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

MAY 20 TO JUNE 23, 2014

1 Introduction

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

On September 24, 2013, Alberta Environment and Sustainable Resource Development (ESRD) issued an Environmental Protection Order (EPO No. EPO-2013-33/NR), requesting the preparation of a Comprehensive Remedial Plan (CRP), as well as the preparation of a monthly progress report.
This report summarizes the progress towards the realization of this plan and includes data collected and reported between May 20 and June 23, 2014.

2 Summary of Activities to Date

2.1 Individual Plan Submissions

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

Table 1: Components of the Comprehensive Remedial Plan

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

Item	Plan Name	Due Date	Submission Date	Approval Date	Implementation Start Date	Completion Date	Section Discussed
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
12.	**Bitumen Emulsion Delineation and Containment Plan**	October 6, 2013	Revised Plan December 22, 2013	February 7, 2014	November 27, 2013	Pending	3.5

2.2 Water Management for Dewatering and Refilling

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

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

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

Decommissioning of Aquadams along the East Ladder Road and Basin 4 started on June 3, 2014 and was suspended on June 16, 2014. Remaining material will be hauled out when ground conditions improve.

3 Water Body Monitoring

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

tailored to the refilling taking place at the 9-21 FTS site and 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 Refilling Water Quantity

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

The cumulative volume of water pumped from the borrow pit into Basin 1 since May 28, 2014 is 31,000 m^3. The total cumulative volume of water pumped from Basin 4 and the borrow pit into Basins 1 and 3 is approximately 258,000 m^3. A summary of daily pumping results from May 28 through June22, 2014 is presented in Appendix A1 and on Appendix A2.

Daily staff gauge monitoring was initiated on March 27, 2014, coinciding with spring breakup and the beginning of water body refilling. An overview of the staff gauge and water level monitoring locations is presented on Figure 2. The results of the staff gauge readings for Basins 3 and 4 are shown on Appendix A3. The results of the staff gauge readings for the downstream fen and the borrow pit are shown on Appendix A4. At the end of pumping, the water level in the borrow pit was approximately 700.0 m above sea level.

3.1.2 Containment Structure

In addition to water being pumped from the borrow pit into Basin 1, water was also pumped from within the containment area (inside the containment wall) and discharged directly back into Basin 1 (Figure 3). Water volumes pumped into Basin 1 from the containment area are shown in Appendix A5 and on Appendix A6.

3.2 Refilling Water Quality

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

3.2.1 Basins 1, 3, and 4 and Downstream Fen

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

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

- All water quality results were within freshwater aquatic life guidelines with the exception of five toluene measurements recorded in the downstream fen (13-SW27 and 13-SW26). Toluene was detected throughout the month. Toluene is widespread in the environment and a common source is motor vehicle exhaust.

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

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

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

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

- From June 6 to 23, 2014, water was treated, sampled, and stored until approval to discharge was received by the Alberta Energy Regulator (AER). A total of 1,126 m^3 of water has been treated and released during the reporting period.

3.2.3 Shallow Groundwater

No shallow groundwater quality samples were collected from May 20 to June 23, 2014.

3.3 Aquatic Surveillance

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

Traces of sheen and isolated bitumen emulsion pellets were observed in the water body on May 22, 23, and 31, as well as June 2, 3, 12, 14, and 17, 2014. These occurrences are shown on Figure 5. The source of the sheen and pellets was residual material remaining from the bitumen emulsion release that has been remobilized into the water column during the refilling. All observed bitumen emulsion pellets and sheen were collected, using absorbent material, and disposed in the onsite hazardous waste bin. Over the reporting period, less than 1 L of bitumen emulsion has been collected from Basins 1 and 3.

3.4 Erosion and Sedimentation Prevention

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

- Discharge locations from within the containment structure were visually assessed several times daily to ensure that water being discharged was clear and free from excess suspended solids. The intake hoses for all of the discharge pumps contain filter screens and were moved as needed to prevent

sediment intake as the water level in the swales changed. Daily qualitative and quantitative assessments of turbidity were conducted across the water body with no issues identified.

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

- An erosion and sediment control plan has been submitted and approved for implementation.

3.5 Bitumen Emulsion Containment

3.5.1 Temporary Containment of Bitumen Emulsion

Low clay berms have been constructed around the fissure at 9-21 to provide temporary containment of bitumen emulsion from the fissure, and to keep surface runoff from coming into contact with the bitumen emulsion. These features are shown on Figure 3. The removal of bitumen emulsion accumulating within the berms was not necessary during the reporting period.

3.5.2 Final Design for Permanent Containment of Bitumen Emulsion Seepage from Fissure

Designs for long-term fissure containment and an access pad have been proposed and are under discussion with AER.

In early May 2014, the fissure containment structure was approved. On May 4, 2014, a Canadian Natural construction crew began building the fissure containment structure and as of June 23, 2014, construction was ongoing. The final design of the access pad was still in discussion.

3.6 Wildlife Management

Wildlife management activities between May 20 and June 23, 2014 included maintaining perimeter fencing; installing, maintaining, and frequently relocating up to four wildlife scare cannons (Zon Guns); and conducting daily inspections.

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

3.7 Waste Management

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

4 Conclusions

The work conducted at the 9-21 FTS site from May 20 to June 23, 2014 included:

- completing refilling of Basin 1 from the borrow pit area; this pumping was completed on June 22, 2014
- operating a PIW treatment system at containment Cell D and releasing treated water when approved
- dewatering from within the containment area
- continuing construction of the 9-21 fissure containment structure

- ongoing monitoring of water quality, pumped quantity, discharge point erosion and sedimentation during refilling, and remediation activities
- monitoring wildlife activity near the water body

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

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

5 References

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

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

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

- Basin Boundary
- Watercourse
- Road
- Cut Line
- Pipeline

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

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

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Primrose 09-21-067-04 W4M

9-21 Water Body Divisions

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jun 2014	8881-523	B. Ethier	H. de Pennart	R. Keller

Figure 1

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\June\Public_9_21\Figure-2-Staff_Gauge_Discharge_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

13-SG8

Basin 4

13-SG12 13-SG11 Basin 4

Basin 3

Basin 3

13-SG7

Basin 2

13-SG6

Basin 1

13-SG13

Borrow Pit

13-SG4

Decomissioned Containment Cell A and B

13-SG2

Containment Cell D
Decommisioned Containment Cell
Basin Boundary
Water Body
Watercourse
Road
Cut Line
Pipeline

Direction of Flow
Staff Gauge Location
Water Level Monitoring Location

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.

