Installation(s): THE WORK
INSTALLATION OF 24 PANELS OF HDPE 60MIL LINER
WITH LAY 10 GEOTEXTILE UNDERLAY FOR ENTIRE
LINING SURFACE AND OVERLAY UP TO PANEL 8
EST EDGE AND ALL SLOPS FOR THE REST OF CELL OVERLAY
IS AFTER 6" INCHES OF SAND.

Part 1 - LAYFIELD ENVIRONMENTAL SYSTEMS LTD.

I, MARC DEMERS, a duly appointed representative of Layfield Environmental Systems Ltd. (LESL), have visually observed the installations (as outlined above), and have found the Work to be complete and free of defects and declare that the Work was completed in accordance with the project specifications, Layfield Environmental Systems' QC program and the terms and conditions of the contract.

Layfield Environmental Systems Representative:

Name: MARC DEMERS
Title: SUPERVISOR
Date: SEPT. 19, 2004 Signature: [Signature]

Part 2 - OWNER (or Representative)

I, _____, a duly appointed representative of _____, do hereby take over and accept the installation(s) described above, and confirm that the work has been completed in accordance with the project specifications and the terms of the conditions of the contract.

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

Owners Representative:

Name: _____
Title: _____
Company: _____
Date: _____ Signature: [Signature]

Comments: _____



1. NORTH ARROW ? W
2. REPAIR NUMBERS & LOCATIONS ? see
3. SITE DESCRIPTIONS ? C
4. SLOPE LENGTHS ? W
5. TITLE BLOCKS COMPLETED ? C
6. CONT. OF SURVEY ACCEPTANCE ? C
7. CONT. OF FINAL ACCEPTANCE ? S

1) SEAM NUMBERS SHOWN ON TESTING LOG SHEETS REPRESENT THE ADJACENT PANEL NUMBERS.

CHANGE IN GRADE
LINER FIELD SEAM
ANCHOR TRENCH
PANEL NUMBER
PIPE PENETRATION
REPAIR NUMBER
PATCH
EXTRUSION BEAD (OR WELD)



PROJECT NAME, COUNTY, LOCATION, MAP, TYPE, ETC.
WAZZAN
WAZZAN
WAZZAN
WAZZAN

SCALE: N.T.S.	PROJECT No.
DWG: 3 of 3	046-SS-1
DWNG IN CHG.	APPD.
DATE: 10/1/84	



LAYFIELD GEOSYNTHETICS INVENTORY LOG

PROJECT NUMBER: 040-087

PROJECT TITLE: CAN. 5 CARD

OWNER: KUSLIK

CONTRACTOR: KUPLIK

LOCATION: KOLARU

SHEET NUMBER: 1

MATERIAL TYPE: GEOMEMBRANE

GEONET GEOTEXTILE OTHER

DATE OF ARRIVAL: SEP. 11, 2004

DATE OF INVENTORY: SEPT 11, 2004

UNLOADING METHOD: 25-AVA76.2

INVENTORY BY: MARC DEMERS

PRODUCT TYPE: WIRE TEXTURE

CONDITION IN TRUCK: GOOD

MATERIAL MANUFACTURER: GSC

[illegible]SUBMITTED BY: [Signature]

DATE: OCT. 3, 2004



GEOMEMBRANE DEPLOYMENT LOG

PROJECT NUMBER: 042-057

PROJECT TITLE: LANDFARM

OWNER: KUDLIK

CONTRACTOR: KUDLIK

LOCATION: KUGAAROK

GEOMEMBRANE SECONDARY PRIMARY CLOSURE OTHER

SUBGRADE CONDITION (SURFACE COMPACTION, PROTRUSION, DESICCATION, EXCESSIVE MOISTURE):

REMARKS: LD 10 GEOTEXTILE UNDERLAY

DATE: SEPT. 12, 2004

SHEET NUMBER: 1

DEPLOYMENT EQUIPMENT: EXCAVATOR

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>1251</u>	<u>1251</u>	<u>1251</u>
DEPLOYMENT LENGTH	<u>167 22'</u>	<u>167</u>	<u>67</u>
AMBIENT AIR TEMP.	<u>12°C</u>	<u>12°C</u>	<u>12°C</u>
VISUAL OBSERVATION	<u>5"</u>	<u>5"</u>	<u>5"</u>
OBSERVED OVERLAP	<u>N.D.</u>	<u>N.D.</u>	<u>N.D.</u>
CHECKED BY			
ADJACENT PANEL	N= <u>2</u> S= <u>4</u> E= <u>2</u> W= <u>2</u>	N= <u>3-4</u> S= <u>1</u> E= <u>3-4</u> W= <u>1</u>	N= <u>4</u> S= <u>4</u> E= <u>5</u> W= <u>2</u>
PANEL/ROLL NUMBER	<u>1482</u>		
DEPLOYMENT LENGTH	<u>100</u>		
AMBIENT AIR TEMP.	<u>12°C</u>		
VISUAL OBSERVATION	<u>5"</u>		
OBSERVED OVERLAP	<u>N.D.</u>		
CHECKED BY			
ADJACENT PANEL	N= <u>3</u> S= <u>4</u> E= <u>5</u> W= <u>2</u>		
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= <u>3</u> S= <u>4</u> E= <u>5</u> W= <u>2</u>		
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= <u>3</u> S= <u>4</u> E= <u>5</u> W= <u>2</u>		

SUBMITTED BY: [Signature]

DATE: SEPT. 3, 2004



GEOMEMBRANE DEPLOYMENT LOG

PROJECT NUMBER: 646-057

PROJECT TITLE: LANDFARM

OWNER: KUDLIK

CONTRACTOR: KUDLIK

LOCATION: KUGARUK

GEOMEMBRANE

SECONDARY

PRIMARY

CLOSURE

OTHER

SUBGRADE CONDITION (SURFACE COMPACTION, PROTRUSION, DESICCATION, EXCESSIVE MOISTURE):

REMARKS: LP 10 UNDERLAY

DATE: SEPT 13

SHEET NUMBER: 2

DEPLOYMENT EQUIPMENT: EXCAVATOR

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>1482</u>	<u>1482</u>	<u>1482 473</u>
DEPLOYMENT LENGTH	<u>169</u>	<u>80</u>	<u>92</u>
AMBIENT AIR TEMP.	<u>14°C</u>	<u>14°C</u>	<u>14°C</u>
VISUAL OBSERVATION	<u>5"</u>	<u>5"</u>	<u>5"</u>
OBSERVED OVERLAP	<u>N.D.</u>	<u>N.D.</u>	<u>N.D.</u>
CHECKED BY			
ADJACENT PANEL	N= <u>6-7</u> S= <u>3-4</u>	N= <u>7</u> S= <u>5</u>	N= <u>6</u> S= <u>5</u>
	E= <u>6-7</u> W= <u>3-4</u>	E= <u>8</u> W= <u>5</u>	E= <u>5</u> W= <u>5</u>
DESCRIPTION	PANEL LOCATION REFERENCE NUMBER <u>8</u>	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>3473</u>		
DEPLOYMENT LENGTH	<u>174</u>		
AMBIENT AIR TEMP.	<u>14°C</u>		
VISUAL OBSERVATION	<u>5"</u>		
OBSERVED OVERLAP	<u>N.D.</u>		
CHECKED BY			
ADJACENT PANEL	N= <u>9-10</u> S= <u>6-7</u>	N= S=	N= S=
	E= <u>9-10</u> W= <u>6-7</u>	E= W=	E= W=
DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= S=	N= S=	N= S=
	E= W=	E= W=	E= W=
DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= S=	N= S=	N= S=
	E= W=	E= W=	E= W=

SUBMITTED BY: [Signature]

DATE: Oct. 4, 2004



GEOMEMBRANE DEPLOYMENT LOG

PROJECT NUMBER: 04C-057

PROJECT TITLE: LAUREL PARK

OWNER: KUHLER

CONTRACTOR: KUHLER

LOCATION: KUCARUK

GEOMEMBRANE SECONDARY PRIMARY CLOSURE OTHER

SUBGRADE CONDITION (SURFACE COMPACTION, PROTRUSION, DESICCATION, EXCESSIVE MOISTURE):

REMARKS: LEAD UNDERLAY

DATE: SEP 14, 2004

SHEET NUMBER: 3

DEPLOYMENT EQUIPMENT: EXCAVATOR

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER <u>9</u>	PANEL LOCATION REFERENCE NUMBER <u>10</u>	PANEL LOCATION REFERENCE NUMBER <u>11</u>
PANEL/ROLL NUMBER	<u>3473</u>	<u>1520</u>	<u>1520</u>
DEPLOYMENT LENGTH	<u>130</u>	<u>54</u>	<u>151</u>
AMBIENT AIR TEMP.	<u>5"</u>	<u>5"</u>	<u>5"</u>
VISUAL OBSERVATION	<u>5"</u>	<u>5"</u>	<u>5"</u>
OBSERVED OVERLAP	<u>5"</u>	<u>5"</u>	<u>5"</u>
CHECKED BY	<u>5"</u>	<u>5"</u>	<u>5"</u>
ADJACENT PANEL	N= <u>10</u> S= <u>8</u> E= <u>11</u> W= <u>8</u>	N= <u>9</u> S= <u>9</u> E= <u>11</u> W= <u>8</u>	N= <u>9</u> S= <u>9</u> E= <u>11</u> W= <u>1-16</u>

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER <u>12</u>	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>24100</u>		
DEPLOYMENT LENGTH	<u>201</u> <u>230</u>		
AMBIENT AIR TEMP.	<u>5"</u>		
VISUAL OBSERVATION	<u>5"</u>		
OBSERVED OVERLAP	<u>5"</u>		
CHECKED BY	<u>5"</u>		
ADJACENT PANEL	N= <u>13</u> S= <u>11</u> E= <u>13</u> W= <u>11</u>	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>	N= <u>12</u> S= <u>12</u> E= <u>12</u> W= <u>12</u>

SUBMITTED BY: FW

DATE: SEP 13, 2004



GEOMEMBRANE DEPLOYMENT LOG

PROJECT NUMBER: 040-057PROJECT TITLE: LANDFILLOWNER: KUDOLIKCONTRACTOR: KUDOLIKLOCATION: KUDOLIK

GEOMEMBRANE

SECONDARY

TERTIARY

CLOSURE

OTHER

SUBGRADE CONDITION (SURFACE COMPACTION, PROTRUSION, DESICCATION, EXCESSIVE MOISTURE):

REMARKS: LO 10 LUXALAYDATE: SEPT 16, 2004SHEET NUMBER: 4DEPLOYMENT EQUIPMENT: EXCAVATOR

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>24108</u>
DEPLOYMENT LENGTH	<u>201</u>
AMBIENT AIR TEMP.	<u>60C</u>
VISUAL OBSERVATION	<u>5"</u>
OBSERVED OVERLAP	<u>N.D.</u>
CHECKED BY	
ADJACENT PANEL	N= S= E=14-K W=12

PANEL LOCATION REFERENCE NUMBER
<u>14</u>
<u>24108</u>
<u>110</u>
<u>60C</u>
<u>5"</u>
<u>N.D.</u>
N= S=15 E=16 W=13

