MONTHLY UPDATE REPORT - PRIMROSE SOUTH 09-21-067-04 W4M

JUNE 24 TO JULY 21, 2014

1 Introduction

The Canadian Natural Resources Limited Primrose South in situ oil sands project is located primarily in the Cold Lake Air Weapons Range approximately 65 km north-northeast of Bonnyville, Alberta. Canadian Natural operations staff discovered a flow to surface (FTS) bitumen emulsion at 09-21-067-04 W4M on June 24, 2013. The FTS bitumen emulsion is beneath an unnamed water body within the Canadian Natural Primrose South production area.

On September 24, 2013, Alberta Environment and Sustainable Resource Development (ESRD) issued an Environmental Protection Order (EPO No. EPO-2013-33/NR), requesting the preparation of a Comprehensive Remedial Plan (CRP), as well as the preparation of a monthly progress report.
This report summarizes the progress towards the realization of this plan and includes data collected and reported between June 24 and July 21, 2014.

2 Summary of Activities to Date

2.1 Individual Plan Submissions

As required by the EPO, the CRP includes the development, submission, and implementation of several specific plans. The status of these plans is indicated in Table 1:

Table 1: Components of the Comprehensive Remedial Plan

Item	Plan Name	Due Date	Submission Date	Approval Date	Implementation Start Date	Completion Date	Section Discussed
1.	**Water Management Plan for Dewatering**	September 26, 2013	September 26, 2013	September 27, 2013	September 27, 2013	October 22, 2013	2.2
2.	**Water Body Monitoring Plan**	September 26, 2013	September 26, 2013	September 27, 2013	September 27, 2013	Ongoing	3.0
3.	**Erosion and Sedimentation Prevention Plan**	September 26, 2013	September 26, 2013	September 27, 2013	September 27, 2013	Ongoing	3.4
4.	**Phase II Environmental Assessment Plan**	October 15, 2013	October 3, 2013	October 17, 2013	December 16, 2013	Ongoing	--
5.	**Bitumen Emulsion Delineation and Containment Plan**	October 6, 2013	October 3, 2013	October 17, 2013	October 18, 2013	Ongoing	3.5
6.	**Amphibian Salvage Plan**	September 26, 2013	September 25, 2013	September 27, 2013	September 27, 2013	October 22, 2013	Complete
7.	**Fish and Fish Habitat**	September 26, 2013	September 25, 2013	September 27, 2013	September 27, 2013	October 30, 2013	Complete

Item	Plan Name	Due Date	Submission Date	Approval Date	Implementation Start Date	Completion Date	Section Discussed
	Assessment Plan						
8.	**Wetlands Impact Assessment Plan**	September 30, 2013	September 25, 2013	September 27, 2013	September 27, 2013	October 30, 2013	Complete
9.	**Water Body Restoration Plan**	November 30, 2013	Revised Plan March 27, 2014	March 27, 2014	March 27, 2014	Ongoing	2.2, 3
10.	**Wildlife Management Plan**	N/A	Revised Plan October 23, 2013	October 23, 2013	October 23, 2013	Ongoing	3.6
11.	**Waste Management Plan**	N/A	Revised Plan October 24, 2013	October 24, 2013	October 24, 2013	Ongoing	3.7
12.	**Bitumen Emulsion Delineation and Containment Plan**	October 6, 2013	Revised Plan December 22, 2013	February 7, 2014	November 27, 2013	Pending	3.5

2.2 Water Management for Dewatering and Refilling

The water body was divided into four basins as indicated on Figure 1. Basins 1, 2, and 3 were dewatered, while Basin 4 and a nearby borrow pit were used to store the water from Basins 1, 2, and 3. Three independent pumping systems were used to pump water from Basins 1, 2, and 3. This configuration allowed Canadian Natural to adjust pumping rates in the various basins as specified in the approved Water Management Plan for Dewatering.

Pumping started on September 27, 2013 and on October 22, 2013 pumping was stopped.
The dewatering activities took place in accordance with the conditions specified in the Water Management Plan for Dewatering and in the Erosion and Sedimentation Prevention Plan (Table 1, Items 1 and 3).

Refilling of the water body from Basin 4 was completed on May 16, 2014. Refilling of the water body from the borrow pit was initiated on May 28, 2014 and completed on June 22, 2014. All of the refilling activities have taken place in accordance with the conditions specified in the Water Body Restoration Plan (Table 1, Item 9).

3 Water Body Monitoring

In accordance with the Water Body Restoration Plan (Table 1, Item 9), an extensive water quality and water quantity monitoring program was implemented on March 19, 2014. This ongoing program complements the ongoing water quality and quantity monitoring implemented in June 2013.

Details of the monitoring program are provided in the following subsections.

3.1 Water Quantity Monitoring

3.1.1 Basins 1, 3, and 4, Borrow Pit, and Downstream Fen

Daily staff gauge monitoring was initiated on March 27, 2014, coinciding with spring breakup.
An overview of the staff gauge and water level monitoring locations is presented on Figure 2. The results

of the staff gauge readings for Basins 3 and 4 are shown on Appendix A1. The results of the staff gauge readings for the downstream fen and the borrow pit are shown on Appendix A2. At the end of refilling pumping, the water level in the borrow pit was approximately 700.0 m above sea level.

3.1.2 Containment Structure

Water was pumped from within the containment area (inside the containment wall) and discharged directly back into Basin 1 (Figure 3). Water volumes pumped into Basin 1 from the containment area are shown in Appendix A3 and on Appendix A4.

3.2 Water Quality Monitoring

Weekly water sampling was initiated March 19, 2014. Water quality was compared to the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (ESRD 2014a) and/or *Environmental Quality Guidelines for Alberta Surface Waters* (ESRD 2014b) at all sampling locations. Sampling locations are shown on Figure 4. New ESRD guidelines for surface water quality were released on April 11, 2014; these guidelines are currently being used for this report and subsequent monthly reports.

3.2.1 Basins 1, 3, and 4 and Downstream Fen

Water quality samples were collected weekly from established surface water sampling sites in Basins 1, 3, and 4 and the downstream fen (Figure 4). The samples were tested to ensure that water quality in the water body was not being affected by ongoing operations at the site. Water quality results are presented in Appendix B.

- Laboratory analysis of water samples was carried out for benzene, toluene, ethylbenzene, and xylenes (BTEX); petroleum hydrocarbons (PHCs) fraction 1 (F1; C_6-C_{10}, excluding BTEX), fraction 2 (F2; $C_{>10}$-C_{16}), fraction 3 (F3; $C_{>16}$-C_{34}), and fraction 4 (F4; $C_{>34}$); polycyclic aromatic hydrocarbons (PAHs); chlorides; total suspended solids; and turbidity.

- All water quality results were within freshwater aquatic life guidelines with the exception of four toluene measurements recorded in the downstream fen (13-SW27 and 13-SW26) and one toluene measurement recorded in Basin 4 (13-SW12). Toluene is widespread in the environment and a common source is motor vehicle exhaust.

3.2.2 Containment Area, Containment Cells, and Potentially Impacted Water System

Water samples were collected from within the containment structure, from drive point groundwater monitoring wells in the discharge area, and from the potentially impacted water (PIW) system, which is designed to treat water from melting ice and frozen sediments stored in containment Cells C and D. Sample results are presented in Appendix B.

- No BTEX, PHCs F1 to F4, PAHs, or routine parameters were detected at levels above the freshwater aquatic life guidelines in the weekly containment structure samples from Swale 1.

- No BTEX, PHCs F1 to F4, PAHs, or routine parameters were detected at levels above the Alberta Tier 1 guidelines for coarse-grained soils in natural areas or freshwater aquatic life guidelines in the drive point groundwater samples from the discharge area.

- A total of 2,351 m^3 of water has been treated and released during the reporting period.

3.2.3 Shallow Groundwater

Shallow groundwater quality samples were collected on July 1, 2014.

All water quality results were within freshwater aquatic life guidelines with the exception of four toluene measurements recorded in drive point wells 13-DP3, 13-DP4, 13-DP5, and 13-DP7.

3.3 Aquatic Surveillance

Ongoing daily monitoring for signs of bitumen emulsion (pellets or sheen) within Basins 1 and 3 (aquatic surveillance) is conducted and documented by Canadian Natural contractors. This monitoring is conducted from the shoreline of the 9-21 water body and by boat.

Traces of sheen and isolated bitumen emulsion pellets were observed in the water body on July 1, 5, 8, 13, 15, and 21, 2014. The locations of these occurrences are shown on Figure 5. The source of the sheen and pellets was residual material remaining from the bitumen emulsion release that has been remobilized into the water column during the water body refilling. All observed bitumen emulsion pellets and sheen were collected, using absorbent material, and disposed in the onsite hazardous waste bin. Over the reporting period, less than 1 L of bitumen emulsion has been collected from Basins 1 and 3.

3.4 Erosion and Sedimentation Prevention

The refilling activities were completed in accordance with the conditions specified in Extension 4 of the Water Body Restoration Plan (Table 1, Item 9).

- The fen to the south of the water body showed no signs of erosion or channelization during water body refilling.

- The erosion and sediment control plan has been implemented.

3.5 Bitumen Emulsion Containment

3.5.1 Permanent Containment of Bitumen Emulsion Seepage from Fissure

In early May 2014, the fissure containment structure was approved. A Canadian Natural construction crew built the fissure containment structure between May 4 and June 30, 2014. As of July 21, 2014, the final design of the access pad had been submitted to Alberta Energy Regulator for approval.

3.6 Wildlife Management

Wildlife management activities between June 24 and July 21, 2014 included maintaining perimeter fencing; installing, maintaining, and frequently relocating up to four wildlife scare cannons (Zon Guns); installing and maintaining amphibian pit fall traps surrounding decontamination Cell D and conducting daily inspections.

During the reporting period, live tadpoles and frogs were observed within Cell D and relocated to a nearby water body, and a total of 15 dead frogs were found in Basin 1 of the 9-21 water body. Before

the amphibian mortalities, Canadian Natural had implemented an amphibian monitoring study looking at survival, growth, species, and numbers in both previously impacted areas and in non-impacted areas to determine if there are lasting effects from the FTS events. Additional testing has been implemented to determine the cause of amphibian mortalities in both the impacted and non-impacted areas.

Current wildlife management plans are working and there have been no other reported impacts to wildlife during the reporting period.

3.7 Waste Management

Materials temporarily stored in lined containment Cells C and D will be transported to the landfill for disposal in 2014, after the material is thawed and dewatered to meet landfill criteria.

4 Conclusions

The work conducted at the 9-21 FTS site from June 24 to July 21, 2014 included:

- operating a PIW treatment system at containment Cell D and releasing treated water
- dewatering from within the containment area
- completing construction of the 9-21 fissure containment structure
- ongoing monitoring of water quality, pumped quantity, discharge point erosion and sedimentation during remediation activities
- monitoring wildlife activity near the water body

Monitoring of the pumping operations indicated that Basins 1 and 3 have not been adversely impacted by the bitumen emulsion release or by refilling activities. There have been no reported impacts to wildlife, other than the amphibian mortalities, during the reporting period.

The work is progressing as planned and the objectives, as required by the EPO, are being achieved within the required time frame.

5 References

Alberta Environment and Sustainable Resource Development (ESRD). 2014a. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Final Draft. Land and Forestry Policy Branch, Policy Division. Edmonton, Alberta. March 18, 2014. http://esrd.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Mar18-2014.pdf

Alberta Environment and Sustainable Resource Development (ESRD). 2014b. *Environmental Quality Guidelines for Alberta Surface Waters.* Water Policy Branch, Policy Division. Edmonton, Alberta. April 1, 2014. http://esrd.alberta.ca/water/education-guidelines/documents/EnvironmentalQualitySurfaceWaters-Apr2014.pdf

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\July\Public_9_21\Figure-1-9_21_Water_Body_Divisions.mxd

Basin Boundary
Watercourse
Road
Cut Line
Pipeline

1:5,000
m
50 0 50 100
NAD 1983 UTM Zone 12N

Reference: Data obtained from AltaLIS © Government of Alberta and GeoBase® used under license. GDM midstream and transportation infrastructure data provided by IHS © 2014 used under license. Site features provided through Matrix Solutions Inc. field efforts. Imagery (September 2013) obtained from Canadian Natural Resources Limited used under license.

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9-21 Water Body Divisions

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jul 2014	8881-523	B. Ethier	R. Reimer	R. Keller

Figure 1

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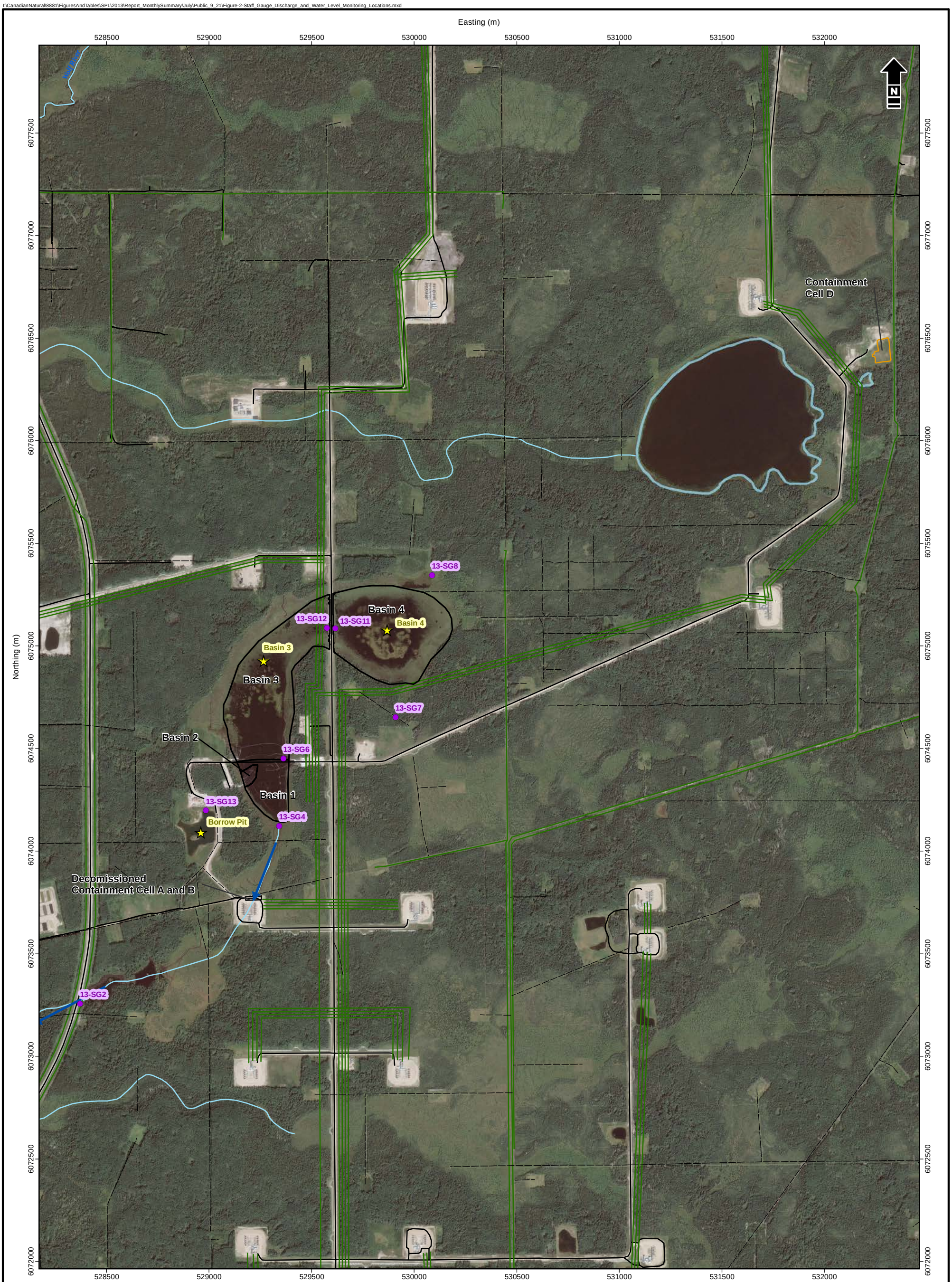

- Containment Cell D
- Decommisioned Containment Cell
- Basin Boundary
- Water Body
- Watercourse
- Road
- Cut Line
- Pipeline
- Direction of Flow
- Staff Gauge Location
- Water Level Monitoring Location

1:17,500 m
180 0 180 360
NAD 1983 UTM Zone 12N

Reference: Data obtained from AltaLIS © Government of Alberta and GeoBase® used under license. GDM midstream and transportation infrastructure data provided by IHS © 2014 used under license. Site features provided through Matrix Solutions Inc. field efforts. Imagery (September 2013) obtained from Canadian Natural Resources Limited used under license.