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

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Primrose 09-21-067-04 W4M

Staff Gauge, Discharge, and Water Level Monitoring Locations

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jun 2014	8881-523	B. Ethier	H. de Pennart	R. Keller

Figure 2

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Easting (m)

Northing (m)

529100 529200 529300 529400 529500

6074700 6074600 6074500 6074400 6074300 6074200 6074100

N

3.6

Basin 3

3.5

2.3 2.2 2.1

Basin 2

1.1

1.2

1.3a

Basin 1

1.7 1.6 1.5a 1.5b 1.4a 1.4b 1.3b 1.3c

50 100 150 200 250 300 350 400 450 500

Fissure 2

Fissure 1

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

Bitumen Sheen Detected
Containment Structure Station Location
Bitumen Detected

1:2,000

m 20 0 20 40

NAD 1983 UTM Zone 12N

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

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Aquatic Surveillance Site Plan

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jun 2014	8881-523	B. Ethier	H. de Pennart	R. Keller

Figure 3

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\June\Public_9_21\Figure-4-2014_Re-watering_and_Monitoring_Plan_Overview.mxd

Easting (m)

Northing (m)

N

Containment Cell D

PIW System

14-SW2

13-DP4

Re-Watering System

Basin 4

13-SW12

13-DP3

Basin 3

13-SW31

Re-Watering System

13-DP7

14-SW3

13-DP5

14-SW1-P1

Containment Cell C

14-SW1-P2

14-SW1

13-SW22

Former Borrow Pit

Basin 1

13-SW46

Basin 2

13-DP6

Downstream Fen

Decomissioned Containment Cell A and B

13-SW26

13-DP1

13-SW27

Pad AC21

13-SW16

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

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

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

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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2014 Re-watering and Monitoring Plan Overview

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jun 2014	8881-523	B. Ethier	H. de Pennart	R. Keller

Figure 4

I:\CanadianNatural\8881\FiguresAndTables\SPL\2013\Report_MonthlySummary\June\Public_9_21\Figure-5-Containment_Structure_Pump_Locations.mxd

Easting (m)

529050 529100 529150 529200 529250 529300

Northing (m)

6074550 6074500 6074450 6074400 6074350 6074300 6074250 6074200 6074150

N

Basin 3

50 pump discharge #112 100 150

4 inch pump #112

Swale 2

pump discharge #077
pump discharge #730
pump discharge #731
pump discharge #063

V-trench Wier

200

Swale 1

4 inch pump #090

6 inch pump #731

4 inch pump #077

4 inch pump #063

250

Swale 3

300

Basin 2

350

Basin 1

400

Fissure 2

Fissure 1

450

500

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

Pump Discharge Line
V-trench Weir
Flow direction
Pump
Pump Discharge Location
Containment Structure Station Location

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

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

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Containment Structure Pump Locations

Date:	Project:	Technical:	Reviewer:	Drawn:
24 Jun 2014	8881-523	B. Ethier	H. de Pennart	R. Keller