PANEL LOCATION REFERENCE NUMBER
<u>15</u>
<u>24115 B</u>
<u>57</u>
<u>60C</u>
<u>5"</u>
<u>N.D.</u>
N=14 S= E=16 W=13

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>24115 B</u>
DEPLOYMENT LENGTH	<u>148</u>
AMBIENT AIR TEMP.	<u>60C</u>
VISUAL OBSERVATION	<u>5"</u>
OBSERVED OVERLAP	<u>N.D.</u>
CHECKED BY	
ADJACENT PANEL	N= S= E=17 W=14-K

PANEL LOCATION REFERENCE NUMBER
<u>17</u>
<u>24115 B</u>
<u>128</u>
<u>60C</u>
<u>5"</u>
<u>N.D.</u>
N= S= E=18 W=16

PANEL LOCATION REFERENCE NUMBER
<u>18</u>
<u>24115 B</u>
<u>167</u>
<u>60C</u>
<u>5"</u>
<u>N.D.</u>
N= S= E= W=17

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	
DEPLOYMENT LENGTH	
AMBIENT AIR TEMP.	
VISUAL OBSERVATION	
OBSERVED OVERLAP	
CHECKED BY	
ADJACENT PANEL	N= S= E= W=

PANEL LOCATION REFERENCE NUMBER
N= S= E= W=

PANEL LOCATION REFERENCE NUMBER
N= S= E= W=

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	
DEPLOYMENT LENGTH	
AMBIENT AIR TEMP.	
VISUAL OBSERVATION	
OBSERVED OVERLAP	
CHECKED BY	
ADJACENT PANEL	N= S= E= W=

PANEL LOCATION REFERENCE NUMBER
N= S= E= W=

PANEL LOCATION REFERENCE NUMBER
N= S= E= W=

SUBMITTED BY: [Signature]DATE: SEP 13, 2004



GEOMEMBRANE TRIAL SEAM LOG

PROJECT NUMBER: 04C-057
PROJECT TITLE: LAYFIELD
OWNER: KOSCIUSKO
CONTACTOR: KOSCIUSKO
LOCATION: KOSCIUSKO
SHEET NUMBER: 2

TF - # FUSION TX - # = EXTRUSION TS - # = SOLVENT

SAMPLE NUMBER	APPROX. TIME & DATE	WELDING MACHINE NUMBER	WELD TECH.	TEMPERATURES			TEST RESULTS				PASS OR RETEST	CHECKED BY	REMARKS		
				AMBIENT AIR TEMP.	PREHEAT OR MACHINE SPEED	EXTRUDER	WEDGE TEMP.	INSIDE PEEL MODE STRENGTH	OUTSIDE PEEL MODE STRENGTH	SHEAR MODE STRENGTH					
TF1	1:20 9-12	DEMTECH 2	N.D.	12°C	300		850°F	154/141	167/159	183/160	157/140	215/1212	P	N.D.	TEXTURE
TF2	8:10 9-13	DEMTECH 2	N.D.	84°C	300		850°F	143/143	154/142	160/150	143/143	207/1210	P	N.D.	TEXTURE
TF3	9:20 9-14	DEMTECH 2	N.D.	8°C	300		850°F	150/154	160/155	140/149	160/149	212/1214	P	N.D.	TEXTURE
TF4	5:10 9-14	DEMTECH 2	N.D.	8°C	300		850°F	150/148	163/170	146/146	155/146	217/1215	P	N.D.	SMOOTH TO TEXTURE
TF5	8:00 9-16	DEMTECH 2	N.D.	6°C	540 300		870°F	170/169	173/163	173/172	166/157	257/1257	P	N.D.	SMOOTH TO
TF6	9:00 9-16	DEMTECH 2	N.D.	6°C	300		870°F	161/160	171/157	157/174	157/174	213/1220	P	N.D.	TEXTURE
TF7	9:00 9-17	DEMTECH 2	N.D.	8°C	540		870°F	166/172	153/162	157/167	154/152	254/1249	P	N.D.	SMOOTH TO
TF8	10:00 9-17	DEMTECH 2	N.D.	12°C	300		870°F	158/152	161/148	165/160	148/160	234/1234	P	N.D.	TEXTURE
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			
								171/171	167/155	170/170	155/170	170/170			</



GEOMEMBRANE DEPLOYMENT LOG

PROJECT NUMBER: 540-001

PROJECT TITLE: LOUSIANA

OWNER: W. C. S. C. I.

CONTRACTOR: W. C. S. C. I.

LOCATION: W. C. S. C. I.

GEO MEMBRANE

SECONDARY

PRIMARY

CLOSURE

OTHER

SUBGRADE CONDITION (SURFACE COMPACTION, PROTRUSION, DESICCATION, EXCESSIVE MOISTURE):

REMARKS: COUS

DATE: SEPT. 17, 2004

SHEET NUMBER: 5

DEPLOYMENT EQUIPMENT: EXCAVATOR

DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER	<u>24115 B</u>	<u>24115 B</u>	<u>Y</u>
DEPLOYMENT LENGTH	<u>70</u>	<u>70</u>	<u>11</u>
AMBIENT AIR TEMP.	<u>17°C</u>	<u>17°C</u>	<u>17°C</u>
VISUAL OBSERVATION	<u>5"</u>	<u>5"</u>	<u>5"</u>
OBSERVED OVERLAP	<u>5"</u>	<u>5"</u>	<u>5"</u>
CHECKED BY	<u>W. C. S. C. I.</u>	<u>W. C. S. C. I.</u>	<u>W. C. S. C. I.</u>
ADJACENT PANEL	N= <u>21</u> S= <u>19</u> E= <u>21</u> W= <u>19</u>	N= <u>21</u> S= <u>13</u> E= <u>22</u> W= <u>19</u>	N= <u>22</u> S= <u>22</u> E= <u>22</u> W= <u>19</u>
DESCRIPTION	PANEL LOCATION REFERENCE NUMBER <u>22</u>	PANEL LOCATION REFERENCE NUMBER <u>23</u>	PANEL LOCATION REFERENCE NUMBER <u>24</u>
PANEL/ROLL NUMBER	<u>Y</u>	<u>Y</u>	<u>Y</u>
DEPLOYMENT LENGTH	<u>57</u>	<u>15-1</u>	<u>11</u>
AMBIENT AIR TEMP.	<u>17°C</u>	<u>17°C</u>	<u>17°C</u>
VISUAL OBSERVATION	<u>5"</u>	<u>5"</u>	<u>5"</u>
OBSERVED OVERLAP	<u>5"</u>	<u>5"</u>	<u>5"</u>
CHECKED BY	<u>W. C. S. C. I.</u>	<u>W. C. S. C. I.</u>	<u>W. C. S. C. I.</u>
ADJACENT PANEL	N= <u>25</u> S= <u>25</u> E= <u>21</u> W= <u>21</u>	N= <u>11</u> S= <u>1</u> E= <u>11</u> W= <u>13</u>	N= <u>23</u> S= <u>13</u> E= <u>23</u> W= <u>13</u>
DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= S=	N= S=	N= S=
	E= W=	E= W=	E= W=
DESCRIPTION	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER	PANEL LOCATION REFERENCE NUMBER
PANEL/ROLL NUMBER			
DEPLOYMENT LENGTH			
AMBIENT AIR TEMP.			
VISUAL OBSERVATION			
OBSERVED OVERLAP			
CHECKED BY			
ADJACENT PANEL	N= S=	N= S=	N= S=
	E= W=	E= W=	E= W=

SUBMITTED BY: W. C. S. C. I.

DATE: SEPT. 3, 2004



LAYFIELD

PROJECT NUMBER: 04C-057

OWNER: Kyocera

LOCATION: ~~YUSSA~~ ~~YUSSA~~

PROJECT TITLE: LAND REFORM

CONTACTOR: KODAK

× FUSION

EXTRUSION

SOLVENT

155	1:20	2:2

SHEET NUMBER: 1

DATE: SEPT 17, 2002

PASSING TRIAL SEAMS

[illegible]

3563	DAILY TOTAL
------	-------------

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR, OR A POINT LOCATION ON THE SEAM.

SUBMITTED BY: A

DATE: OCT 2 2001

LS FORM 4

LAYFIELD ENVIRONMENTAL SYSTEMS



LAYFIELD

GEOMEMBRANE SEAM LOG

PROJECT NUMBER: 046-057

PROJECT TITLE: LAND FARM

OWNER: KODOLIK

CONTACTOR: KODOLIK

LOCATION: KODOLIK

X FUSION

EXTRUSION

SOLVENT

NO. TIME TECH ID

152	8:10	M.D.

SHEET NUMBER: 2

DATE: SEP. 13, 2004

PASSING TRIAL SEAMS

SEAM NUMBER	SEAM SECTION * START POINT FINISH POINT	APPROX. START TIME	AMB. AIR TEMP.	WELD TECH.	PREHEAT OR MACH. SPEED	MACHINE TEMPERATURES		APPROX. LENGTH WELDED	DESTR. NUMBER	CHK'D BY	REMARKS	NON-DESTRUCTIVE	
						DIGITAL SET WEDGE OR BARREL	DIGITAL SET WEDGE OR BARREL					TEST DATE	CHECKED BY
3-4/5	SEAS - NEAS	10:05	14°C	M.D.	300	850°F	-	167		M.D.		9-13	M.D.
6-17	SEAS - NEAS	5:00	14°C	M.D.	300	850°F	-	22.4		M.D.		9-14	M.D.
5-16-7	SEAS - NEAS	3:20	14°C	M.D.	300	850°F	-	169		M.D.		9-15	M.D.
6-7-8	SEAS - NEAS	6:40	14°C	M.D.	300	850°F	-	172		M.D.		9-14	M.D.
/	-												
/	-												
/	-												
/	-												
/	-												
/	-												
/	-												
DAILY TOTAL												570.5	

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR, OR A POINT LOCATION ON THE SEAM.

SUBMITTED BY: KODOLIK
DATE: SEP. 13, 2004

LAYFIELD ENVIRONMENTAL SYSTEMS



LAYFIELD

GEOMEMBRANE SEAM LOG

PROJECT NUMBER: 0400-057

PROJECT TITLE: LANDFARM

OWNER: KODOLAK

CONTACTOR: KODOLAK

LOCATION: 7600 N. 1300 E.

PREPARED TRIAL SEAMS

<u>X</u> FUSION	NO.	TIME	TECH ID
	743	9:20	N.D.
EXTRUSION	744	5:10	N.D.
SOLVENT			

SHEET NUMBER: 3
DATE: SEPT 14, 2004

SEAM NUMBER	SEAM SECTION * START POINT	FINISH POINT	APPROX. START TIME	AMB. AIR TEMP.	WELD TECH.	PREHEAT OR MACH. SPEED	MACHINE TEMPERATURES		APPROX. LENGTH WELDED	DESTR. NUMBER	CHK'D BY	REMARKS	NON-DESTRUCTIVE	
							DIGITAL SET WEDGE OR BARREL	DIGITAL SET WEDGE OR BARREL					TEST DATE	CHECKED BY
8710	5005	10005	9:55	8°C	N.D.	300	850°F	-	175		N.D.		9-15	N.D.
7110	0005	10005	9:50	8°C	N.D.	300	850°F	-	22		N.D.		9-15	N.D.
9011	5005	10005	2:30	8°C	N.D.	300	850°F	-	154		N.D.		9-15	N.D.
11112	5005	10005	5:40	8°C	N.D.	300	850°F	-	201		N.D.		9-15	N.D.
/	-	-					-	-						
/	-	-					-	-						
/	-	-					-	-						
/	-	-					-	-						
/	-	-					-	-						
/	-	-					-	-						
/	-	-					-	-						
DAILY TOTAL										582				

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR, OR A POINT LOCATION ON THE SEAM.

