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

AUGUST 19 TO SEPTEMBER 22, 2014

1 Introduction

The Canadian Natural Resources Limited Primrose South in situ oil sands project is located in the Cold Lake Air Weapons Range approximately 65 km north-northeast of Bonnyville, Alberta. Canadian Natural operations staff discovered a bitumen emulsion flow to surface (FTS) area at 09-21-067-04 W4M on June 24, 2013. The bitumen emulsion FTS area 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 addresses that requirement and summarizes the progress towards the realization of the CRP and includes data collected and reported between August 19 and September 22, 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	Complete
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	--

Item	Plan Name	Due Date	Submission Date	Approval Date	Implementation Start Date	Completion Date	Section Discussed
5.	**Bitumen Emulsion Delineation and Containment Plan**	October 6, 2013	Revised Plan December 22, 2013	February 7, 2014	November 27, 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 Assessment Plan**	September 26, 2013	September 25, 2013	September 27, 2013	September 27, 2013	October 30, 2013	Complete
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

2.2 Water Management for Dewatering and Refilling

Activities related to dewatering and refilling were completed on June 22, 2014. No new information to report.

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 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

Staff gauge and water level monitoring locations are shown on Figures 1 and 2. Staff gauges are monitored monthly and readings for Basins 3 and 4 are in Appendix A1, and readings for the downstream fen and the borrow pit are in Appendix A2.

3.1.2 Containment Structure

Water was pumped from inside the containment wall 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

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). Sampling locations are shown on Figure 4.

3.2.1 Basins 1, 3, and 4 and Downstream Fen

Water quality samples were collected from the 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 provided 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 guidelines except toluene, which was found on at least one, and up to four locations on four separate sampling dates in the surface water. Toluene is widespread in the environment and a common source is motor vehicle exhaust. However, under certain conditions, toluene may also be produced by plants. The origin of the toluene detected in the fen is currently being investigated. Sample results are presented in Appendix B1-3.

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

Water samples were collected from within the containment structure, from shallow groundwater monitoring wells in the discharge area, and from a system, which is used to treat water and sediments stored in containment Cells C and D. Sample results are presented in Appendix B4-9.

- No BTEX, PHCs F1 to F4, PAHs, or routine parameters were detected at levels above guidelines in the shallow groundwater samples or soil samples collected from the discharge area with the exception of toluene and F2 in one well (14-DP2).

- A total of 2,637 1,953 m^3 of water has been treated and released during the reporting period.

3.3 Aquatic Surveillance

Daily monitoring for signs of bitumen emulsion (pellets or sheen) within Basins 1 and 3 is conducted and documented by Canadian Natural contractors. This monitoring is conducted by walking the shoreline of the water body and by boat. (Figure 5)

Sheen and bitumen pellets were observed intermittently during the reporting period. The source of the sheen and pellets was small amounts of material that were not cleaned from the water and sediment after the original bitumen emulsion release. 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 0.5 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 monitoring continues.

3.5 Bitumen Emulsion Containment

3.5.1 Permanent Containment of Bitumen Emulsion Seepage from Fissure

In early May 2014, the fissure containment structure (FCS) was approved. A Canadian Natural construction crew built the FCS between May 4 and June 30, 2014. Following discussion with Alberta Energy Regulator (AER) and ESRD, a revised design of the access pad was prepared and submitted to AER and ESRD for review and approval. Verbal approval to start construction was received and construction of the access pad over the FCS started on September 10, 2014. Construction is expected to be completed in late October or Early November 2014.

3.6 Wildlife Management

Wildlife management activities between August 19 and September 22, 2014 involved maintaining amphibian pit fall traps surrounding decontamination Cell D and conducting daily inspections.

During the reporting period, no wildlife mortality was noted within or around the water body.

3.7 Waste Management

Transportation of materials temporarily stored in lined containment Cells C and D to the Tervita Bonnyville landfill for disposal started in August 2014. Transportation for disposal is ongoing as the material is thawed and dewatered to meet landfill criteria.

4 Conclusions

The work conducted at the 9-21 FTS site from August 19 to September 22, 2014 included:

- operating a PIW treatment system at containment Cell D and releasing treated water
- transporting dewatered material from containment Cells C and D to the landfill for disposal
- dewatering from within the containment area
- ongoing monitoring of water quality, pumped quantity, discharge point erosion and sedimentation during remediation activities
- monitoring wildlife activity near the water body

Monitoring of Basins 1 and 3 indicates that there are no adverse impacts related to the bitumen emulsion release or refilling activities.

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, 2014 and Updates*. Final Draft. Land and Forestry Policy Branch, Policy Division. Edmonton, Alberta. May 23, 2014. http://esrd.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-May23-2014.pdf

Alberta Environment and Sustainable Resource Development (ESRD). 2014b. *Environmental Quality Guidelines for Alberta Surface Waters.* Water Policy Branch, Policy Division. Edmonton, Alberta. July 14, 2014. ISBN: 978-1-4601-1524-4. http://esrd.alberta.ca/water/education-guidelines/documents/EnvironmentalQualitySurfaceWaters-Jul14-2014.pdf

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\2014\September\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. Imagery (September 2013) obtained from Canadian Natural Resources Limited used under license.

