March 15, 2008

Alberta Environment
Enforcement and Monitoring Division
11th Floor, Oxbridge Place
9820-106 Street
Edmonton, Alberta
T5K 2J6

Dear Sir/Madam:

RE: 2007 GROUNDWATER MONITORING REPORT – SYNCRUDE MILDRED LAKE SITE

Attached, please find two copies of our Annual Compliance Report for 2007 pursuant to clause 11.9.1 of Approval 26-02-00 under the Environmental Protection and Enhancement Act. We respectfully submit this report in accordance with the terms and conditions of the Environmental Protection and Enhancement Act and amendments, and in accordance with sound engineering and environmental practices.

We trust that the report is satisfactory at this time.

Yours truly,

Nathalie Bérubé

Attachment

Environmental Services and Regulatory Approvals
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2007
GROUNDWATER MONITORING
REPORT

SYNCRUDE CANADA LTD.
MILDRED LAKE SITE

SUBMITTED TO
ALBERTA ENVIRONMENT

IN COMPLIANCE WITH
APPROVAL 26-02-00, CLAUSE 11.9.1

PREPARED BY: **Femi Baiyewun**
Geotechnical Division, Technical / Operations Support Department

REPORT ISSUED: **March 15, 2008**

Geotechnical Division, Technical / Operations Support Department
Syncrude Canada Ltd.

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Appendix A: License Requirements and Amendments — *Following Text*

Appendix B: Complete Analytical Results and Water Elevations — *Following Text*

Appendix C: Historical Trend Plots — *Following Text*

1 Introduction

This Syncrude Canada Ltd. report is completed in compliance with Clause 11.9.1 of Approval 26-02-00 under the Environmental Protection and Enhancement Act, which stipulates the requirement to submit an annual groundwater monitoring summary for the Mildred Lake Site to Alberta Environment.

The intent of the groundwater monitoring program is to understand the effects of Syncrude's oil sand mining, bitumen upgrading, and associated operations on the local groundwater quality. Water samples are collected and analyzed from numerous monitoring wells and surface water locations throughout the area. Particular focus is placed on groundwater monitoring in the vicinity of the following facilities:

- Mildred Lake Settling Basin (MLSB) and Mildred Lake East Toe Berm (MLETB)
- Southwest Sand Storage (SWSS)
- Sulphur Block Storage
- In-Pit Tailings Areas
- Proposed Flue Gas Desulphurization (FGD) Landfill Project
- Sewage Lagoons
- Special Waste Interim Storage Area (SWISA)

2 Site Description

The Syncrude Mildred Lake site is located in northeastern Alberta, forty kilometers north of the city of Fort McMurray. At this site oil sand is mined, the bitumen is extracted from the oil sand then upgraded to a synthetic crude oil. The major by-products of this operation include tailings sand, sulphur and coke.

The site can be divided into three general areas: the mine, the tailings areas, and the plant site. There are two open pit mines, Base Mine (presently reclaimed as 400 and 700 dumps) and North Mine, and three tailings areas, Mildred Lake Settling Basin (MLSB), Southwest Sand Storage (SWSS) and In-pit areas which comprised of the West In-pit (WIP), the Southeast Pond (SEP) and the Northeast Pond (NEP). Other significant features include coke storage cells, overburden dumps, sulphur blocks, sand and gravel pits, sewage treatment facilities, and the Beaver Creek Diversion.

The surface mineable area is associated with the topographic low along the Athabasca River valley. The ore deposit is a bitumen-saturated sedimentary deposit of the Lower Cretaceous McMurray Formation. At the Mildred Lake Site, the open pit excavation reaches an average depth of 65 meters and covers an area of approximately 39 km^2. A satellite image of the Syncrude Mildred Lake site is shown in Figure 2.1.

Syncrude has been operating its open pit oil sand mine since 1978. During the first fifteen years or so, mining utilized a combination of draglines, bucket-wheel reclaimers, conveyors, trucks, and shovels. Since 1996 mining has switched to shovels, large haul trucks and pipeline hydro-transport to move the oil sand to the extraction plant. The extraction process involves digestion and conditioning of the oil sand with hot water and caustic soda (NaOH) to facilitate the separation process. Tailings composed of sand, silt and clay with water and small residual amount of bitumen is the primary by-product of the extraction process. These tailings are hydraulically transported to one of the disposal areas. Initially the tailings deposits are saturated with water from the extraction process. In the remainder of the report, such waters will be referred to as process-affected water, and this relates to waters that have been associated with the extraction process.

The bitumen froth product is separated from the sand and converted to a light, sweet, synthetic crude oil, called Syncrude Sweet Blend (SSB). In 2007, Syncrude produced 111.33 million barrels of SSB. By-products of the upgrading process include elemental sulphur and coke.

The focus of the groundwater monitoring program is to assess the impact of process water on groundwater. There are several other facilities on the Syncrude site that pose a potential risk to groundwater quality. These include the sulphur blocks, the SWISA and the sewage lagoons. Since 1993, sulphur has been stored on site in the northwest portion of the plant site. Domestic wastewater produced at Syncrude is treated onsite in sewage lagoons located adjacent to the Athabasca River. All surface water and groundwater monitoring locations are shown on Figure 2.2.

FIGURE 2.1: MILDRED LAKE SITE, SATELLITE PHOTOGRAPH

2.1 Mildred Lake Site and Surrounding Water Users

A search was completed for licensed water wells in the area surrounding the Mildred Lake Site through the Groundwater Information Centre's Web site. An additional search for licensed surface water and groundwater users was completed through the Northeast Boreal Regional office of Alberta Environment. These searches covered the area outlined in Figure 2.1, extending over five kilometres from the Mildred Lake Site. Not all licensed surface water and groundwater wells have coordinates associated with them. In addition, the well identification numbers given for the wells are those obtained from the Groundwater Database. Those that have coordinates provided are shown on Figure 2.1A. Sixty-one well records, mostly for industrial use, were identified within this search area as shown below in Table 2.2. It is not known from the database how many and which wells are still active.

Table 2.1: Search Area for Groundwater Users

					Twp
	0	17	43	21	94
	22	3	8	0	93
	12	1	44	5	92
	2	0	4	2	91
Range	12	11	10	9	

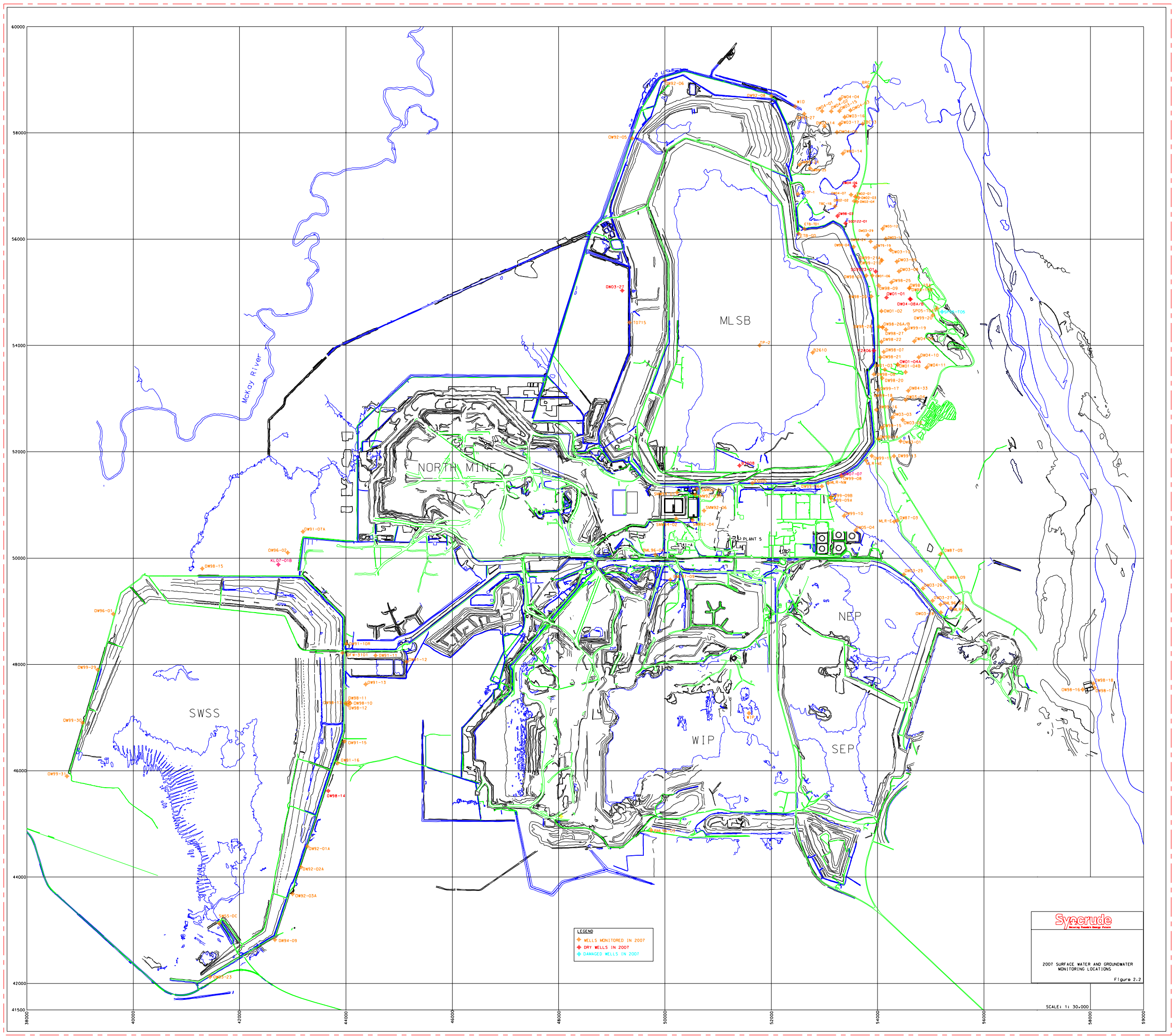
Table 2.2: Summary of Wells Located Around the Mildred Lake Site