SUBMITTED BY: W. W. W.

DATE: SEPT 13, 2004

IS FORM 4

LAYFIELD ENVIRONMENTAL SYSTEMS



LAYFIELD

GEOMEMBRANE SEAM LOG

PROJECT NUMBER: 500-057

PROJECT TITLE: LANDFARM

OWNER: KOSCIUSKO

CONTACTOR: KOSCIUSKO

LOCATION: KOSCIUSKO

PASSING TYPICAL SEAMS

SHEET NUMBER: 4
DATE: SEP 16, 2004

NO.	TIME	TECH ID
1	8:00	M.D.
2	8:10	M.D.
3		
4		

FUSION
EXTRUSION
SOLVENT

SEAM NUMBER	SEAM SECTION * START POINT FINISH POINT	APPROX. START TIME	AMB. AIR TEMP.	WELD TECH.	PREHEAT OR MACH. SPEED	MACHINE TEMPERATURES		APPROX. LENGTH WELDED	DESTR. NUMBER	CHK'D BY	REMARKS	NON-DESTRUCTIVE	
						DIGITAL SET WEDGE OR BARREL	DIGITAL SET WEDGE OR BARREL					TEST DATE	CHECKED BY
12/15	5005-0205	8:30	60°	M.D.	540	850° F	-	264		M.D.		7-16	M.D.
13/15	5005-0205	10:40	60°	M.D.	540	850° F	-	167		M.D.		7-16	M.D.
14/16	5005-0205	11:30	60°	M.D.	540	850° F	-	148		M.D.		7-16	M.D.
14/15	5005-0205	10:35	60°	M.D.	300	850° F	-	23		M.D.		7-16	M.D.
16/17	5005-0205	4:00	60°	M.D.	540	850° F	-	128		M.D.		7-16	M.D.
17/18	5005-0205	5:25	60°	M.D.	540	850° F	-	107		M.D.		7-16	M.D.
1													
1													
1													
1													
DAILY TOTAL								777					

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR, OR A POINT LOCATION ON THE SEAM.

SUBMITTED BY: [Signature]
DATE: OCT 13, 2004

LAYFIELD ENVIRONMENTAL SYSTEMS

LS FORM 4



LAYFIELD

GEOMEMBRANE SEAM LOG

PROJECT NUMBER: 040-051

PROJECT TITLE: LEASE ROAD

OWNER: KODOLIK

CONTACTOR: KODOLIK

LOCATION: Valley way

PASSING TRIAL SEAMS

FUSION

TIME

NO.

TECH ID

757	8:00	757
758	10:00	758

EXTRUSION

SOLVENT

SHEET NUMBER: 5

DATE: OCT 17, 2004

SEAM NUMBER	SEAM SECTION * START POINT FINISH POINT	APPROX. START TIME	AMB. AIR TEMP.	WELD TECH.	PREHEAT OR MACH. SPEED	MACHINE TEMPERATURES			APPROX. LENGTH WELDED	DESTR. NUMBER	CHK'D BY	REMARKS	NON- DESTRUCTIVE	
						DIGITAL SET WEDGE OR BARREL	DIGITAL SET WEDGE OR BARREL	TEST DATE					CHECKED BY	
18/19	5605 - 5605	5:20	17°C	N.M.	540	850°F	-	-	73		N.M.		7-18	N.M.
19/20	5605 - 5605	10:30	17°C	N.M.	540	850°F	-	-	73		N.M.		7-18	N.M.
20/21	5605 - 5605	10:20	17°C	N.M.	300	850°F	-	-	57		N.M.		7-18	N.M.
21/22	5605 - 5605	11:15	17°C	N.M.	300	850°F	-	-	184		N.M.		7-18	N.M.
22/23	5605 - 5605	2:25	17°C	N.M.	540	850°F	-	-	191		N.M.		7-18	N.M.
23/24	5605 - 5605	3:40	17°C	N.M.	300	850°F	-	-	412		N.M.		7-18	N.M.
24/25	5605 - 5605	4:20	17°C	N.M.			-	-						
25/26	5605 - 5605						-	-						
26/27	5605 - 5605						-	-						
27/28	5605 - 5605						-	-						
28/29	5605 - 5605						-	-						
29/30	5605 - 5605						-	-						
30/31	5605 - 5605						-	-						
31/32	5605 - 5605						-	-						
32/33	5605 - 5605						-	-						
33/34	5605 - 5605						-	-						
34/35	5605 - 5605						-	-						
35/36	5605 - 5605						-	-						
36/37	5605 - 5605						-	-						
37/38	5605 - 5605						-	-						
38/39	5605 - 5605						-	-						
39/40	5605 - 5605						-	-						
40/41	5605 - 5605						-	-						
41/42	5605 - 5605						-	-						
42/43	5605 - 5605						-	-						
43/44	5605 - 5605						-	-						
44/45	5605 - 5605						-	-						
45/46	5605 - 5605						-	-						
46/47	5605 - 5605						-	-						
47/48	5605 - 5605						-	-						
48/49	5605 - 5605						-	-						
49/50	5605 - 5605						-	-						
50/51	5605 - 5605						-	-						
51/52	5605 - 5605						-	-						
52/53	5605 - 5605						-	-						
53/54	5605 - 5605						-	-						
54/55	5605 - 5605						-	-						
55/56	5605 - 5605						-	-						
56/57	5605 - 5605						-	-						
57/58	5605 - 5605						-	-						
58/59	5605 - 5605						-	-						
59/60	5605 - 5605						-	-						
60/61	5605 - 5605						-	-						
61/62	5605 - 5605						-	-						
62/63	5605 - 5605						-	-						
63/64	5605 - 5605						-	-						
64/65	5605 - 5605						-	-						
65/66	5605 - 5605						-	-						
66/67	5605 - 5605						-	-						
67/68	5605 - 5605						-	-						
68/69	5605 - 5605						-	-						
69/70	5605 - 5605						-	-						
70/71	5605 - 5605						-	-						
71/72	5605 - 5605						-	-						
72/73	5605 - 5605						-	-						
73/74	5605 - 5605						-	-						
74/75	5605 - 5605						-	-						
75/76	5605 - 5605						-	-						
76/77	5605 - 5605						-	-						
77/78	5605 - 5605						-	-						
78/79	5605 - 5605						-	-						
79/80	5605 - 5605						-	-						
80/81	5605 - 5605						-	-						
81/82	5605 - 5605						-	-						
82/83	5605 - 5605						-	-						
83/84	5605 - 5605						-	-						
84/85	5605 - 5605						-	-						
85/86	5605 - 5605						-	-						
86/87	5605 - 5605						-	-						
87/88	5605 - 5605						-	-						
88/89	5605 - 5605						-	-						
89/90	5605 - 5605						-	-						
90/91	5605 - 5605						-	-						
91/92	5605 - 5605						-	-						
92/93	5605 - 5605						-	-						
93/94	5605 - 5605						-	-						
94/95	5605 - 5605						-	-						
95/96	5605 - 5605						-	-						
96/97	5605 - 5605						-	-						
97/98	5605 - 5605						-	-						
98/99	5605 - 5605						-	-						
99/100	5605 - 5605						-	-						
100/101	5605 - 5605						-	-						
101/102	5605 - 5605						-	-						
102/103	5605 - 5605						-	-						
103/104	5605 - 5605						-	-						
104/105	5605 - 5605						-	-						
105/106	5605 - 5605						-	-						
106/107	5605 - 5605						-	-						
107/108	5605 - 5605						-	-						
108/109	5605 - 5605						-	-						
109/110	5605 - 5605						-	-						
110/111	5605 - 5605						-	-						
111/112	5605 - 5605						-	-						
112/113	5605 - 5605						-	-						
113/114	5605 - 5605						-	-						
114/115	5605 - 5605						-	-						
115/116	5605 - 5605						-	-						
116/117	5605 - 5605						-	-						
117/118	5605 - 5605						-	-						
118/119	5605 - 5605						-	-						
119/120	5605 - 5605						-	-						
120/121	5605 - 5605						-	-						
121/122	5605 - 5605						-	-						
122/123	5605 - 5605						-	-						
123/124	5605 - 5605						-	-						
124/125	5605 - 5605						-	-						
125/126	5605 - 5605						-	-						
126/127	5605 - 5605						-	-						
127/128	5605 - 5605						-	-						
128/129	5605 - 5605						-	-						
129/130	5605 - 5605						-	-						
130/131	5605 - 5605						-	-						
131/132	5605 - 5605						-	-						
132/133	5605 - 5605						-	-						
133/134	5605 - 5605						-	-						
134/135	5605 - 5605						-	-						
135/136	5605 - 5605						-	-						
136/137	5605 - 5605						-	-						
137/138	5605 - 5605						-	-						
138/139	5605 - 5605						-	-						
139/140	5605 - 5605						-	-						
140/141	5605 - 5605						-	-						
141/142	5605 - 5605						-	-						
142/143	5605 - 5605						-	-						
143/144	5605 - 5605						-	-						
144/145	5605 - 5605						-	-						
145/146	5605 - 5605						-	-						
146/147	5605 - 5605						-	-						
147/148	5605 - 5605						-	-						
148/149	5605 - 5605						-	-						
149/150	5605 - 5605						-	-						
150/151	5605 - 5605						-	-						
151/152	5605 - 5605						-	-						
152/153	5605 - 5605						-	-						
153/154	5605 - 5605													



LAYFIELD

GEOMEMBRANE SEAM PRESSURE TEST LOG

PROJECT NUMBER: 044-657

PROJECT TITLE: LAND FARM

OWNER: KODOLIK

CONTRACTOR: KODOLIK

LOCATION: KULAPARUK

DATE: SEP. 13, 2004

SHEET NUMBER: 2

SEAM NUMBER	SEAM SECTION * FROM TO	TECH. ID	PRESSURE START FINISH	TIME START FINISH	RESULTS PASS / FAIL	SEAM COMPLETE NO YES	CHECKED BY	REMARKS **
1 12	SE05 - 10	N.D.	39 : 38	2:25 : 2:30	P	-	N.D.	
2 13	SE05 - 405	N.D.	37 : 37	1:10 : 1:15	P	-	N.D.	
2 14	NE05 - SE05	N.D.	39 : 38	1:10 : 1:15	P	-	N.D.	
3 14	KE05 - WE05	N.D.	35 : 34	11:52 : 12:01	P	-	N.D.	
3 15	NE05 - 10	N.D.	40 : 39	2:35 : 2:40	P	-	N.D.	
4 15	SE05 - 10	N.D.	38 : 38	1:10 : 1:15	P	-	N.D.	
4 15	10 - NE05	N.D.	35 : 34	1:01 : 1:06		-	N.D.	
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT ON THE SEAM.