Figure 5

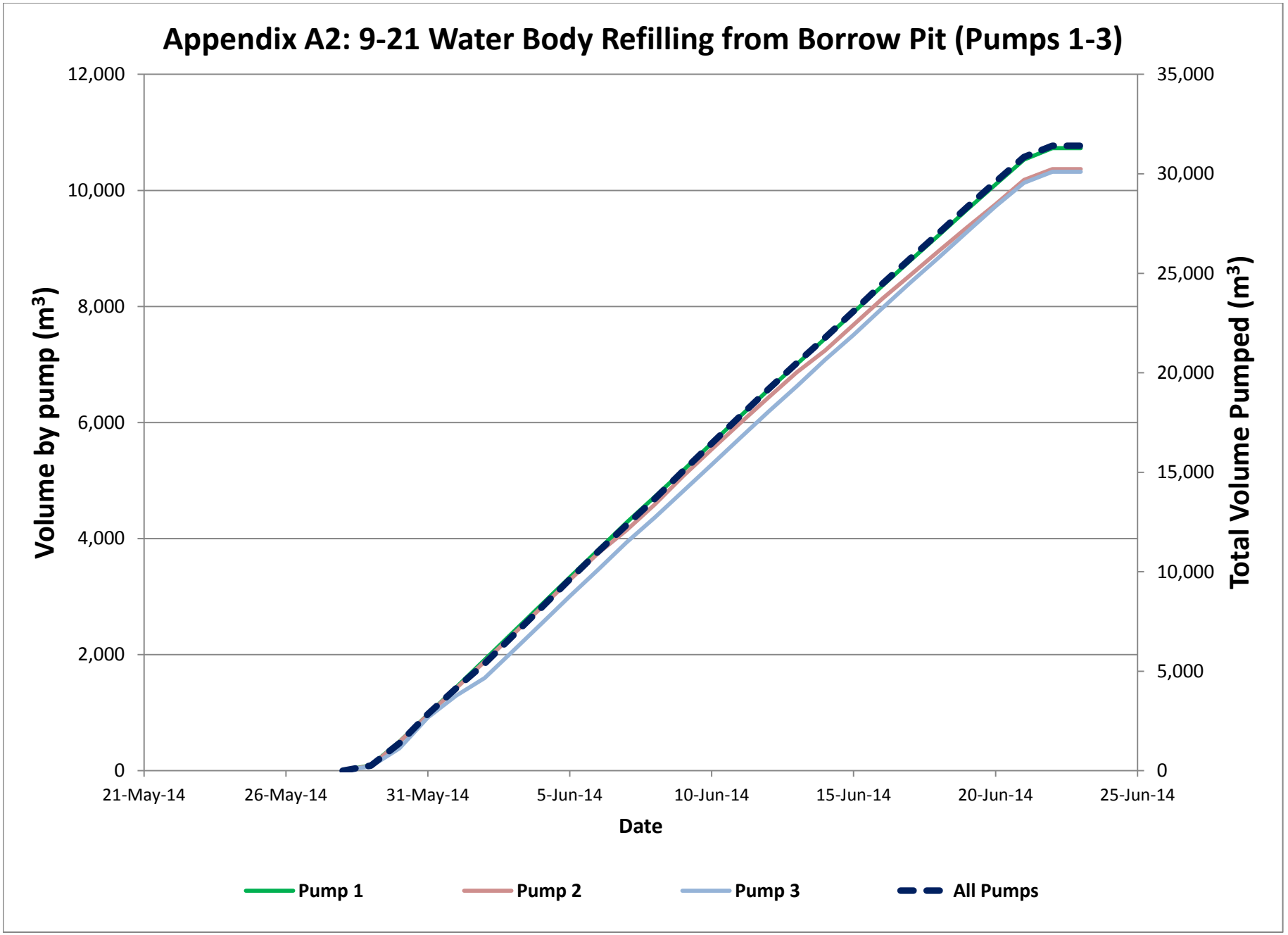
APPENDIX A

WATER LEVELS AND PUMP VOLUMES

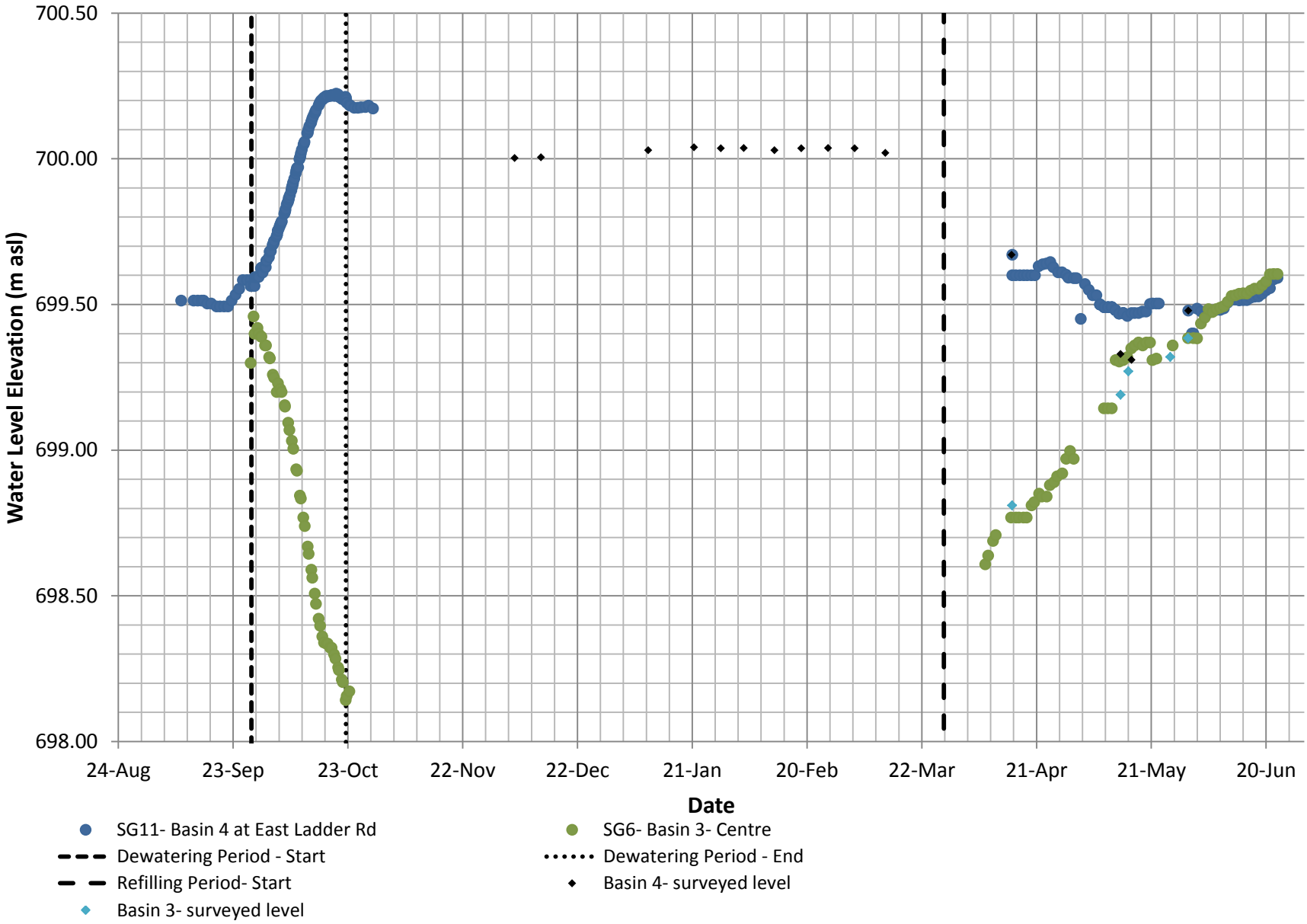
Appendix A1: Daily Flow Volumes from Borrow Pit to Basin 1

CNRL Primrose 09-21 Water Body: Refilling Phase (Pumps 1-3)