Well-ID	Status Date	Owner	Use	1/4 or LSD	SEC	TWP	Range	W of Meridian
0279842	17/11/1987	Kim Lamontagne	Industrial	NE	4	91	10	4
0279843	15/11/1982	Alta Forest Service	Industrial	00	24	91	10	4
0279843	07/11/1977	Poplar Creek Sales	Industrial	07	26	91	10	4
0279845	26/07/1977	Poplar Creek Gravel pit	Industrial	NE	26	91	10	4
0279845	04/05/1987	Can Roxy	Industrial	06	30	91	12	4
0279847	04/05/1987	Can Roxy	Industrial	04	33	91	12	4
0279841	-	Bear Oil Co # Rodeo 2	Industrial	05	17	91	9	4
1270006	11/05/2004	Suncor Energy Inc	Industrial	11	32	91	9	4
0150376	13/03/1990	Carbovan	Industrial	SW	12	92	10	4
0151049	07/05/1990	Carbovan	Industrial	SW	12	92	10	4
1827856	07/04/2005	Alberta Environment	Industrial	SE	14	92	10	4
0296253	18/05/2001	Midstream Joint Venture	Industrial	NE	12	92	10	4
0296250	30/03/2001	Graham Construction & Engng	Industrial	SW	12	92	10	4
0279884	01/10/1971	GCOS # P54	Industrial	09	28	92	10	4
0279882	-	GCOS #K16	Industrial	14	28	92	10	4
0279881	-	GCOS # K15	Industrial	11	28	92	10	4
0279880	-	GCOS # PK18	Industrial	02	28	92	10	4

Table 2.2: Summary of Wells Located Around the Mildred Lake Site (Continued)

Well-ID	Status Date	Owner	Use	1/4 or LSD	SEC	TWP	Range	W of Meridian
0279879	-	GCOS # P58	Industrial	01	28	92	10	4
0279878	07/10/1971	GCOS # P39	Industrial	15	27	92	10	4
0279877	-	GCOS # P57	Industrial	12	27	92	10	4
02798876	-	GCOS # K4	Industrial	03	27	92	10	4
0279875	-	GCOS # K3	Industrial	08	27	92	10	4
0279874	-	Empire Dev	Industrial	00	23	92	10	4
0279873	-	GCOS	Industrial	03	23	92	10	4
0279869	01/10/1971	GCOS	Industrial	15	22	92	10	4
0279866	-	ARC # K17	Industrial	13	22	92	10	4
0279864	01/10/1971	GCOS # P49	Industrial	02	22	92	10	4
0279863	01/10/1971	GCOS # OBS 2	Industrial	14	14	92	10	4
0279860	01/10/1971	GCOS # P19	Industrial	01	5	92	10	4
0040931	15/02/2002	Suncor Energy Inc	Industrial	NE	7	92	10	4
0287976	17/09/1997	Burnco Rock Products	Industrial	SE	19	92	9	4
1500034	09/11/2006	Suncor Energy Inc	Industrial	NE	7	92	9	4
0235766	-	Sun Oil	Industrial	06	3	93	10	4
0235174	-	#74-8 Athabasca Bridge Study	Industrial	NW	29	93	10	4
0235179	-	Bear Oil Co Ltd # Bear Vampire 2	Industrial	04	32	93	10	4
0235182	-	Alta Forest Service	Industrial	00	26	93	11	4
1827859	-	Alta Environment	Industrial	SE	25	93	11	4
0042469	-	PTI Camp Services	Industrial	SW	5	93	11	4
0042470	-	PetroCan #WSW3	Industrial	04	8	93	12	4
0168219	-	AOSTRA UTF Site	Industrial	SE	7	93	12	4
0235187	-	Sinclair Can Oil Co	Industrial	01	8	93	12	4
0235188	-	Sinclair Can #TH20	Industrial	01	9	93	12	4
0235189	-	Sinclair Can #TH20	Industrial	01	16	93	12	4
0235190	-	Sinclair Can #TH20	Industrial	01	17	93	12	4
0235191	-	Sinclair Can #TH20	Industrial	01	19	93	12	4
0286009	-	Gibson Petroleum Co Ltd	Industrial	01	7	93	12	4
0299208	-	PetroCan	Industrial	NW	5	93	12	4
0235209	-	#TH75-95 STN 861+58.5	Industrial	SW	7	93	10	4
0235213	-	#TH75-95 STN 861+58.5	Industrial	06	7	93	10	4
1911642	-	Inland Concrete	Industrial	SE	19	93	10	4
0299207	-	PTI Group Inc	Industrial	NE	32	93	10	4
0235249	-	Home Oil	Industrial	12	26	93	10	4
0235246	-	Home Oil	Industrial	12	25	93	10	4
0233810	-	ARC # 1-457	Industrial	13	12	93	11	4
0233809	-	ARC	Industrial	13	12	93	11	4
0288029	24/02/1998	OSOWN	Industrial	03	28	93	11	4
0235200	11/01/1974	Home Oil	Industrial	12	30	93	9	4
0235202	11/01/1974	Home Oil	Industrial	12	31	93	9	4
0233808	25/03/1975	Home Oil CO #7	Industrial	02	28	93	9	4
0235199	11/01/1974	Home Oil	Industrial	13	29	93	9	4
0235261	21/09/1973	Alta Forestry Ranger Stn.	Industrial	SW	36	93	11	4

Figure 2.2: Surface Water and Groundwater Monitoring Locations



3 Physiography and Geology

3.1 Topography and Drainage

The Mildred Lake site falls within the Saskatchewan Plain division of the Interior Plains physiographic region. Adjacent to the northeast edge of the area is the Athabasca Plain, a subdivision of the major Canadian Shield physiographic region.

The natural topography across the Syncrude site reaches an elevation of 380 meters above mean sea level (mamsl) on the southwest and falls toward the Athabasca River on the east. East of Highway 63, the topography drops rapidly toward the Athabasca River. To the east of the Athabasca River is the Muskeg Mountain, which rises to approximately 610 mamsl.

The dominant drainage feature is the Athabasca River that is located at approximately 2.5 km east of the Mildred Lake site. Mean monthly flows between the years 1958 and 2006 for the "Athabasca River below McMurray" (Environment Canada station #07DA001), are typically highest in July (1,385 m3/s) and lowest in February (161 m3/s).

The MacKay River is the only other major drainage feature. It is located about 9 km west of the Mildred Lake plant site. Mean annual flow between 1972 and 2006 was 13.8 m3/s. The lowest mean monthly flow occurred in February (0.411 m3/s), while the highest mean monthly flows occurred in May (39.7 m3/s). The gauging station is located 5.6 km NW of Fort MacKay (#07DB001), with a drainage area of 5,570 km2. The MacKay River joins the Athabasca River at Fort MacKay

Beaver Creek is an important minor feature because its former upper course traversed the location of the present day Syncrude Mildred Lake Operation. Beaver Creek is now diverted at the south end of the site into Poplar Creek. However, low flow is observed at the northeast end of the Beaver Creek around the Mildred Lake Settling Basing (MLSB).

3.2 Geology

The geology of the Mildred Lake site is illustrated on schematic cross-sections (Figures 3.2, 3.3 and 3.4). The locations of these cross-sections are shown on Figure 3.1.

Devonian Age Deposits

The Upper Devonian Waterways Formation comprises the main unit immediately underlying the Cretaceous sequence. Crickmay (1957) subdivided the Waterways Formation into five members, which are, in ascending order: Firebag, Calumet, Christina, Moberly, and Mildred. The different members of the Waterways Formation form a series of limestone beds with varying proportions of shale. The hydraulic conductivity of the limestone at the Mildred Lake Site is usually very low. In the past, exposures at the base of the mine pit have revealed clay-filled fractures within the limestone.

Cretaceous Age Deposits

<u>McMurray Formation:</u> The deepest Cretaceous strata in the regional study area are the rocks of the McMurray Formation. These strata are separated from the underlying Devonian strata by a major erosional unconformity. The present stream profiles of the lower Athabasca River and Clearwater River are now controlled by the pre-Cretaceous erosion surface. The McMurray Formation has been divided into three stratigraphic units: Lower McMurray (Coastal Plain / Fluvial), Middle McMurray (Estuarine) and Upper McMurray (Near Shore) as described below.

Lower Member (Coastal Plain/Fluvial): Unconformably overlies the erosional surface of the Devonian. Its lowest beds consist of residual clays formed from weathering of the Devonian strata. These beds are overlain by silts and clays of a fluvial origin and by coarse sands, whose thickness is largely controlled by the topography of the unconformity surface on the Devonian sequence. The sand may be either water saturated (the basal aquifer) or bitumen saturated. The basal aquifer is discontinuous throughout Lease 17 and 22.

Middle (Estuarine) and Upper (Near Shore) Members of the McMurray Formation: Consist mainly of a bitumen-saturated quartz sand, interbedded with lenticular beds of micaceous silts, shales, and in places, clays. The Middle Member is characterized by frequent primary sedimentary structures, particularly current bedding, while the Upper Member is more commonly horizontally bedded. The Middle and Upper Members constitute the main ore body being mined in the Athabasca oil sands area (Figure 3.2).

Clearwater Formation: Conformably overlies the McMurray Formation. The deepest beds are glauconitic sandstone and have been termed the Wabiskaw Member. Their distinctive olive green colour makes them useful as an easily identifiable marker horizon throughout the area. The Wabiskaw Member grades up into gray marine shale, which makes up the remainder of this stratigraphic unit. The Clearwater Formation increases in thickness to the west corresponding to the rising topography away from the Athabasca River (Figure 3.2).

Grand Rapids Formation: Likewise, the Grand Rapids Formation only occurs on progressively higher ground southwest of the Mildred Lake Site. It is described as “salt and pepper” sand, generally unconsolidated, and consists of fragments of quartz, feldspar, glauconite, chert, muscovite, and biotite.