** RECORD ANY QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS.

DATE: OCT. 13, 2004

SUBMITTED BY: [Signature]



LAYFIELD

GEOMEMBRANE SEAM PRESSURE TEST LOG

PROJECT NUMBER: Q-11-057

OWNER: KODOLIK

LOCATION: KUGAARUK

PROJECT TITLE: LAND FARM

CONTRACTOR: KODOLIK

DATE: SEPT. 14, 2001

SHEET NUMBER: 2

SEAM NUMBER	SEAM SECTION *	TECH. ID	PRESSURE START FINISH	TIME START FINISH	RESULTS PASS / FAIL	SEAM COMPLETE NO YES	CHECKED BY	REMARKS **
3 15	SE03 - 10	N.D.	40 : 39	10:10 : 10:15	P	-	N.D.	
6 17	SE05 - 18	N.D.	30 : 30	4:30 : 4:35	P	-	N.D.	
6 17	18 - SE03	N.D.	38 : 38	4:44 : 4:54	P	-	N.D.	
6 18	SE03 - SE05	N.D.	35 : 35	4:52 : 4:57	P	-	N.D.	
5 17	SE05 - 17	N.D.	35 : 35	4:56 : 4:58	P	-	N.D.	
5 17	17 - SE05	N.D.	38 : 38	4:58 : 4:58	P	-	N.D.	
7 18	SE05 - 24	N.D.	37 : 37	4:57 : 4:56	P	-	N.D.	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
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1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT ON THE SEAM.

** RECORD ANY QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS.

DATE: OCT 2, 2001

SUBMITTED BY: [Signature]

LS FORM 5

LAYFIELD ENVIRONMENTAL SYSTEMS



LAYFIELD

GEOMEMBRANE SEAM PRESSURE TEST LOG

PROJECT NUMBER: 045-657

OWNER: KGS Linc

LOCATION: KUGA RAIL

PROJECT TITLE: LAYFIELD

CONTRACTOR: KUGA RAIL

DATE: SEP 15, 2004

SHEET NUMBER: 3

SEAM NUMBER	SEAM SECTION * FROM TO	TECH ID	PRESSURE START FINISH	TIME START FINISH	RESULTS PASS/FAIL	SEAM COMPLETE NO YES	CHECKED BY	REMARKS **
5 16	NEOS - 2B	M.A.	37 :36	4:52 :4:57	P	-	M.A.	
5 16	2B - SEOS	M.A.	38 :36	4:52 :4:57	P	-	M.A.	
7 18	SEOS - 2A	M.A.	35 :35	4:52 :4:57	P	-	M.A.	
8 19	NEOS - SEOS	M.A.	44 :43	1:31 :1:36	P	-	M.A.	
8 110	SEOS - NEOS	M.A.	39 :37	1:31 :1:36	P	-	M.A.	
9 110	NEOS - SEOS	M.A.	46 :46	1:30 :1:35	P	-	M.A.	
10 111	SEOS - NEOS	M.A.	38 :58	4:51 :4:56	P	-	M.A.	
11 111	NEOS - 2B	M.A.	36 :36	5:00 :5:05	P	-	M.A.	
11 112	NEOS - SEOS	M.A.	35 :35	1:30 :1:35	P	-	M.A.	
1	-							
1	-							
1	-							
1	-							
1	-							
1	-							
1	-							
1	-							
1	-							

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT ON THE SEAM.

** RECORD ANY QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS.

LS FORM 5

LAYFIELD ENVIRONMENTAL SYSTEMS

DATE: SEP 15, 2004

SUBMITTED BY: M.A.



LAYFIELD

GEOMEMBRANE SEAM PRESSURE TEST LOG

PROJECT NUMBER: 540057PROJECT TITLE: LAND FARMOWNER: WorthingtonCONTRACTOR: KUMBLARLOCATION: PULLY WAYDATE: SEP 16, 2004SHEET NUMBER: 4

SEAM NUMBER	SEAM SECTION * FROM TO	TECH. ID	PRESSURE START FINISH	TIME START FINISH	RESULTS PASS/FAIL	SEAM COMPLETE NO YES	CHECKED BY	REMARKS **
12 / 13	5205 - 0205	M.D.	35 : 35	2:04 : 2:07	P	- L	M.D.	
13 / 14	5205 - 5205	M.D.	35 : 35	2:04 : 2:07	P	- L	M.D.	
13 / 14	5205 - 0205	M.D.	35 : 35	2:04 : 2:07	P	- L	M.D.	
14 / 15	4205 - 0205	M.D.	37 : 37	2:04 : 2:09	P	- L	M.D.	
14 / 16	5205 - 0205	M.D.	37 : 37	2:03 : 2:03	P	- L	M.D.	
15 / 16	5205 - 5205	M.D.	35 : 35	2:03 : 2:03	P	- L	M.D.	
15 / 17	5205 - 0205	M.D.	35 : 35	2:03 : 2:03	P	- L	M.D.	
16 / 17	24 - 0205	M.D.	35 : 35	4:55 : 5:00	P	- L	M.D.	
16 / 17	24 - 0205	M.D.	35 : 35	4:58 : 5:03	P	- L	M.D.	
17 / 18	5205 - 0205	M.D.	35 : 35	5:48 : 5:53	P	- L	M.D.	
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		
/	-		:	:		-		

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT ON THE SEAM.

** RECORD ANY QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS.

DATE: SEP 13, 2004SUBMITTED BY: [Signature]

LS FORM 5

LAYFIELD ENVIRONMENTAL SYSTEMS



Layfield

GEOMEMBRANE SEAM PRESSURE TEST LOG

PROJECT NUMBER: 0-15-057

PROJECT TITLE: LANDFILL

OWNER: KANSAS

CONTRACTOR: MCDONALD

LOCATION: Valley Day

DATE: Sept. 19, 2004

SHEET NUMBER: 5

SEAM NUMBER	SEAM SECTION *	TECH. ID	PRESSURE START FINISH	TIME START FINISH	RESULTS PASS/FAIL	SEAM COMPLETE NO YES	CHECKED BY	REMARKS **
117	5000 - 10000	M.D.	37 37	8:03 8:35	P	-	M.D.	
118	5000 - 10000	M.D.	35 35	8:35 8:36	P	-	M.D.	
119	5000 - 10000	M.D.	35 35	8:37 8:44	P	-	M.D.	
120	5000 - 10000	M.D.	41 41	8:34 8:38	P	-	M.D.	
121	5000 - 10000	M.D.	42 42	8:34 8:39	P	-	M.D.	
122	5000 - 10000	M.D.	36 36	8:36 8:38	P	-	M.D.	
123	5000 - 10000	M.D.	36 36	8:36 8:38	P	-	M.D.	
124	5000 - 10000	M.D.	38 38	8:37 8:42	P	-	M.D.	
125	5000 - 10000	M.D.	35 35	8:41 8:44	P	-	M.D.	
126	5000 - 10000	M.D.	36 36	8:41 8:44	P	-	M.D.	
127	5000 - 10000	M.D.	36 36	8:41 8:44	P	-	M.D.	
128	5000 - 10000	M.D.	39 39	8:40 8:45	P	-	M.D.	
129	5000 - 10000	M.D.	35 35	8:35 8:38	P	-	M.D.	
130	5000 - 10000	M.D.	42 42	8:35 8:38	P	-	M.D.	
1	-							
1	-							

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT ON THE SEAM.

** RECORD ANY QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS.

DATE: 09-20-2004

SUBMITTED BY: [Signature]



LAYFIELD GEOMEMBRANE VACUUM / AIR LANCE TEST LOG

PROJECT NUMBER: 040-057 PROJECT TITLE: LANDFARM
OWNER: KODOLK CONTRACTOR: KODOLK
LOCATION: KUGSAROR DATE: SEPTEMBER 14, 2004

VACUUM BOX ✓ AIR LANCE ✓ SHEET NUMBER: 1

SEAMS										REPAIRS					
SEAM NUMBER	SEAM SECTION * FROM TO	TEST DATE	TECH ID	DEFECTS **	SEAM COMPLETE NO YES	CHK'D BY	REMARKS **	DEFECT CODE	TEST DATE	TECH ID	DEFECTS **	CHK'D BY	REMARKS **		
	-							1 A	9-13	P.D.		P.D.			
	-							1 B	9-13	P.D.		P.D.			
	-							1 C	9-13	P.D.		P.D.			
	-							1 D	9-13	P.D.		P.D.			
	-							1 E	9-13	P.D.		P.D.			
	-							1 F	9-13	P.D.		P.D.			
	-							1 G	9-13	P.D.		P.D.			
	-							1 H	9-13	P.D.		P.D.			
	-							1 I	9-13	P.D.		P.D.			
	-							1 J	9-13	P.D.		P.D.			
	-							1 K	9-13	P.D.		P.D.			
	-							1 L	9-13	P.D.		P.D.			
	-							1 M	9-13	P.D.		P.D.			
	-							1 N	9-13	P.D.		P.D.			
	-							1 O	9-13	P.D.		P.D.			
	-							1 P	9-14	P.D.		P.D.			
	-							1 Q	9-14	P.D.		P.D.			
	-							1 R	9-14	P.D.		P.D.			
	-							1 S	9-14	P.D.		P.D.			
	-							1 T	9-14	P.D.		P.D.			

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT LOCATION ON THE SEAM

** RECORD QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS

PROJECT NUMBER: 642-057

CONTRACTOR: KUDLICK

LOCATION: W 4 C 4 1 2 2 2

VACUUM BOX **X**

[illegible]

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EOS), A REPAIR NUMBER, OR A POINT LOCATION ON THE SEAM

*** RECORD QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS

LS FORM 6

Layfield Environmental Systems

SUBMITTED BY: Wendy A. S.
DATE: 5/30/04


LAYFIELD

PROJECT NUMBER: 04C-657

PROJECT NUMBER: DUK-657

PROJECT TITLE: LAND FARM

OWNER: Koushik

CONTRACTOR: KODAK

LOCATION: KCSGA 1124

DATE: SEPT. 18, 2001

VACUUM BOX X

AIR LANCE

SHEET NUMBER: 3

[illegible]