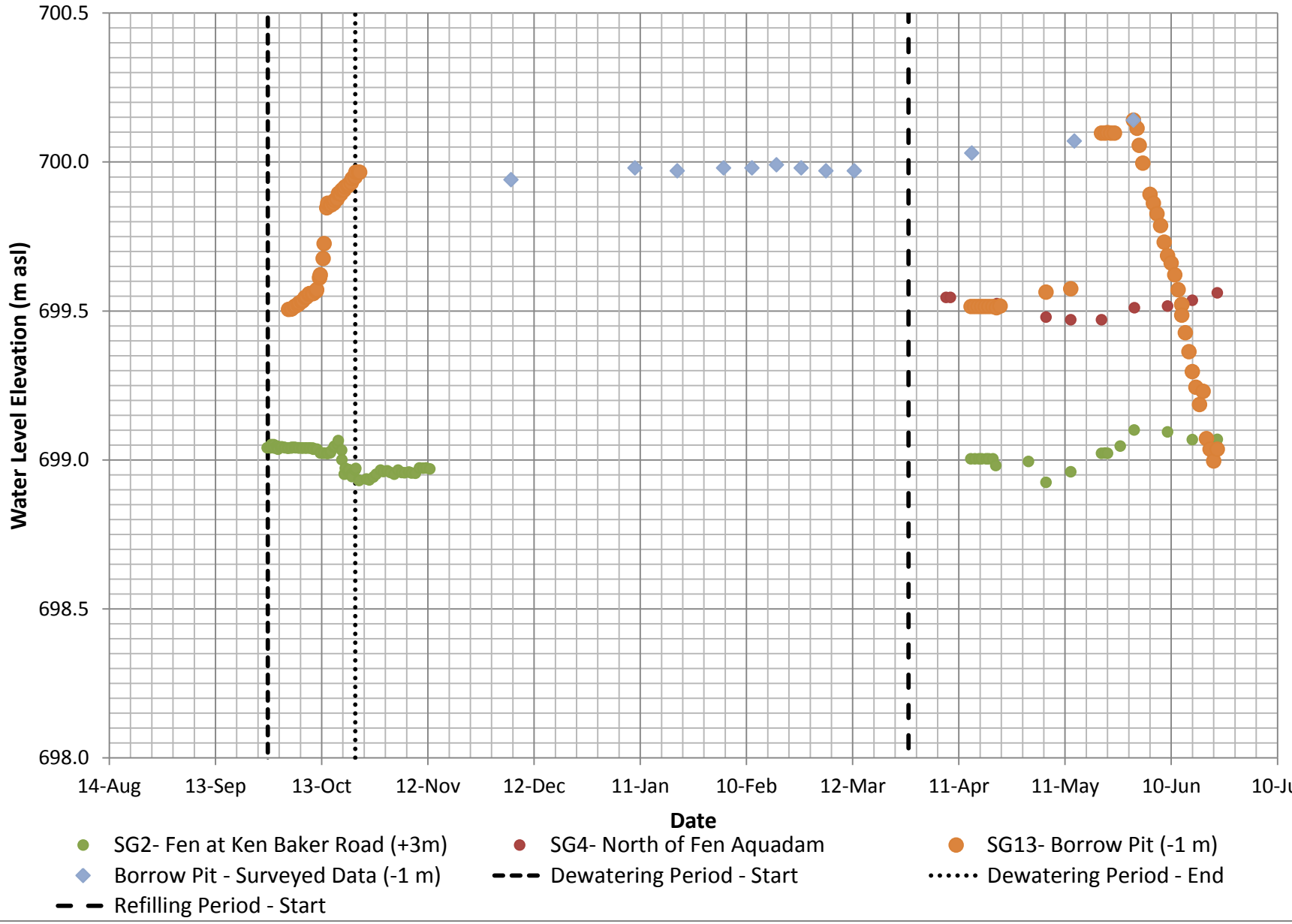
Date	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Rewatering Volume (m^3/day)	Cumulative Pumped (m^3)	Daily Volume to Water Body from Pumps 1-7 (m^3/day)	Cumulative Total to Water Body from Pumps 1-7 (m^3)
	Borrow Pit							
	Pump 1		Pump 2		Pump 3			
28-May-14	-	-	-	-	-	-	-	-
29-May-14	93	93	87	87	74	74	253	253
30-May-14	408	500	411	498	311	385	1,130	1,383
31-May-14	466	967	464	962	533	918	1,464	2,847
1-Jun-14	470	1,437	458	1,420	376	1,293	1,304	4,150
2-Jun-14	474	1,911	459	1,879	303	1,596	1,236	5,386
3-Jun-14	473	2,384	466	2,345	467	2,063	1,406	6,792
4-Jun-14	474	2,857	465	2,810	469	2,532	1,407	8,199
5-Jun-14	477	3,334	474	3,284	474	3,005	1,425	9,624
6-Jun-14	468	3,802	463	3,747	460	3,466	1,391	11,014
7-Jun-14	474	4,276	397	4,144	467	3,933	1,338	12,353
8-Jun-14	446	4,721	444	4,588	433	4,366	1,323	13,675
9-Jun-14	455	5,177	492	5,080	454	4,820	1,401	15,076
10-Jun-14	464	5,640	456	5,536	454	5,274	1,374	16,450
11-Jun-14	462	6,102	452	5,988	457	5,731	1,370	17,821
12-Jun-14	459	6,561	443	6,431	454	6,184	1,356	19,176
13-Jun-14	445	7,006	433	6,864	442	6,626	1,320	20,496
14-Jun-14	441	7,447	379	7,243	457	7,083	1,277	21,773
15-Jun-14	452	7,899	442	7,685	429	7,511	1,322	23,096
16-Jun-14	455	8,354	445	8,131	456	7,968	1,356	24,452
17-Jun-14	440	8,793	413	8,544	447	8,415	1,300	25,752
18-Jun-14	435	9,228	413	8,957	430	8,844	1,278	27,030
19-Jun-14	446	9,674	407	9,365	444	9,288	1,297	28,327
20-Jun-14	429	10,103	398	9,763	438	9,726	1,266	29,592
21-Jun-14	428	10,530	418	10,181	402	10,129	1,248	30,840
22-Jun-14	196	10,727	186	10,367	191	10,320	574	31,414
23-Jun-14	0	10,727	0	10,367	0	10,320	0	31,414


Appendix A2: 9-21 Water Body Refilling from Borrow Pit (Pumps 1-3)
Volume by pump (m³)
Total Volume Pumped (m³)
12,000
10,000
8,000
6,000
4,000
2,000
0
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
21-May-14
26-May-14
31-May-14
5-Jun-14
10-Jun-14
15-Jun-14
20-Jun-14
25-Jun-14
Date
Pump 1
Pump 2
Pump 3
All Pumps

Appendix A3: Water Levels at 9-21 Water Body



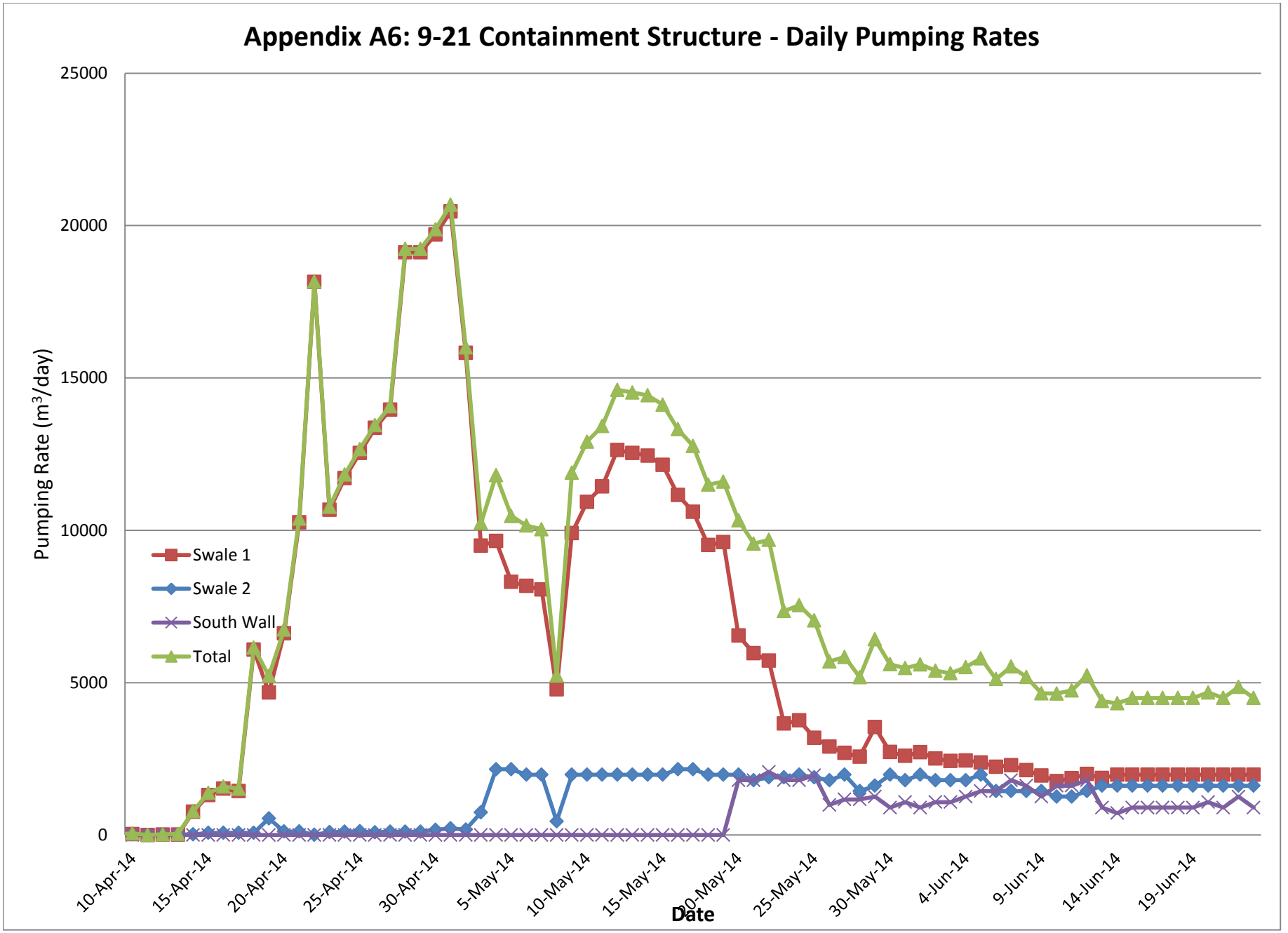
Appendix A4: Water Levels in the Downstream Fen and Borrow Pit