Quaternary Age Deposits

The surficial geology of the region consists of deposits of Pleistocene and Holocene age. These surficial deposits include glacio-lacustrine clays, glacial, tills, fluvial deposits and aeolian sand. Syncrude’s classification of overburden geology, which includes the Quaternary deposits and Cretaceous units overlying the McMurray Formation, is shown in the Facies Chart, Table 3.1.

Of particular interest from a hydrogeologic perspective are the glacio-fluvial deposits. Within the current operating portion of Syncrude’s leases 17 and 22, there are two areas with significant glacio-fluvial deposits: east of the MLSB and north of the SWSS. East of the MLSB, glacio-fluvial deposits extend from under the tailings facility east toward the Athabasca River. The sand and gravel deposits overly a silty-sandy till and is capped with a thin layer of Holocene organics. North of the SWSS, the glacio-fluvial deposit is present in the form of a buried Pleistocene channel (G-Pit channel). Five to ten meters of glacial till and glacio-lacustrine clays overlie the G-Pit channel. The channel has been traced to run from near the MacKay River, south under the SWSS, flows north, then turns westward again to the MacKay River (Figure 3.1). The channel has been partially removed by the North Mine, which is currently extending to the north and northwest to the proposed mine limit.

Figure 3.1: Site Plan Showing Location of Cross-Sections

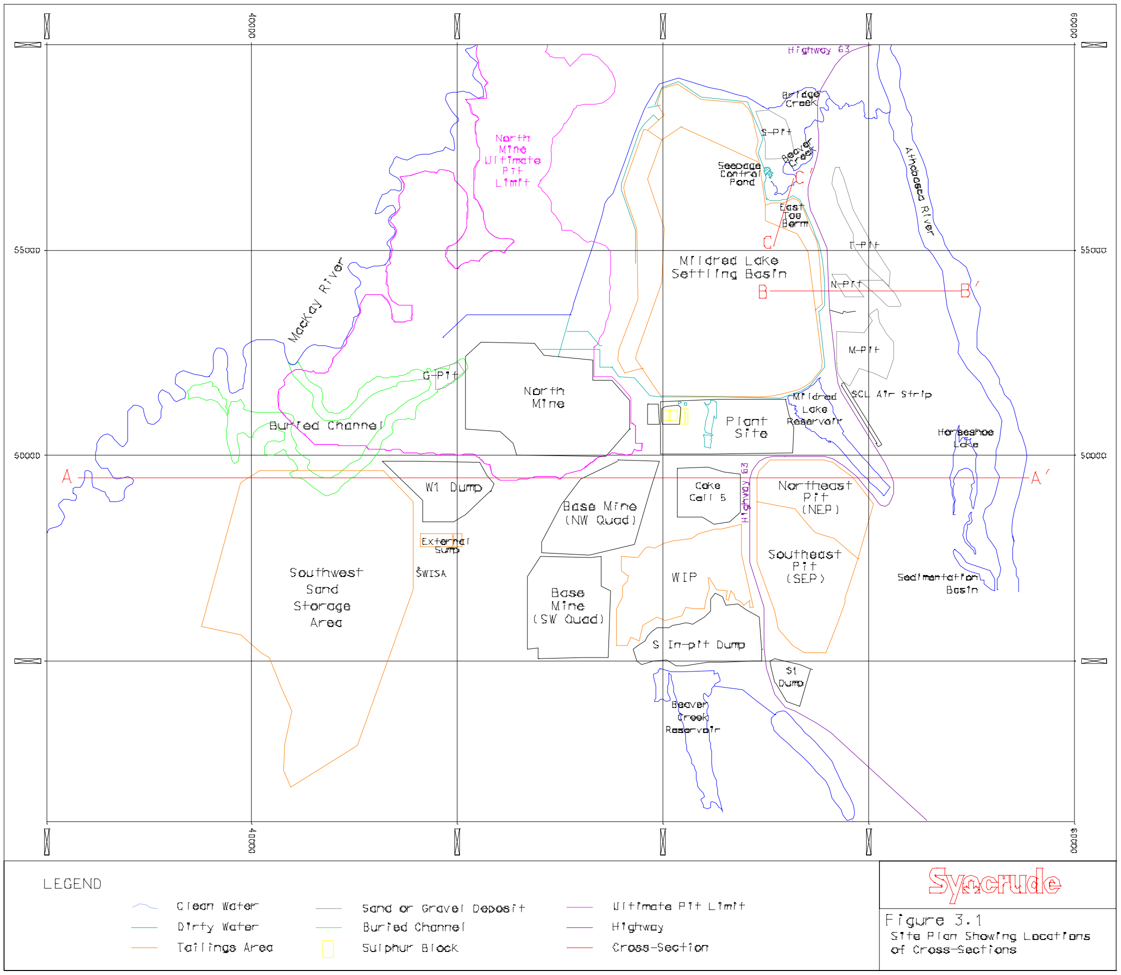


Figure 3.2: Schematic Cross-Section A-A'

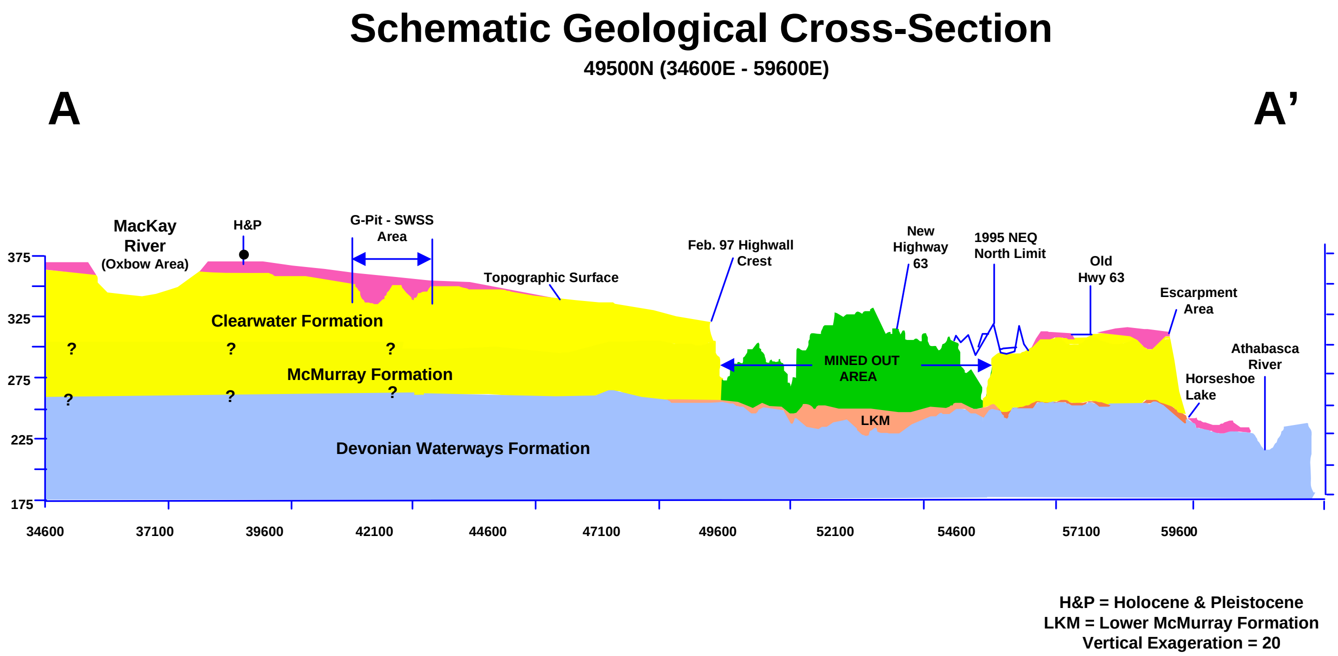


Figure 3.3: Schematic Cross-Section B-B'

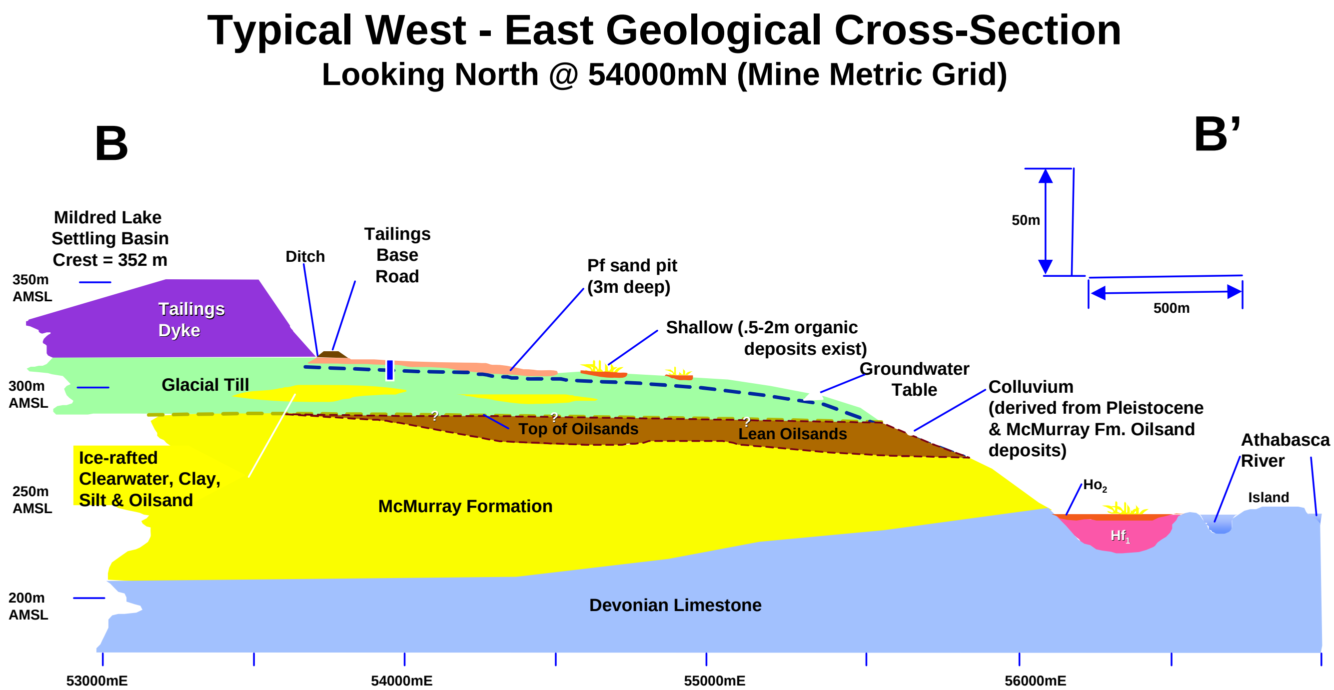


Figure 3.4: Schematic Cross-Section C-C’