* REFERENCE SEAM ENDPOINTS FROM AN END OF SEAM (EGS), A REPAIR NUMBER, OR A POINT LOCATION ON THE SEAM

RECORD QUANTITY OF LEAKS DETECTED AND REFERENCE NEW DEFECT CODE IN REMARKS

LS FORM 6

LAYFIELD ENVIRONMENTAL SYSTEMS

SUBMITTED BY: [Signature]
DATE: 5-20-94



LAYFIELD

GEOMEMBRANE DEFECT / REPAIR LOG

PROJECT NUMBER: 046-057

PROJECT TITLE: LANDFARM

OWNER: KODOLIK

CONTRACTOR: KODOLIK

LOCATION: KODOLIK

SHEET NUMBER: 1

DEFECT CODE	LOG DATE	DEFECT LOCATION		DEFECT TYPE	REPAIR TYPE	WELD TECH.	REPAIR DATE	REMARKS **	TEST DATE	CHECKED BY
		SEAM OR PANEL NO.	DEFECT LOCATION DESCRIPTION							
1A	9-13	P 3	5' S OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1B	9-13	P 2	3' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1C	9-13	P 2	10' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1D	9-13	P 2	16' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1E	9-13	P 2	24' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1F	9-13	P 2	30' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1G	9-13	P 2	37' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1H	9-13	P 2	43' W OF S TOE	W.D.	P	W.D.	9-13	6' E OF S 1-2	9-13	W.D.
1I	9-13	P 2	3' S OF S TOE	W.D.	P	W.D.	9-13	3' W OF S 2-4	9-13	W.D.
1J	9-13	P 2	9' W OF S TOE	W.D.	P	W.D.	9-13	3' W OF S 2-4	9-13	W.D.
1K	9-13	P 4	9' S OF S TOE	W.D.	P	W.D.	9-13	3' E OF S 2-4	9-13	W.D.
1L	9-13	P 2	5' T-4	T	C.W.	W.D.	9-13	3' E OF S 2-4	9-13	W.D.
1M	9-13	P 5	5' 3' W	T	C.W.	W.D.	9-13		9-13	W.D.
1N	9-13	S 1-2	W.D. TO W.D.	W.D.	C.W.	W.D.	9-13		9-13	W.D.
1O	9-14	S 2-5	3' W OF S 3.4 TOE	W.D.	C.W.	W.D.	9-14		9-14	W.D.
1P	9-13	S 4-5	24' W OF S TOE	W.D.	P	W.D.	9-13		9-13	W.D.
1Q	9-14	S 6-7	1'	T	P	W.D.	9-14		9-14	W.D.
1R	9-14	S 6-7	8' W OF S 8	W.D.	P	W.D.	9-14		9-14	W.D.
1S	9-14	S 6-7	P 5	T	C.W.	W.D.	9-14		9-14	W.D.
1T	9-14	S 3-7	33' W OF S 6-7	P	C.W.	W.D.	9-14		9-14	W.D.

DEFECT TYPE: AD - ANIMAL RELATED DAMAGE
 B - UNPERSPECTED RESIN READ
 BO - FUSION WELDER BURN
 BS - ROOTS/STICK FROM FILL PENETRATION
 CO - CHANGE OF OVERLAP
 CR - CREASE
 D - INSTALLATION DAMAGE
 DS - DESTRUCTIVE TEST NUMBER
 REPAIR TYPE: P - PATCH, C - CAP, RS - RECONSTRUCTED SEAM, CW - CROWNFIELD

EXT - EXTENSION
 FM - FISHMOUTH
 FS - FAILED SEAM LENGTH
 FTS - FIELD TEST STRIP
 FT - HEAT TACK BURN
 IO - INSUFFICIENT OVERLAP (UNDER SPEC.)
 MD - MANUFACTURE/DELIVERY DAMAGE

PT - PRESSURE TEST CUT
 SI - SOIL SURFACE IRREGULARITY
 SL - SLAG ON TEXTURED SHEET
 T - THREE PANEL INTERSECTION
 VL - VACUUM TEST LEAK
 WR - WRINKLE
 WS - WELDER RESTART
 OTHER:

PASSING TRAIL SEAMS	
NO.	TIME
TX 1	10:14
TX 2	8:00

** COLUMNS TO BE USED BY THE PROJECT SUPERVISOR OR LEAD TECHNICIAN ONLY.
 LPL FORM 7

LAYFIELD ENVIRONMENTAL SYSTEMS

SUBMITTED BY: W.D.
 DATE: 05/3/2007



GEOMEMBRANE DEFECT / REPAIR LOG

PROJECT TITLE: LAMAR V. A. 2 W

CONTRACTOR: KUDYLIK

SHEET NUMBER: 2

[illegible]

PASSING TRIAL SEAMS		
NO.	TIME	RECORD
7x2	3:00	N.D.
7x3	3:40	N.D.
7x4	4:14	N.D.

SSI - SOIL SURFACE IRREGULARITY
 SSI - SLAG ON TEXTURED SHEET
 T - THREE PANEL INTERSECTION
 VVL - VACUUM TEST LEAK
 WWR - WRINKLE
 WWS - WELDER RESTART
 OTHER:

EXT - EXTENSION
FM - FISHMOUTH
FS - FAILED SEAM LENGTH
FTS - FIELD TEST STRIP
HT - HEAT TACK BURN
ID - INSUFFICIENT OVERLAP (UNDER SPREAD)
MD - MANUFACTURE/DELIVERY DAMAGE
WD - WELD

B. UNDISPERSED RESIN BRAD
BO. FUSION WELDER BURN
BS. BOOT/SKIRT FROM ENL PENETRATION
CO. CHANGE OF OVERLAY
CR. CREASE
D. INSTALLATION DAMAGE
DS# - DESTRUCTIVE TEST NUMBER

REPAIR TYPE: P-PATCH, C-CAP, RS-RECONSTRUCTED SEAM, G&W-GRIND/WELD

**** COLUMNS TO BE USED BY THE PROJECT SUPERVISOR OR LEAD TECHNICIAN ONLY.**

LLPL FORM 7

LAYFIELD ENVIRONMENTAL SYSTEMS



LAYFIELD

PROJECT TITLE: LOW EARTH

CONTRACTOR: KODLIS

SHEET NUMBER: 3

[illegible]

PASSING TRIAL SEAMS		
NO.	TIME	TECHNO.
4 x 5	5:40	M. N.

** COLUMNS TO BE USED BY THE PROJECT SUPERVISOR OR LEAD TECHNICIAN ONLY.
 LPL FORM 7
 LAYFELD ENVIRONMENTAL SYSTEMS

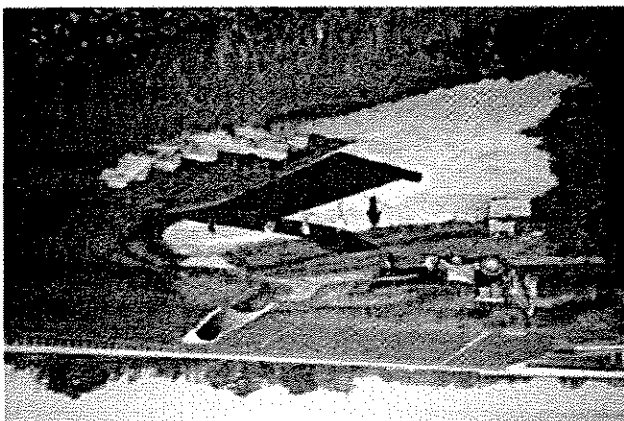
SUBMITTED BY: hwa
DATE: SEP 3 1983



Geotextiles - Nonwoven

Non-woven needle-punched geotextiles offer excellent water flow properties for drainage and other applications.

Needle-punched non-woven geotextiles are made from polypropylene fibres that are tangled together in a needle-punching process. The fibres may be made in continuous or short lengths and achieve their strength by interlocking. Needle-punched non-woven geotextiles have excellent water flow rates and are used for filtration of soil fines. Needle-punched non-woven geotextiles have been used in drainage applications including trench drains, as a wrapping for perforated pipe, for erosion protection, and combined with three-dimensional structures to create prefabricated drains. They are also commonly used with geomembranes to provide a protective cushion. Needle-punched non-woven primary functions: filtration; separation; protection; drainage. Secondary functions: reinforcement.



02 Mar 2006										
Non-Woven Needle-Punched Geotextiles - US Values										
	ASTM	LP3.5	LP4	LP4.5	LP6	LP7	LP8	LP10	LP12	LP16
Grab Tensile (lbs)	D4632	90	100	120	160	180	203	250	300	380
Elongation (%)	D4632	50	50	50	50	50	50	50	50	50
Tear (lbs)	D4533	40	50	50	60	75	85	100	115	140
Puncture (lbs)	D4833	55	65	65	85	100	110	150	175	235
Mullen Burst (psi)	D3786	185	210	230	280	330	350	460	580	750
AOS (sieve)	D4751	50	70	70	70	70	80	100	100	100
Permittivity (sec-1)	D4491	2.0	2.0	1.5	1.3	1.5	1.4	1.2	0.9	0.7
Water Flow (gpm/ft ²)	D4491	150	140	120	110	100	90	80	65	50
Weight ¹ (oz/yd ²)	D5261	3.5	4.0	4.5	5.5	7.0	7.5	9.0	11.5	16.0
Thickness ¹ (mil)	D5199	40	45	50	70	85	85	100	110	165
UV (500 hrs)	D4355	70%	70%	70%	70%	70%	70%	70%	70%	70%
Roll Size (ft)		15 x	15 x	15 x	15 x	15 x	15 x	15 x	15 x	15 x
Roll Weight ¹ (lbs)		360	360	360	300 ²	300 ²	300 ²	300	300	250

Note¹: Typical values. All other values are minimum average roll values (MARV).
Note²: LP6, LP7, and LP8 may be 15 x 360 ft depending on inventory.

Layfield Geosynthetics and Industrial Fabrics Ltd.
 www.geomembranes.com
 service@geomembranes.com
 Fax: 780-455-5218
 Tel: 780-453-6731
 Toll Free: 800-840-2884

Geosynthetics, North America
 Fax: 425-254-1575
 Tel: 425-254-1075
 Toll Free: 800-796-6868

Geosynthetics, US West Coast

Non-Woven Needle-Punched Geotextiles - Metric Values										
02 Mar 2006	ASTM	LP3.5	LP4	LP4.5	LP6	LP7	LP8	LP10	LP12	LP16
Grab Tensile (N)	D4632	400	445	530	710	800	900	1,110	1,330	1,690
Elongation (%)	D4632	50	50	50	50	50	50	50	50	50
Tear (N)	D4533	175	220	220	265	330	375	445	510	622
Puncture (N)	D4833	240	285	285	375	445	485	665	775	1,045
Mullen Burst (kPa)	D3786	1,270	1,445	1,585	1,930	2,275	2,410	3,170	3,995	5,170
AOS (microns)	D4751	300	212	212	212	212	180	150	150	150
Permittivity (sec-1)	D4491	2.0	2.0	1.5	1.3	1.5	1.4	1.2	0.9	0.7
Water Flow (l/min/m ²)	D4491	6,112	5,690	4,885	4,480	4,074	3,657	3,251	2,648	2,035
Weight ¹ (g/m ²)	D5261	115	135	145	185	230	245	310	385	540
Thickness ¹ (mm)	D5199	1.2	1.5	1.3	1.7	2.1	2.1	2.9	3.0	4.1
UV (500 hrs)	D4355	70%	70%	70%	70%	70%	70%	70%	70%	70%
Roll Size (m)		4.57 x	4.57 x	4.57 x	4.57 x	4.57 x	4.57 x	4.57 x	4.57 x	4.57 x
Roll Weight ¹ (kg)		110	110	110	91.4 ²	91.4 ²	91.4 ²	91.4	181	112
Note ¹ : Typical values. All other values are minimum average roll values (MARV).										
Note ² : LP6, LP7, and LP8 may be 4.57 x 110 m depending on inventory.										