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Primrose 09-21-067-04 W4M

9-21 Water Body Divisions

Date:	Project:	Technical:	Reviewer:	Drawn:
22 Sep 2014	8881-523	B. Zaitlin	R. Reimer	R. Keller

Figure 1

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\2014\September\Public_9_21\Figure-2-Staff_Gauge_and_Water_Level_Monitoring_Locations.mxd

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

Containment Cell E

13-SG8

Basin 4

13-SG12 13-SG11

Basin 4

Basin 3

Basin 3

13-SG7

Basin 2

13-SG6

Containment Cell C

Basin 1

13-SG13

Borrow Pit

13-SG4

Decomissioned Containment Cell A and B

13-SG2

Containment Cell
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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Primrose 09-21-067-04 W4M

Staff Gauge and Water Level Monitoring Locations

Date:	Project:	Technical:	Reviewer:	Drawn:
22 Sep 2014	8881-523	B. Zaitlin	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

Culvert 2

Swale 2

200

250

300

Basin 2

Culvert 1

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

Floculation Treatment
Light Tower
Pump
Pump Discharge Location
Containment Structure Station Location
Culvert

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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Primrose 09-21-067-04 W4M

Containment Structure Pump Locations

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

Figure 3

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\2014\September\Public_9_21\Figure-4-Monitoring_Plan_Overview.mxd

Easting (m)

Northing (m)

528500 529000 529500 530000 530500 531000 531500 532000

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

N

Containment Cell D
PIW System
14-SW2
Containment Cell E
13-DP4
Basin 4
13-SW12
13-DP3
Basin 3
13-SW31
13-DP5
14-SW1-P1
13-DP7
14-SW3
Containment Cell C
14-SW1-P2
14-SW81 (See Note)
14-SW1
13-SW22
Former Borrow Pit
13-SW46
Basin 2
Basin 1
13-DP6
Downstream Fen
Decomissioned Containment Cell A and B
13-SW26
Pad AC21
13-DP1
13-SW27
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
Drivepoint Piezometer Sample Location
Surface Water Sample Location

Note: 14-SW81 sample taken from collected water inside sheet pile wall

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

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Primrose 09-21-067-04 W4M

Monitoring Plan Overview

Date:	Project:	Technical:	Reviewer:	Drawn:
22 Sep 2014	8881-523	B. Zaitlin	R. Reimer	R. Keller

Figure 4

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\2014\September\Public_9_21\Figure-5-Aquatic_Surveillance_Site_Plan.mxd

Easting (m)

529100 529200 529300 529400 529500

Northing (m)

6074700 6074600 6074500 6074400 6074300 6074200

N

3.6

Basin 3

3.5

50 100 150 200 250 300 350 400 450 500

2.3 2.2 2.1 1.1 1.2 1.3a 1.3b 1.3c 1.4a 1.4b 1.5a 1.5b 1.6 1.7

Basin 2

Basin 1

Fissure 2

Fissure 1

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

Bitumen Sheen Detected
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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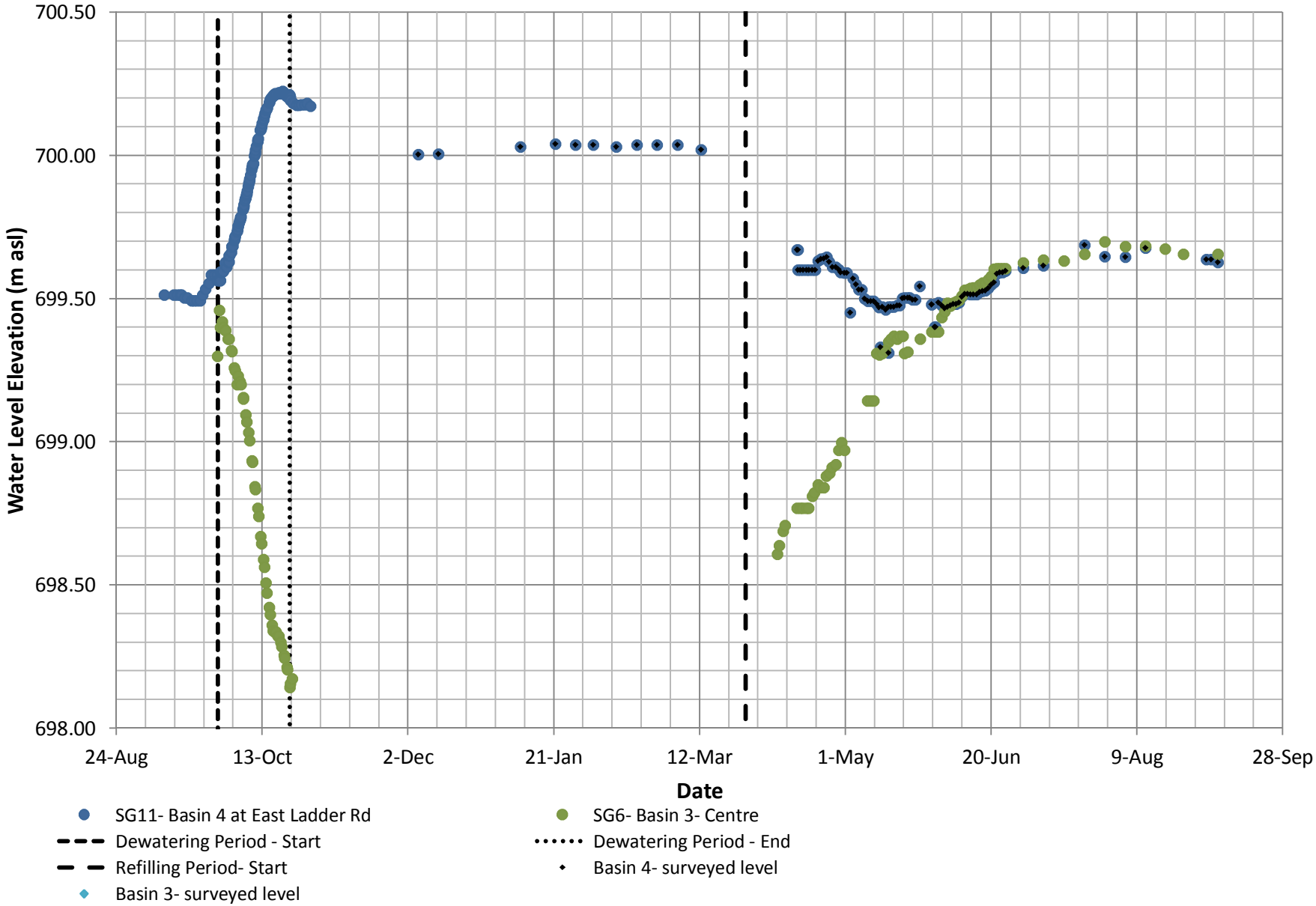
Aquatic Surveillance Site Plan