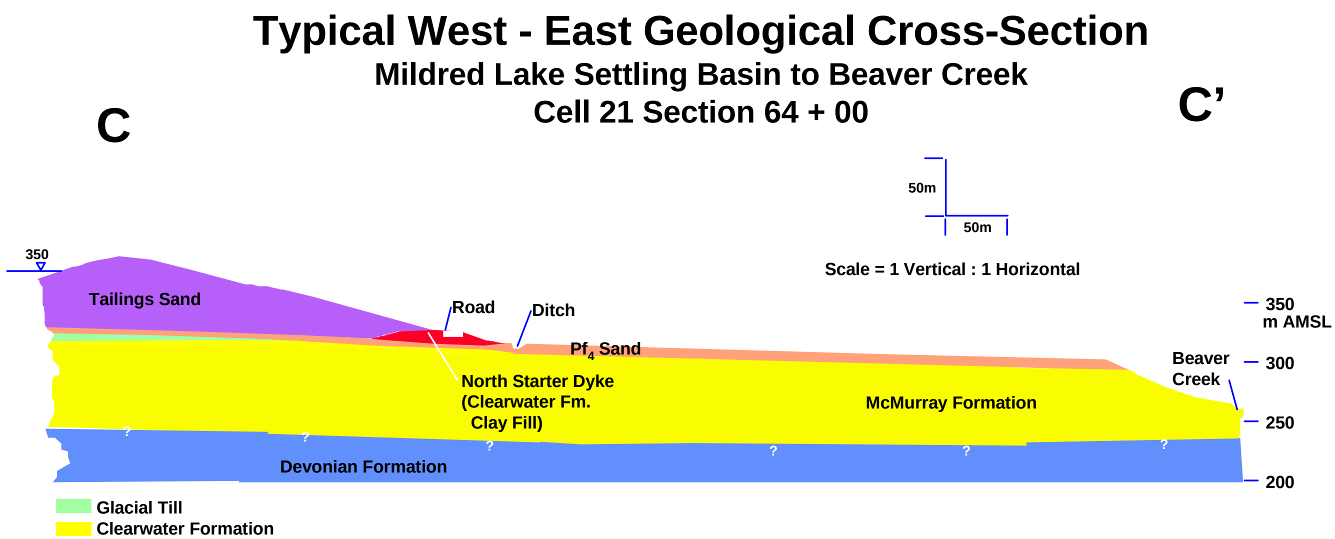


Table 3.1: Overburden Geology Facies Chart

GEOLOGICAL EPOCH	DEPOSITIONAL ENVIRONMENT	GEOLOGIC SYMBOL	UNIFIED SOIL CLASSIFICATION	RANGE OF THICKNESS	LITHOLOGIC DESCRIPTION
HOLOCENE	Erosional Features & Sediments	He2	Variable	Variable	Slump material; mixed glacial and bedrock materials; variable lithology.
HOLOCENE	Erosional Features & Sediments	He1	Variable	Variable	Gully, creek; thin alluvial cover on valley slopes, thin alluvial materials along streams.
HOLOCENE	Highly Organic Deposits	Ho2	OL, PT	0.2-6.0 m	Dark brown or black muskeg or peat; primarily mosses & sedges.
HOLOCENE	Highly Organic Deposits	Ho1	OL,OH	Commonly <0.3 m	Brown, grey or black organic mineral soils; mixture of clay, silt, sand & organics.
HOLOCENE	Lacustrine (Lakeshore)	Hl2	Variable	0.30 m Commonly <1.5 m	Whitish-grey sand, silt and clay with some gravel, shells and organics.
HOLOCENE	Lacustrine (Lake Bottom)	Hl1	CH, OH, MH	0-1.5 m	Whitish-grey silt and clay with shells and organics.
HOLOCENE	Alluvial Stream	Hf1	CH, OH	0-3.0 m Commonly 0-1.5 m	Grey bedded sand, silt/clay with brown patches or streaks of organics. Confined to valleys of recent streams.
HOLOCENE	Beaver Creek Alluvium	Hf1*	CH, OH Minor SM, SC	0-6.0 m	Silt and clay with some sand lenses and organics confined to Beaver Creek.
HOLOCENE	Aeolian Deposits	Hae	SP	0-9.0 m Commonly 0-1.5 m	Light brown to buff fine-grained sand in sheet and dune form; poorly graded.
PLEISTOCENE	Glacio-Lacustrine (Lakeshore)	Pl3	SM, SC, SW	0-3.0 m Commonly <1.5 m	Sand with minor silt, clay and gravel. Shallow water deposits.
PLEISTOCENE	Glacio-Lacustrine (Mixed)	Pl2	CH, MH, CL, ML	0-6.0 m Commonly <3.0 m	Grey, pink or brown stratified clay, silt & sand interbedded (mm-cm) with gravel or boulder till layers.
PLEISTOCENE	Glacio- Lacustrine (Silt & Clay)	Pl1	CH, MH	0-9.0 m Commonly <3.0 m	Greenish-grey or brown silt and clay with minor sand lenses. Similar to Pl2 but with no gravel content.
PLEISTOCENE	Glacial Outwash (Sand)	Pf4	SW, SP	Variable	Brown, orange, grey or grey-white coarse to fine-grained sand; may contain lenses of black sand.
PLEISTOCENE	Glacial Outwash (Sand & Gravel)	Pf3	GW, GP, GM & GC	Variable	Brown or grey sand and gravel with brightly coloured cobbles and boulders.
PLEISTOCENE	Glacio-Fluvial Meltwater Channel (Coarse)	Pf5b	GM, GC; minor CL	0-6.0 m Commonly <3.0 m	Rust, rusty-brown or brown sandy, silty and clayey gravel with cobbles and boulders.
PLEISTOCENE	Glacio-Fluvial Meltwater Channel (Fine)	Pf5a	SM, SC; minor CL	0-9.0 m Commonly <3.0 m	Brown and grey sand and silty sand; very fine to coarse-grained.
PLEISTOCENE	Glacial Deposits (Ablation Till)	Pg3	SM, SP, SC	0-6.0 m Locally may be thicker	Sand, silt and clay with cobbles and boulders deposited in situ by glacial ablation.
PLEISTOCENE	Glacial Deposits (Lodgement/ Firebag Till)	Pg1	SM, SC	0-12.0 m Commonly 3.0-9.0 m	Brown to grey silty fine-grained sand with gravel and clay. Some cobbles and boulders present. Contains lenses of glaciofluvial deposits. Commonly oil impregnated in basal sands.
	UNCONFORMITY				
CRETACEOUS	Beach Complex (Grand Rapids Formation)	Kg	No data	0-10.0 m (on SCL)	Buff to light brown sand and sandstone.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kcg	No data	0-9.0 m (on SLC)	Fine-grained sand, silt and clay with traces of glauconite.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kcf	No data	14.4-19.7 m Mean: 17.1m	Fine to very fine-grained greenish-grey glauconitic sand interbedded with silt and clay.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kce	CH, CL	4.0-9.7 m Mean: 6.6 m	Greyish-black silty clay; fissile; minor lenses of fine-grained sand and silt.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kcd	SC, SM, SP, SW, CH, CL	7.3-13.7 m Mean:11.4 m	Greenish-grey to grey interbedded very fine to medium-grained glauconitic silty sand, sandy silt and clay.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kcc	CH, CL, ML	18.3-26.3 m Mean:23.2 m	Grey-black shales; interbedded clayey silt with clay-rich strata. Low-density black clay at top and base. Bioturbated.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kcb	CL, CH	4.0-7.0 m Mean: 5.4 m	Interbedded glauconitic fine-grained sand, clayey silt and silty clay. One thinly laminated, highly montmorillonitic, low density clay in middle,& one near top contact.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kca	CH	3.0-6.0 m Mean: 4.5 m	Silty-clay in upper part; clayey silt in lower part; clay-rich with glauconitic silt stringers near basal contact.
CRETACEOUS	Marine/ Shoreface (Clearwater Formation)	Kcw	SC, SM, ML,CH, CL	0.3-5.5 m Mean: 2.6 m	Interbedded glauconitic fine to medium-grained sandy silt, silt and clayey silt.

4 Groundwater Sampling and Decommissioning Procedures

Well Development

Prior to sampling, wells are purged to remove stagnant water that may not be representative of the formation. Development methods vary slightly depending on the installation and formation being sampled. Where possible, wells are purged by removing three well volumes prior to sampling. Wells installed in lower hydraulic conductivity units are purged by repeatedly removing all water possible, and allowing these wells to recover until sufficient water is available for sampling. Recovery of such wells usually takes a long time and prolongs the sampling time. Purging is completed using either dedicated WaTerra inertial pumps (IP) or Bailer (B).

The specific purging method used for each well is presented in Appendix A, along with the analytical results in Appendix B.

Sampling

Wells are sampled using either a dedicated inertia pump or a bailer. Surface water samples are termed grab samples (G). When required, samples are filtered using a disposable 45-micron in-line filter. The specific device used for each well is identified in Appendix A, along with the analytical results in Appendix B.

Routine Parameters (major ions, pH, EC, TSS, TDS)

A 500-ml polyethylene bottle is rinsed with the well water, then slowly filled to overflowing and immediately sealed. No preservative is required for these analyses.