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Staff Gauge, Discharge, and Water Level Monitoring Locations

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jul 2014	8881-523	B. Ethier	R. Reimer	R. Keller

Figure 2

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Easting (m)

529050 529100 529150 529200 529250 529300

Northing (m)

6074550 6074500 6074450 6074400 6074350 6074300 6074250 6074200 6074150

N

Basin 3

pump discharge #112

pump discharge #063

100

50

150

4 inch pump #112

4 inch pump #063

Swale 2

200

250

300

Basin 2

350

4 inch pump #090

Basin 1

Fissure 2

Fissure 1

400

450

500

Access
Rig Matting
Sand Bag Wall
Swale
Water Body
Berm
Containment Structure
Buried fissure

Pump Discharge Line
Floculation Netting
Rip Rap
Flow direction
Floculation Treatment
Light Tower
Pump
Pump Discharge Location
Containment Structure Station Location

Reference: Site features provided through Matrix Solutions Inc. field efforts.

1:1,250 m
10 0 10 20
NAD 1983 UTM Zone 12N

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Containment Structure Pump Locations

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jul 2014	8881-523	B. Ethier	R. Reimer	R. Keller

Figure 3

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Easting (m)

528500 529000 529500 530000 530500 531000 531500 532000

Northing (m)

6077500 6077000 6076500 6076000 6075500 6075000 6074500 6074000 6073500 6073000 6072500 6072000

N

Containment Cell D

PIW System

14-SW2

13-DP4

Re-Watering System

Basin 4

13-SW12

13-DP3

Basin 3

13-SW31

Re-Watering System

13-DP7

14-SW3

13-DP5

14-SW1-P1

Containment Cell C

14-SW1-P2

14-SW1

13-SW22

Former Borrow Pit

Basin 1

13-SW46

Basin 2

Downstream Fen

13-DP6

Decomissioned Containment Cell A and B

13-SW26

13-DP1

13-SW27

Pad AC21

13-SW16

Containment Cell
Decommisioned Containment Cell
Access
Rig Matting
Basin Boundary
Old Borrow Area
Water Body
Watercourse
Road
Cut Line

Pipeline
Containment Structure
Potentially Impacted Water System
Re-Watering System
Surface Water Sample Location
Drivepoint Piezometer Sample Location

1:17,500

m

180 0 180 360

NAD 1983 UTM Zone 12N

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2014 Re-watering and Monitoring Plan Overview

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jul 2014	8881-523	B. Ethier	R. Reimer	R. Keller

Figure 4

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Easting (m)

529100 529200 529300 529400 529500

Northing (m)

6074700 6074600 6074500 6074400 6074300 6074200 6074100

N

3.6

Basin 3

3.5

Minor Spill (July 21, 2014)

50 100 150 200 250 300 350 400 450 500

2.3 2.2 2.1

Basin 2

1.1 1.2 1.3a 1.3b 1.3c

Fissure 2

Fissure 1

Basin 1

1.7 1.6 1.5a 1.5b 1.4a 1.4b

Access
Rig Matting
Water Body
Berm
Containment Structure
Buried fissure
Existing Silt Boom
Existing Sorb Boom
Zone

Bitumen Sheen Detected
Bitumen Detected
Spill Incident
Containment Structure Station Location

1:2,000

m 20 0 20 40

NAD 1983 UTM Zone 12N

Reference: Site features provided through Matrix Solutions Inc. field efforts. Imagery (September 2013) obtained from Canadian Natural Resources Limited used under license.

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Aquatic Surveillance Site Plan

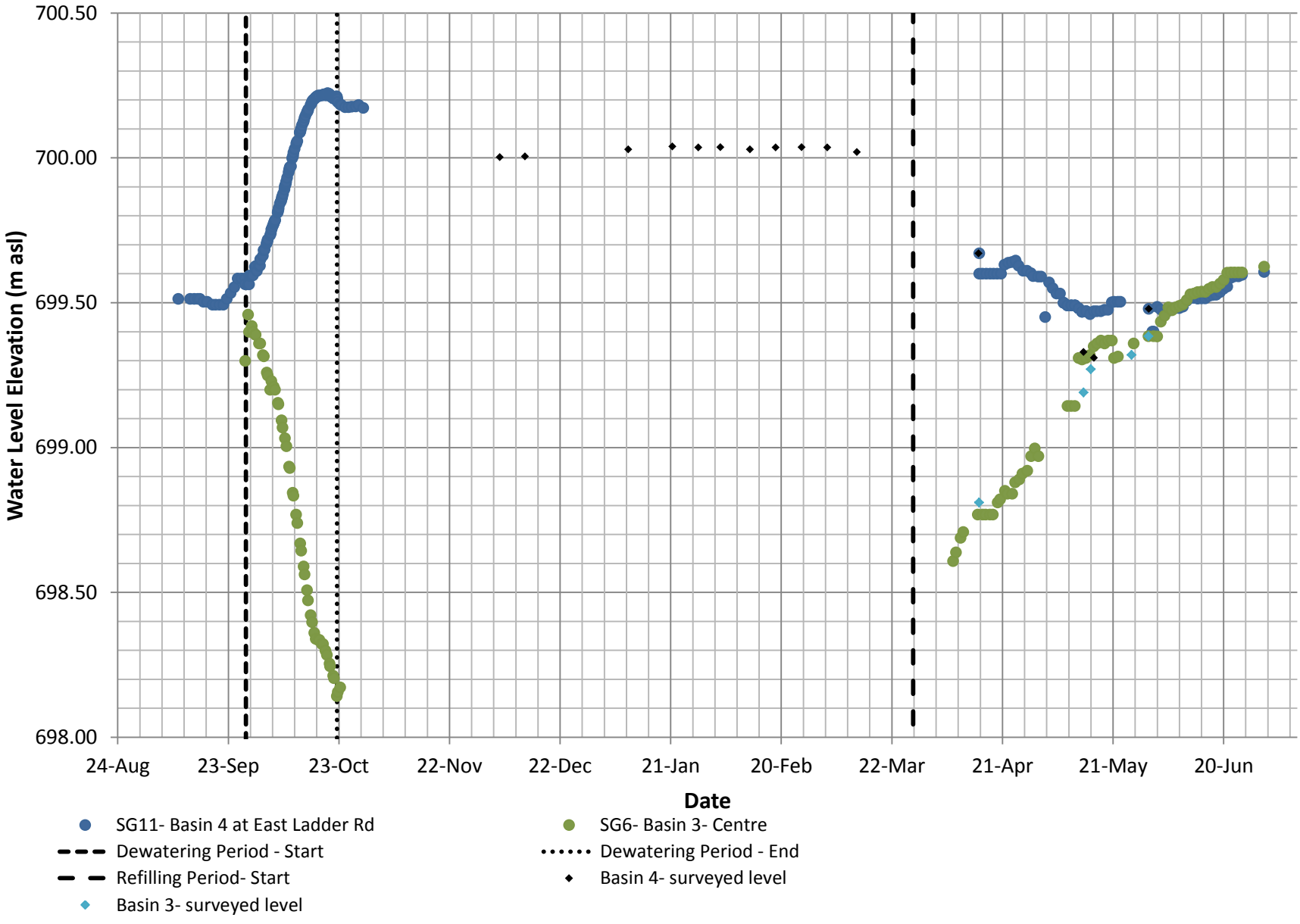
Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jul 2014	8881-523	B. Ethier	R. Reimer	R. Keller

Figure 5

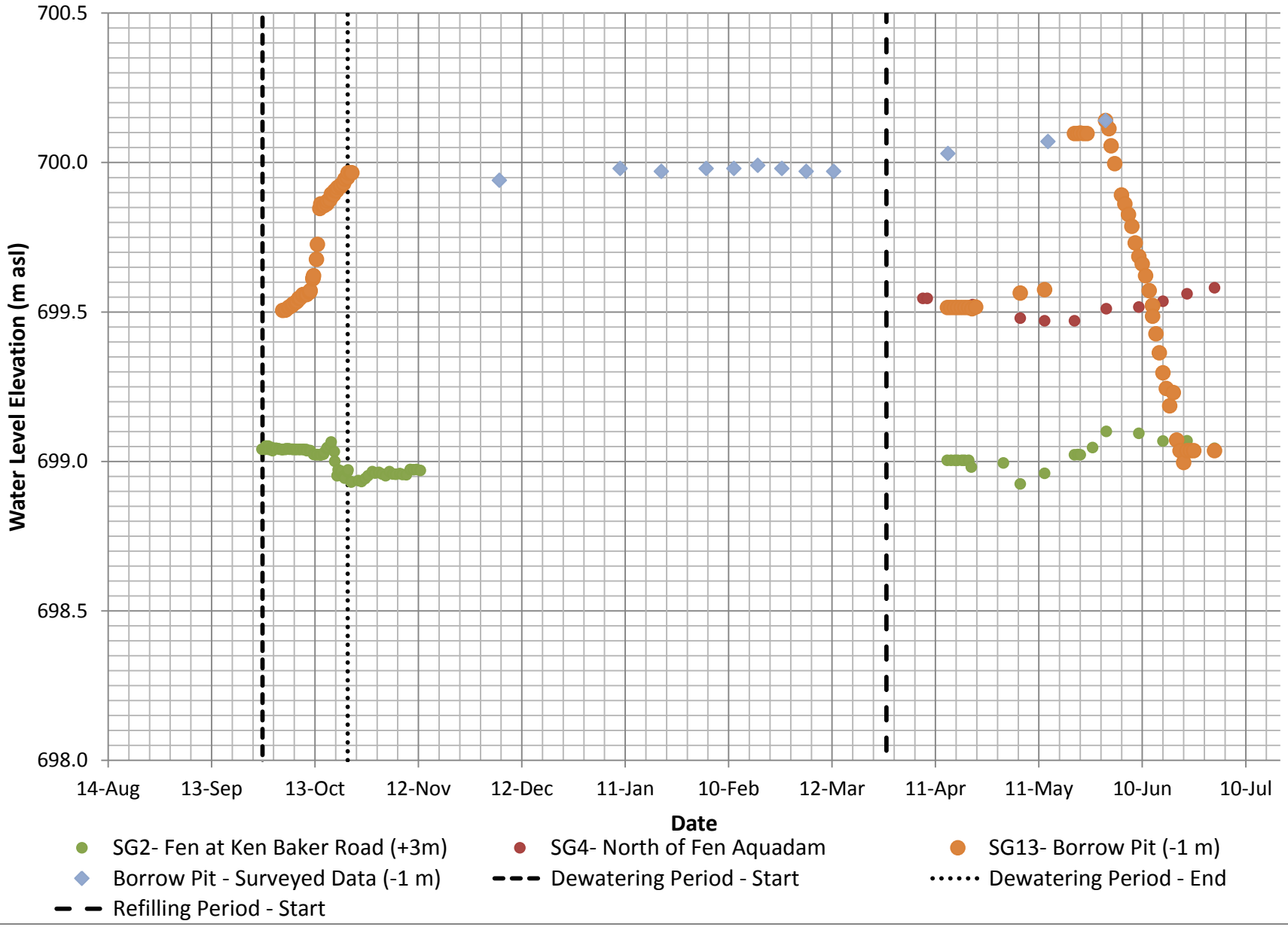
APPENDIX A

WATER LEVELS AND PUMP VOLUMES

Appendix A1: Water Levels at 9-21 Water Body



Appendix A2: Water Levels in the Downstream Fen and Borrow Pit



Appendix A3: Daily Volumes Pumped from from the Containment structure to Basin 1 and 3

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total		Comments
	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Daily Volume to Water Body from Containment Structure (m^3/day)	Cumulative Total to Water Body from Containment Structure (m^3)	
	14-SW1-P1		14-SW1-P2		South Wall				
27-Mar-14	-	-	-	-	-	-	-	-	
28-Mar-14	-	-	-	-	-	-	-	-	
29-Mar-14	-	-	-	-	-	-	-	-	
30-Mar-14	-	-	-	-	-	-	-	-	
31-Mar-14	-	-	-	-	-	-	-	-	
1-Apr-14	-	-	-	-	-	-	-	-	
2-Apr-14	-	-	-	-	-	-	-	-	
3-Apr-14	-	-	-	-	-	-	-	-	
4-Apr-14	-	-	-	-	-	-	-	-	
5-Apr-14	-	-	-	-	-	-	-	-	
6-Apr-14	15	15	-	-	-	-	15	15	
7-Apr-14	23	38	4	4	-	-	28	42	
8-Apr-14	0	38	11	15	-	-	11	53	
9-Apr-14	11	49	14	30	-	-	25	79	
10-Apr-14	31	80	23	53	-	-	54	133	
11-Apr-14	0	80	0	53	-	-	0	133	
12-Apr-14	11	91	13	66	-	-	24	157	
13-Apr-14	15	106	25	91	-	-	40	197	
14-Apr-14	765	871	20	111	-	-	785	982	
15-Apr-14	1,308	2,179	73	184	-	-	1,381	2,363	
16-Apr-14	1,521	3,700	70	254	-	-	1,591	3,954	
17-Apr-14	1,442	5,142	75	329	-	-	1,517	5,471	
18-Apr-14	6,081	11,223	70	399	-	-	6,151	11,621	
19-Apr-14	4,675	15,898	545	944	-	-	5,220	16,841	
20-Apr-14	6,623	22,521	114	1,058	-	-	6,737	23,578	
21-Apr-14	10,261	32,782	116	1,173	-	-	10,377	33,955	
22-Apr-14	18,147	50,929	7	1,181	-	-	18,154	52,110	
23-Apr-14	10,673	61,602	93	1,274	-	-	10,766	62,876	
24-Apr-14	11,714	73,316	113	1,387	-	-	11,827	74,703	
25-Apr-14	12,539	85,856	123	1,510	-	-	12,662	87,366	
26-Apr-14	13,361	99,217	89	1,599	-	-	13,450	100,816	
27-Apr-14	13,959	113,176	111	1,709	-	-	14,070	114,886	
28-Apr-14	19,120	132,296	110	1,819	-	-	19,230	134,116	
29-Apr-14	19,121	151,417	111	1,930	-	-	19,232	153,348	
30-Apr-14	19,707	171,124	170	2,100	-	-	19,877	173,225	
1-May-14	20,462	191,586	219	2,319	-	-	20,681	193,906	
2-May-14	15,820	207,406	178	2,497	-	-	15,998	209,904	
3-May-14	9,497	216,903	740	3,237	-	-	10,237	220,141	
4-May-14	9,646	226,549	2,160	5,397	-	-	11,806	231,947	
5-May-14	8,309	234,858	2,160	7,557	-	-	10,469	242,416	
6-May-14	8,176	243,034	1,980	9,537	-	-	10,156	252,572	
7-May-14	8,055	251,089	1,980	11,517	-	-	10,035	262,607	