Date:	Project:	Technical:	Reviewer:	Drawn:
23 Sep 2014	8881-523	B. Zaitlin	R. Reimer	R. Keller

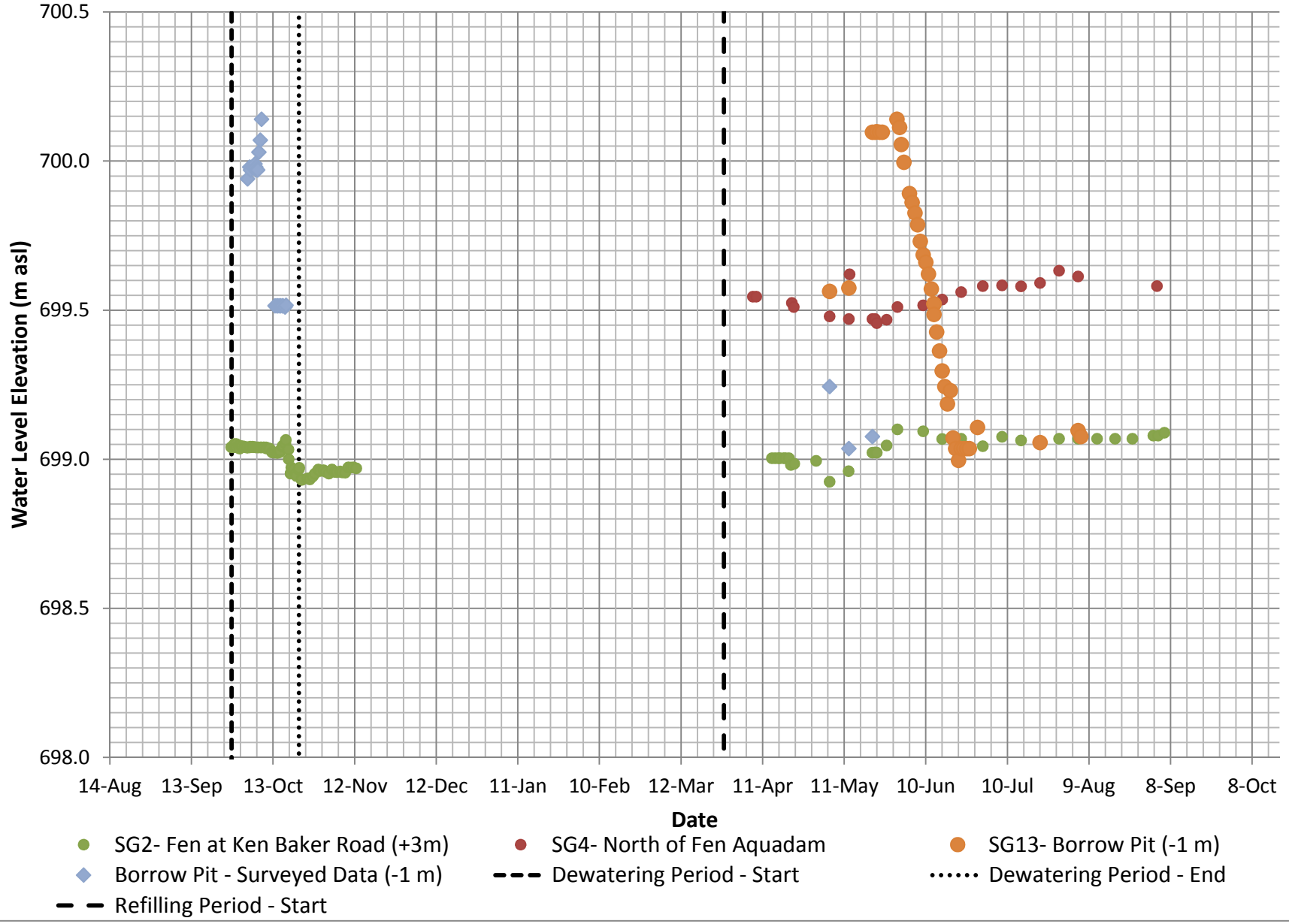
Figure 5

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 the Containment Structure to Basin 1 and 3