Dissolved Organic Carbon (DOC)

A 100-ml amber glass bottle is rinsed with filtered water, then filled halfway. A pre-measured volume (1-ml) of 1:1 sulphuric acid (H_2SO_4) is added, and then the remainder of the bottle is filled and immediately sealed.

Phenols

A 100-ml amber glass bottle is rinsed with sampled water, and filled halfway. A pre-measured volume (1-ml) of 1:1 sulphuric acid (H_2SO_4) is added, and then the remainder of the bottle is filled and immediately sealed.

Trace Metals

A 500-ml PETE or HDPE bottle is rinsed with filtered sample water. The bottle is filled halfway with filtered sample water, a pre-measured volume (5-ml) of 20% nitric acid is added, and the remainder of the bottle is filled and immediately sealed.

Field measurements (pH, EC, temperature)

Field measurements of pH, electrical conductivity and temperature are completed after all other samples are collected (provided sufficient water is available). Portable pH and conductivity probes are rinsed with de-ionized water and dried before measurements are taken. The probes are calibrated regularly to ensure accuracy of field measurements.

Sample bottles are labeled and stored in a cooler while sampling is carried out. Samples are sent directly by courier to a contract laboratory for analysis. Chain of custody paperwork accompanies all samples.

In 2007, Golder Associates Ltd. conducted sampling. ALS Laboratory Group (formerly Enviro-Test Laboratories) was contracted to complete analysis of all the surface water and groundwater samples. Syncrude Research collected surface water samples from MLSB (TP-2) and WIP.

Well Abandonment

From time to time, monitoring wells are damaged or abandoned. These monitoring wells are decommissioned in a way that will prevent the migration of contaminants through the well casing.

4.1 Quality Assurance and Control

The contract laboratory uses standard analytical methods and procedures. Standard in-house QA/QC protocols include the analysis of blanks, duplicates and surrogate recoveries for organic analyses, matrix spikes and 10 percent replicates for every sample batch.

Duplicate samples were collected for routine major ions (eight samples), consisting of dissolved metals (three sample), phenols (one sample) and naphthenic acids (four samples). To provide a quantitative measure of the precision of the duplicate analysis, the relative percent difference (RPD) was calculated for those parameters in which the reported concentrations were greater than 4.0 times the detection limit (Tables 4.1 to 4.3).

Most of the duplicate samples were within the accepted standard for groundwater samples (20 percent). Samples exceeding the 20% criterion were phenol, naphthenic acid, zinc and aluminum in six out of eighteen samples. However, the locations of the six samples are at the source points which discharge into the recycle system.

Table 4.1: Phenols - Duplicate Samples

ID	Sample Date	Phenols (mg/l)
OW98-12	27-Jun-07	< 0.001
OW98-12	27-Jun-07	< 0.002
RPD*		**0.00 %**

Table 4.2: Naphthenic Acids - Duplicate Samples

ID	Sample Date	Naphthenic Acids (mg/l)	ID	Sample Date	Naphthenic Acids (mg/l)
DFW-3101	12-Jul-07	22	OW03-11	09-Jul-07	< 1
DFW-3101	12-Jul-07	28	OW03-11	05-Jul-07	< 1
RPD		**24%**	**RPD**		**
OW04-02	20-Jun-07	11	TBC-3	29-Jun-07	2
OW04-02	20-Jun-07	9	TBC-3	29-Jun-07	3
RPD		**20%**	**RPD**		**40 %**

** RPD not calculated as one or both measurements for constituent is not more than 4.0 times the specified detection limit: aluminum = 0.04 mg/l; arsenic = 0.0016 mg/l; zinc = 0.008 mg/l; Phenol = 0.004.
Concentrations in mg/l

Table 4.3: Dissolved Metals - Duplicate Samples

ID	TBC-3	TBC-3	RPD	DFW-3101	DFW-3101	RPD	SMW94-01	SMW94-01	RPD
Sample Date	29-Jun-07	29-Jun-07		12-Jul-07	12-Jul-07		07-Jun-07	07-Jun-07	
Fe	0.012	0.011	**8.7 %**	0.014	0.018	**25.0 %**	3.57	3.57	**0 %**
Al	< 0.01	< 0.01	**	< 0.01	0.01	**	0.05	0.04	**22.2 %**
As	0.0011	0.0012	**8.7 %**	0.0053	0.0057	**7.3 %**	0.0005	0.0004	**22.2 %**
B	0.196	0.199	**1.5 %**	2.59	2.67	**3.0 %**	0.402	0.402	**0 %**
Cd	< 0.0001	< 0.0001	**	< 0.0001	< 0.0001	**	< 0.001	< 0.001	**
Cr	0.0015	0.002	**28.6 %**	< 0.005	< 0.005	**	0.0019	0.0012	**45.2 %**
Cu	< 0.0006	< 0.0006	**	0.0009	0.001	**10.5 %**	< 0.0006	< 0.0006	**
Pb	< 0.0001	< 0.0001	**	< 0.0001	0.0001	**	< 0.0001	0.0001	**
Ni	0.0018	0.0019	**5.4 %**	0.0076	0.0072	**5.4 %**	0.0023	0.002	**14.0 %**
Zn	0.003	< 0.002	**0 %**	0.014	0.012	**15.4 %**	< 0.002	< 0.002	**

** RPD not calculated as one or both measurements for constituent is not more than 4.0 times the specified detection limit: aluminum = 0.04 mg/l; arsenic = 0.0016 mg/l; zinc = 0.008 mg/l; Phenol = 0.004.
Concentrations in mg/l

5 Monitoring Network

Syncrude maintains a network of surface water sampling points and groundwater monitoring wells (Figure 2.2) to identify any impact that the tailings facilities, sulphur storage, special waste interim storage, proposed FGD landfill and sewage treatment areas may have on groundwater quality. Monitoring is focused on the geologic units with the greatest potential for contaminant transport. The groundwater monitoring network has been divided into eight separate areas based on geology and potential contaminant sources (Figure 5.1). Data gathered on surface water samples from both potential sources and receptor areas are summarized in Section 5.1 and discussed in more detail throughout the text of Section 5, as the results pertain to each area.

To interpret the analytical results, the trend of key parameters over time and the relative concentrations of major ions have been examined. When historical data is not available, current data is compared to background values for the same hydro-stratigraphic unit in that specific area. Chloride and sodium are particularly useful tracers of process water, since they are present in high concentrations in process water relative to groundwater background concentrations. Naphthenic acids have also been used to aid in identifying groundwater influenced by process water. Recent work suggests that natural concentrations of naphthenic acids in the shallow Pleistocene aquifers are low. For specific wells, analysis for naphthenic acids was completed. The change in pH over time is the principal indicator used to identify impact from sulphur storage.

5.1 Surface Water Samples

5.1.1 Background

5.1.1.1 Description

Water samples are collected from various facilities that contain or transport process affected water, including the tailings storage facilities, tailings dyke filter drains, ditches, and the seepage collection pond. These samples provide an indication of the source concentrations of process water and aid in the identification of process-water contamination of groundwater.

Samples are also collected from several natural water bodies around the site. Each of these natural water bodies has undergone significant changes to its flow regime, due to the construction of Syncrude's Mildred Lake Site.

5.1.1.2 **Monitoring Network**

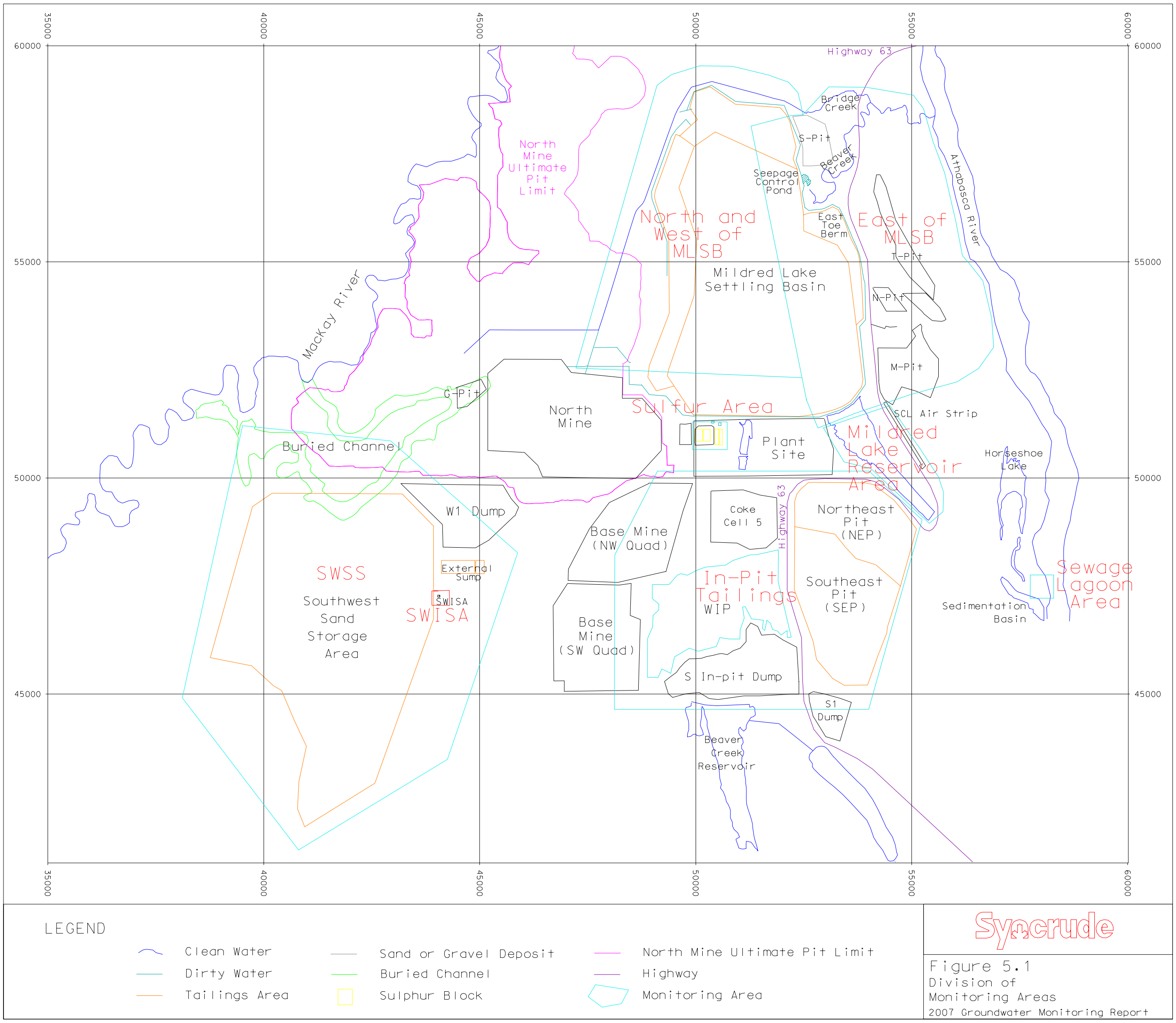
In 2007, there were a total of eight sample locations within the dirty water system, from the MLSB, MLETB, SWSS, and in-pit tailings.