Appendix A3: Daily Volumes Pumped from from the Containment structure to Basin 1 and 3

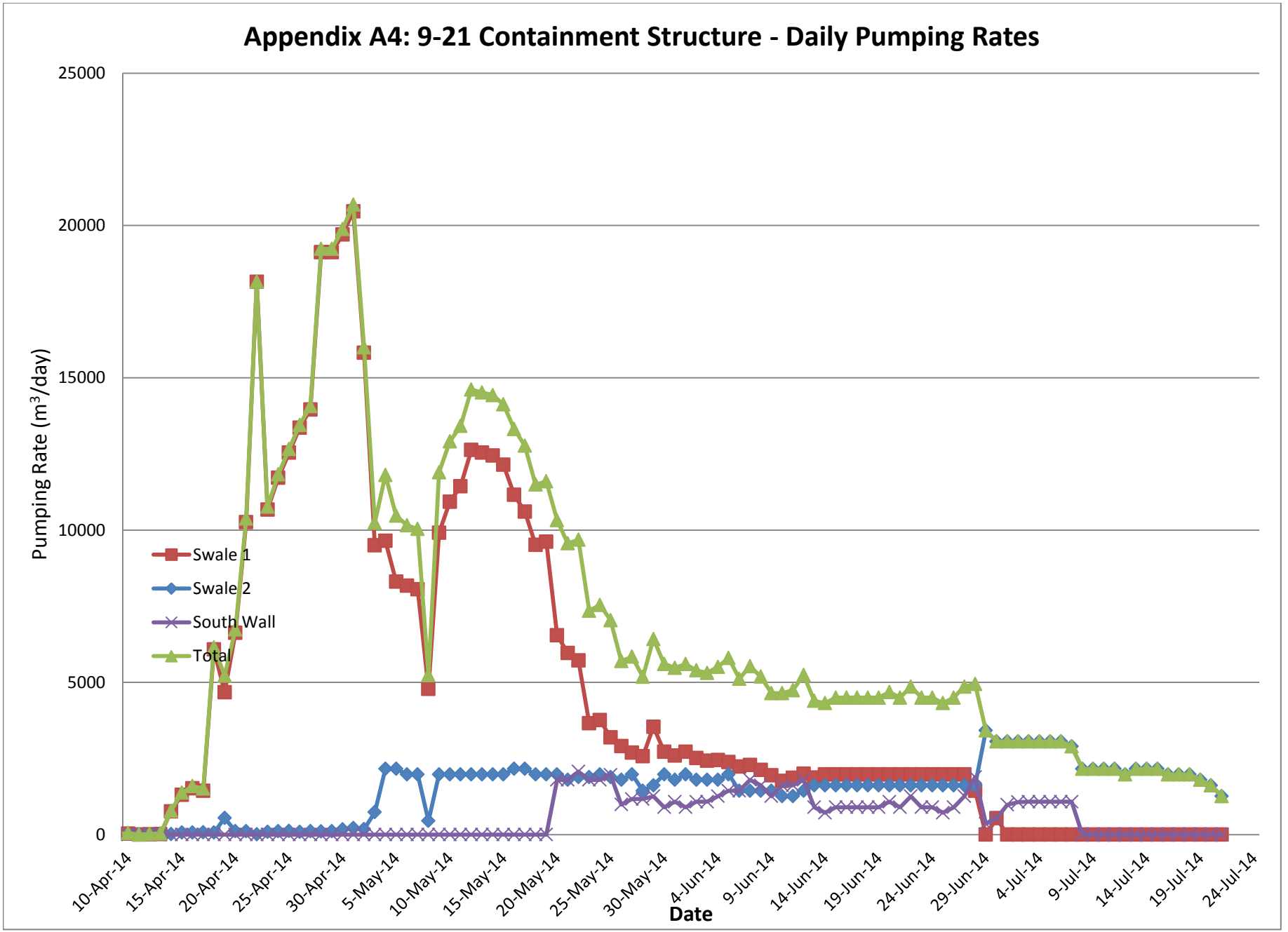
CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total		Comments
	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Daily Volume to Water Body from Containment Structure (m^3/day)	Cumulative Total to Water Body from Containment Structure (m^3)	
	14-SW1-P1		14-SW1-P2		South Wall				
8-May-14	4,783	255,872	450	11,967	-	-	5,233	267,840	
9-May-14	9,911	265,783	1,980	13,947	-	-	11,891	279,731	
10-May-14	10,928	276,711	1,980	15,927	-	-	12,908	292,639	
11-May-14	11,439	288,150	1,980	17,907	-	-	13,419	306,058	
12-May-14	12,630	300,780	1,980	19,887	-	-	14,610	320,668	
13-May-14	12,539	313,319	1,980	21,867	-	-	14,519	335,187	
14-May-14	12,450	325,769	1,980	23,847	-	-	14,430	349,616	
15-May-14	12,143	337,912	1,980	25,827	-	-	14,123	363,740	
16-May-14	11,157	349,069	2,160	27,987	-	-	13,317	377,057	
17-May-14	10,608	359,677	2,160	30,147	-	-	12,768	389,825	
18-May-14	9,515	369,192	1,980	32,127	-	-	11,495	401,320	
19-May-14	9,616	378,808	1,980	34,107	-	-	11,596	412,916	
20-May-14	6,548	385,356	1,980	36,087	1800	1800	10,328	423,244	Begin Pumping From Swale 3
21-May-14	5,964	391,320	1,800	37,887	1800	3,600	9,564	432,808	
22-May-14	5,723	397,043	1,890	39,777	2070	5,670	9,683	442,491	Poly installed from station: 191-212, 215-242
23-May-14	3,659	400,702	1,890	41,667	1800	7,470	7,349	449,840	Poly installed from station: 152-182
24-May-14	3,762	404,464	1,980	43,647	1800	9,270	7,542	457,382	Poly installed from station: 120-128.5, 135-151
25-May-14	3,192	407,656	1,890	45,537	1960	11,230	7,042	464,424	Poly installed from station: 73.5-120
26-May-14	2,905	410,561	1,800	47,337	990	12,220	5,695	470,119	Poly installed from station: 59.5-73.5, 246-269.5
27-May-14	2,692	413,253	1,980	49,317	1170	13,390	5,842	475,961	Poly installed from station: 277-351
28-May-14	2,571	415,824	1,440	50,757	1170	14,560	5,181	481,142	Poly installed from station: 352-385
29-May-14	3,541	419,365	1,620	52,377	1,260	15,820	6,421	487,563	
30-May-14	2,723	422,088	1,980	54,357	900	16,720	5,603	493,166	
31-May-14	2,599	424,687	1,800	56,157	1080	17,800	5,479	498,645	
1-Jun-14	2,721	427,408	1,980	58,137	900	18,700	5,601	504,246	
2-Jun-14	2,513	429,921	1,800	59,937	1,080	19,780	5,393	509,639	
3-Jun-14	2,429	432,351	1,800	61,737	1080	20,860	5,309	514,948	
4-Jun-14	2,448	434,799	1,800	63,537	1260	22,120	5,508	520,456	
5-Jun-14	2,380	437,179	1,980	65,517	1440	23,560	5,800	526,256	
6-Jun-14	2,239	439,418	1,440	66,957	1440	25,000	5,119	531,375	
7-Jun-14	2,290	441,708	1,440	68,397	1800	26,800	5,530	536,905	
8-Jun-14	2,128	443,836	1,440	69,837	1620	28,420	5,188	542,093	
9-Jun-14	1,948	445,784	1440	71,097	1,260	29,860	4,648	546,741	
10-Jun-14	1,764	447,548	1,260	72,357	1620	31,480	4,644	551,385	
11-Jun-14	1,864	449,412	1,260	73,617	1620	33,100	4,744	556,129	
12-Jun-14	2,000	451,412	1,440	75,057	1800	34,900	5,240	561,369	
13-Jun-14	1,874	453,286	1,620	76,677	900	35,800	4,394	565,763	
14-Jun-14	1,980	455,266	1,620	78,297	720	36,520	4,320	570,083	
15-Jun-14	1,980	457,246	1,620	79,917	900	37,420	4,500	574,583	
16-Jun-14	1,980	459,226	1,620	81,537	900	38,320	4,500	579,083	
17-Jun-14	1,980	461,206	1,620	83,157	900	39,220	4,500	583,583	
18-Jun-14	1,980	463,186	1,620	84,777	900	40,120	4,500	588,083	
19-Jun-14	1,980	465,166	1,620	86,397	900	41,020	4,500	592,583	

Appendix A3: Daily Volumes Pumped from from the Containment structure to Basin 1 and 3

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total		Comments
	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Daily Volume to Water Body from Containment Structure (m^3/day)	Cumulative Total to Water Body from Containment Structure (m^3)	
	14-SW1-P1		14-SW1-P2		South Wall				
20-Jun-14	1,980	467,146	1,620	88,017	1080	42,100	4,680	597,263	
21-Jun-14	1,980	469,126	1,620	89,637	900	43,000	4,500	601,763	
22-Jun-14	1,980	471,106	1,620	91,257	1260	44,260	4,860	606,623	
23-Jun-14	1,980	473,086	1,620	92,877	900	45,160	4,500	611,123	
24-Jun-14	1,980	475,066	1,620	94,497	900	46,060	4,500	615,623	
25-Jun-14	1,980	477,046	1,620	96,117	720	46,780	4,320	619,943	
26-Jun-14	1,980	479,026	1,620	97,737	900	47,680	4,500	624,443	
27-Jun-14	1,980	481,006	1,620	99,357	1260	48,940	4,860	629,303	
28-Jun-14	1,440	482,446	1,620	100,977	1890	50,830	4,950	634,253	
29-Jun-14	0	482,446	3,420	104,397	360	51,190	3,420	637,673	Pumps and swales re-adjusted. Only swale 2 realses water over the wall
30-Jun-14	540	482,986	3,060	107,457	540	51,730	3,060	640,733	
1-Jul-14	0	482,986	3,060	110,517	980	52,710	3,060	643,793	
2-Jul-14	0	482,986	3,060	113,577	1070	53,780	3,060	646,853	
3-Jul-14	0	482,986	3,060	116,637	1080	54,860	3,060	649,913	
4-Jul-14	0	482,986	3,060	119,697	1080	55,940	3,060	652,973	
5-Jul-14	0	482,986	3,060	122,757	1080	57,020	3,060	656,033	
6-Jul-14	0	482,986	3,060	125,817	1080	58,100	3,060	659,093	
7-Jul-14	0	482,986	2,900	128,717	1080	59,180	2,900	661,993	
8-Jul-14	0	482,986	2,160	130,877	-	-	2,160	664,153	Only recording swale 2 pump totals. Only swale 2 releases water over the wall.
9-Jul-14	0	482,986	2,160	133,037	-	-	2,160	666,313	
10-Jul-14	0	482,986	2,160	135,197	-	-	2,160	668,473	
11-Jul-14	0	482,986	2,160	137,357	-	-	2,160	670,633	
12-Jul-14	0	482,986	1,980	139,337	-	-	1,980	672,613	
13-Jul-14	0	482,986	2,160	141,497	-	-	2,160	674,773	
14-Jul-14	0	482,986	2,160	143,657	-	-	2,160	676,933	
15-Jul-14	-	-	2,160	145,817	-	-	2,160	679,093	
16-Jul-14	-	-	1,980	147,797	-	-	1,980	681,073	
17-Jul-14	-	-	1,980	149,777	-	-	1,980	683,053	
18-Jul-14	-	-	1,980	151,757	-	-	1,980	685,033	
19-Jul-14	-	-	1,800	153,557	-	-	1,800	686,833	
20-Jul-14	-	-	1,620	155,177	-	-	1,620	688,453	
21-Jul-14	-	-	1,260	156,437	-	-	1,260	689,713	


Appendix A4: 9-21 Containment Structure - Daily Pumping Rates
Pumping Rate (m3/day)
25000
20000
15000
10000
5000
0
Swale 1
Swale 2
South Wall
Total
10-Apr-14
15-Apr-14
20-Apr-14
25-Apr-14
30-Apr-14
5-May-14
10-May-14
15-May-14
20-May-14
25-May-14
30-May-14
4-Jun-14
9-Jun-14
14-Jun-14
19-Jun-14
24-Jun-14
29-Jun-14
4-Jul-14
9-Jul-14
14-Jul-14
19-Jul-14
24-Jul-14
Date