Appendix A5: Daily Volumes Pumped from from the Containment structure to Basin 1 and 3

CNRL Primrose 09-21 Water Body: Refilling Phase

Date	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)	Containment Structure Total: Daily Volume to Water Body from Containment Structure (m^3/day)	Containment Structure Total: Cumulative Total to Water Body from Containment Structure (m^3)	Comments
	Containment Structure								
	14-SW1-P1		14-SW1-P2		South Wall				
27-Mar-14	-	-	-	-	-	-	-	-	
28-Mar-14	-	-	-	-	-	-	-	-	
29-Mar-14	-	-	-	-	-	-	-	-	
30-Mar-14	-	-	-	-	-	-	-	-	
31-Mar-14	-	-	-	-	-	-	-	-	
1-Apr-14	-	-	-	-	-	-	-	-	
2-Apr-14	-	-	-	-	-	-	-	-	
3-Apr-14	-	-	-	-	-	-	-	-	
4-Apr-14	-	-	-	-	-	-	-	-	
5-Apr-14	-	-	-	-	-	-	-	-	
6-Apr-14	15	15	-	-	-	-	15	15	
7-Apr-14	23	38	4	4	-	-	28	42	
8-Apr-14	0	38	11	15	-	-	11	53	
9-Apr-14	11	49	14	30	-	-	25	79	
10-Apr-14	31	80	23	53	-	-	54	133	
11-Apr-14	0	80	0	53	-	-	0	133	
12-Apr-14	11	91	13	66	-	-	24	157	
13-Apr-14	15	106	25	91	-	-	40	197	
14-Apr-14	765	871	20	111	-	-	785	982	
15-Apr-14	1,308	2,179	73	184	-	-	1,381	2,363	
16-Apr-14	1,521	3,700	70	254	-	-	1,591	3,954	
17-Apr-14	1,442	5,142	75	329	-	-	1,517	5,471	
18-Apr-14	6,081	11,223	70	399	-	-	6,151	11,621	
19-Apr-14	4,675	15,898	545	944	-	-	5,220	16,841	
20-Apr-14	6,623	22,521	114	1,058	-	-	6,737	23,578	
21-Apr-14	10,261	32,782	116	1,173	-	-	10,377	33,955	
22-Apr-14	18,147	50,929	7	1,181	-	-	18,154	52,110	
23-Apr-14	10,673	61,602	93	1,274	-	-	10,766	62,876	
24-Apr-14	11,714	73,316	113	1,387	-	-	11,827	74,703	
25-Apr-14	12,539	85,856	123	1,510	-	-	12,662	87,366	
26-Apr-14	13,361	99,217	89	1,599	-	-	13,450	100,816	
27-Apr-14	13,959	113,176	111	1,709	-	-	14,070	114,886	
28-Apr-14	19,120	132,296	110	1,819	-	-	19,230	134,116	
29-Apr-14	19,121	151,417	111	1,930	-	-	19,232	153,348	
30-Apr-14	19,707	171,124	170	2,100	-	-	19,877	173,225	
1-May-14	20,462	191,586	219	2,319	-	-	20,681	193,906	
2-May-14	15,820	207,406	178	2,497	-	-	15,998	209,904	
3-May-14	9,497	216,903	740	3,237	-	-	10,237	220,141	
4-May-14	9,646	226,549	2,160	5,397	-	-	11,806	231,947	
5-May-14	8,309	234,858	2,160	7,557	-	-	10,469	242,416	
6-May-14	8,176	243,034	1,980	9,537	-	-	10,156	252,572	
7-May-14	8,055	251,089	1,980	11,517	-	-	10,035	262,607	
8-May-14	4,783	255,872	450	11,967	-	-	5,233	267,840	
9-May-14	9,911	265,783	1,980	13,947	-	-	11,891	279,731	
10-May-14	10,928	276,711	1,980	15,927	-	-	12,908	292,639	
11-May-14	11,439	288,150	1,980	17,907	-	-	13,419	306,058	
12-May-14	12,630	300,780	1,980	19,887	-	-	14,610	320,668	
13-May-14	12,539	313,319	1,980	21,867	-	-	14,519	335,187	
14-May-14	12,450	325,769	1,980	23,847	-	-	14,430	349,616	
15-May-14	12,143	337,912	1,980	25,827	-	-	14,123	363,740	
16-May-14	11,157	349,069	2,160	27,987	-	-	13,317	377,057	
17-May-14	10,608	359,677	2,160	30,147	-	-	12,768	389,825	
18-May-14	9,515	369,192	1,980	32,127	-	-	11,495	401,320	
19-May-14	9,616	378,808	1,980	34,107	-	-	11,596	412,916	
20-May-14	6,548	385,356	1,980	36,087	1800	1800	10,328	423,244	Begin Pumping From Swale 3
21-May-14	5,964	391,320	1,800	37,887	1800	3,600	9,564	432,808	
22-May-14	5,723	397,043	1,890	39,777	2070	5,670	9,683	442,491	Poly installed from station: 191-212, 215-242
23-May-14	3,659	400,702	1,890	41,667	1800	7,470	7,349	449,840	Poly installed from station: 152-182
24-May-14	3,762	404,464	1,980	43,647	1800	9,270	7,542	457,382	Poly installed from station: 120-128.5, 135-151
25-May-14	3,192	407,656	1,890	45,537	1960	11,230	7,042	464,424	Poly installed from station: 73.5-120
26-May-14	2,905	410,561	1,800	47,337	990	12,220	5,695	470,119	Poly installed from station: 59.5-73.5, 246-269
27-May-14	2,692	413,253	1,980	49,317	1170	13,390	5,842	475,961	Poly installed from station: 277-351
28-May-14	2,571	415,824	1,440	50,757	1170	14,560	5,181	481,142	Poly installed from station: 352-385
29-May-14	3,541	419,365	1,620	52,377	1,260	15,820	6,421	487,563	
30-May-14	2,723	422,088	1,980	54,357	900	16,720	5,603	493,166	
31-May-14	2,599	424,687	1,800	56,157	1080	17,800	5,479	498,645	
1-Jun-14	2,721	427,408	1,980	58,137	900	18,700	5,601	504,246	
2-Jun-14	2,513	429,921	1,800	59,937	1,080	19,780	5,393	509,639	
3-Jun-14	2,429	432,351	1,800	61,737	1080	20,860	5,309	514,948	
4-Jun-14	2,448	434,799	1,800	63,537	1260	22,120	5,508	520,456	
5-Jun-14	2,380	437,179	1,980	65,517	1440	23,560	5,800	526,256	
6-Jun-14	2,239	439,418	1,440	66,957	1440	25,000	5,119	531,375	
7-Jun-14	2,290	441,708	1,440	68,397	1800	26,800	5,530	536,905	
8-Jun-14	2,128	443,836	1,440	69,837	1620	28,420	5,188	542,093	
9-Jun-14	1,948	445,784	1440	71,097	1,260	29,860	4,648	546,741	
10-Jun-14	1,764	447,548	1,260	72,357	1620	31,480	4,644	551,385	
11-Jun-14	1,864	449,412	1,260	73,617	1620	33,100	4,744	556,129	
12-Jun-14	2,000	451,412	1,440	75,057	1800	34,900	5,240	561,369	
13-Jun-14	1,874	453,286	1,620	76,677	900	35,800	4,394	565,763	
14-Jun-14	1,980	455,266	1,620	78,297	720	36,520	4,320	570,083	
15-Jun-14	1,980	457,246	1,620	79,917	900	37,420	4,500	574,583	
16-Jun-14	1,980	459,226	1,620	81,537	900	38,320	4,500	579,083	
17-Jun-14	1,980	461,206	1,620	83,157	900	39,220	4,500	583,583	
18-Jun-14	1,980	463,186	1,620	84,777	900	40,120	4,500	588,083	
19-Jun-14	1,980	465,166	1,620	86,397	900	41,020	4,500	592,583	
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	