At the MLETB, the surface water sampling points (F2001 – F2501 finger drains) were dry in the last five years and none of these could be sampled in 2007 for there was no flow in these finger drains. However, water samples from ETB-GD and ETB-TD1 were taken from the perimeter ditch-granular drain, which is representative of the expected seepage flow from the MLETB. The monitoring of the finger drain for trickles shall continue in 2008.

The MLSB samples were taken from a central location in the pond and the seepage collection pond to represent the characteristics of the seepage from the dyke. The off-take pipe (B2610) was dry at the time of sampling.

From WIP, samples were collected at the recycle water barge. Sampling at the SWSS comprised of a surface water sample from the decant area (SWSS-DC) and the SWSS – W1 Dump interface filter (DFW-3101).

Figure 5.1: Division of Monitoring Areas



Additional sampling of Beaver Creek was also completed in support of the Beaver Creek Environmental Risk Assessment (ERA) field study to determine the impact of seepage on Beaver Creek. A report on that study will be submitted to AENV in March 2008.
Samples from outside the dirty water system included Beaver Creek, Bridge Creek and Mildred Lake Reservoir (MLR). Samples were collected from two locations along Beaver Creek, just downstream of the lower seepage collection pond (TBC-1B) and at the Highway 63 crossing (TBC-3). The West Interceptor Ditch (WID) was sampled just upstream of the Bridge Creek discharge and Bridge Creek was sampled at Highway 63 while four samples were collected from Mildred Lake Reservoir (MLR) along the shoreline.

Sample locations are listed in Table 5.1 and shown on Figure 5.2.

Table 5.1: Surface Water Sampling Locations

Dirty Water System		
Area	**Location**	**Sample ID**
MLETB	Ditch Granular Drain	ETB-TD1 ETB-GD
MLSB	Pond Off-take pipe Seepage Collection pond	TP-2 T0715 SCP-1
SWSS	Decant (pond water) Filter drain pipe	SWSS-DC DFW-3101
WIP	Pond	WIP
Areas Outside of Dirty Water System		
Area	**Location**	**Sample ID**
Bridge Creek	WID just upstream of discharge to creek At Highway 63	WID BRC
Beaver Creek	Downstream of Lower Seepage Collection dam At Highway 63	TBC-1B TBC-3
Mildred Lake Reservoir	NW corner NE corner E side SW corner	MLR-NW MLR-NE MLR-E MLR-SW

5.1.2 Results and Discussion

The dirty water source areas will be discussed before their respective receiving groundwater or surface water chemistry. Surface areas outside the dirty water system will be discussed along with the receiving environment groundwater chemistry, as it pertains to each area.

The samples collected from within the dirty water system are completed to provide an indication of the process water chemistry within these facilities. At the MLETB, there was no flow from any of the finger drains and we shall continue to watch for trickles in the subsequent year. The trends of the major ion and selected metals concentrations have reduced slightly at ETB-GD except chromium and zinc, while those of the naphthenic acid have slightly increased from 26mg/L (2006) to 29 mg/L (2007), though a reducing trend persisted up to 2006. At SCP-1, TBC-1 and ETB-TD1, the major ions increased slightly this year, which is still within the historical trend while naphthenic acid has been showing a reducing trend in the past years though slightly increased this year from 18mg/L (2006) to 24 mg/L (2007). At TBC-3, a stable flat trend was observed for the major ions, selected metals and naphthenic acid. Other areas such as SWSS-DC, WID and T0715 have the major ions and naphthenic acid on reducing trends. The general trends of the concentrations in the surface water chemistry of the various facilities has remained fairly stable and constant over time despite the re-use and recycling of process water, leaching of salts and organics from the oil-sand, the addition of caustic soda and dumping of other various wastes into the tailings facilities.

The complete analytical results are included in Appendix B, while trend plots are included in Appendix C. A summary of key chemical parameters is provided in Table 5.2.

5.1.3 Recommended Sampling Schedule for 2007

Annual sampling of all existing monitoring locations identified in Table 5.1 will continue in 2008, with the following proposed changes:

- Finger drains sample points shall be observed for trickles or flow from the earliest spring to the start of winter.

Analysis will be conducted in accordance with AENV requirements for the tailings areas in 2008.

The 2007 Beaver Creek Ecological Risk Assessment (ERA) shall be submitted as a separate document by March 2008 as requested.

Figure 5.2: Surface Water Sampling Locations

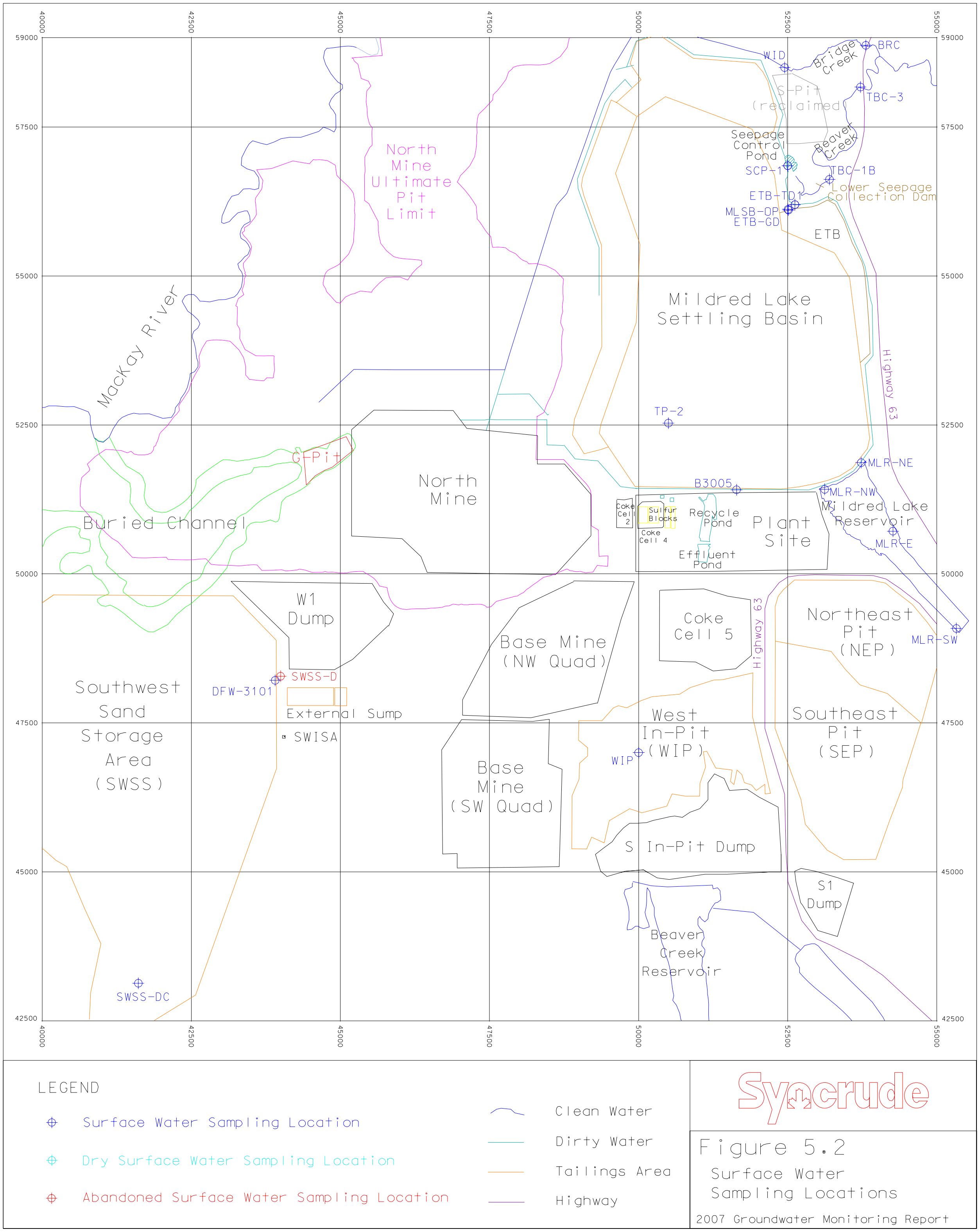


Table 5.2: Summary of Key Chemical Parameters

	Sample ID	Sample Date	Conductivity	pH	HCO_3	Cl_2	SO_4	Ca	Na	TDS	Phenols	Ammonia	DOC	Naphthenic Acids
MLSB	ETB-GD	06-Jun-07	2080	8.1	997	215	18.8	36.7	446	1340	-		65	29
	ETB-TD1	06-Jun-07	2750	8.4	967	381	116	48.7	574	1600	-		60	24
	TP-2	05-Jul-07	2930	7.96	721	350	348	22.8	598	1690	0.027	36.7	45	60.4
	T0715	10-Jul-07	2440	7.6	1060	217	195	51.9	481	1620	-		49	52
	SCP-1	26-Jun-07	2460	8.5	966	275	115	35.1	527	1520			56	21
SWSS	SWSS-DC	12-Jul-07	3570	8.5	723	612	386	14	776	2770	-		78	15
	DFW-3101	12-Jul-07	3900	8.3	1220	521	424	29.3	885	2620			71	22
	DFW-3101*	12-Jul-07	3900	8.3	1210	528	415	30	874	2620	-		86	28
WIP	WIP	05-Jul-07	3290	8.1	803	490	369	17.7	812	2200	0.017	15	51	75.1
Bridge Creek	WID	15-Jul-07	296	8.2	180	7	7.9	31.9	28	270	-		49	< 1
	BRC	29-Jun-07	900	8.1	271	76	130	76.3	88	620	-		32	2
Beaver Creek	TBC-1B	26-Jun-07	2560	7.7	917	382	83	122	401	1570	-		54	6
	TBC-3	26-Jun-07	2560	7.7	344	155	217	96.9	164	860			14	2
	TBC-3 *	26-Jun-07	2560	7.7	344	151	214	96.7	161	880	-		15	3
MLR	MLR-NW	29-Jun-07	329	8.5	144	12	27.4	33.8	23	200	-		12	< 1
	MLR-NE	29-Jun-07	413	8.2	196	18	27.6	37.2	39	260	-		13	2
	MLR-E	29-Jun-07	346	8.2	158	13	28.9	38.1	21	220			11	1
	MLR-SW	29-Jun-07	350	8.1	161	12	27.7	37.5	22	230	-		10	< 1