APPENDIX B

WATER QUALITY RESULTS SUMMARY

TABLE B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Surface Water Samples									
13-SW12	19-Mar-14	<0.0004	***0.0044***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	27-Mar-14	<0.0004	***0.0085***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	01-Apr-14	<0.0004	***0.0006***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	08-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	15-Apr-14	<0.0004	***0.0180***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	22-Apr-14	<0.0004	***0.0040***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	29-Apr-14	<0.0004	***0.0140***	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW12	22-May-14	<0.00040	***0.00055***	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW12	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW12	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW12	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW12	23-Jun-14	<0.00040	***0.00130***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW12	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	<0.10	---	---
13-SW12	08-Jul-14	<0.00040	***0.00170***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW12a	06-May-14	<0.0004	***0.0060***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12a	13-May-14	<0.00040	***0.00120***	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12a	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12b	06-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW12b	13-May-14	<0.00040	***0.00096***	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12c	20-May-14	<0.00040	0.00042	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW16	13-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW16	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW16	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW16	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW16	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW16	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	<0.10	---	---
13-SW16	08-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	15-Jul-14	<0.00040	***0.00068***	<0.00040	<0.00080	<0.10	<0.10	---	---
ESRD Freshwater Aquatic Life*		**0.04**	**0.0005**	**0.09**	**0.03**	**NS^{ST}**	**NS^{ST}**	**NS**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**0.024**	**0.0024**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Surface Water Samples									
13-SW22	01-Apr-14	<0.0004	***0.00230***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	08-Apr-14	<0.0004	***0.00084***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	15-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	22-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	29-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW22	06-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW22	13-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW22	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW22	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW22	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW22	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW22	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW22	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW22	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	<0.10	---	---
13-SW22	08-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	13-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	0.23	<0.20
13-SW26	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW26	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW26	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW26	09-Jun-14	<0.00040	***0.00290***	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW26	16-Jun-14	<0.00040	***0.00100***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	23-Jun-14	<0.00040	***0.00150***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	01-Jul-14	<0.00040	***0.00670***	<0.00040	<0.0040	<0.10	<0.10	---	---
13-SW26	08-Jul-14	<0.00040	***0.00500***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	15-Jul-14	<0.00040	***0.00450***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26 dup	15-Jul-14	<0.00040	***0.00370***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	13-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW27	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW27	27-May-14	<0.00040	***0.00100***	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW27	02-Jun-14	<0.0004	***0.00140***	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW27	09-Jun-14	<0.00040	***0.00096***	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW27	16-Jun-14	<0.00040	***0.00100***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	23-Jun-14	<0.00040	***0.00270***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	01-Jul-14	<0.00040	***0.00210***	<0.00040	<0.0040	<0.10	<0.10	---	---
13-SW27	08-Jul-14	<0.00040	***0.00170***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	15-Jul-14	<0.00040	***0.00250***	<0.00040	<0.00080	<0.10	<0.10	---	---
ESRD Freshwater Aquatic Life*		**0.04**	**0.0005**	**0.09**	**0.03**	**NS^{ST}**	**NS^{ST}**	**NS**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**0.024**	**0.0024**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Surface Water Samples									
13-SW31	08-Apr-14	<0.0004	***0.0011***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31	15-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31 dup	15-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31	22-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31 dup	22-Apr-14	<0.0004	0.00043	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31	29-Apr-14	<0.0004	***0.0017***	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW31 dup	29-Apr-14	<0.0004	***0.0150***	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW31	06-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	06-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	0.11	<0.20	<0.20
13-SW31	13-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	13-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31 dup	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW31	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31 dup	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31 dup	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31 dup	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	<0.10	---	---
13-SW31 dup	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	0.11	<0.10	---	---
13-SW31	08-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31 dup	08-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Basin 3 Culvert	15-Jul-14	<0.00040	***0.00240***	<0.00040	<0.00080	<0.10	<0.10	---	---
Basin 4 Culvert	15-Jul-14	<0.00040	***0.00180***	<0.00040	<0.00080	<0.10	<0.10	---	---
ESRD Freshwater Aquatic Life*		**0.04**	**0.0005**	**0.09**	**0.03**	**NS^{ST}**	**NS^{ST}**	**NS**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**0.024**	**0.0024**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Containment Structure Samples									
14-SW1-P1	01-Apr-14	<0.0004	0.00046	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
14-SW1-P1	22-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
14-SW1-P1	29-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	---	---
14-SW1-P1	06-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.20	<0.20
14-SW1-P1	13-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.20	<0.20
14-SW1-P1	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-SW1-P1	27-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
14-SW1-P2	05-Apr-14	<0.0004	0.00050	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW46	20-May-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW46	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW46	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW46	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW46	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW46	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	0.11	<0.10	---	---
13-SW46	08-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-SW81	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
14-SW81	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
14-SW81	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-SW81	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-SW81	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	0.2	---	---
14-SW81	08-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Minimal Detection Limit		**0.0004**	**0.0004**	**0.0004**	**0.0008**	**0.1**	**0.1**	**0.2**	**0.2**
ESRD Freshwater Aquatic Life*		**0.04**	**0.0005**	**0.09**	**0.03**	**NS^{ST}**	**NS^{ST}**	**NS**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**0.024**	**0.0024**	**NS**	**NS**	**NS**	**NS**	**NS**

Notes:

--- - not analyzed

NS - guideline not specified

ST - see applicable guidelines for short-term exposure guideline

* - Environmental Quality Guidelines for Alberta Surface Waters (ESRD 2014)

Italics - indicates values do not meet applicable guidelines

TABLE B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[c]phenanthrene µg/L	Benzo[a]pyrene µg/L	Benzo[e]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	2-Methylnaphthalene µg/L	Perylene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L	TOTAL PAH µg/L
Surface Water Samples																								
13-SW12	19-Mar-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	27-Mar-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	01-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	08-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	15-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.065***	<0.20	0.065
13-SW12	22-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	29-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	0.19	<0.050	<0.050	<0.020	<0.20	0.19
13-SW12	22-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12a	06-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.035***	<0.20	0.035
13-SW12a	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12a	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12b	06-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.033***	<0.20	0.033
13-SW12b	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW12c	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW16	15-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
ESRD Freshwater Aquatic Life*		**5.8**	**NS**	**4.4**	**0.012**	**0.018**	**NS**	**NS**	**NS**	**NS**	**0.015**	**NS**	**NS**	**NS**	**0.04**	**3**	**NS**	**1**	**NS**	**NS**	**0.4**	**0.025**	**3.4**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[c]phenanthrene µg/L	Benzo[a]pyrene µg/L	Benzo[e]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	2-Methylnaphthalene µg/L	Perylene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L	TOTAL PAH µg/L
Surface Water Samples																								
13-SW22	01-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	08-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	15-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	22-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	29-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	06-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.038***	<0.20	0.038
13-SW22	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW22	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26	15-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW26 dup	15-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW27	15-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
ESRD Freshwater Aquatic Life*		**5.8**	**NS**	**4.4**	**0.012**	**0.018**	**NS**	**NS**	**NS**	**NS**	**0.015**	**NS**	**NS**	**NS**	**0.04**	**3**	**NS**	**1**	**NS**	**NS**	**0.4**	**0.025**	**3.4**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[c]phenanthrene µg/L	Benzo[a]pyrene µg/L	Benzo[e]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	2-Methylnaphthalene µg/L	Perylene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L	TOTAL PAH µg/L
Surface Water Samples																								
13-SW31	08-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	15-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	15-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	22-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	22-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	29-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	29-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	06-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.038***	<0.20	0.038
13-SW31 dup	06-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.033***	<0.20	0.033
13-SW31	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31 dup	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW31	08-Jul-14	<0.12	<0.12	<0.24	<0.012	<0.010	<0.010	<0.010	<0.010	<0.060	<0.0089	<0.060	<0.010	<0.0089	<0.012	<0.060	<0.010	<0.12	<0.12	<0.060	<0.060	<0.024	<0.24	ND
13-SW31	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
Basin 3 Culvert	15-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
Basin 4 Culvert	15-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
ESRD Freshwater Aquatic Life*		**5.8**	**NS**	**4.4**	**0.012**	**0.018**	**NS**	**NS**	**NS**	**NS**	**0.015**	**NS**	**NS**	**NS**	**0.04**	**3**	**NS**	**1**	**NS**	**NS**	**0.4**	**0.025**	**3.4**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[c]phenanthrene µg/L	Benzo[a]pyrene µg/L	Benzo[e]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	2-Methylnaphthalene µg/L	Perylene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L	TOTAL PAH µg/L
Containment Structure Samples																								
14-SW1-P1	01-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW1-P1	22-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW1-P1	29-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW1-P1	06-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	***0.033***	<0.20	0.033
14-SW1-P1	13-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW1-P1	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW1-P1	27-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW1-P2	05-Apr-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	20-May-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW81	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW81	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW81	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW81	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW81	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-SW81	08-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
Minimal Detection Limit		**0.1**	**0.1**	**0.2**	**0.01**	**0.0085**	**0.0085**	**0.0085**	**0.0085**	**0.05**	**0.0075**	**0.05**	**0.0085**	**0.0075**	**0.01**	**0.05**	**0.0085**	**0.1**	**0.1**	**0.05**	**0.05**	**0.02**	**0.2**	**-**
ESRD Freshwater Aquatic Life*		**5.8**	**NS**	**4.4**	**0.012**	**0.018**	**NS**	**NS**	**NS**	**NS**	**0.015**	**NS**	**NS**	**NS**	**0.04**	**3**	**NS**	**1**	**NS**	**NS**	**0.4**	**0.025**	**3.4**	**NS**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Notes:

--- - not analyzed

NS - not specified

ND - not detected

* - Environmental Quality Guidelines for Alberta Surface Waters (ESRD 2014)

Italics - indicates values do not meet applicable guidelines

TABLE B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Lab pH	Lab EC	Ca	Mg	Na	K	Cl	SO_4	NO_2-N	NO_3-N	NO_3+NO_2-N	Total Alkalinity	HCO_3	Hardness	TDS	TSS	Turbidity
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
Surface Water Samples																		
13-SW12	19-Mar-14	7.56	90	12	3	0.98	2.6	1.2	<1	<0.01	<0.01	<0.001	43	52	42	46	24	10
13-SW12	27-Mar-14	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	6.7	3.1
13-SW12	01-Apr-14	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	4	---
13-SW12	08-Apr-14	---	---	---	---	---	---	<1	---	---	---	---	---	---	---	---	37	27
13-SW12	15-Apr-14	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	40	14
13-SW12	22-Apr-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	37	15
13-SW12	29-Apr-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	7.3	1.8
13-SW12	22-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	<1.0	0.55
13-SW12	27-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	1.3	0.57
13-SW12	02-Jun-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	<1.0	0.66
13-SW12	09-Jun-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	1.3	0.55
13-SW12	16-Jun-14	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	17	4.2
13-SW12	23-Jun-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	3.3	2.1
13-SW12	01-Jul-14	---	---	---	---	---	---	<2.0	---	---	---	---	---	---	---	---	---	---
13-SW12	08-Jul-14	---	---	---	---	---	---	1.7	---	---	---	---	---	---	---	---	---	---
13-SW12a	06-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	20	5.7
13-SW12a	13-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	1.3	0.88
13-SW12a	20-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	3.3	1.1
13-SW12b	06-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	59	19
13-SW12b	13-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	170	9.5
13-SW12c	20-May-14	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	6.7	2.5
13-SW16	13-May-14	---	---	---	---	---	---	6.0	---	---	---	---	---	---	---	---	10	11
13-SW16	20-May-14	---	---	---	---	---	---	5.7	---	---	---	---	---	---	---	---	3.3	2.4
13-SW16	27-May-14	---	---	---	---	---	---	3.4	---	---	---	---	---	---	---	---	2	0.95
13-SW16	02-Jun-14	---	---	---	---	---	---	4.4	---	---	---	---	---	---	---	---	<1.0	1.1
13-SW16	09-Jun-14	---	---	---	---	---	---	3.5	---	---	---	---	---	---	---	---	2	0.81
13-SW16	16-Jun-14	---	---	---	---	---	---	7.4	---	---	---	---	---	---	---	---	10	3.5
13-SW16	23-Jun-14	---	---	---	---	---	---	7.5	---	---	---	---	---	---	---	---	66	7.6
13-SW16	01-Jul-14	---	---	---	---	---	---	8.4	---	---	---	---	---	---	---	---	---	---
13-SW16	08-Jul-14	---	---	---	---	---	---	5.3	---	---	---	---	---	---	---	---	---	---
13-SW16	15-Jul-14	---	---	---	---	---	---	5.4	---	---	---	---	---	---	---	---	---	---
ESRD Freshwater Aquatic Life*		**6.5-9.0^{pH}**	**NS**	**NS**	**NS**	**NS**	**NS**	**120^{LT}**	**H^{SO4}**	**Cl^{LT}**	**3^{LT}**	**NS**	**20^{Alk}**	**NS**	**NS**	**NS**	**narrative**	**narrative**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**100^{crop}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^{crop}**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**

TABLE B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Lab pH	Lab EC	Ca	Mg	Na	K	Cl	SO_4	NO_2-N	NO_3-N	NO_3+NO_2-N	Total Alkalinity	HCO_3	Hardness	TDS	TSS	Turbidity
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
Surface Water Samples																		
13-SW22	01-Apr-14	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	3.3	---
13-SW22	08-Apr-14	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	7.3	6.1
13-SW22	15-Apr-14	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	220	120
13-SW22	22-Apr-14	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	33	8.8
13-SW22	29-Apr-14	---	---	---	---	---	---	3.5	---	---	---	---	---	---	---	---	130	100
13-SW22	06-May-14	---	---	---	---	---	---	1.7	---	---	---	---	---	---	---	---	130	170
13-SW22	13-May-14	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	150	200
13-SW22	20-May-14	---	---	---	---	---	---	3.5	---	---	---	---	---	---	---	---	58	67
13-SW22	27-May-14	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	18	30
13-SW22	02-Jun-14	---	---	---	---	---	---	2.8	---	---	---	---	---	---	---	---	31	42
13-SW22	09-Jun-14	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	8.7	16
13-SW22	16-Jun-14	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	3.3	7.2
13-SW22	23-Jun-14	---	---	---	---	---	---	2	---	---	---	---	---	---	---	---	4	7.4
13-SW22	01-Jul-14	---	---	---	---	---	---	6.7	---	---	---	---	---	---	---	---	---	---
13-SW22	08-Jul-14	---	---	---	---	---	---	2	---	---	---	---	---	---	---	---	---	---
13-SW26	13-May-14	---	---	---	---	---	---	8.0	---	---	---	---	---	---	---	---	6	4.4
13-SW26	20-May-14	---	---	---	---	---	---	3.7	---	---	---	---	---	---	---	---	3.3	2.8
13-SW26	27-May-14	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	6.7	1.5
13-SW26	02-Jun-14	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	7.3	1.2
13-SW26	09-Jun-14	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	8.7	3.4
13-SW26	16-Jun-14	---	---	---	---	---	---	2.9	---	---	---	---	---	---	---	---	18	20
13-SW26	23-Jun-14	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	45	7.6
13-SW26	01-Jul-14	---	---	---	---	---	---	6.4	---	---	---	---	---	---	---	---	---	---
13-SW26	08-Jul-14	---	---	---	---	---	---	2.2	---	---	---	---	---	---	---	---	---	---
13-SW26	15-Jul-14	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	---	---
13-SW26 dup	15-Jul-14	---	---	---	---	---	---	2.2	---	---	---	---	---	---	---	---	---	---
13-SW27	13-May-14	---	---	---	---	---	---	3.9	---	---	---	---	---	---	---	---	1.3	1.7
13-SW27	20-May-14	---	---	---	---	---	---	3.3	---	---	---	---	---	---	---	---	11	4.2
13-SW27	27-May-14	---	---	---	---	---	---	3.0	---	---	---	---	---	---	---	---	5.3	3.7
13-SW27	02-Jun-14	---	---	---	---	---	---	3.9	---	---	---	---	---	---	---	---	2.7	3.3
13-SW27	09-Jun-14	---	---	---	---	---	---	3.7	---	---	---	---	---	---	---	---	4	4.7
13-SW27	16-Jun-14	---	---	---	---	---	---	3.4	---	---	---	---	---	---	---	---	17	21
13-SW27	23-Jun-14	---	---	---	---	---	---	3.2	---	---	---	---	---	---	---	---	8	7.2
13-SW27	01-Jul-14	---	---	---	---	---	---	3.8	---	---	---	---	---	---	---	---	---	---
13-SW27	08-Jul-14	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	---	---
13-SW27	15-Jul-14	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	---	---
ESRD Freshwater Aquatic Life*		**6.5-9.0^{pH}**	**NS**	**NS**	**NS**	**NS**	**NS**	**120^{LT}**	**H^{SO4}**	**Cl^{LT}**	**3^{LT}**	**NS**	**20^{Alk}**	**NS**	**NS**	**NS**	**narrative**	**narrative**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**100^{crop}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^{crop}**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**