Appendix A6: 9-21 Containment Structure - Daily Pumping Rates
Pumping Rate (m3/day)
25000
20000
15000
10000
5000
0
Swale 1
Swale 2
South Wall
Total
10-Apr-14
15-Apr-14
20-Apr-14
25-Apr-14
30-Apr-14
5-May-14
10-May-14
15-May-14
20-May-14
25-May-14
30-May-14
4-Jun-14
9-Jun-14
14-Jun-14
19-Jun-14
Date

APPENDIX B

WATER QUALITY RESULTS SUMMARY

APPENDIX B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited
09-21-064-04 W4M

Sample Point	Sample Date	MSI Sample Number	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	08881140319312	<0.0004	***0.0044***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	27-Mar-14	08881140327003	<0.0004	***0.0085***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	01-Apr-14	08881140401001	<0.0004	***0.0006***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	08-Apr-14	08881140408312	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	15-Apr-14	08881140415312	<0.0004	***0.0180***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	22-Apr-14	08881140422312	<0.0004	***0.0040***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12	29-Apr-14	08881140429312	<0.0004	***0.0140***	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW12	22-May-14	08881140522001	<0.00040	***0.00055***	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12	27-May-14	08881140527312	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW12	02-Jun-14	08881140602312	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW12	09-Jun-14	08881140609312	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW12	16-Jun-14	08881140616312	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW12a	06-May-14	08881140506312	<0.0004	***0.0060***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW12a	13-May-14	08881140513312	<0.00040	***0.00120***	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12a	20-May-14	08881140520312	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12b	06-May-14	08881140506346	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW12b	13-May-14	08881140513313	<0.00040	***0.00096***	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW12c	20-May-14	08881140520313	<0.00040	0.00042	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW16	13-May-14	08881140513316	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW16	20-May-14	08881140520316	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW16	27-May-14	08881140527316	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW16	02-Jun-14	08881140602316	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW16	09-Jun-14	08881140609316	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW16	16-Jun-14	08881140616316	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
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**

APPENDIX B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited
09-21-064-04 W4M

Sample Point	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C_6-C_{10} - BTEX mg/L	F2 $C_{>10}$-C_{16} mg/L	F3 $C_{>16}$-C_{34} mg/L	F4 $C_{>34}$-C_{50} mg/L
Surface Water Samples										
13-SW22	01-Apr-14	08881140401002	<0.0004	***0.00230***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	08-Apr-14	08881140408322	<0.0004	***0.00084***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	15-Apr-14	08881140415322	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	22-Apr-14	08881140422322	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW22	29-Apr-14	08881140429322	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW22	06-May-14	08881140506322	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW22	13-May-14	08881140513322	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW22	20-May-14	08881140520322	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW22	27-May-14	08881140527322	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW22	02-Jun-14	08881140602322	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW22	09-Jun-14	08881140609322	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW22	16-Jun-14	08881140616322	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW26	13-May-14	08881140513326	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	0.23	<0.20
13-SW26	20-May-14	08881140520326	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW26	27-May-14	08881140527326	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW26	02-Jun-14	08881140602326	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW26	09-Jun-14	08881140609326	<0.00040	***0.00290***	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW26	16-Jun-14	08881140616326	<0.00040	***0.00100***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW27	13-May-14	08881140513327	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW27	20-May-14	08881140520327	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW27	27-May-14	08881140527327	<0.00040	***0.00100***	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW27	02-Jun-14	08881140602327	<0.0004	***0.00140***	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW27	09-Jun-14	08881140609327	<0.00040	***0.00096***	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW27	16-Jun-14	08881140616327	<0.00040	***0.00100***	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31	08-Apr-14	08881140408331	<0.0004	***0.0011***	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31	15-Apr-14	08881140415331	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31 dup	15-Apr-14	08881140415531	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31	22-Apr-14	08881140422331	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31 dup	22-Apr-14	08881140422531	<0.0004	0.00043	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW31	29-Apr-14	08881140429331	<0.0004	***0.0017***	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW31 dup	29-Apr-14	08881140429531	<0.0004	***0.0150***	<0.0004	<0.0008	<0.1	<0.1	---	---
13-SW31	06-May-14	08881140506331	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	06-May-14	08881140506531	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	0.11	<0.20	<0.20
13-SW31	13-May-14	08881140513331	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	13-May-14	08881140513531	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
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**

APPENDIX B1.