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	14-SW1-P1		14-SW1-P2		South Wall			
	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)
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

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

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	14-SW1-P1		14-SW1-P2		South Wall			
	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)
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
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

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

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	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			
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
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
23-May-14	3,659	400,702	1,890	41,667	1800	7,470	7,349	449,840
24-May-14	3,762	404,464	1,980	43,647	1800	9,270	7,542	457,382
25-May-14	3,192	407,656	1,890	45,537	1960	11,230	7,042	464,424
26-May-14	2,905	410,561	1,800	47,337	990	12,220	5,695	470,119
27-May-14	2,692	413,253	1,980	49,317	1170	13,390	5,842	475,961
28-May-14	2,571	415,824	1,440	50,757	1170	14,560	5,181	481,142
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

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

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	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			
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
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

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

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	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-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
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
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

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

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	14-SW1-P1		14-SW1-P2		South Wall			
	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)
20-Jul-14	-	-	1,620	155,177	-	-	1,620	688,453
21-Jul-14	-	-	1,260	156,437	-	-	1,260	689,713
22-Jul-14	-	-	1,260	157,697	-	-	1,260	690,973
23-Jul-14	-	-	1,260	158,957	-	-	1,260	692,233
24-Jul-14	-	-	1,260	160,217	-	-	1,260	693,493
25-Jul-14	-	-	1,980	162,197	-	-	1,980	695,473
26-Jul-14	-	-	2,160	164,357	-	-	2,160	697,633
27-Jul-14	-	-	1,080	165,437	-	-	1,080	698,713
28-Jul-14	-	-	1,080	166,517	-	-	1,080	699,793
29-Jul-14	-	-	1,980	168,497	-	-	1,980	701,773
30-Jul-14	-	-	1,215	169,712	-	-	1,215	702,988
31-Jul-14	-	-	1,260	170,972	-	-	1,260	704,248
1-Aug-14	-	-	1,170	172,142	-	-	1,170	705,418
2-Aug-14	-	-	1,215	173,357	-	-	1,215	706,633
3-Aug-14	-	-	1,215	174,572	-	-	1,215	707,848
4-Aug-14	-	-	1,305	175,877	-	-	1,305	709,153
5-Aug-14	-	-	1,350	177,227	-	-	1,350	710,503
6-Aug-14	-	-	1,260	178,487	-	-	1,260	711,763
7-Aug-14	-	-	1,350	179,837	-	-	1,350	713,113
8-Aug-14	-	-	1,260	181,097	-	-	1,260	714,373
9-Aug-14	-	-	1,710	182,807	-	-	1,710	716,083
10-Aug-14	-	-	1,125	183,932	-	-	1,125	717,208
11-Aug-14	-	-	1,215	185,147	-	-	1,215	718,423