Abbreviations:

Conductivity (µS/cm), Ca – Calcium (mg/l), Cl_2 – Chloride (mg/l), Na – Sodium (mg/l), SO_4 – Sulfate (mg/l), HCO_3 –Bicarbonate (mg/l), TDS – Total Dissolved Solids (mg/l), Phenols (mg/l), Ammonia (mgN./L), DOC – Dissolved Organic Carbon (mg/l), Naphthenic Acids (mg/l), " - " not analyzed

* Duplicate Sample

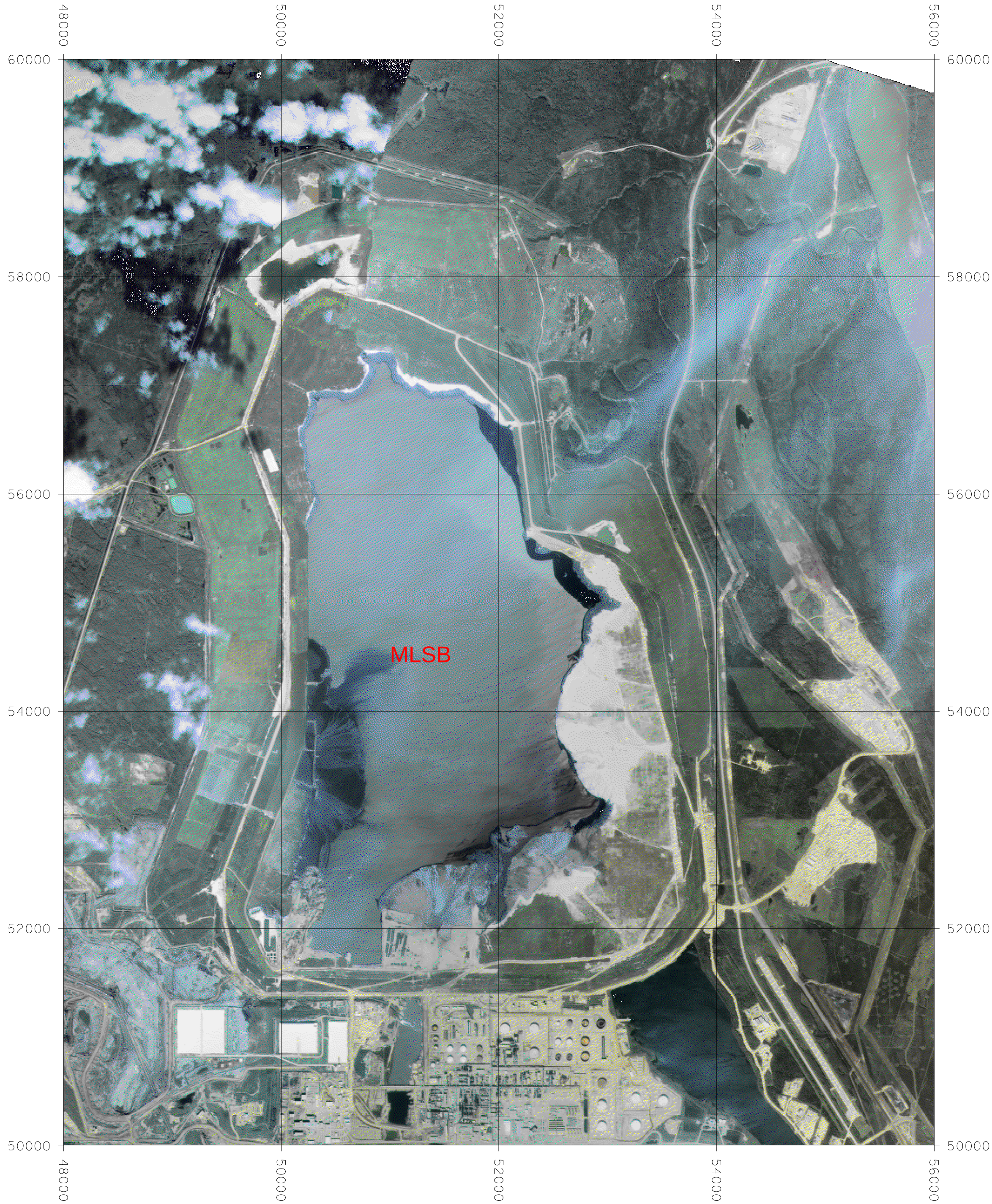
5.2 East of the Mildred Lake Settling Basin

5.2.1 Background

5.2.1.1 Area Description

The Mildred Lake Settling Basin (MLSB) covers an area of approximately 30 square kilometers with significant natural topographic changes to the east of the MLSB. Near the toe of the MLSB, ground elevation is approximately 310 meters. Continuing east, the topography drops to an escarpment in a series of steps to a low of 230 meters, the elevation of the Athabasca River. Two small creeks, Bridge Creek and Beaver Creek, have deeply incised channels that flow easterly through this area. Other features in the area include Highway 63, buried gas and telephone lines, Syncrude's buried Aurora process water pipeline, bitumen pipeline, and power lines. In addition, Syncrude-operated the sand and gravel pit at T-Pit, two undeveloped granular deposits (N-Pit and M-Pit), and the Fort MacKay Ranger Station are located east of the MLSB. Figure 5.3 shows an aerial photograph of this area.

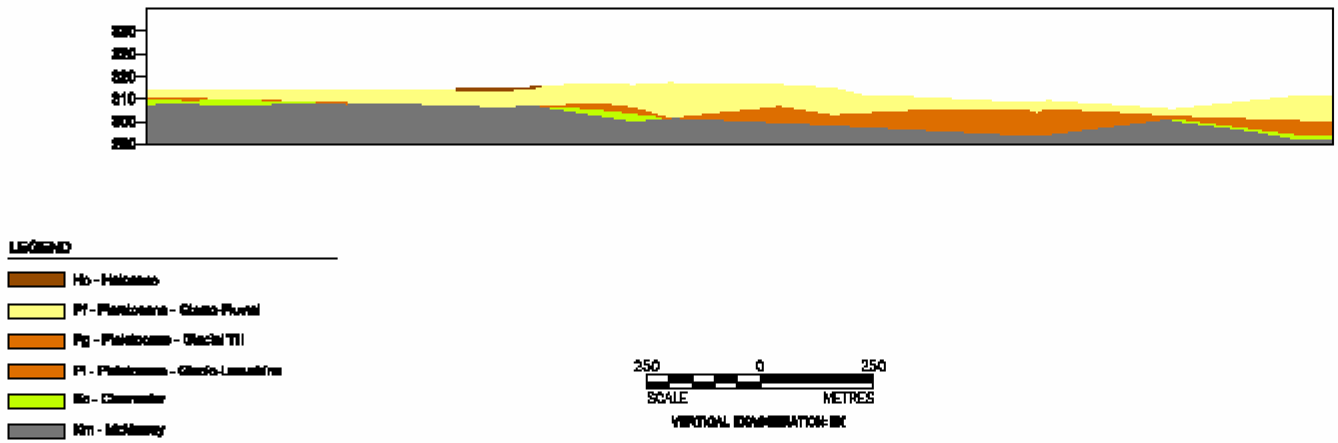
Figure 5.3: Air Photo of the East MLSB Area



5.2.1.2 Geology

The geology east of the MLSB varies significantly from the toe of the tailings structure to the Athabasca River. At the top of the escarpment near the MLSB, glacio-fluvial sands and gravels range in thickness from zero to fifteen meters. This fluvial deposit is generally underlain by glacial till which can be over fifteen meters thick. The Clearwater Formation has been eroded with the exception of localized remnants of the lower members. The McMurray Formation is generally encountered directly under the till. Figure 5.4 shows a north-south schematic cross-section at the top of the escarpment. Within the Athabasca River valley, in the T-Pit area, ten to forty meters of glacio-fluvial sands and gravels lie directly on top of the McMurray Formation or Devonian Limestone.

Figure 5.4: SCHEMATIC CROSS-SECTION, EAST OF MLSB
SECTION ALONG 54000 E (LOOKING WEST)



L:\2006\1346\06-1346-003\3000\Cross-sections\Fig 5-4 Section 54000 East.dwg Aug 30, 2007 – 2:50pm

The glacio-fluvial deposits are typically heterogeneous, ranging from well to poorly sorted silty fine-grained sand to coarse gravel. Clay lenses are common within the deposit. The till consists of silty sand to sandy silt with light bitumen staining, and is generally quite dense with the exception of the upper few meters. East of T-Pit, little geological information is available. Recent alluvial deposits are believed to cover this area.