WATER QUALITY RESULTS - DISSOLVED HYDROCARBONS

Canadian Natural Resources Limited
09-21-064-04 W4M

Sample Point	Sample Date	MSI Sample Number	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	20-May-14	08881140520331	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	20-May-14	08881140520531	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW31	27-May-14	08881140527331	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31 dup	27-May-14	08881140527531	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31	02-Jun-14	08881140602331	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW31 dup	02-Jun-14	08881140602531	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW31	09-Jun-14	08881140609531	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31 dup	09-Jun-14	08881140609331	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW31	16-Jun-14	08881140616331	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
13-SW31 dup	16-Jun-14	08881140616531	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
Containment Structure Samples										
14-SW1-P1	01-Apr-14	08881140401003	<0.0004	0.00046	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
14-SW1-P1	22-Apr-14	08881140422381	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
14-SW1-P1	29-Apr-14	08881140429001	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	---	---
14-SW1-P1	06-May-14	08881140506381	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.20	<0.20
14-SW1-P1	13-May-14	08881140513381	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1	<0.20	<0.20
14-SW1-P1	20-May-14	08881140520381	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
14-SW1-P1	27-May-14	08881140527381	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
14-SW1-P2	05-Apr-14	08881140405001	<0.0004	0.00050	<0.0004	<0.0008	<0.1	<0.1	<0.2	<0.2
13-SW46	20-May-14	08881140520346	<0.00040	<0.00040	<0.00040	<0.00080	<0.1	<0.10	<0.20	<0.20
13-SW46	02-Jun-14	08881140602346	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
13-SW46	09-Jun-14	08881140609346	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
13-SW46	16-Jun-14	08881140616346	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	---	---
14-SW81	02-Jun-14	08881140602381	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.10	<0.20	<0.20
14-SW81	09-Jun-14	08881140609381	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10	<0.20	<0.20
14-SW81	16-Jun-14	08881140616381	<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

APPENDIX B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	MSI Sample Number	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	08881140319312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140327003	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140401001	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140408312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140415312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140422312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140429312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<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	08881140522001	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140506312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140513312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520312	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140506346	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140513313	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520313	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140513316	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520316	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527316	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602316	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609316	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616316	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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-Apr-14	08881140401002	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140408322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140415322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140422322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140429322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140506322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140513322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616322	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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**

APPENDIX B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	MSI Sample Number	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-SW26	13-May-14	08881140513326	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520326	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527326	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602326	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609326	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616326	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140513327	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520327	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527327	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602327	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609327	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616327	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08-Apr-14	08881140408331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140415331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140415531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140422331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140422531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140429331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140429531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140506331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140506531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140513331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140513531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616331	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616531	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	---
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**

APPENDIX B2.

WATER QUALITY RESULTS - POLYCYCLIC AROMATIC HYDROCARBONS

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Date	MSI Sample Number	Acenaphthene µg/L	Acenaphthylene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[b+j]fluoranthene µg/L	Benzo[k]fluoranthene µg/L	Benzo[g,h,i]perylene µg/L	Benzo[c]phenanthrene µg/L	Benzo[a]pyrene µg/L	Benzo[e]pyrene µg/L	Chrysene µg/L	Dibenz[a,h]anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	Indeno[1,2,3-cd]pyrene µg/L	Naphthalene µg/L	2-Methylnaphthalene µg/L	Perylene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L	TOTAL PAH µg/L
Containment Structure Samples																									
14-SW1-P1	01-Apr-14	08881140401003	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140422381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140429001	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140506381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<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	08881140513381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140520381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140527381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140405001	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<0.0085	<0.0075	<0.010	<0.050	<0.0085	<0.10	<0.10	<0.050	<0.050	<0.020	<0.20	ND
13-SW46	20-May-14	08881140520346	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602346	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609346	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616346	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140602381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140609381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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	08881140616381	<0.10	<0.10	<0.20	<0.010	<0.0085	<0.0085	<0.0085	<0.0085	<0.050	<0.0075	<0.050	<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

APPENDIX B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Matrix Sample Number	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	08881140319312	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	08881140327003	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	6.7	3.1
13-SW12	01-Apr-14	08881140401001	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	4	---
13-SW12	08-Apr-14	08881140408312	---	---	---	---	---	---	<1	---	---	---	---	---	---	---	---	37	27
13-SW12	15-Apr-14	08881140415312	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	40	14
13-SW12	22-Apr-14	08881140422312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	37	15
13-SW12	29-Apr-14	08881140429312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	7.3	1.8
13-SW12	22-May-14	08881140522001	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	<1.0	0.55
13-SW12	27-May-14	08881140527312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	1.3	0.57
13-SW12	02-Jun-14	08881140602312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	<1.0	0.66
13-SW12	09-Jun-14	08881140609312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	1.3	0.55
13-SW12	16-Jun-14	08881140616312	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	17	4.2
13-SW12a	06-May-14	08881140506312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	20	5.7
13-SW12a	13-May-14	08881140513312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	1.3	0.88
13-SW12a	20-May-14	08881140520312	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	3.3	1.1
13-SW12b	06-May-14	08881140506346	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	59	19
13-SW12b	13-May-14	08881140513313	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	170	9.5
13-SW12c	20-May-14	08881140520313	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	6.7	2.5
13-SW16	13-May-14	08881140513316	---	---	---	---	---	---	6.0	---	---	---	---	---	---	---	---	10	11
13-SW16	20-May-14	08881140520316	---	---	---	---	---	---	5.7	---	---	---	---	---	---	---	---	3.3	2.4
13-SW16	27-May-14	08881140527316	---	---	---	---	---	---	3.4	---	---	---	---	---	---	---	---	2	0.95
13-SW16	02-Jun-14	08881140602316	---	---	---	---	---	---	4.4	---	---	---	---	---	---	---	---	<1.0	1.1
13-SW16	09-Jun-14	08881140609316	---	---	---	---	---	---	3.5	---	---	---	---	---	---	---	---	2	0.81
13-SW16	16-Jun-14	08881140616316	---	---	---	---	---	---	7.4	---	---	---	---	---	---	---	---	10	3.5
13-SW22	01-Apr-14	08881140401002	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	3.3	---
13-SW22	08-Apr-14	08881140408322	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	7.3	6.1
13-SW22	15-Apr-14	08881140415322	---	---	---	---	---	---	1.4	---	---	---	---	---	---	---	---	220	120
13-SW22	22-Apr-14	08881140422322	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	33	8.8
13-SW22	29-Apr-14	08881140429322	---	---	---	---	---	---	3.5	---	---	---	---	---	---	---	---	130	100
13-SW22	06-May-14	08881140506322	---	---	---	---	---	---	1.7	---	---	---	---	---	---	---	---	130	170
13-SW22	13-May-14	08881140513322	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	150	200
13-SW22	20-May-14	08881140520322	---	---	---	---	---	---	3.5	---	---	---	---	---	---	---	---	58	67
13-SW22	27-May-14	08881140527322	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	18	30
13-SW22	02-Jun-14	08881140602322	---	---	---	---	---	---	2.8	---	---	---	---	---	---	---	---	31	42
13-SW22	09-Jun-14	08881140609322	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	8.7	16
13-SW22	16-Jun-14	08881140616322	---	---	---	---	---	---	1.5	---	---	---	---	---	---	---	---	3.3	7.2
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**