Geomembranes - HDPE

High Density Polyethylene (HDPE) is the most common field fabricated geomembrane material.

The popularity of High Density Polyethylene (HDPE) is primarily due to its low initial material cost and excellent chemical resistance. This allows thicker sections to be used compared to other geomembrane materials. A thick, durable, HDPE liner can be placed in exposed applications where the cost of other materials would be prohibitive. HDPE has excellent chemical resistance which is often the driving force behind the selection of HDPE. HDPE is a field assembled lining material that cannot be practically fabricated in the shop. All HDPE projects, regardless of size, must be installed by trained Layfield installers.

HDPE is a versatile material which is used widely across all applications. One of the main uses of HDPE is for landfill base liners where its chemical resistance is used to good effect. HDPE can also be used in a multitude of secondary containment, pond linings, and water containment projects. HDPE is best used as an exposed lining material, and has the UV resistance required for many years of outstanding service.

HDPE Minimum Material Properties										25 Nov 2003
Style	ASTM	HDPE 40	HDPE 60	HDPE 80	HDPE 60	HDPE 80	HDPE 60	HDPE 80	HDPE 60	HDPE 80
Nominal Thickness	D5199	40 mil 1.0 mm	60 mil 1.5 mm	80 mil 2.0 mm	57 mil 1.42 mm	76 mil 1.90 mm				
Density (Untextured)	D792	0.94	0.94	0.94	0.94	0.94				
Tensile Strength Modified Type IV Die	D638	84 psi 14.7 kN/m	126 psi 22.0 kN/m	168 psi 29.0 kN/m	126 psi 22.0 kN/m	168 psi 29.0 kN/m				
	Stress at Yield	14.7 kN/m	22.0 kN/m	29.0 kN/m	22.0 kN/m	29.0 kN/m				
	Stress @ Break	152 psi 26.6 kN/m	225 psi 40.0 kN/m	304 psi 53.0 kN/m	90 psi 15.8 kN/m	120 psi 21.0 kN/m				
	Strain @ Yield 33 mm Gauge	12%	12%	12%	12%	12%				
	Strain @ Break 50 mm Gauge	700%	700%	700%	100%	100%				
Tear Resistance	D1004	28 lbs 125 N	42 lbs 187 N	56 lbs 249 N	42 lbs 187 N	56 lbs 249 N				
Dimensional Stability	D1204 Max Cng.	± 2%	± 2%	± 2%	± 2%	± 2%				
Notched Constant Load ESCR	D5397	200 Hours	200 Hours	200 Hours	200 Hours	200 Hours				
Puncture Resistance	D4833	72 lbs 320 N	108 lbs 480 N	144 lbs 640 N	90 lbs 400 N	120 lbs 534 N				
Carbon Black Content	D1603	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%				
Carbon Black Dispersion	D5596	CAT 1 or 2	CAT 1 or 2	CAT 1 or 2	CAT 1 or 2	CAT 1 or 2				

HDPE Minimum Field Seam Strengths										25 Nov 2003
Style	ASTM	HDPE 40	HDPE 60	HDPE 80	HDPE 60	HDPE 80	HDPE 60	HDPE 80	HDPE 60	HDPE 80
Bonded Seam Strength	Test Temp 23°C, 73°F	80 psi 14 N/mm	120 psi 21 N/mm	160 psi 28 N/mm	120 psi 21 N/mm	160 psi 28 N/mm				
Peel Adhesion Test	Test Temp 23°C, 73°F	FTB 52 psi 9 N/mm	FTB 78 psi 14 N/mm	FTB 104 psi 18 N/mm	FTB 78 psi 14 N/mm	FTB 104 psi 18 N/mm				

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25 Nov 2003		HDPE Minimum Field Seam Strengths				
Style	ASTM	HDPE 40 Smooth	HDPE 60 Smooth	HDPE 80 Smooth	HDPE 60 Textured	HDPE 80 Textured
Bonded Seam Strength Test Temp 23°C, 73°F	D6392	80 ppi 14 N/mm	120 ppi 21 N/mm	160 ppi 28 N/mm	120 ppi 21 N/mm	160 ppi 28 N/mm
Peel Adhesion Test Test Temp 23°C, 73°F	D6392	FTB 52 ppi 9 N/mm	FTB 78 ppi 14 N/mm	FTB 104 ppi 18 N/mm	FTB 78 ppi 14 N/mm	FTB 104 ppi 18 N/mm

Since HDPE is a field fabricated material welding and testing need to be completed with great care.

The extrusion welder was the first welding technique developed for HDPE. It is a thickness dependant technique that requires a minimum material thickness to create an effective weld without distortion. Extrusion welds in sheet less than 1.0 mm (40 mil) thick are not recommended. Extrusion welds in 1.0 mm (40 mil) HDPE show some distortion and can sometimes be very difficult to prepare around intricate pipe penetrations and mechanical attachments. 1.5 mm (60 mil) HDPE can be reliably extrusion welded in most situations and is recommended in most applications. Welds in 2.0 and 2.5 mm (80 mil and 100 mil) are excellent and are recommended in applications that require exceptional durability. Extrusion welds are very slow and are typically used only for repairs and details. Extrusion welds are very difficult to prepare on vertical or overhead walls, and require a minimum clearance of 1 m (3 ft). This is especially important in sump details where a minimum clearance must be maintained underneath the lowest pipe penetration.

Hot wedge welders have become the technique of choice for HDPE installers over the past 10 years. Wedge welders are fast, produce excellent welds in sheet from 1.0 mm to 2.5 mm (40 to 100 mil), and can be easily tested. Hot wedge welders today produce two weld tracks separated by a small unbonded channel. By sealing off both ends of this channel, and then pumping it full of air, entire seams can be checked quickly and effectively.

Weather is a major factor in all HDPE lining installations. Precipitation in any form, whether rain, snow, dew, or fog can bring HDPE installation to a halt. Cold weather can slow down an installation, however HDPE has been installed in temperatures as low as -30°C (-20°F). The presence of moisture in the form of frost, snow, and ice are bigger problems than outside air temperatures.

Testing of HDPE seams is done by two methods, depending on the welding technique. On hot wedge welds the Dual Seam Air Pressure test is used. This test utilizes the unbonded space between the two welds as an air channel. The technician seals both ends and inflates the channel. The air pressure in the channel is observed for ten to fifteen minutes and any changes noted. Pass/fail criteria would be written into the job specifications.

Extrusion welds are tested with the Vacuum Box test method. This test is part of ASTM D4437 (method 7.3). A soap solution is flooded onto the area to be tested, a clear box is placed on top, and a vacuum applied to the box. Any bubbles appearing in the seam indicates an unbonded area. Vacuum box testing is suitable for extrusion welds, and for testing other seams and details where an air pressure test is not practical.

EXCERPTS FROM PHASE III ENVIRONMENTAL SITE ASSESSMENT REPORT

Dillon Consulting Limited
February 9, 2001

**Phase III Environmental Site
Assessment - Bulk Fuel
Storage Facility
Kugaaruk, Nunavut**

Revision 1

February 9, 2001

**Phase III Environmental Site Assessment - Bulk Fuel
Storage Facility
Kugaaruk, Nunavut**

Government of Nunavut
Public Works & Services -
Petroleum Products Division

00-7756-1000

Submitted by

**Dillon Consulting
Limited**

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EXECUTIVE SUMMARY

The Department of Public Works and Services - Petroleum Products Division (PPD), retained Dillon Consulting Limited (Dillon), to conduct an environmental investigation of the Bulk Fuel Storage Facility in Kugaaruk, Nunavut. Dillon conducted a Phase III Environmental Site Assessment (ESA) as part of the investigation. The purpose of the investigation was to define the extent of hydrocarbon contamination at the tank farm and to determine probable sources of the contamination.

Phase III ESA activities included the development of 46 test locations, from which 46 soil samples were collected and sent for further chemical analysis to Bodecote Technitrol Inc. in Pointe-Claire, Quebec.

Dillon conducted on site Hydrocarbon Vapor Emissions (HVE) testing using a Gastech 1238 ME instrument. HVE levels, with the aid of visual and olfactory evidence, was used in the selection of sample locations.

Dillon identified and delineated, where possible, five areas of contamination. It is estimated that 3500 m³ of contaminated material is present at the Kugaaruk site. Site contamination consists of BTEX and TPH concentrations above Government of Nunavut recommended industrial land-use criteria.

With the exception of the plume to the south west corner of the site, it is the recommendation of this report that the facility be remediated based on the identified contaminant plumes and the most appropriate remediation technique for this soil is landfarming which involves the excavation of the contaminated soil, storing it on an impermeable liner and tilling the soil in two batches. It is estimated that this method will cost approximately \$18 000 per year and will require an estimated 6 years to complete.

It is likely, however, that the plume to the south west of the site originated from a point source, most likely the P-50 tank. It is recommended that this tank be drained, cleaned and inspected for structural damage and the integrity of the liner under this tank be inspected. The tank floor may be replaced at an estimated cost of \$200 000 to \$300 000. If the liner is no longer in tact, four monitoring wells should be installed around the tank to monitor and deal with product accumulation. These monitoring wells may be installed for approximately \$40 000. As well, an attempt should also be made to quantify the migration of hydrocarbon contamination off-site in this area.

Table 4.1
Borehole Summary

Identification	Sample Depth (m)	Visual Observations	Olfactory Observations	Vapour Headspace Results
PEL-1	0.6-0.8	Olive brown sandy gravel with some cobbles and boulders. No staining. Dry-damp. Refusal @ 0.8m	No odour	5ppm
PEL-2	0.5-0.7	Olive brown sandy gravel with some cobbles and boulders. Some black staining. Dry-damp. Refusal @ 0.7m	Faint odour	50ppm
PEL-3	0.5-0.65	Olive brown sandy gravel with some cobbles and boulders. Some black staining. Dry-moist. Refusal @ 0.65m	Moderate odour	25ppm
PEL-4	0.3-0.5	Olive brown sandy gravel. No staining. Dry-damp. Refusal @ 0.5m	No odour	10ppm
PEL-5	0.5-0.65	Light brown sandy gravel with cobbles and boulders. No staining. Dry-moist. 0.6m-0.65m: black organic rich layer. Refusal @ 0.65m	No odour	40ppm
PEL-6	0.3-0.5	Olive brown sandy gravel with some cobbles and boulders. Major black staining throughout. Dry-moist. Refusal @ 0.5m	Strong hydrocarbon odour	230ppm
PEL-7	0.4-0.6	Olive brown sandy gravel with some cobbles and boulders. No staining. Dry-moist. Refusal @ 0.6m	No odour	25ppm
PEL-8	0.4-0.55	Olive brown sandy gravel with some cobbles and boulders. No staining. Dry-moist. Refusal @ 0.55m	No odour	30ppm
PEL-9	0.4-0.55	Olive brown sandy gravel with some cobbles and boulders. Dry-moist. 0.5m-0.55m: black staining. Refusal @ 0.55m	Moderate odour	60ppm
PEL-10	0.4-0.6	Olive brown sandy gravel with some cobbles and boulders. No staining. Dry-moist. Refusal @ 0.6m	No odour	25ppm