TABLE B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Lab pH	Lab EC	Ca	Mg	Na	K	Cl	SO_4	NO_2-N	NO_3-N	NO_3+NO_2-N	Total Alkalinity	HCO_3	Hardness	TDS	TSS	Turbidity
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
Surface Water Samples																		
13-SW31	08-Apr-14	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	4.7	3.6
13-SW31	15-Apr-14	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	170	54
13-SW31 dup	15-Apr-14	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	420	130
13-SW31	22-Apr-14	---	---	---	---	---	---	3.3	---	---	---	---	---	---	---	---	100	34
13-SW31 dup	22-Apr-14	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	37	7.2
13-SW31	29-Apr-14	---	---	---	---	---	---	1.8	---	---	---	---	---	---	---	---	4.7	2.1
13-SW31 dup	29-Apr-14	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	6.0	1.4
13-SW31	06-May-14	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	140	180
13-SW31 dup	06-May-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	80	17
13-SW31	13-May-14	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	20	24
13-SW31 dup	13-May-14	---	---	---	---	---	---	7.9	---	---	---	---	---	---	---	---	25	13
13-SW31	20-May-14	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	33	69
13-SW31 dup	20-May-14	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	23	60
13-SW31	27-May-14	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	15	27
13-SW31 dup	27-May-14	---	---	---	---	---	---	21	---	---	---	---	---	---	---	---	1.3	0.55
13-SW31	02-Jun-14	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	28	46
13-SW31 dup	02-Jun-14	---	---	---	---	---	---	2.2	---	---	---	---	---	---	---	---	11	2.9
13-SW31	09-Jun-14	---	---	---	---	---	---	1.2	---	---	---	---	---	---	---	---	2	1.5
13-SW31 dup	09-Jun-14	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	11	18
13-SW31	16-Jun-14	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	1.3	7.9
13-SW31 dup	16-Jun-14	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	5.3	7.6
13-SW31	23-Jun-14	---	---	---	---	---	---	11.0	---	---	---	---	---	---	---	---	71	5.6
13-SW31 dup	23-Jun-14	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	2.7	1.6
13-SW31	01-Jul-14	---	---	---	---	---	---	2.9	---	---	---	---	---	---	---	---	---	---
13-SW31 dup	01-Jul-14	---	---	---	---	---	---	4.4	---	---	---	---	---	---	---	---	---	---
13-SW31	08-Jul-14	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	---	---
13-SW31 dup	08-Jul-14	---	---	---	---	---	---	1.2	---	---	---	---	---	---	---	---	---	---
Basin 3 Culvert	15-Jul-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	---	---
Basin 4 Culvert	15-Jul-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	---	---
ESRD Freshwater Aquatic Life*		**6.5-9.0^{pH}**	**NS**	**NS**	**NS**	**NS**	**NS**	**120^{LT}**	**H^{SO4}**	**Cl^{LT}**	**3^{LT}**	**NS**	**20^{Alk}**	**NS**	**NS**	**NS**	**narrative**	**narrative**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**100^{crop}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^{crop}**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**

TABLE B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Lab pH	Lab EC	Ca	Mg	Na	K	Cl	SO_4	NO_2-N	NO_3-N	NO_3+NO_2-N	Total Alkalinity	HCO_3	Hardness	TDS	TSS	Turbidity
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
Containment Structure Samples																		
14-SW1-P1	01-Apr-14	---	---	---	---	---	---	46	---	---	---	---	---	---	---	---	21	---
14-SW1-P1	01-Apr-14	---	---	---	---	---	---	3.0	---	---	---	---	---	---	---	---	400	360
14-SW1-P1	29-Apr-14	---	---	---	---	---	---	3.2	---	---	---	---	---	---	---	---	350	510
14-SW1-P1	06-May-14	---	---	---	---	---	---	16	---	---	---	---	---	---	---	---	320	400
14-SW1-P1	13-May-14	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	54	82
14-SW1-P1	20-May-14	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	43	62
14-SW1-P1	27-May-14	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	14	18
14-SW1-P2	05-Apr-14	---	---	---	---	---	---	22	---	---	---	---	---	---	---	---	130	---
13-SW46	20-May-14	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	34	20
13-SW46	02-Jun-14	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	5.3	4.3
13-SW46	09-Jun-14	---	---	---	---	---	---	1.8	---	---	---	---	---	---	---	---	1.3	1.3
13-SW46	16-Jun-14	---	---	---	---	---	---	1.7	---	---	---	---	---	---	---	---	5.3	4.8
13-SW46	23-Jun-14	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	36	15
13-SW46	01-Jul-14	---	---	---	---	---	---	4.6	---	---	---	---	---	---	---	---	---	---
13-SW46	08-Jul-14	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---
14-SW81	02-Jun-14	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	24	39
14-SW81	09-Jun-14	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	450	1000
14-SW81	16-Jun-14	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	8	18
14-SW81	23-Jun-14	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	15	24
14-SW81	01-Jul-14	---	---	---	---	---	---	4.7	---	---	---	---	---	---	---	---	---	---
14-SW81	08-Jul-14	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	---	---
Minimal Detection Limit		**0.1**	**1**	**0.3**	**0.2**	**0.5**	**0.3**	**1**	**0.5**	**0.003**	**0.003**	**0.003**	**0.5**	**0.5**	**0.5**	**10**	**3**	**0.1**
ESRD Freshwater Aquatic Life*		**6.5-9.0^{pH}**	**NS**	**NS**	**NS**	**NS**	**NS**	**120^{LT}**	**H^{SO4}**	**Cl^{LT}**	**3^{LT}**	**NS**	**20^{Alk}**	**NS**	**NS**	**NS**	**narrative**	**narrative**
ESRD Agriculture - Irrigation*		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**100^{crop}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^{crop}**	**NS**	**NS**
ESRD Agriculture - Livestock*		**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**

Notes:

--- - not analyzed

NS - not specified

crop - guideline level is crop dependent; criterion shown is most stringent value

H - dependent on hardness value

Cl - dependent on chloride value

pH - not to be altered by more than 0.5 units from background

LT - long-term exposure guideline; see applicable guidelines for further details

Alk - minimum value, unless natural conditions are less

SO4 - guideline level is hardness dependent; hardness values greater than 250 mg/L need to be determined based on site water

* - Environmental Quality Guidelines for Alberta Surface Waters (ESRD 2014)

Italics - values do not meet applicable guidelines

TABLE B4.

WATER QUALITY RESULTS - PIW SAMPLES - GENERAL PARAMETERS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Cl mg/L	TSS mg/L	Turbidity NTU
Pre-Treatment				
14-PIW-PRE	28-Apr-14	52	260	460
14-PIW-PRE	30-Apr-14	43	7.3	100
14-PIW-PRE	08-May-14	24	92	170
14-PIW-PRE	02-Jun-14	13	140	160
14-PIW-PRE	09-Jun-14	33	57	70
14-PIW-PRE	10-Jun-14	14	37	29
15-26 Pre-Treatment	16-Jun-14	25	---	---
15-26 Pre-Treatment	19-Jun-14	22	---	---
15-26 Pre-Treatment	21-Jun-14	17	---	---
15-26 Pre-Treatment	24-Jun-14	17	---	---
15-26 Pre-Treatment	26-Jun-14	18	---	---
15-26 Pre-Treatment	27-Jun-14	14	---	---
15-26 Pre-Treatment	29-Jun-14	8.3	---	---
15-26 Pre-Treatment	30-Jun-14	12	---	---
15-26 Pre-Treatment	01-Jul-14	12	---	---
15-26 Pre-Treatment	03-Jul-14	24	---	---
Discharge				
14-PIW	08-May-14	30	100	170
14-PIW	20-May-14	30	43	44
14-PIW	27-May-14	<1	66	86
14-PIW	02-Jun-14	11	99	210
14-PIW	09-Jun-14	39	12	41
14-PIW	10-Jun-14	22	23	30
15-26 14-SW20	03-Jun-14	1.2	6.7	2.5
Upstream Bag Filter				
15-26 U/S Bag Filter	16-Jun-14	26	---	---
15-26 U/S Bag Filter	19-Jun-14	20	---	---
15-26 U/S Bag Filter	21-Jun-14	20	---	---
15-26 U/S Bag Filter	24-Jun-14	21	---	---
15-26 U/S Bag Filter	26-Jun-14	18	---	---
15-26 U/S Bag Filter	27-Jun-14	16	---	---
15-26 U/S Bag Filter	29-Jun-14	14	---	---
15-26 U/S Bag Filter	30-Jun-14	11	---	---
15-26 U/S Bag Filter	01-Jul-14	14	---	---
15-26 U/S Bag Filter	03-Jul-14	20	---	---
Alberta Tier 1 - Natural Areas*		**230[A]**	**NS**	**NS**

TABLE B4.

WATER QUALITY RESULTS - PIW SAMPLES - GENERAL PARAMETERS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Cl mg/L	TSS mg/L	Turbidity NTU
Downstream Bag Filter				
15-26 D/S Bag Filter	16-Jun-14	24	---	---
15-26 D/S Bag Filter	19-Jun-14	20	---	---
15-26 D/S Bag Filter	21-Jun-14	19	---	---
15-26 D/S Bag Filter	24-Jun-14	18	---	---
15-26 D/S Bag Filter	26-Jun-14	17	---	---
15-26 D/S Bag Filter	27-Jun-14	15	---	---
15-26 D/S Bag Filter	29-Jun-14	7.5	---	---
15-26 D/S Bag Filter	30-Jun-14	9.8	---	---
15-26 D/S Bag Filter	01-Jul-14	14	---	---
15-26 D/S Bag Filter	03-Jul-14	17	---	---
Downstream Carbon Filter				
15-26 D/S Carbon Filter	16-Jun-14	57	---	---
15-26 D/S Carbon Filter	19-Jun-14	18	---	---
15-26 D/S Carbon Filter	21-Jun-14	18	---	---
15-26 D/S Carbon Filter	24-Jun-14	23	---	---
15-26 D/S Carbon Filter	26-Jun-14	13	---	---
15-26 D/S Carbon Filter	27-Jun-14	14	---	---
15-26 D/S Carbon Filter	29-Jun-14	6.2	---	---
15-26 D/S Carbon Filter	30-Jun-14	10	---	---
15-26 D/S Carbon Filter	01-Jul-14	14	---	---
15-26 D/S Carbon Filter	03-Jul-14	27	---	---
Downstream Clay Filter				
15-26 D/S Clay Filter	16-Jun-14	29	---	---
15-26 D/S Clay Filter	19-Jun-14	21	---	---
15-26 D/S Clay Filter	21-Jun-14	17	---	---
15-26 D/S Clay Filter	24-Jun-14	25	---	---
15-26 D/S Clay Filter	26-Jun-14	15	---	---
15-26 D/S Clay Filter	27-Jun-14	15	---	---
15-26 D/S Clay Filter	29-Jun-14	8.8	---	---
15-26 D/S Clay Filter	30-Jun-14	10	---	---
15-26 D/S Clay Filter	01-Jul-14	16	---	---
15-26 D/S Clay Filter	03-Jul-14	25	---	---
Alberta Tier 1 - Natural Areas*		**230[A]**	**NS**	**NS**

TABLE B4.

WATER QUALITY RESULTS - PIW SAMPLES - GENERAL PARAMETERS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Cl mg/L	TSS mg/L	Turbidity NTU
C-Ring Containment				
C Ring Containment	17-Jun-14	24	---	---
C Ring Containment	19-Jun-14	22	---	---
C Ring Containment	21-Jun-14	21	---	---
C Ring Containment	24-Jun-14	18	---	---
C Ring Containment	26-Jun-14	15	---	---
C Ring Containment	27-Jun-14	15	---	---
C Ring Containment	29-Jun-14	9.4	---	---
C Ring Containment	30-Jun-14	12	---	---
C Ring Containment	01-Jul-14	15	---	---
C Ring Containment	03-Jul-14	19	---	---
C Ring Containment	09-Jul-14	25	---	---
C Ring Containment	11-Jul-14	9.5	---	---
C Ring Containment	17-Jul-14	21	---	---
C Ring Containment	19-Jul-14	16	---	---
Minimal Detection Limit		**1**	**3**	**0.1**
Alberta Tier 1 - Natural Areas*		**230[A]**	**NS**	**NS**

Notes:

--- - not analyzed

NS - not specified

[A] - indicates guideline for Aquatic Life exposure pathway

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)

Italics - values do not meet applicable guidelines

TABLE B5.

WATER QUALITY RESULTS - PIW SAMPLES - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Pre-Treatment									
14-PIW-PRE	28-Apr-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	---	---
14-PIW-PRE	30-Apr-14	<0.0004	0.002	0.00046	0.0023	<0.1	0.24	---	---
14-PIW-PRE	08-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	0.13	---	---
14-PIW-PRE	02-Jun-14	<0.0004	0.00075	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
14-PIW-PRE	09-Jun-14	<0.0004	<0.0004	<0.0004	<0.0004	<0.1	<0.10	<0.20	<0.20
14-PIW-PRE	10-Jun-14	<0.00040	0.0018	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	16-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	0.21
15-26 Pre-Treatment	19-Jun-14	<0.00040	0.0036	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	21-Jun-14	<0.00040	0.0023	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	24-Jun-14	<0.00040	0.0029	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	26-Jun-14	<0.00040	0.0027	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	27-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	29-Jun-14	0.00058	0.0025	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	30-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 Pre-Treatment	01-Jul-14	<0.00040	0.0021	<0.00040	<0.004	<0.10	<0.10	0.32	<0.20
15-26 Pre-Treatment	03-Jul-14	<0.00040	0.0039	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
Discharge									
14-PIW	08-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	---	---
14-PIW	20-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.2	<0.2
14-PIW	27-May-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	0.18	1	<0.2
14-PIW	02-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
14-PIW	09-Jun-14	<0.0004	0.00044	<0.0004	<0.0004	<0.1	0.32	0.37	<0.20
14-PIW	10-Jun-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
15-26 14-SW20	03-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
Upstream Bag Filter									
15-26 U/S Bag Filter	16-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	19-Jun-14	<0.00040	0.0033	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	21-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	24-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	26-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	0.15	0.22	<0.20
15-26 U/S Bag Filter	27-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	29-Jun-14	<0.00040	0.0024	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	30-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	01-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 U/S Bag Filter	03-Jul-14	<0.00040	0.0023	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
Alberta Tier 1 - Coarse Grained Soils - Natu		**0.005^{P,MAC}**	**0.024^{P,AO}**	**0.0024^{P,AO}**	**0.3^{P,AO}**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**

TABLE B5.