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

CNRL Primrose 09-21 Water Body: Refilling Phase

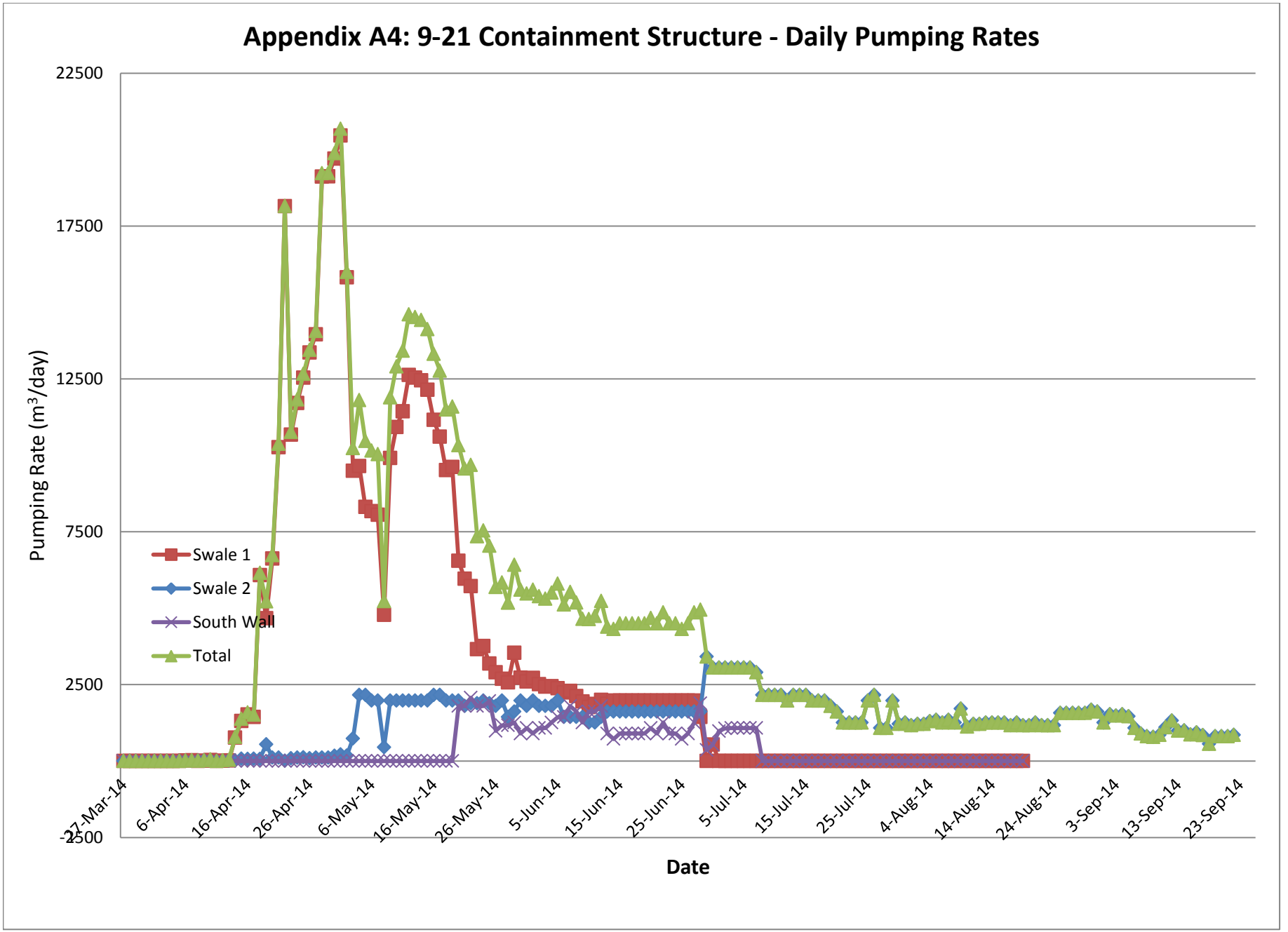
Date	Containment Structure						Containment Structure Total	
	14-SW1-P1		14-SW1-P2		South Wall			
	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Daily Volume to Water Body from Containment Structure (m^3/day)	Cumulative Total to Water Body from Containment Structure (m^3)
12-Aug-14	-	-	1,215	186,362	-	-	1,215	719,638
13-Aug-14	-	-	1,260	187,622	-	-	1,260	720,898
14-Aug-14	-	-	1,260	188,882	-	-	1,260	722,158
15-Aug-14	-	-	1,260	190,142	-	-	1,260	723,418
16-Aug-14	-	-	1,260	191,402	-	-	1,260	724,678
17-Aug-14	-	-	1,170	192,572	-	-	1,170	725,848
18-Aug-14	-	-	1,260	193,832	-	-	1,260	727,108
19-Aug-14	-	-	1,170	195,002	-	-	1,170	728,278
20-Aug-14			1,170	196,172			1,170	729,448
21-Aug-14			1,260	197,432			1,260	730,708
22-Aug-14			1,170	198,602			1,170	731,878
23-Aug-14			1,170	199,772			1,170	733,048
24-Aug-14			1,170	200,942			1,170	734,218
25-Aug-14			1,575	202,517			1,575	735,793
26-Aug-14			1,575	204,092			1,575	737,368
27-Aug-14			1,575	205,667			1,575	738,943
28-Aug-14			1,575	207,242			1,575	740,518
29-Aug-14			1,575	208,817			1,575	742,093
30-Aug-14			1,680	210,497			1,680	743,773
31-Aug-14			1,620	212,117			1,620	745,393
1-Sep-14			1,260	213,377			1,260	746,653
2-Sep-14			1,530	214,907			1,530	748,183
3-Sep-14			1,485	216,392			1,485	749,668

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

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	Containment Structure						Containment Structure Total	
	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			
4-Sep-14			1,530	217,922			1,530	751,198
5-Sep-14			1,462	219,384			1,462	752,660
6-Sep-14			1,080	220,464			1,080	753,740
7-Sep-14			900	221,364			900	754,640
8-Sep-14			810	222,174			810	755,450
9-Sep-14			788	222,962			788	756,238
10-Sep-14			855	223,817			855	757,093
11-Sep-14			1,103	224,920			1,103	758,196
12-Sep-14			1,328	226,248			1,328	759,524
13-Sep-14			998	227,246			998	760,521
14-Sep-14			1,005	228,251			1,005	761,526
15-Sep-14			870	229,121			870	762,396
16-Sep-14			938	230,058			938	763,334
17-Sep-14			848	230,906			848	764,181
18-Sep-14			563	231,468			563	764,744
19-Sep-14			810	232,278			810	765,554
20-Sep-14			810	233,088			810	766,364
21-Sep-14			810	233,898			810	767,174
22-Sep-14			855	234,753			855	768,029