PEL-11	0.1-0.3	Gravelly coarse sand with some gray staining throughout. Dry-damp. Refusal @ 0.3m shallow rock.	Moderate odour	475ppm
PEL-12	0.2-0.4	Light brown gravelly coarse sand with some cobbles and boulders. Black gray staining throughout. Dry-moist. Refusal @ 0.4m	Faint odour	50ppm
PEL-13	0.3-0.5	Light brown gravelly coarse sand with some cobbles and boulders. Some staining on rocks. Dry-moist. Refusal @ 0.5m	Faint odour	30ppm
PEL-14	0.3-0.55	Olive brown sandy gravel with some cobbles and boulders. Moderate gray/black staining. Damp-moist. Refusal @ 0.55m	Moderate odour	75ppm
PEL-15	0.4-0.6	Olive brown gravelly coarse sand with cobbles and boulders. Heavy gray staining throughout. Damp-moist. Refusal @ 0.6m	Moderate odour	5%LEL
PEL-16	0.4-0.6	Olive brown gravelly coarse sand with some silt, cobbles and boulders. Gray/black staining at bottom. Damp-moist. Refusal @ 0.6m	Faint odour	50ppm
PEL-17	0.5-0.7	Olive brown gravelly, medium coarse sand with some silt. Moderate gray staining throughout. Damp-moist. Refusal @ 0.7m	Moderate odour	5%LEL
PEL-18	0.5-0.7	Light gray gravelly sand with some cobbles. Moderate gray staining throughout. Damp-moist. Refusal @ 0.7m	Moderate odour	5%LEL
PEL-19	0.3-0.5	Olive brown gravelly coarse sand with some cobbles. Some staining. Damp-moist. Refusal @ 0.5m	No odour	20ppm
PEL-20	0.3-0.45	Olive brown gravelly coarse sand with some cobbles. Some staining throughout. Damp-moist. Refusal @ 0.45m	Moderate odour	425ppm

PEL-21	0.3-0.5	Olive brown gravelly, medium coarse sand with silt modifier and some cobbles. No staining. Damp-moist. Refusal @ 0.5m	No odour	10ppm
PEL-22	0.3-0.5	Olive brown gravelly coarse sand. No staining. Damp-moist. Refusal @ 0.5m	No odour	10ppm
PEL-23	0.1-0.35	Olive brown gravelly coarse sand. No staining. Damp-moist. Refusal @ 0.35m	Faint odour	40ppm
PEL-24	0.1-0.35	Olive brown gravelly coarse sand. Some black staining throughout. Damp-moist. Refusal @ 0.35m	Moderate odour	5%LEL
PEL-25	0.1-0.35	Grayish brown gravelly sand with some cobbles and boulders. Heavy black staining throughout. Damp-moist. Refusal @ 0.35m	Strong odour	20%LEL
PEL-26	0.3-0.5	Light gray gravelly, medium coarse sand with some cobbles and boulders. Some gray staining. Moist-wet. Water @ 0.5m.	Moderate odour	300ppm
PEL-27	0.2-0.4	Medium coarse sand with silt modifier and some cobbles and boulders. Heavy gray/black staining throughout. Moist-wet. Water @ 0.4m.	Strong odour	225ppm
PEL-28	0.3-0.5	Olive brown medium coarse sand with some cobbles and boulders. Moderate black staining throughout. Damp-moist. Refusal @ 0.5m	Strong odour	450ppm
PEL-29	0.3-0.5	Olive brown medium coarse sand with some cobbles and boulders. Moderate gray/black staining throughout. Dry-damp. Refusal @ 0.5m	Moderate odour	275ppm
PEL-30	0.5-0.75	Olive brown medium coarse sand with cobbles and boulders. Moderate gray/black staining throughout. Moist-wet. Water @ 0.7m.	Moderate odour	10%LEL
PEL-31	0.3-0.5	Olive brown medium coarse sand with silt modifier and some cobbles and boulders. Moderate gray/black staining throughout. Damp-moist. Refusal @ 0.5m	Moderate odour	80ppm

PEL-32	0.5-0.7	Olive brown medium coarse sand with silt modifier and some cobbles and boulders. Heavy gray staining throughout. Moist-wet. Water @ 0.5m.	Moderate odour	80ppm
PEL-33	0.3-0.5	Olive brown gravelly sand with some cobbles and boulders. Some black staining. Damp-moist. Refusal @ 0.5m	Faint odour	20ppm
PEL-34	0.3-0.5	Light gray gravelly, medium coarse sand with silt modifier. Some black staining. Moist-wet. Water @ 0.5m.	Faint odour	15ppm
PEL-35	0.2-0.4	0-0.2m. Rich organic layer. Dark brown gravelly medium coarse sand with some silt. No staining. Damp-moist. Refusal @ 0.4m	Faint odour	35ppm
PEL-36	0.4-0.6	Olive gray medium coarse sand with silt modifier. Moderate gray staining throughout. Moist-wet. Water @ 0.5m.	Faint odour	75ppm
PEL-37	0.2-0.4	Light brown sandy gravel with some cobbles and boulders. No staining. Wet. Water @ 0.2m.	No odour	25ppm
PEL-38	0.4-0.65	Olive brown medium coarse sand with some cobbles and boulders. Some gray staining. Damp-moist. Refusal @ 0.65m	Moderate odour	10% LEL
PEL-39	0.1-0.3	Olive brown medium coarse sand with some cobbles and boulders. Some gray staining. Damp-moist. Refusal @ 0.3m bedrock everywhere.	Moderate odour	450ppm
PEL-40	0.4-0.6	Light brown medium coarse sand with some cobbles and boulders. No staining. Damp-moist. Refusal @ 0.6m	No odour	10ppm
PEL-41	0.4-0.6	Light brown medium coarse sand with some cobbles and boulders. No staining. Damp-moist. Rich organic layer @ 0.5m-0.6m. Refusal @ 0.6m	No odour	20ppm

PEL-42	0.4-0.6	Light brown medium coarse, gravelly sand with some cobbles and boulders. Heavy staining throughout. Damp-moist. Refusal @ 0.6m	Strong odour	50%LEL
PEL-43	0.3-0.5	Light brown medium coarse gravelly sand with some cobbles and boulders. Some black staining. Damp-moist. Refusal @ 0.5m	Faint odour	80ppm
PEL-44	0.5-0.7	Light gray medium coarse sand with silt modifier and some cobbles and boulders. Some staining throughout. Moist-wet. Water @ 0.5m.	Faint odour	25ppm
PEL-45	0.2-0.4	Light brown medium coarse, gravelly sand with some cobbles and boulders. Some staining. Damp-moist. Refusal @ 0.4m	Faint odour	15ppm
PEL-46	0.1-0.3	Light brown medium coarse, gravelly sand with some cobbles and boulders. No staining. Damp-moist. Refusal @ 0.3m	No odour	10ppm

Laboratory Soil Analysis and HVE Results

Sample ID	Parameter Concentrations								TPH (ppm)	HVE (Gastech) *(ppm)
	Benzene (ppm)	Toluene (ppm)	Ethyl- benzene (ppm)	Xylene (ppm)	C ₆ -C ₁₀ (ppm)	C ₁₁ -C ₂₀ (ppm)	C ₂₁ -C ₃₀ (ppm)	C ₃₁ -C ₄₀ (ppm)		
PEL-1	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	5
PEL-2	<0.05	<0.1	<0.1	<0.1	<10	100	100	<50	200	50
PEL-3	<0.05	<0.1	<0.1	<0.1	<10	<50	70	70	140	25
PEL-4	<0.05	<0.1	<0.1	<0.1	<10	<50	1650	2060	3740	10
PEL-5	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	40
PEL-6	<0.05	<0.1	<0.1	<0.1	<10	1640	120	<50	1760	230
PEL-7	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	25
PEL-8	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	30
PEL-9	<0.05	<0.1	<0.1	<0.1	<10	60	<50	<50	60	60
PEL-10	<0.05	<0.1	<0.1	<0.1	<10	240	160	<50	400	25
PEL-11	<0.05	<0.1	<0.1	<0.1	<10	1420	230	<50	1650	475
PEL-12	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	50
PEL-13	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	30
PEL-14	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	75
PEL-15	<0.05	<0.1	<0.1	1.2	58	4000	260	<50	4418	5%LEL
PEL-16	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	50
PEL-17	<0.05	<0.1	<0.1	2.4	89	4700	700	<50	5489	5%LEL
PEL-18	<0.05	<0.1	<0.1	<0.1	23	2000	500	<50	2523	5%LEL
PEL-19	<0.05	<0.1	<0.1	<0.1	<10	<50	740	<50	740	20
PEL-20	<0.05	<0.1	<0.1	<0.1	23	2500	500	<50	3023	425
PEL-21	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	10
PEL-22	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	10
PEL-23	<0.05	<0.1	<0.1	<0.1	<10	310	60	<50	370	40
PEL-24	<0.05	<0.1	<0.1	0.5	48	17000	3300	<50	20348	5%LEL
PEL-25	0.2	3.3	0.3	1.2	35	4800	800	<50	5635	20%LEL
PEL-26	<0.05	<0.1	<0.1	<0.1	<10	80	<50	<50	80	300
PEL-27	<0.05	<0.1	<0.1	<0.1	<10	<50	1200	200	1400	225
PEL-28	<0.05	<0.1	<0.1	0.6	93	3900	600	50	4643	450
PEL-29	<0.05	<0.1	<0.1	<0.1	<10	<50	300	70	270	275
PEL-30	<0.05	<0.1	<0.1	<0.1	120	<50	<50	<50	120	10%LEL
PEL-31	<0.05	<0.1	<0.1	<0.1	<10	<50	110	<50	110	80
PEL-32	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	80
PEL-33	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	20
PEL-34	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	15
PEL-35	<0.05	<0.1	<0.1	<0.1	<10	190	70	<50	260	35
PEL-36	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	75
PEL-37	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	25
PEL-38	<0.05	0.6	<0.1	1.3	152	6400	1000	<50	7582	10%LEL
PEL-39	<0.05	<0.1	<0.1	<0.1	64	2300	460	<50	3824	450
PEL-40	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	10
PEL-41	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	20
PEL-42	<0.05	0.9	<0.5	20	151	4100	210	<50	4461	50%LEL
PEL-43	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	80
PEL-44	<0.05	<0.1	<0.1	<0.1	<10	<50	<50	<50	ND	25
PEL-45	<0.05	<0.1	<0.1	<0.1	<10	<50	160	<50	160	15
PEL-46	<0.05	<0.1	<0.1	<0.1	<10	<50	62	62	140	10
Maximum Industrial Criteria	5	0.8	20	20	NS	NS	NS	NS	2500	-

Notes: ND = Not Detected
NS = Not Specified
BOLD = Above Criteria

*Some Hydrocarbon Vapour Emissions (HVE) are expressed in % LEL as opposed to ppm

5.0 INVESTIGATION SUMMARY

The Kugaaruk Bulk Fuel Storage Facility was investigated to determine the extent of hydrocarbon impacts to soil.