WATER QUALITY RESULTS - PIW SAMPLES - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Downstream Bag Filter									
15-26 D/S Bag Filter	16-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	0.69	2.7	<0.20
15-26 D/S Bag Filter	19-Jun-14	<0.00040	0.0032	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	21-Jun-14	<0.00040	0.0024	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	24-Jun-14	<0.00040	0.0023	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	26-Jun-14	<0.00040	0.0021	<0.00040	<0.004	<0.10	0.1	<0.20	<0.20
15-26 D/S Bag Filter	27-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	29-Jun-14	<0.00040	0.0025	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	30-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	01-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Bag Filter	03-Jul-14	<0.00040	0.0027	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
Downstream Carbon Filter									
15-26 D/S Carbon Filter	16-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	0.35	<0.20
15-26 D/S Carbon Filter	19-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	21-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	24-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	26-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	27-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	29-Jun-14	0.00059	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	30-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	01-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Carbon Filter	03-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
Downstream Clay Filter									
15-26 D/S Clay Filter	16-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	0.2	<0.20	<0.20
15-26 D/S Clay Filter	19-Jun-14	<0.00040	0.0035	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Clay Filter	21-Jun-14	<0.00040	0.0028	<0.00040	<0.004	0.1	<0.10	<0.20	<0.20
15-26 D/S Clay Filter	24-Jun-14	<0.00040	0.0022	<0.00040	<0.004	<0.1	0.11	<0.20	<0.20
15-26 D/S Clay Filter	26-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	0.11	<0.20	<0.20
15-26 D/S Clay Filter	27-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Clay Filter	29-Jun-14	<0.00040	0.0024	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Clay Filter	30-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Clay Filter	01-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
15-26 D/S Clay Filter	03-Jul-14	<0.00040	0.0023	<0.00040	<0.004	<0.10	<0.10	0.21	<0.20
Alberta Tier 1 - Coarse Grained Soils - Natu		**0.005^{P,MAC}**	**0.024^{P,AO}**	**0.0024^{P,AO}**	**0.3^{P,AO}**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**

TABLE B5.

WATER QUALITY RESULTS - PIW SAMPLES - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
C-Ring Containment									
C Ring Containment	17-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	0.22
C Ring Containment	19-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	21-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	24-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	26-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	27-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	29-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	30-Jun-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	0.29	<0.20
C Ring Containment	01-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	03-Jul-14	<0.00040	<0.002	<0.00040	<0.004	<0.10	<0.10	<0.20	<0.20
C Ring Containment	09-Jul-14	<0.00040	0.00069	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	11-Jul-14	<0.00040	0.00048	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	17-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	19-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
Minimal Detection Limit		**0.0004**	**0.0004**	**0.0004**	**0.0008**	**0.1**	**0.1**	**0.2**	**0.2**
Alberta Tier 1 - Coarse Grained Soils - Natu		**0.005^{P,MAC}**	**0.024^{P,AO}**	**0.0024^{P,AO}**	**0.3^{P,AO}**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**

Notes:

--- - not analyzed

NS - not specified

A - indicates guideline for Aquatic Life exposure pathway

P - indicates guideline for Potable Groundwater exposure pathway

AO - aesthetic objective from *Guidelines for Canadian Drinking Water Quality-Summary Table* (Health Canada 2012)

MAC - maximum acceptable concentration based on health effects from *Guidelines for Canadian Drinking Water Quality-Summary Table* (Health Canada 2012)

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)

Italics - values do not meet applicable guidelines

TABLE B6.

WATER QUALITY RESULTS - PIW SAMPLES - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Monitoring Well	Sample Date	Acenaphthene µg/L	Acenaphthylene µg/L	Anthracene µg/L	Benz[a]anthracene^{++} µg/L	Benzo[b+j]fluoranthene^{++} µg/L	Benzo[k]fluoranthene^{++} µg/L	Benzo[g,h,i]perylene^{++} µg/L	Benzo[a]pyrene^{++} µg/L	Chrysene^{++} µg/L	Dibenz[a,h]anthracene^{++} µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-c,d]pyrene^{++} µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Benzo[a]pyreneTPE^{+++} µg/L
Pre-Treatment																		
14-PIW-PRE	28-Apr-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.51	<0.050	<0.020	ND
14-PIW-PRE	30-Apr-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	***59***	<0.050	<0.020	ND
14-PIW-PRE	08-May-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	0.012	0.061	<0.0085	0.57	0.10	***0.046****	ND
14-PIW-PRE	02-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
14-PIW-PRE	09-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
14-PIW-PRE	10-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	16-Jun-14	<0.10	<0.10	<0.010	0.016	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	0.0016
15-26 Pre-Treatment	19-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.015	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	21-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	24-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	26-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	27-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	29-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	30-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.025	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	01-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 Pre-Treatment	03-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
Discharge																		
14-PIW	08-May-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	***0.034****	ND
14-PIW	20-May-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.21	<0.050	<0.020	ND
14-PIW	27-May-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	***14***	<0.050	<0.020	ND
14-PIW	02-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.17	<0.050	<0.020	ND
14-PIW	09-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	***22***	<0.050	<0.020	ND
14-PIW	10-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.14	<0.050	<0.020	ND
15-26 14-SW20	03-Jun-14	<0.12	<0.12	<0.012	<0.010	<0.010	<0.010	<0.010	<0.0089	<0.010	<0.0089	<0.012	<0.060	<0.010	<0.12	<0.060	<0.024	ND
Upstream Bag Filter																		
15-26 U/S Bag Filter	16-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.22	<0.050	<0.020	ND
15-26 U/S Bag Filter	19-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.015	<0.0075	<0.010	<0.050	<0.0085	0.12	<0.050	<0.020	ND
15-26 U/S Bag Filter	21-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.17	<0.050	<0.020	ND
15-26 U/S Bag Filter	24-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.11	<0.050	<0.020	ND
15-26 U/S Bag Filter	26-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.11	<0.050	<0.020	ND
15-26 U/S Bag Filter	27-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 U/S Bag Filter	29-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 U/S Bag Filter	30-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.025	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 U/S Bag Filter	01-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.15	<0.050	<0.020	ND
15-26 U/S Bag Filter	03-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
Downstream Bag Filter																		
15-26 D/S Bag Filter	16-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	1.00	<0.050	0.02	ND
15-26 D/S Bag Filter	19-Jun-14	<0.10	<0.10	***0.034***	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.015	<0.0075	<0.010	<0.050	<0.0085	0.12	<0.050	<0.020	ND
15-26 D/S Bag Filter	21-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.31	0.051	<0.020	ND
15-26 D/S Bag Filter	24-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.19	<0.050	<0.020	ND
15-26 D/S Bag Filter	26-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.16	<0.050	<0.020	ND
15-26 D/S Bag Filter	27-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Bag Filter	29-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Bag Filter	30-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.025	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Bag Filter	01-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.2	<0.050	<0.020	ND
15-26 D/S Bag Filter	03-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
Alberta Tier 1 - Coarse Grained Soils -		**5.8^{A}**	**46^{A}**	**0.012^{A}**	**0.018^{A}**	**0.48^{A}**	**0.48^{A}**	**0.17^{A}**	**0.015^{A}**	**1.4^{A}**	**0.26^{A}**	**0.04^{A}**	**3^{A}**	**0.21^{A}**	**1.1^{A}**	**0.4^{A}**	**0.025^{A}**	**0.01^{P}**

TABLE B6.

WATER QUALITY RESULTS - PIW SAMPLES - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Monitoring Well	Sample Date	Acenaphthene µg/L	Acenaphthylene µg/L	Anthracene µg/L	Benz[a]anthracene++ µg/L	Benzo[b+j]fluoranthene++ µg/L	Benzo[k]fluoranthene++ µg/L	Benzo[g,h,i]perylene++ µg/L	Benzo[a]pyrene++ µg/L	Chrysene++ µg/L	Dibenz[a,h]anthracene++ µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-c,d]pyrene++ µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Benzo[a]pyreneTPE+++ µg/L
Downstream Carbon Filter																		
15-26 D/S Carbon Filter	16-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	1.10	<0.050	<0.020	ND
15-26 D/S Carbon Filter	19-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.015	<0.0075	<0.010	<0.050	<0.0085	0.17	<0.050	<0.020	ND
15-26 D/S Carbon Filter	21-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.19	<0.050	<0.020	ND
15-26 D/S Carbon Filter	24-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.16	<0.050	<0.020	ND
15-26 D/S Carbon Filter	26-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.13	<0.050	<0.020	ND
15-26 D/S Carbon Filter	27-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.1	<0.050	<0.020	ND
15-26 D/S Carbon Filter	29-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Carbon Filter	30-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.025	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Carbon Filter	01-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Carbon Filter	03-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
Downstream Clay Filter																		
15-26 D/S Clay Filter	16-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	1.10	<0.050	<0.020	ND
15-26 D/S Clay Filter	19-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.015	<0.0075	<0.010	<0.050	<0.0085	0.22	<0.050	<0.020	ND
15-26 D/S Clay Filter	21-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.3	<0.050	<0.020	ND
15-26 D/S Clay Filter	24-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.23	<0.050	<0.020	ND
15-26 D/S Clay Filter	26-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.18	<0.050	<0.020	ND
15-26 D/S Clay Filter	27-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.12	<0.050	<0.020	ND
15-26 D/S Clay Filter	29-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
15-26 D/S Clay Filter	30-Jun-14	<0.10	<0.10	<0.010	0.017	<0.0085	<0.0085	<0.0085	<0.0075	<0.025	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	0.0017
15-26 D/S Clay Filter	01-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.13	<0.050	<0.020	ND
15-26 D/S Clay Filter	03-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
C-Ring Containment																		
C Ring Containment	17-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.12	<0.050	<0.020	ND
C Ring Containment	19-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.015	<0.0075	<0.010	<0.050	<0.0085	0.10	<0.050	<0.020	ND
C Ring Containment	21-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.18	<0.050	<0.020	ND
C Ring Containment	24-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.17	<0.050	<0.020	ND
C Ring Containment	26-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.16	<0.050	<0.020	ND
C Ring Containment	27-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	0.10	<0.050	<0.020	ND
C Ring Containment	29-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
C Ring Containment	30-Jun-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.025	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
C Ring Containment	01-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
C Ring Containment	03-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	ND
C Ring Containment	09-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.39	<0.050	<0.020	ND
C Ring Containment	11-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.12	<0.050	<0.020	ND
C Ring Containment	17-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.14	<0.050	<0.020	ND
C Ring Containment	19-Jul-14	<0.10	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.11	<0.050	<0.020	ND
Minimal Detection Limit		**0.1**	**0.1**	**0.01**	**0.0085**	**0.0085**	**0.0085**	**0.0085**	**0.0075**	**0.0085**	**0.0075**	**0.01**	**0.05**	**0.0085**	**0.1**	**0.05**	**0.02**	**-**
Alberta Tier 1 - Coarse Grained Soils -		**5.8[A]**	**46[A]**	**0.012[A]**	**0.018[A]**	**0.48[A]**	**0.48[A]**	**0.17[A]**	**0.015[A]**	**1.4[A]**	**0.26[A]**	**0.04[A]**	**3[A]**	**0.21[A]**	**1.1[A]**	**0.4[A]**	**0.025[A]**	**0.01[P]**

Notes:

ND - not detected

NS - not specified

[A] - indicates guideline for Aquatic Life exposure pathway

[P] - indicates guideline for Potable Groundwater exposure pathway

++ - carcinogenic PAH compounds

+++ - equivalent Benzo[a]pyrene concentrations calculated by Matrix Solutions are based on relative carcinogenic potency

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)

** - concentration is determined to be suspect as pyrene was detected in all samples analyzed in Maxxam batch 7479418 (including blanks)

Italics - values do not meet applicable guidelines

TABLE B7.

WATER QUALITY RESULTS - GROUNDWATER SAMPLES IN PIW DISCHARGE AREA - GENERAL PARAMETERS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Cl mg/L	TSS mg/L	Turbidity NTU
14-DP1	02-Jun-14	7.3	3500	3100
14-DP1	09-Jun-14	9.4	940	2000
14-DP1	16-Jun-14	7.4	1200	720
14-DP1	23-Jun-14	9.3	530	220
14-DP2	02-Jun-14	8.7	2600	2200
14-DP2	09-Jun-14	9.6	2600	3000
14-DP2	16-Jun-14	8	1800	930
14-DP2	23-Jun-14	9.4	1100	420
14-DP2	14-Jul-14	11	---	---
14-DP3	02-Jun-14	11	1300	810
14-DP3	09-Jun-14	11	1400	920
14-DP3	16-Jun-14	9.2	980	440
14-DP3	23-Jun-14	8.9	390	210
14-DP3	14-Jul-14	8.2	---	---
14-DP4	02-Jun-14	7.1	3700	2900
14-DP4	09-Jun-14	7.1	280	240
14-DP4	16-Jun-14	5	270	180
14-DP4	23-Jun-14	4.3	340	130
14-DP4	14-Jul-14	5.4	---	---
14-DP5	02-Jun-14	5.2	1300	460
14-DP5	09-Jun-14	3.9	370	130
14-DP5	16-Jun-14	2.7	430	130
14-DP5	23-Jun-14	2.2	150	46
14-DP5	14-Jul-14	3.8	---	---
Alberta Tier 1 - Natural Areas*		**230[A]**	**NS**	**NS**
ESRD Freshwater Aquatic Life**		**120[LT]**	**narrative**	**narrative**
ESRD Agriculture - Irrigation**		**100[crop]**	**NS**	**NS**
ESRD Agriculture - Livestock**		**NS**	**NS**	**NS**

TABLE B7.

WATER QUALITY RESULTS - GROUNDWATER SAMPLES IN PIW DISCHARGE AREA - GENERAL PARAMETERS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Cl mg/L	TSS mg/L	Turbidity NTU
14-DP6	02-Jun-14	7.8	550	250
14-DP6	09-Jun-14	5.7	190	110
14-DP6	16-Jun-14	4.3	140	33
14-DP6	23-Jun-14	2.5	55	15
14-DP6	14-Jul-14	2.6	---	---
14-DP7	14-Jul-14	8.8	---	---
Minimal Detection Limit		**1**	**3**	**0.1**
Alberta Tier 1 - Natural Areas*		**230^{A}**	**NS**	**NS**
ESRD Freshwater Aquatic Life**		**120^{LT}**	**narrative**	**narrative**
ESRD Agriculture - Irrigation**		**100^{crop}**	**NS**	**NS**
ESRD Agriculture - Livestock**		**NS**	**NS**	**NS**

Notes:

NS - not specified

^{A} - indicates guideline for Aquatic Life exposure pathway

^{crop} - guideline level is crop dependent; criterion shown is most stringent value

^{LT} - long-term exposure guideline; see applicable guidelines for further details

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)

** - *Environmental Quality Guidelines for Alberta Surface Waters* (ESRD 2014)

Italics - values do not meet applicable ESRD guidelines

TABLE B8.