Appendix A4: 9-21 Containment Structure - Daily Pumping Rates



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-SW12	05-Aug-14	<0.00040	***0.00380***	<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-SW12	02-Sep-14	<0.00040	***0.01100***	<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-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	---	---
13-SW16	22-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	29-Jul-14	<0.00040	***0.00064***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	05-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	12-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	18-Aug-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
13-SW16 dup	18-Aug-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
13-SW16	25-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW16	02-Sep-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
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-SW22	05-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW22	02-Sep-14	<0.00040	<0.00040	<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-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-SW26	22-Jul-14	<0.00040	***0.00130***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	29-Jul-14	<0.00040	***0.00120***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	05-Aug-14	<0.00040	***0.00190***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	12-Aug-14	<0.00040	***0.00320***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	18-Aug-14	<0.0004	***0.00540***	<0.0004	<0.0008	<0.10	<0.10	---	---
13-SW26	19-Aug-14	<0.0004	***0.00160***	<0.0004	<0.0008	<0.10	---	---	---
13-SW26	25-Aug-14	<0.00040	***0.00094***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	02-Sep-14	<0.00040	***0.00280***	<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	---	---
13-SW27	22-Jul-14	<0.00040	***0.00170***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	29-Jul-14	<0.00040	***0.00270***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	05-Aug-14	<0.00040	***0.00110***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	12-Aug-14	<0.00040	***0.01100***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	18-Aug-14	<0.0004	***0.01600***	<0.0004	<0.0008	<0.10	<0.10	---	---
13-SW27	19-Aug-14	<0.0004	***0.00290***	<0.0004	<0.0008	<0.10	---	---	---
13-SW27	25-Aug-14	<0.00040	***0.04200***	<0.00040	<0.00080	<0.18	<0.18	---	---
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	---	---
13-SW31	22-Jul-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	29-Jul-14	<0.00040	0.00042	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	05-Aug-14	<0.00040	***0.00520***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	12-Aug-14	<0.00040	***0.00710***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	25-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	02-Sep-14	<0.00040	***0.00110***	<0.00040	<0.00080	<0.10	0.13	---	---
13-SW31 dup	02-Sep-14	<0.00040	<0.00040	<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-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	---	---
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	---	---
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
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	---	---
14-SW81	05-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Minor Spill Sampling									
9-21 Dock Spill	11-Sep-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
Boat Motor Spill	22-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**	**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:

--- - 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-SW12	05-Aug-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-Sep-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
13-SW16	22-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	29-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	05-Aug-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	12-Aug-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	18-Aug-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 dup	18-Aug-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	25-Aug-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-Sep-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-SW22	05-Aug-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-Sep-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-SW26	22-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	29-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	05-Aug-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	12-Aug-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	18-Aug-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	25-Aug-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-Sep-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-SW27	22-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	29-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	05-Aug-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	12-Aug-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	18-Aug-14	<0.11	<0.11	<0.22	<0.011	<0.0095	<0.0095	<0.0095	<0.0095	<0.056	<0.0084	<0.056	<0.0095	<0.0084	<0.011	<0.056	<0.0095	<0.11	<0.11	<0.056	<0.056	<0.022	<0.22	ND
13-SW27	25-Aug-14	<0.17	<0.17	<0.33	<0.017	<0.014	<0.014	<0.014	<0.014	<0.083	<0.012	<0.083	<0.014	<0.012	<0.017	<0.083	<0.014	<0.17	<0.17	<0.083	<0.083	<0.033	<0.33	ND
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
13-SW31	22-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-SW31	29-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-SW31	05-Aug-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	12-Aug-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	25-Aug-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-Sep-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-Sep-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-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
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
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
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
14-SW81	05-Aug-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
Minor Spill Sampling																								
9-21 Dock Spill	11-Sep-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
Boat Motor Spill	22-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-SW12	05-Aug-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	180	39
13-SW12	02-Sep-14	---	220	---	---	---	---	1.5	---	---	---	---	---	---	---	---	---	---
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	---	---	---	---	---	---	---	---	---	---
13-SW16	22-Jul-14	---	---	---	---	---	---	5.7	---	---	---	---	---	---	---	---	9.3	7.1
13-SW16	29-Jul-14	---	---	---	---	---	---	7.1	---	---	---	---	---	---	---	---	10	6.2
13-SW16	05-Aug-14	---	---	---	---	---	---	5.5	---	---	---	---	---	---	---	---	7.3	8
13-SW16	12-Aug-14	---	130	---	---	---	---	5.9	---	---	---	---	---	---	---	---	---	---
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-SW16	18-Aug-14	---	160	---	---	---	---	6.7	---	---	---	---	---	---	---	---	---	---
13-SW16	18-Aug-14	---	160	---	---	---	---	6.5	---	---	---	---	---	---	---	---	---	---
13-SW16	25-Aug-14	---	160	---	---	---	---	6.1	---	---	---	---	---	---	---	---	---	---
13-SW16	02-Sep-14	---	150	---	---	---	---	6.4	---	---	---	---	---	---	---	---	---	---
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-SW22	05-Aug-14	---	---	---	---	---	---	1.7	---	---	---	---	---	---	---	---	3.3	4.1
13-SW22	02-Sep-14	---	130	---	---	---	---	1.7	---	---	---	---	---	---	---	---	---	---
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-SW26	22-Jul-14	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	15	14
13-SW26	29-Jul-14	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	12	12
13-SW26	05-Aug-14	---	---	---	---	---	---	2.5	---	---	---	---	---	---	---	---	120	17
13-SW26	12-Aug-14	---	220	---	---	---	---	2.3	---	---	---	---	---	---	---	---	---	---
13-SW26	18-Aug-14	---	250	---	---	---	---	2.4	---	---	---	---	---	---	---	---	---	---
13-SW26	25-Aug-14	---	280	---	---	---	---	1.5	---	---	---	---	---	---	---	---	---	---
13-SW26	02-Sep-14	---	310	---	---	---	---	1.9	---	---	---	---	---	---	---	---	---	---
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-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	---	---	---	---	---	---	---	---	---	---
13-SW27	22-Jul-14	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	11	6.1
13-SW27	29-Jul-14	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	6.7	4
13-SW27	05-Aug-14	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	110	17
13-SW27	12-Aug-14	---	450	---	---	---	---	2.4	---	---	---	---	---	---	---	---	---	---
13-SW27	18-Aug-14	---	560	---	---	---	---	3.4	---	---	---	---	---	---	---	---	---	---
13-SW27	25-Aug-14	---	620	---	---	---	---	4.5	---	---	---	---	---	---	---	---	---	---
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	---	---	---	---	---	---	---	---	---	---
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 µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl 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	TSS mg/L	Turbidity NTU
Surface Water Samples																		
13-SW31	08-Jul-14	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	---	---
13-SW31 dup	08-Jul-14	---	---	---	---	---	---	1.2	---	---	---	---	---	---	---	---	---	---
13-SW31	22-Jul-14	---	---	---	---	---	---	5.7	---	---	---	---	---	---	---	---	9.3	7.2
13-SW31	29-Jul-14	---	---	---	---	---	---	6.1	---	---	---	---	---	---	---	---	6	5.3
13-SW31	05-Aug-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	3.3	1.8
13-SW31	12-Aug-14	---	440	---	---	---	---	2.3	---	---	---	---	---	---	---	---	---	---
13-SW31	25-Aug-14	---	160	---	---	---	---	6.3	---	---	---	---	---	---	---	---	---	---
13-SW31	02-Sep-14	---	220	---	---	---	---	1.2	---	---	---	---	---	---	---	---	---	---
13-SW31	02-Sep-14	---	120	---	---	---	---	1.7	---	---	---	---	---	---	---	---	---	---
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	---	---	---	---	---	---	---	---	---	---
Basin 3 Culvert	15-Jul-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	---	---
Basin 4 Culvert	15-Jul-14	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	---	---
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	---
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 µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl 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	TSS mg/L	Turbidity NTU
Containment Structure Samples																		
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	---	---	---	---	---	---	---	---	---	---
14-SW81	05-Aug-14	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	46	20
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
Carbon and Clay Media Change June 7-8				
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	---	---
Second Shelf Cleaning Filter added August 15				
Second Shelf Cleaning Filter added into Operation August 23				
15-26 Pre-Treatment	04-Sep-14	11	---	---
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
Carbon and Clay Media Change June 7-8				
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
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
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	---	---
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	---	---
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 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	---	---
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	---	---
C Ring Containment	22-Jul-14	19	---	---
C Ring Containment	24-Jul-14	15	---	---
C Ring Containment	26-Jul-14	13	---	---
C Ring Containment	28-Jul-14	6.2	---	---
C Ring Containment	30-Jul-14	10	---	---
C Ring Containment	01-Aug-14	10	---	---
C Ring Containment	04-Aug-14	11	---	---
C Ring Containment	06-Aug-14	13	---	---
C Ring Containment	08-Aug-14	14	---	---
C Ring Containment	12-Aug-14	9.8	---	---
C Ring Containment	13-Aug-14	9	---	---
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
Second Shelf Cleaning Filter added August 15				
C Ring Containment	15-Aug-14	18	---	---
C Ring Containment	19-Aug-14	15	---	---
C Ring Containment	20-Aug-14	18	---	---
C Ring Containment	22-Aug-14	13	---	---
Second Shelf Cleaning Filter added into Operation August 23				
C Ring Containment	24-Aug-14	13	---	---
C Ring Containment	26-Aug-14	13	---	---
C Ring Containment	28-Aug-14	18	---	---
C Ring Containment	01-Sep-14	8.5	---	---
C Ring Containment	03-Sep-14	13	---	---
C Ring Containment	04-Sep-14	11	---	---
Clay and Carbon Filter Media Disposed of and Replaced September 7				
C Ring Containment	08-Sep-14	13	---	---
C Ring Containment	11-Sep-14	28	---	---
C Ring Containment	15-Sep-14	23	---	---
C Ring Containment	16-Sep-14	24	---	---
C Ring Containment	18-Sep-14	14	---	---
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
Carbon and Clay Media Change June 7-8									
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
Second Shelf Cleaning Filter added August 15									
Second Shelf Cleaning Filter added into Operation August 23									
15-26 Pre-Treatment	04-Sep-14	<0.0004	***0.038***	<0.0004	<0.0008	<0.10	0.16	---	---
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
Carbon and Clay Media Change June 7-8									
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
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
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
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
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 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
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	---	---
C Ring Containment	22-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	24-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	26-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	28-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	30-Jul-14	<0.00040	<0.0004	<0.00040	<0.0008	<0.10	<0.10	---	---
C Ring Containment	01-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
C Ring Containment	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
C Ring Containment	06-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
C Ring Containment	08-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
C Ring Containment	12-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
C Ring Containment	13-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
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
Second Shelf Cleaning Filter added August 15									
C Ring Containment	15-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
C Ring Containment	19-Aug-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	20-Aug-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	22-Aug-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
Second Shelf Cleaning Filter added into Operation August 23									
C Ring Containment	24-Aug-14	<0.0004	0.0014	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	26-Aug-14	<0.0004	0.0016	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	28-Aug-14	<0.0004	0.0033	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	01-Sep-14	<0.0004	0.0029	<0.0004	<0.0008	<0.10	0.13	---	---
C Ring Containment	03-Sep-14	<0.0004	0.0093	<0.0004	<0.0008	<0.10	0.12	---	---
C Ring Containment	04-Sep-14	<0.0004	0.0092	<0.0004	<0.0008	<0.10	0.11	---	---
Clay and Carbon Filter Media Disposed of and Replaced September 7									
C Ring Containment	08-Sep-14	<0.0004	0.0082	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	11-Sep-14	<0.0004	0.00057	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	15-Sep-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	16-Sep-14	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	---	---
C Ring Containment	18-Sep-14	<0.0004	0.00076	<0.0004	<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 C