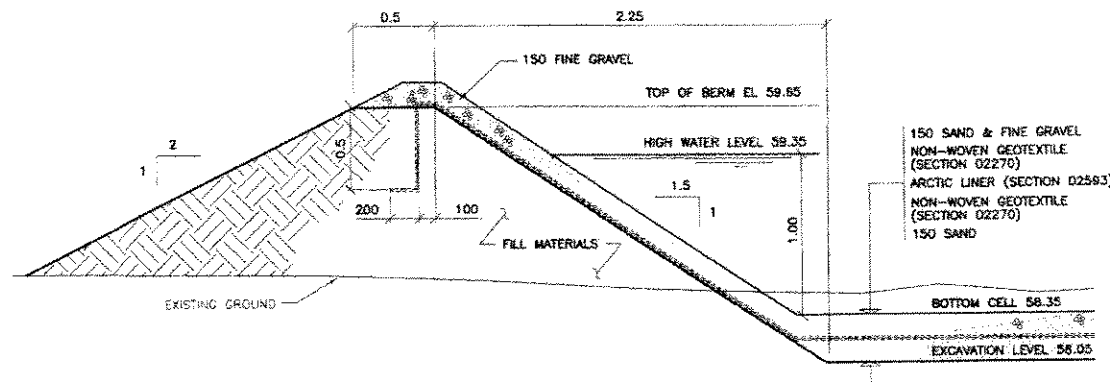
In total, the field investigation included the development of 46 test pits from which 46 soil samples were collected and sent for laboratory analysis. On-site testing techniques were used as an aid in determining test pit locations needed to define the extent of hydrocarbon soil impact. The screening techniques included visual and olfactory observations, and Hydrocarbon Vapour Emission (HVE) readings using a Gastech® 1238 ME instrument.

Selected samples, chosen as confirmations or closure samples from the field investigation were submitted to an independent laboratory for detailed testing. Analytical test parameters included BTEX compounds and Total Petroleum Hydrocarbons (TPH).

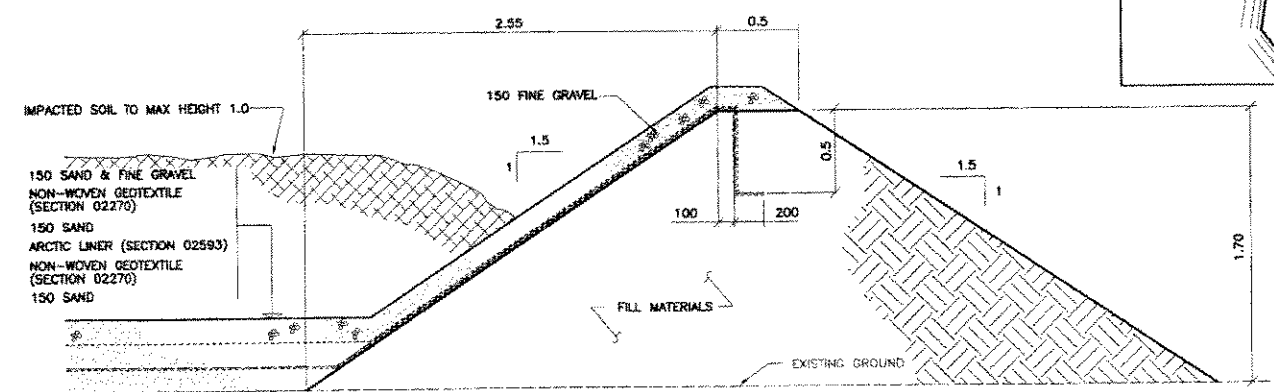
Laboratory results indicated that two samples, Pel-25 and Pel-42, contained BTEX concentrations exceeding industrial land-use criteria while TPH results ranged from non-detectable to 20 348 ppm. Based on gas chromatography results, the major contaminant is most likely a diesel.

It is estimated that 3500 m³ of hydrocarbon contaminated soil above specified guidelines is present on site at the Kugaaruk Bulk Fuel Storage Facility. This estimate is based on the assumption that the volume of impacted soil extends to a depth of 1 m.

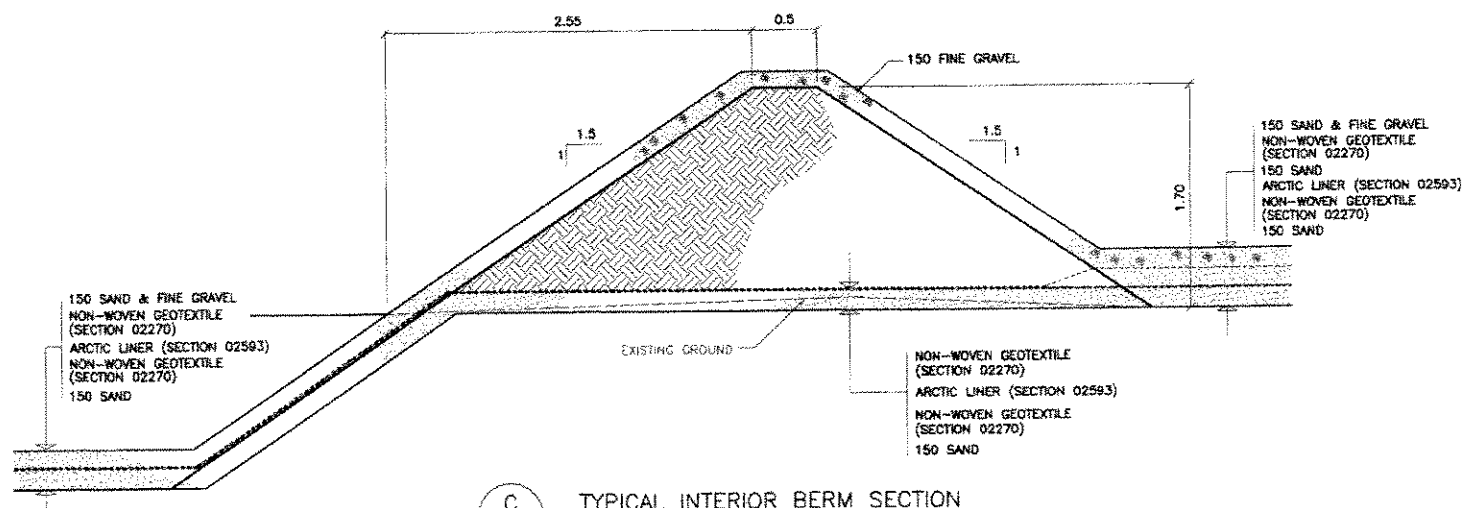
ENGINEERING DRAWINGS



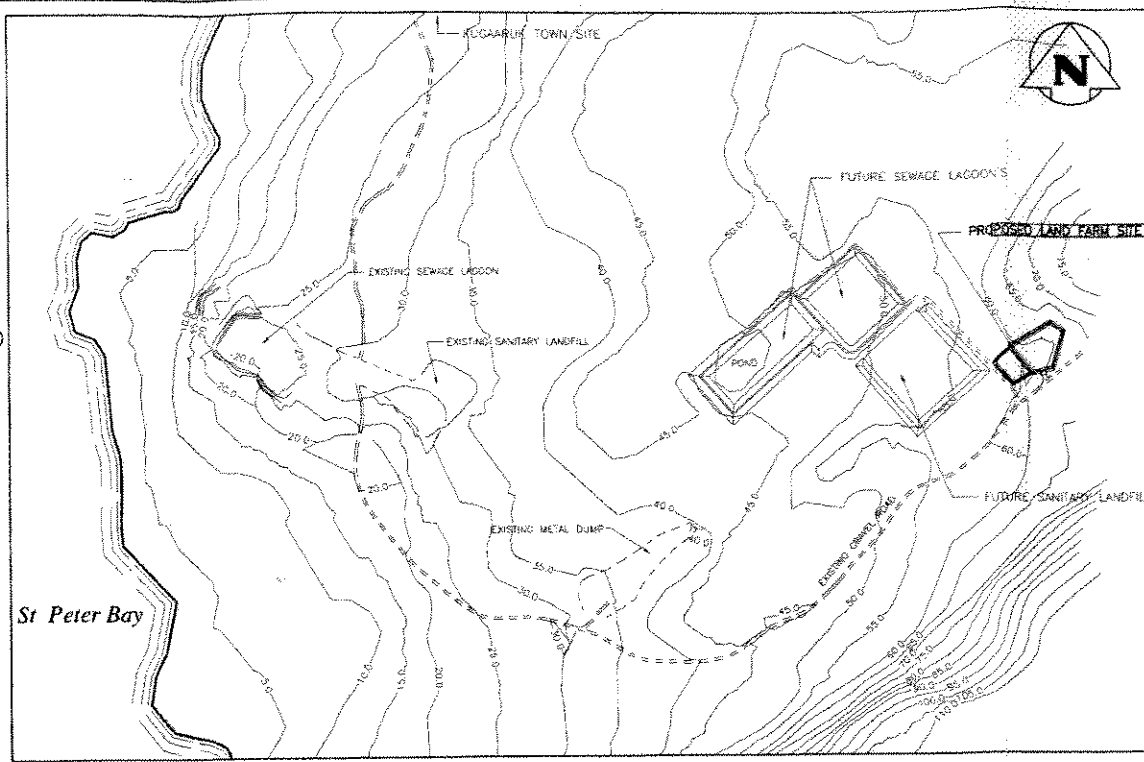
A TYPICAL WATER RUNOFF BERM SECTION
1 : 20



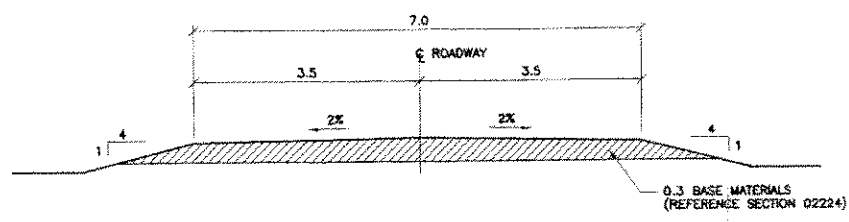
B TYPICAL SOIL BERM SECTION
1 : 20



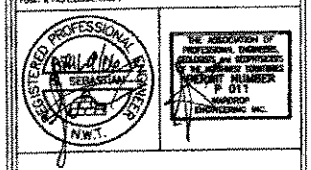
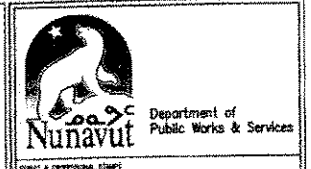
C TYPICAL INTERIOR BERM SECTION
1 : 25



1 LOCATION PLAN
1 : 5000



D ROADWAY SECTION
1 : 50



NOTES

NO.	DATE	DESCRIPTION	BY	CHKD.
1	04.04.22	ISSUED FOR PERMIT APPROVAL	CC	
2				
3				
4				
5				
6				
7				
8				
9				
10				

DESIGN	JOH
DRAWN	CHD
CHECKED	
PROJECT FILE	
FUEL FACILITY EXPANSION/RELOCATION KUGAARUK, NUNAVUT	
PROJECT NUMBER	01-4109
CONTAMINATED SOIL SITE SECTIONS & DETAILS	
SCALE	AS NOTED
DATE	04.04.22
PROJECT NO.	01-4109-C1002
REV.	B