WATER QUALITY RESULTS - GROUNDWATER SAMPLES IN PIW DISCHARGE AREA - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
14-DP1	02-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP1	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP1	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP1	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP2	02-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP2	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP2	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	***0.13***	---	---
14-DP2	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP2	14-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	***0.13***	---	---
14-DP3	02-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP3	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP3	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP3	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP3	14-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP4	02-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP4	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP4	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP4	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP4	14-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP5	02-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP5	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP5	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP5	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP5	14-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Alberta Tier 1 - Coarse Grained Soi		**0.005^{P,MAC}**	**0.024^{P,AO}**	**0.0024^{P,AO}**	**0.3^{P,AO}**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**
ESRD Freshwater Aquatic Life**		**0.04**	**0.0005**	**0.09**	**0.03**	**NSST**	**NSST**	**NS**	**NS**
ESRD Agriculture - Irrigation**		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock**		**NS**	**0.024**	**0.0024**	**NS**	**NS**	**NS**	**NS**	**NS**

TABLE B8.

WATER QUALITY RESULTS - GROUNDWATER SAMPLES IN PIW DISCHARGE AREA - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
14-DP6	02-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP6	09-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-DP6	16-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP6	23-Jun-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP6	14-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP7	14-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Minimal Detection Limit		**0.0004**	**0.0004**	**0.0004**	**0.0008**	**0.1**	**0.1**	**0.2**	**0.2**
Alberta Tier 1 - Coarse Grained Soi		**0.005^{P,MAC}**	**0.024^{P,AO}**	**0.0024^{P,AO}**	**0.3^{P,AO}**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**
ESRD Freshwater Aquatic Life**		**0.04**	**0.0005**	**0.09**	**0.03**	**NSST**	**NSST**	**NS**	**NS**
ESRD Agriculture - Irrigation**		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock**		**NS**	**0.024**	**0.0024**	**NS**	**NS**	**NS**	**NS**	**NS**

Notes:

NS - not specified

A - indicates guideline for Aquatic Life exposure pathway

P - indicates guideline for Potable Groundwater exposure pathway

AO - aesthetic objective from *Guidelines for Canadian Drinking Water Quality-Summary Table* (Health Canada 2012)

MAC - maximum acceptable concentration based on health effects from *Guidelines for Canadian Drinking Water Quality-Summary Table* (Health Canada 2012)

ST - see applicable guidelines for short-term exposure guideline

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)

** - Environmental Quality Guidelines for Alberta Surface Waters (ESRD 2014)

Italics - values do not meet applicable ESRD guidelines

TABLE B9.

WATER QUALITY RESULTS - GROUNDWATER SAMPLES IN PIW DISCHARGE AREA - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Monitoring Well	Sample Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[c]phenanthrene µg/L	Benzo[a]pyrene µg/L	Benzo[e]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	2-Methylnaphthalene µg/L	Perylene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L	TOTAL PAH µg/L
14-DP1	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP1	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP1	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP1	23-Jun-14	<0.10	<0.10	<0.21	<0.010	<0.0089	<0.0089	<0.0089	<0.0089	<0.052	<0.0078	<0.052	<0.0089	<0.0078	<0.010	<0.052	<0.0089	<0.10	<0.10	<0.052	<0.052	<0.021	<0.21	ND
14-DP2	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	0.011	<0.0075	0.023	<0.050	<0.0085	<0.10	<0.10	<0.050	0.086	<0.020	0.46	0.58
14-DP2	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP2	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP2	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP2	14-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	0.11	<0.10	<0.050	<0.050	<0.020	<0.20	0.11
14-DP3	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP3	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP3	16-Jun-14	<0.15	<0.15	<0.29	<0.015	<0.013	<0.013	<0.013	<0.013	<0.074	<0.011	<0.074	<0.013	<0.011	<0.015	<0.074	<0.013	<0.15	<0.15	<0.074	<0.074	<0.029	<0.29	ND
14-DP3	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP3	14-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP4	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP4	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP4	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP4	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP4	14-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP5	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP5	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP5	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP5	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP5	14-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP6	02-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP6	09-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP6	16-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP6	23-Jun-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP6	14-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
14-DP7	14-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
Minimal Detection Limit		**0.1**	**0.1**	**0.2**	**0.01**	**0.0085**	**0.0085**	**0.0085**	**0.0085**	**0.05**	**0.0075**	**0.05**	**0.0085**	**0.0075**	**0.01**	**0.05**	**0.0085**	**0.1**	**0.1**	**0.05**	**0.05**	**0.02**	**0.2**	**-**
Alberta Tier 1 - Coarse Grained Soi		**5.8[A]**	**46[A]**	**NS**	**0.012[A]**	**0.018[A]**	**0.48[A]**	**0.48[A]**	**0.17[A]**	**NS**	**0.015[A]**	**NS**	**1.4[A]**	**0.26[A]**	**0.04[A]**	**3[A]**	**0.21[A]**	**1.1[A]**	**NS**	**NS**	**0.4[A]**	**0.025[A]**	**NS**	**0.01[P]**
ESRD Freshwater Aquatic Life**		**5.8**	**NS**	**4.4**	**0.012**	**0.018**	**NS**	**NS**	**NS**	**NS**	**0.015**	**NS**	**NS**	**NS**	**0.04**	**3**	**NS**	**1**	**NS**	**NS**	**0.4**	**0.025**	**3.4**	**NS**
ESRD Agriculture - Irrigation**		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
ESRD Agriculture - Livestock**		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Notes:

--- - not analyzed

ND - not detected

NS - not specified

[A] - indicates guideline for Aquatic Life exposure pathway

[P] - indicates guideline for Potable Groundwater exposure pathway

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AENV 2010)

** - Environmental Quality Guidelines for Alberta Surface Waters (ESRD 2014)

TABLE B10.

SURFACE WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point		Sample Depth cm	Sample Time	Sample Date	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_3+NO_2-N mg/L	Total Alkalinity^ mg/L	HCO_3 mg/L	Hardness^ mg/L	TDS mg/L	TOC mg/L	Cl mg/L	TSS mg/L	Turbidity NTU
13-DP1	Drive point southwest of Pad 21	0	---	04-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5.5	---	---
13-DP1	Drive point southwest of Pad 21	0	---	11-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.7	---	---
13-DP1	Drive point southwest of Pad 21	---	---	18-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	25-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21		---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.2	550	250
13-DP1	Drive point southwest of Pad 21	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	175	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	126	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6.5	1200	190
13-DP1	Drive point southwest of Pad 21	---	---	03-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	04-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.9	540	780
13-DP1	Drive point southwest of Pad 21	138	---	05-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	150	---	06-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	158	---	07-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	164	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	09-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	10-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	13-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.1	650	240
13-DP1	Drive point southwest of Pad 21	---	---	14-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.3	350	290
13-DP1	Drive point southwest of Pad 21	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.6	770	390
13-DP1	Drive point southwest of Pad 21	---	---	16-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.3	430	570
13-DP1	Drive point southwest of Pad 21	---	---	17-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.7	1500	1200
13-DP1	Drive point southwest of Pad 21	---	---	19-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.8	350	130
13-DP1	Drive point southwest of Pad 21	---	---	20-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.8	290	400
13-DP1	Drive point southwest of Pad 21	---	---	21-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.0	780	590
13-DP1	Drive point southwest of Pad 21	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.7	870	250
13-DP1	Drive point southwest of Pad 21	---	---	23-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.6	730	430
13-DP2	Drive point SW of Basin 4		---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5.7	4600	<0.10
13-DP2	Drive point SW of Basin 4		---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.4	---	<0.10
13-DP2	Drive point SW of Basin 4	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.2	3000	<0.10
13-DP2	Drive point SW of Basin 4	191	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP2	Drive point SW of Basin 4	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.6	---	---
13-DP2	Drive point SW of Basin 4	205	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP2	Drive point SW of Basin 4	134	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.4	170	160
13-DP2	Drive point SW of Basin 4	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.3	97	27
13-DP2	Drive point SW of Basin 4	Exova	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.9	120	49.7
13-DP2	Drive point SW of Basin 4	---	---	18-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.5	890	810
13-DP2	Drive point SW of Basin 4	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.7	75	35
13-DP2 dup	Drive point SW of Basin 4	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.5	74	30
13-DP2	Drive point SW of Basin 4	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.0	---	---
AENV Freshwater Aquatic Life*					**6.5-8.5**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.06*** **	**3***[b]	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**230[cc]**	**NS**	**NS**
AENV Agriculture - Irrigation*					**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^^**	**NS**	**100^^**	**NS**	**NS**
AENV Agriculture - Livestock*					**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**	**NS**	**NS**

TABLE B10.

SURFACE WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point		Sample Depth cm	Sample Time	Sample Date	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_3+NO_2-N mg/L	Total Alkalinity^ mg/L	HCO_3 mg/L	Hardness^ mg/L	TDS mg/L	TOC mg/L	Cl mg/L	TSS mg/L	Turbidity NTU
13-DP3	Drive point S of Basin 3 near E Ladder Road		---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.7	---	<0.10
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.0	---	<0.10
13-DP3	Drive point S of Basin 3 near E Ladder Road	87	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.2	2000	970
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.9	700	63
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.2	560	280
13-DP3	Drive point S of Basin 3 near E Ladder Road	96	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.2	590	61
13-DP3	Drive point S of Basin 3 near E Ladder Road	115	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.9	380	180
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5.0	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.4	---	<0.10
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.0	---	<0.10
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.9	740	270
13-DP4	Drive point N of Basin 3 near E Ladder Road	75	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.2	400	140
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1	490	300
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.1	450	270
13-DP4	Drive point N of Basin 3 near E Ladder Road	82	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1	1400	69
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.5	3300	250
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	03-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1	2.7	0.79
13-DP4	Drive point N of Basin 3 near E Ladder Road	117	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.8	160	190
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1	800	550
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.8	220	44
13-DP4	Drive point N of Basin 3 near E Ladder Road	140	---	29-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1.0	63	26
13-DP4	Drive point N of Basin 3 near E Ladder Road	1315	---	05-Nov-13	6.9	540	77	25	2.1	1.6	<0.50	<0.0030	0.0039	0.0039	290	360	290	280	---	<1.0	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	12-Nov-13	6.94	500	69	24	1.9	1.6	<1.0	<0.0030	<0.0030	<0.0030	280	340	270	270	---	<1.0	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	8.9	---	---
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6.3	---	---
13-DP5	Drive point W side of Basin 3	---	---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6.7	####	<0.10
13-DP5	Drive point W side of Basin 3	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5.5	1400	620
13-DP5	Drive point W side of Basin 3	85	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.5	830	360
13-DP5	Drive point W side of Basin 3	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.8	840	550
13-DP5	Drive point W side of Basin 3	91	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.5	410	490
13-DP5	Drive point W side of Basin 3	110	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP5	Drive point W side of Basin 3	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP5	Drive point W side of Basin 3	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP5	Drive point W side of Basin 3	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	13.0	---	---
13-DP6	Drive point S side of Basin 3	---	---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	16.0	1000	2700
13-DP6	Drive point S side of Basin 3	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.8	130	63
13-DP6	Drive point S side of Basin 3	78	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.5	200	64
13-DP6	Drive point S side of Basin 3	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.8	100	37
13-DP6	Drive point S side of Basin 3	105	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.0	67	16
13-DP6	Drive point S side of Basin 3	98	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.7	52	59
13-DP6	Drive point S side of Basin 3	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.0	240	120
13-DP6	Drive point S side of Basin 3	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.6	29	15
13-DP6	Drive point S side of Basin 3	---	---	29-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.3	78	32
13-DP6	Drive point S side of Basin 3	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	8.6	---	---
AENV Freshwater Aquatic Life*					**6.5-8.5**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.06*** **	**3*** [b]	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**230** [cc]	**NS**	**NS**
AENV Agriculture - Irrigation*					**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^^**	**NS**	**100^^**	**NS**	**NS**
AENV Agriculture - Livestock*					**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**	**NS**	**NS**

TABLE B10.

SURFACE WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point		Sample Depth cm	Sample Time	Sample Date	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_3+NO_2-N mg/L	Total Alkalinity^ mg/L	HCO_3 mg/L	Hardness^ mg/L	TDS mg/L	TOC mg/L	Cl mg/L	TSS mg/L	Turbidity NTU
13-DP7	Drive point E side of Basin 3	---	---	28-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5.1	---	<0.10
13-DP7	Drive point E side of Basin 3	---	---	29-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.3	1000	990
13-DP7	Drive point E side of Basin 3	101	---	30-Sep-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.3	340	230
13-DP7	Drive point E side of Basin 3	---	---	01-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.3	950	510
13-DP7	Drive point E side of Basin 3	104	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.6	770	260
13-DP7	Drive point E side of Basin 3	120	---	08-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.2	---	460
13-DP7	Drive point E side of Basin 3	---	---	15-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.4	40	59
13-DP7	Drive point E side of Basin 3	---	---	22-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP7	Drive point E side of Basin 3	---	---	29-Oct-13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13-DP7	Drive point E side of Basin 3	---	---	01-Jul-14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	19.0	---	---
Minimal Detection Limit					**0.1**	**1**	**0.3**	**0.2**	**0.5**	**0.3**	**0.5**	**0.003**	**0.003**	**0.003**	**0.5**	**0.5**	**0.5**	**10**	**0.5**	**1**	**---**	**---**
AENV Freshwater Aquatic Life*					**6.5-8.5**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.06*** **	**3***[b]**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**230[cc]**	**NS**	**NS**
AENV Agriculture - Irrigation*					**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**500^^**	**NS**	**100^^**	**NS**	**NS**
AENV Agriculture - Livestock*					**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**1000**	**10**	**NS**	**100**	**NS**	**NS**	**NS**	**3000**	**NS**	**NS**	**NS**	**NS**

Notes:

--- - not analyzed

NS - not specified

^ - expressed as $CaCO_3$

^^ - guideline level is crop dependent; criterion shown is most stringent value

cc - continuous concentration guideline, National Recommended Water Quality Criteria (USEPA, 2009)

A - 1 day minimum, acute guideline

b - indicates long-term exposure guideline; short-term exposure guideline = 124 mg/L

* - Alberta Environment Surface Water Quality Guidelines for use in Alberta (AENV, 1999)

*** - Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, acessed on line July 2012)

Italics - indicates values do not meet applicable guidelines

TABLE B11.