APPENDIX B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Matrix Sample Number	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-SW26	13-May-14	08881140513326	---	---	---	---	---	---	8.0	---	---	---	---	---	---	---	---	6	4.4
13-SW26	20-May-14	08881140520326	---	---	---	---	---	---	3.7	---	---	---	---	---	---	---	---	3.3	2.8
13-SW26	27-May-14	08881140527326	---	---	---	---	---	---	2.3	---	---	---	---	---	---	---	---	6.7	1.5
13-SW26	02-Jun-14	08881140602326	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	7.3	1.2
13-SW26	09-Jun-14	08881140609326	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	8.7	3.4
13-SW26	16-Jun-14	08881140616326	---	---	---	---	---	---	2.9	---	---	---	---	---	---	---	---	18	20
13-SW27	13-May-14	08881140513327	---	---	---	---	---	---	3.9	---	---	---	---	---	---	---	---	1.3	1.7
13-SW27	20-May-14	08881140520327	---	---	---	---	---	---	3.3	---	---	---	---	---	---	---	---	11	4.2
13-SW27	27-May-14	08881140527327	---	---	---	---	---	---	3.0	---	---	---	---	---	---	---	---	5.3	3.7
13-SW27	02-Jun-14	08881140602327	---	---	---	---	---	---	3.9	---	---	---	---	---	---	---	---	2.7	3.3
13-SW27	09-Jun-14	08881140609327	---	---	---	---	---	---	3.7	---	---	---	---	---	---	---	---	4	4.7
13-SW27	16-Jun-14	08881140616327	---	---	---	---	---	---	3.4	---	---	---	---	---	---	---	---	17	21
13-SW31	08-Apr-14	08881140408331	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	4.7	3.6
13-SW31	15-Apr-14	08881140415331	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	170	54
13-SW31 dup	15-Apr-14	08881140415531	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	420	130
13-SW31	22-Apr-14	08881140422331	---	---	---	---	---	---	3.3	---	---	---	---	---	---	---	---	100	34
13-SW31 dup	22-Apr-14	08881140422531	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	37	7.2
13-SW31	29-Apr-14	08881140429331	---	---	---	---	---	---	1.8	---	---	---	---	---	---	---	---	4.7	2.1
13-SW31 dup	29-Apr-14	08881140429531	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	6.0	1.4
13-SW31	06-May-14	08881140506331	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	140	180
13-SW31 dup	06-May-14	08881140506531	---	---	---	---	---	---	<1.0	---	---	---	---	---	---	---	---	80	17
13-SW31	13-May-14	08881140513331	---	---	---	---	---	---	2.1	---	---	---	---	---	---	---	---	20	24
13-SW31 dup	13-May-14	08881140513531	---	---	---	---	---	---	7.9	---	---	---	---	---	---	---	---	25	13
13-SW31	20-May-14	08881140520331	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	33	69
13-SW31 dup	20-May-14	08881140520531	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	23	60
13-SW31	27-May-14	08881140527331	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	15	27
13-SW31 dup	27-May-14	08881140527531	---	---	---	---	---	---	21	---	---	---	---	---	---	---	---	1.3	0.55
13-SW31	02-Jun-14	08881140602331	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	28	46
13-SW31 dup	02-Jun-14	08881140602531	---	---	---	---	---	---	2.2	---	---	---	---	---	---	---	---	11	2.9
13-SW31	09-Jun-14	08881140609531	---	---	---	---	---	---	1.2	---	---	---	---	---	---	---	---	2	1.5
13-SW31 dup	09-Jun-14	08881140609331	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	11	18
13-SW31	16-Jun-14	08881140616331	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	1.3	7.9
13-SW31 dup	16-Jun-14	08881140616531	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	5.3	7.6
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**

APPENDIX B3.

WATER QUALITY RESULTS - ROUTINE WATER CHEMISTRY

Canadian Natural Resources Limited

09-21-064-04 W4M

Sample Point	Sample Date	Matrix Sample Number	Lab pH	Lab EC	Ca	Mg	Na	K	Cl	SO_4	NO_2-N	NO_3 -N	NO_3+NO_2-N	Total Alkalinity	HCO_3	Hardness	TDS	TSS	Turbidity
				µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
Containment Structure Samples																			
14-SW1-P1	01-Apr-14	08881140401003	---	---	---	---	---	---	46	---	---	---	---	---	---	---	---	21	---
14-SW1-P1	01-Apr-14	08881140422381	---	---	---	---	---	---	3.0	---	---	---	---	---	---	---	---	400	360
14-SW1-P1	29-Apr-14	08881140429001	---	---	---	---	---	---	3.2	---	---	---	---	---	---	---	---	350	510
14-SW1-P1	06-May-14	08881140506381	---	---	---	---	---	---	16	---	---	---	---	---	---	---	---	320	400
14-SW1-P1	13-May-14	08881140513381	---	---	---	---	---	---	1.3	---	---	---	---	---	---	---	---	54	82
14-SW1-P1	20-May-14	08881140520381	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	43	62
14-SW1-P1	27-May-14	08881140527381	---	---	---	---	---	---	2.0	---	---	---	---	---	---	---	---	14	18
14-SW1-P2	05-Apr-14	08881140405001	---	---	---	---	---	---	22	---	---	---	---	---	---	---	---	130	---
13-SW46	20-May-14	08881140520346	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	34	20
13-SW46	02-Jun-14	08881140602346	---	---	---	---	---	---	1.6	---	---	---	---	---	---	---	---	5.3	4.3
13-SW46	09-Jun-14	08881140609346	---	---	---	---	---	---	1.8	---	---	---	---	---	---	---	---	1.3	1.3
13-SW46	16-Jun-14	08881140616346	---	---	---	---	---	---	1.7	---	---	---	---	---	---	---	---	5.3	4.8
14-SW81	02-Jun-14	08881140602381	---	---	---	---	---	---	2.6	---	---	---	---	---	---	---	---	24	39
14-SW81	09-Jun-14	08881140609381	---	---	---	---	---	---	2.4	---	---	---	---	---	---	---	---	450	1000
14-SW81	16-Jun-14	08881140616381	---	---	---	---	---	---	1.9	---	---	---	---	---	---	---	---	8	18
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