* - *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
Carbon and Clay Media Change June 7-8																		
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
Second Shelf Cleaning Filter added August 15																		
Second Shelf Cleaning Filter added into Operation August 23																		
15-26 Pre-Treatment	04-Sep-14	0.1	<0.10	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.0075	0.0099	<0.0075	<0.010	0.13	<0.0085	0.16	0.20	***0.039***	0.0001
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
Carbon and Clay Media Change June 7-8																		
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
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
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
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
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 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
C Ring Containment	22-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
C Ring Containment	24-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	0.16	<0.050	<0.020	ND
C Ring Containment	26-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	28-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
C Ring Containment	30-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	01-Aug-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	04-Aug-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	0.19	<0.050	<0.020	ND
C Ring Containment	06-Aug-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	08-Aug-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
C Ring Containment	12-Aug-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
C Ring Containment	13-Aug-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
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
Second Shelf Cleaning Filter added August 15																		
C Ring Containment	15-Aug-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-Aug-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	<0.050	ND
C Ring Containment	20-Aug-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	<0.050	ND
C Ring Containment	22-Aug-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	<0.050	ND
Second Shelf Cleaning Filter added into Operation August 23																		
C Ring Containment	24-Aug-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	26-Aug-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	28-Aug-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	***0.04***	ND
C Ring Containment	01-Sep-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	03-Sep-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	0.02	ND
C Ring Containment	04-Sep-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	0.056	0.024	ND
Clay and Carbon Filter Media Disposed of and Replaced September 7																		
C Ring Containment	08-Sep-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	0.051	<0.020	ND
C Ring Containment	11-Sep-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	15-Sep-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	16-Sep-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	0.024	ND
C Ring Containment	18-Sep-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	0.024	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-DP1	04-Aug-14	9.5	1600	610
14-DP1	02-Sep-14	13	---	---
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-DP2	04-Aug-14	12	140	38
14-DP2	02-Sep-14	13	---	---
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-DP3	04-Aug-14	10	1100	360
14-DP3	02-Sep-14	13	---	---
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-DP4	04-Aug-14	6.3	110	38
14-DP4	02-Sep-14	14	---	---
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	---	---
14-DP5	04-Aug-14	4.4	4	2
14-DP5	02-Sep-14	12	---	---
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-DP6	04-Aug-14	2.8	18	3.1
14-DP6	02-Sep-14	11	---	---
14-DP7	14-Jul-14	8.8	---	---
14-DP7	02-Sep-14	11	---	---
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-DP1	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP1	02-Sep-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-DP2	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP2	02-Sep-14	<0.00040	***0.0019***	<0.00040	<0.00080	<0.10	***0.15***	---	---
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-DP3	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP3	02-Sep-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-DP4	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP4	02-Sep-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	---	---
14-DP5	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP5	02-Sep-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Alberta Tier 1 - Coarse Grained Soils - Natural Areas*		**$0.005^{P,MAC}$**	**$0.024^{P,AO}$**	**$0.0024^{P,AO}$**	**$0.3^{P,AO}$**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**
ESRD Freshwater Aquatic Life**		**0.04**	**0.0005**	**0.09**	**0.03**	**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 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-DP6	04-Aug-14	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-DP6	02-Sep-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	---	---
14-DP7	02-Sep-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 Soils - Natural Areas*		**$0.005^{P,MAC}$**	**$0.024^{P,AO}$**	**$0.0024^{P,AO}$**	**$0.3^{P,AO}$**	**2.2^{P}**	**1.1^{P}**	**NS**	**NS**
ESRD Freshwater Aquatic Life**		**0.04**	**0.0005**	**0.09**	**0.03**	**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:

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-DP1	04-Aug-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	02-Sep-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	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-DP2	04-Aug-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	02-Sep-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	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-DP3	04-Aug-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	02-Sep-14	<0.16	<0.16	<0.32	<0.016	<0.014	<0.014	<0.014	<0.014	<0.081	<0.012	<0.081	<0.014	<0.012	<0.016	<0.081	<0.014	<0.16	<0.16	<0.081	<0.081	<0.032	<0.32	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-DP4	04-Aug-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-Sep-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-DP5	04-Aug-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-Sep-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
Alberta Tier 1 - Coarse Grained Soils - Natural Areas*		**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**

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-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-DP6	04-Aug-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-Sep-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
14-DP7	02-Sep-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 Soils - Natural Areas*		**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)