WATER QUALITY RESULTS - WATER BODIES AND WATERCOURSES

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Location	Sample Depth	Sample Time	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1[TT] C_6-C_{10} mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L	Phenol mg/L	Naphthenic Acids mg/L
13-DP1	Drive point southwest of Pad 21	0	---	04-Sep-13	<0.0004	0.0015	<0.0004	<0.0008	<0.1	<0.11	<0.22	<0.22	0.019	<1
13-DP1	Drive point southwest of Pad 21	0	---	11-Sep-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	0.017	---
13-DP1	Drive point southwest of Pad 21	---	---	18-Sep-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	25-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21		---	28-Sep-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.71	<1.4	<1.4	---	---
13-DP1	Drive point southwest of Pad 21	---	---	29-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	175	---	30-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	01-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	126	---	02-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	03-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	04-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.71	<1.4	<1.4	---	---
13-DP1	Drive point southwest of Pad 21	138	---	05-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	150	---	06-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	158	---	07-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	164	---	08-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	09-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	10-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	---	---	---	---	---
13-DP1	Drive point southwest of Pad 21	---	---	13-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	14-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	16-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	17-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	19-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	20-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	21-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP1	Drive point southwest of Pad 21	---	---	23-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	---	---	---	---	---
13-DP2	Drive point SW of Basin 4	---	---	28-Sep-13	<0.0004	0.0015	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP2	Drive point SW of Basin 4	---	---	29-Sep-13	<0.0004	0.00057	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP2	Drive point SW of Basin 4	---	---	29-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP2	Drive point SW of Basin 4	191	---	30-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	---	---	---	---	---
13-DP2	Drive point SW of Basin 4	---	---	01-Oct-13	<0.0004	0.0007	<0.0004	<0.0008	<0.1	<0.77	<1.6	<1.6	---	---
13-DP2	Drive point SW of Basin 4	205	---	02-Oct-13	<0.0004	<0.64	<0.0004	<0.0008	<0.1	---	---	---	---	---
13-DP2	Drive point SW of Basin 4	134	---	08-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	<1.0
13-DP2	Drive point SW of Basin 4	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	0.26	<0.2	---	---
13-DP2	Drive point SW of Basin 4	Exova	---	15-Oct-13	<0.001	<0.001	<0.001	<0.001	<0.2	<0.2	<0.1	<0.1	---	---
13-DP2	Drive point SW of Basin 4	---	---	18-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP2	Drive point SW of Basin 4	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP2 dup	Drive point SW of Basin 4	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP2	Drive point SW of Basin 4	---	---	01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	0.12	---	---	---	---
AENV Freshwater Aquatic Life*					**0.370**	**0.002**	**0.09**	**0.2**	**NS**	**NS**	**NS**	**NS**		

TABLE B11.

WATER QUALITY RESULTS - WATER BODIES AND WATERCOURSES

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Location	Sample Depth	Sample Time	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1[TT] C_6-C_{10} mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L	Phenol mg/L	Naphthenic Acids mg/L
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	28-Sep-13	<0.0004	***0.0033***	<0.0004	<0.0008	<0.1	<0.1	0.25	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	29-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	87	---	30-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	30-Sep-13	<0.0004	0.0010	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	01-Oct-13	<0.0004	0.00089	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	96	---	02-Oct-13	<0.0004	0.00057	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	115	---	08-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	<1.0
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	---	---	---	---	---
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	01-Jul-14	<0.00040	***0.0041***	<0.00040	<0.0040	<0.10	<0.10	---	---	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	28-Sep-13	<0.0004	0.0014	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	28-Sep-13	<0.0004	0.0011	<0.0004	<0.0008	<0.1	<0.1	0.24	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	29-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	75	---	30-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	01-Oct-13	<0.0004	0.0014	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	01-Oct-13	<0.0004	0.0016	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	82	---	02-Oct-13	<0.0004	0.0014	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	02-Oct-13	---	---	---	---	---	---	---	---	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	03-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	117	---	08-Oct-13	<0.0004	0.0012	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	<1.0
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	140	---	29-Oct-13	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	1315	---	05-Nov-13	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	12-Nov-13	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	26-Nov-13	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	---	---	---	---	---
13-DP4	Drive point N of Basin 3 near E Ladder Road			01-Jul-14	<0.00040	***0.031***	<0.00040	<0.0040	<0.10	<0.10	---	---	---	---
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road			01-Jul-14	<0.00040	***0.033***	<0.00040	<0.0040	<0.10	<0.10	---	---	---	---
13-DP5	Drive point W side of Basin 3	---	---	28-Sep-13	<0.0004	***0.16***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	---	---	29-Sep-13	<0.0004	***0.220***	0.0006	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	85	---	30-Sep-13	<0.0004	***0.150***	0.0005	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	---	---	01-Oct-13	<0.0004	***0.100***	0.00045	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	91	---	02-Oct-13	<0.0004	***0.025***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	110	---	08-Oct-13	<0.0004	***0.003***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP5	Drive point W side of Basin 3	---	---	22-Oct-13	<0.0004	0.00065	<0.0004	<0.0008	<0.1	---	---	---	---	---
13-DP5	Drive point W side of Basin 3	---	---	01-Jul-14	<0.00040	***0.0053***	<0.00040	<0.0040	<0.10	<0.10	---	---	---	---
AENV Freshwater Aquatic Life*					**0.370**	**0.002**	**0.09**	**0.2**	**NS**	**NS**	**NS**	**NS**		

TABLE B11.

WATER QUALITY RESULTS - WATER BODIES AND WATERCOURSES

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Location	Sample Depth	Sample Time	Sample Date	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1[TT] C_6-C_{10} mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L	Phenol mg/L	Naphthenic Acids mg/L
13-DP6	Drive point S side of Basin 3	---	---	28-Sep-13	<0.0004	***0.08***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	---	---	29-Sep-13	<0.0004	***0.0026***	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	78	---	30-Sep-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	---	---	01-Oct-13	<0.0004	0.0013	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	105	---	02-Oct-13	<0.0004	0.0018	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	98	---	08-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	<1.0
13-DP6	Drive point S side of Basin 3	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP6	Drive point S side of Basin 3	108	---	29-Oct-13	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20	---	---
13-DP6	Drive point S side of Basin 3			01-Jul-14	<0.00040	<0.0020	<0.00040	<0.0040	<0.10	<0.10	---	---	---	---
13-DP7	Drive point E side of Basin 3	---	---	28-Sep-13	<0.0004	***0.018***	<0.0004	<0.0008	<0.1	0.14	<0.2	<0.2	---	---
13-DP7	Drive point E side of Basin 3	---	---	29-Sep-13	<0.0004	***0.010***	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP7	Drive point E side of Basin 3	101	---	30-Sep-13	<0.0004	***0.008***	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP7	Drive point E side of Basin 3	---	---	01-Oct-13	<0.0004	***0.010***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP7	Drive point E side of Basin 3	104	---	02-Oct-13	<0.0004	0.002	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	---
13-DP7	Drive point E side of Basin 3	120	---	08-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2	---	<1.0
13-DP7	Drive point E side of Basin 3	---	---	15-Oct-13	<0.0004	<0.002	<0.0004	<0.004	<0.1	<0.1	<0.2	<0.2	---	---
13-DP7	Drive point E side of Basin 3	---	---	22-Oct-13	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	---	---	---	---	---
13-DP7	Drive point E side of Basin 3	225	---	29-Oct-13	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.11	<0.23	<0.23	---	---
13-DP7	Drive point E side of Basin 3	--	---	01-Jul-14	<0.00040	***0.023***	<0.00040	<0.0040	<0.10	<0.10	---	---	---	---
Minimal Detection Limit					**0.0004**	**0.002**	**0.0004**	**0.004**	**0.1**	**0.1**	**0.2**	**0.2**		
AENV Freshwater Aquatic Life*					**0.370**	**0.002**	**0.09**	**0.2**	**NS**	**NS**	**NS**	**NS**		

Notes:

--- - not analyzed

NS - guideline not specified

* - Alberta Environment Surface Water Quality Guidelines for use in Alberta (AENV, 1999)

Italics - indicates values do not meet applicable guidelines

TABLE B12.

WATER QUALITY RESULTS - WATER BODIES AND WATERCOURSES

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Location	Sample Depth	Sample Time	Sample Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
13-DP1	Drive point southwest of Pad 21	0	---	04-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0085	<0.0075	***0.019***	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.012	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	126	---	02-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.17	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	03-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.18	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	04-Oct-13	<0.32	<0.32	<0.64	<0.032	<0.027	<0.027	<0.027	<0.027	<0.024	<0.027	<0.024	<0.032	<0.16	<0.027	<0.32	<0.16	<0.064	<0.64
13-DP1	Drive point southwest of Pad 21	138	---	05-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.14	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	13-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	14-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	15-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	16-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	17-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	19-Oct-13	<0.13	<0.13	<0.25	<0.013	<0.011	<0.011	<0.011	<0.011	<0.0094	<0.011	<0.0094	<0.013	<0.063	<0.011	<0.13	<0.063	<0.025	<0.25
13-DP1	Drive point southwest of Pad 21	---	---	20-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	21-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP1	Drive point southwest of Pad 21	---	---	22-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	15-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	15-Oct-13	<0.1	<0.1	<0.1	<0.005	<0.01	<0.1	<0.1	<0.05	<0.008	<0.1	<0.05	<0.01	<0.1	<0.05	<0.1	<0.1	<0.01	<0.3
13-DP2	Drive point SW of Basin 4	---	---	18-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	22-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2 dup	Drive point SW of Basin 4	---	---	22-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP2	Drive point SW of Basin 4	---	---	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.02	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
AENV Freshwater Aquatic Life*					**5.8^**	**NS**	**4.4^**	**0.012^**	**0.018^**	**NS**	**NS**	**NS**	**0.015^**	**NS**	**NS**	**0.015^**	**3^**	**NS**	**1.1^**	**0.4^**	**0.025^**	**3.4^**

TABLE B12.

WATER QUALITY RESULTS - WATER BODIES AND WATERCOURSES

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Location	Sample Depth	Sample Time	Sample Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.013	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	30-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP3 dup	Drive point S of Basin 3 near E Ladder Road	86.5	---	30-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	01-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.13	<0.05	<0.02	<0.2
13-DP3	Drive point S of Basin 3 near E Ladder Road	95.5	---	02-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.11	<0.05	<0.02	<0.2
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	15-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.12	<0.05	<0.02	<0.2
13-DP3	Drive point S of Basin 3 near E Ladder Road	---	---	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.02	<0.0075	<0.01	<0.05	<0.0085	<0.10	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.014	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.021	<0.05	<0.0085	0.15	0.067	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.12	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	75	---	30-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	01-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.13	<0.05	<0.02	<0.2
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	01-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.11	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	02-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.11	<0.05	<0.02	<0.2
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	82	---	02-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.10	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	03-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	15-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.12	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	22-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP4	Drive point N of Basin 3 near E Ladder Road	140	---	29-Oct-13	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP4	Drive point N of Basin 3 near E Ladder Road	1315	---	05-Nov-13	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	12-Nov-13	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP4	Drive point N of Basin 3 near E Ladder Road	---	---	07-Jan-14	<0.10	<0.10	<0.20	<0.010	***0.037***	<0.0085	<0.0085	<0.0085	<0.0075	0.028	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP4 dup	Drive point N of Basin 3 near E Ladder Road	---	---	07-Jan-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP5	Drive point W side of Basin 3	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	***0.025***	<0.05	<0.0085	0.12	<0.05	<0.02	<0.2
13-DP5	Drive point W side of Basin 3	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	0.012	<0.05	<0.0085	0.2	<0.05	<0.02	<0.2
13-DP5	Drive point W side of Basin 3	85	---	30-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.2	<0.05	<0.02	<0.2
13-DP5	Drive point W side of Basin 3	---	---	01-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.2	<0.05	<0.02	<0.2
13-DP5	Drive point W side of Basin 3	91	---	02-Oct-13	<0.11	<0.11	<0.22	<0.011	<0.0094	<0.0094	<0.0094	<0.0094	<0.0083	<0.0094	<0.0083	<0.011	<0.056	<0.0094	0.15	<0.056	<0.022	<0.22
13-DP5	Drive point W side of Basin 3	---	---	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.020	<0.0075	<0010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP6	Drive point S side of Basin 3	---	---	28-Sep-13	<0.2	<0.2	<0.40	<0.02	<0.017	<0.017	<0.017	<0.017	<0.015	<0.017	<0.015	***0.031***	<0.1	<0.017	<0.2	<0.1	<0.04	<0.59
13-DP6	Drive point S side of Basin 3	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.1	<0.05	<0.02	<0.2
13-DP6	Drive point S side of Basin 3	78	---	30-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP6	Drive point S side of Basin 3	---	---	01-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.11	<0.05	<0.02	<0.2
13-DP6	Drive point S side of Basin 3	105	---	02-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.11	<0.05	<0.02	<0.2
13-DP6	Drive point S side of Basin 3	---	---	15-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.13	<0.05	<0.02	<0.2
13-DP6	Drive point S side of Basin 3	---	---	22-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP6	Drive point S side of Basin 3	108	---	29-Oct-13	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
13-DP6	Drive point S side of Basin 3	---	---	01-Jul-14	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.050	<0.020	<0.20
AENV Freshwater Aquatic Life*					**5.8^**	**NS**	**4.4^**	**0.012^**	**0.018^**	**NS**	**NS**	**NS**	**0.015^**	**NS**	**NS**	**0.015^**	**3^**	**NS**	**1.1^**	**0.4^**	**0.025^**	**3.4^**

TABLE B12.

WATER QUALITY RESULTS - WATER BODIES AND WATERCOURSES

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Location	Sample Depth	Sample Time	Sample Date	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
13-DP7	Drive point E side of Basin 3	---	---	28-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.014	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP7	Drive point E side of Basin 3	---	---	29-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.12	<0.05	<0.02	<0.2
13-DP7	Drive point E side of Basin 3	101	---	30-Sep-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	0.11	<0.05	<0.02	<0.2
13-DP7	Drive point E side of Basin 3	---	---	01-Oct-13	<0.11	<0.11	<0.22	<0.011	<0.0093	<0.0093	<0.0093	<0.0093	<0.0082	<0.0093	<0.0082	<0.011	<0.055	<0.0093	0.13	<0.055	<0.022	<0.22
13-DP7	Drive point E side of Basin 3	104	---	02-Oct-13	<0.12	<0.12	<0.23	<0.012	<0.0099	<0.0099	<0.0099	<0.0099	<0.0087	<0.0099	<0.0087	<0.012	<0.058	<0.0099	0.13	<0.058	<0.023	<0.23
13-DP7	Drive point E side of Basin 3	---	---	15-Oct-13	<0.1	<0.1	<0.2	<0.01	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	<0.0085	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
13-DP7	Drive point E side of Basin 3	---	---	01-Jul-14	<0.1	<0.1	<0.2	<0.01	0.015	<0.0085	<0.0085	<0.0085	<0.0075	<0.020	<0.0075	<0.01	<0.05	<0.0085	<0.1	<0.05	<0.02	<0.2
Minimal Detection Limit					**0.1**	**0.1**	**0.2**	**0.01**	**0.0085**	**0.0085**	**0.0085**	**0.0085**	**0.0075**	**0.0085**	**0.0075**	**0.01**	**0.05**	**0.0085**	**0.1**	**0.05**	**0.02**	**0.2**
AENV Freshwater Aquatic Life*					**5.8^**	**NS**	**4.4^**	**0.012^**	**0.018^**	**NS**	**NS**	**NS**	**0.015^**	**NS**	**NS**	**0.015^**	**3^**	**NS**	**1.1^**	**0.4^**	**0.025^**	**3.4^**

Notes:

--- - not analyzed

NS - not specified

* - Alberta Environment Surface Water Quality Guidelines for use in Alberta (AENV, 1999)

Italics - indicates values do not meet applicable guidelines