5.2.1.3 Surface Water Sources & Receivers

Sources of contamination at the east side of MLSB include the MLSB itself, the Mildred Lake East Toe Berm (MLETB), and the Seepage Control Pond (SCP), which receives seepage water from the MLSB and MLETB filters, off-takes and finger drains (which are now dry), as well as contaminated seepage water pumped from seven wells installed at the toe of the MLETB (which are reporting considerably low flows) and from sumps or water ponds located downstream of the SCP dam.

Potential surface water receivers of process-affected waters from these sources include the SCP, Beaver Creek, Bridge Creek, and Mildred Lake Reservoir.

Monitoring Network

The groundwater monitoring network east of the MLSB consists of eighty-one monitoring wells including one well that was destroyed and another that was damaged in 2007 (which are SP05-T05 and OW99-07 which will be replaced and repaired in 2008 respectively) and one seepage point. No new monitoring wells were installed in 2007 east of MLSB. Current monitoring network was adequate for the description of the groundwater flow paths within the area.

The three dewatering wells in T-Pit area (DW03-013, DW03-017 and DW03-047) installed in 2003 have been abandoned. One of the piezometers, SP05-T047 was sampled while SP05-T05 was destroyed. However, Syncrude intends to replace the destroyed well in 2008.

During 2007, five monitoring wells were dry. These are OW01-01, OW04-04A, OW04-08A, OW04-08B and OW04-06. Seepage areas SG0122-01 was also dry, and therefore was not sampled.

Chemical analyses were completed in accordance with AENV requirements for the tailings areas (Appendix A). Additional analyses for naphthenic acids were completed at several locations.

The location of all monitoring wells and sampling locations are shown on Figure 5.5. The groundwater wells are screened primarily in the Pleistocene sand aquifer (installation details are summarized in Table 5.3).

5.2.2 Results and Discussion

The surficial Pleistocene sand and gravel deposit has the greatest potential for contaminant transport east of the MLSB. This deposit forms a generally continuous unconfined aquifer from the east side of the MLSB to the east side of T-Pit. The aquifer is vertically bound by the underlying till, oil sand or limestone aquitard. Contaminant migration is expected to be limited through the underlying units, due to their low hydraulic conductivity.

Groundwater flow patterns in the surficial Pleistocene sand deposit are complex due to the topographic changes, varying hydraulic conductivity, and the complex geometry of the sand deposit.

In general, the flow direction is to the east, from the MLSB to the Athabasca River escarpment. At the base of the first significant drop in the escarpment (T-Pit area), groundwater flow changes toward the south. This typifies a high hydraulic conductivity sand-gravel deposit and a likelihood of the existence of a terminal buried channel within the T-Pit area. Locally, in the vicinity of Beaver Creek, groundwater flow is toward the creek. General flow directions are shown in Figure 5.5, although local flow directions vary from the overall trends.

The geological conditions east of the MLSB make this area very susceptible to influence from process water. The water chemistry in the wells located east of the MLSB can be grouped into three categories.
(1) Wells with background chemistry, typically low concentrations of dissolved species, low electrical conductivity, and low concentrations of naphthenic acids.
(2) Wells having elevated chloride concentrations, slightly elevated concentration of other major ions, and background concentrations of naphthenic acids geologically.
(3) Wells showing what is interpreted as influenced by Syncrude's process water, typically having elevated concentrations of sodium, chloride, bicarbonate, and naphthenic acids.

However, this classification shall be revised in the 2008 sampling program to adequately reflect the natural geo-chemistry of the areas in the evaluation of the impacted groundwater.

The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. Table 5.4 provides a summary of key chemical parameters.

Table 5.3: Location of Monitoring Wells, East of MLSB

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
OW79-19	55842	53947	269	8.2	9.8	Sand
OW80-14	57610	53343	268.8	2.4	5.2	Sand
OW84-33	53150	54573	314	-	-	Sand
OW98-03	56434	53244	296.3	0.6	2.3	Sand
OW98-04	55853	53550	300.8	3	4.6	Sand
OW98-05	55314	53785	307.4	7.9	9.5	Sand
OW98-06	54922	53882	309.7	6.2	7.8	Sand
OW98-07	53881	54115	316.1	6.5	8.2	Sand
OW98-08	53457	53932	315.7	6.2	7.9	Sand
OW98-09	55129	54022	308.7	10.8	12.5	Sand
OW98-19A	55078	54595	265.9	1.8	3.4	Sand
OW98-19B	55079	54594	265.9	7.6	9.1	Sand
OW98-20	53386	54085	316.7	3.4	6.4	Sand
OW98-21	53781	54053	315.9	5.5	7	Sand
OW98-22	54069	54070	310.5	4	5.5	Sand
OW98-24	55960	53866	273.5	7.6	9.1	Sand
OW98-25	55189	54255	276	12.2	15.2	Sand
OW98-26A	54342	54091	307.8	0.9	2.4	Sand
OW98-26B	54342	54090	307.9	4	5.5	Till
OW98-27	54299	54159	308	2.4	4	Sand
OW98-28	54352	54026	308.7	1.8	3.4	Sand
OW99-05	51399	53023	308.1	7.6	9.1	Sand
OW99-06	51353	52948	306.4	3.1	4.6	Sand
OW99-07	51560	53317	309	4.3	5.8	Sand
OW99-08	51536	53322	309.3	7.3	8.8	Sand
OW99-12	51922	53888	309	0.6	2.1	Oilsand
OW99-13	51918	54308	315.1	5.8	7.3	Sand
OW99-14	52240	54018	313.4	2	2.6	Sand
OW99-15	52455	54077	313.6	2.4	3.1	Sand
OW99-16	52792	53974	313.3	3.1	4.6	Sand
OW99-17	53164	54003	314.3	4.6	6.1	Sand
OW99-18	52983	54276	314.1	2.3	3.8	Sand
OW99-19	54301	54526	305.3	1.2	2.7	Sand
OW99-20	54568	55039	272.9	20.1	21.6	Sand
OW99-21A	55603	54075	267.8	3.7	5.2	Sand
OW99-21B	55601	54075	267.8	8.5	10.1	Sand
OW99-24	57400	52532	276.5	0.9	2.1	Sand
OW99-25	57334	52729	277.1	1.5	3.1	Sand
OW99-27	58355	52620	287.3	3.1	4.6	Sand
OW99-28	58367	52288	285.6	0.3	1.8	Oil sand

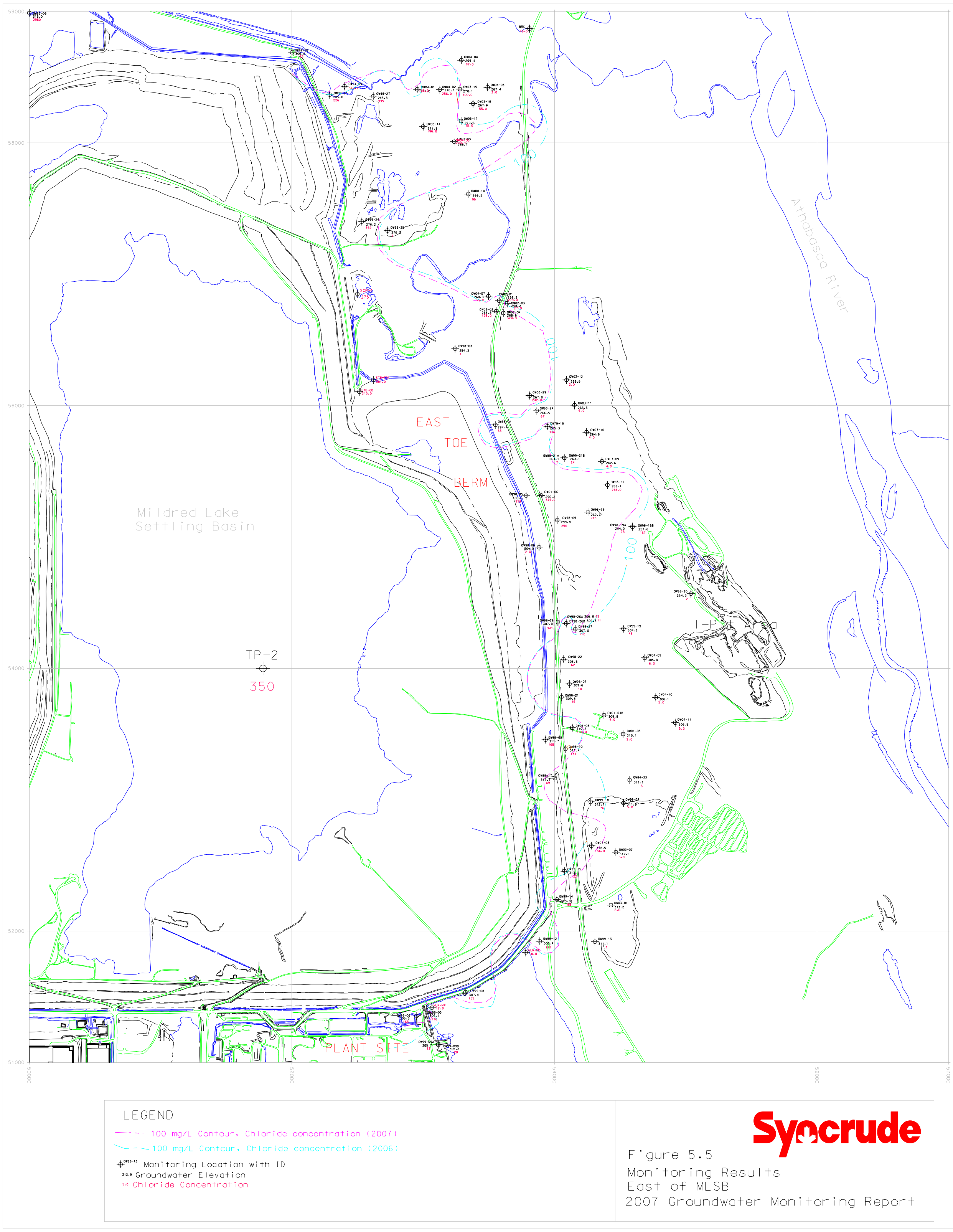
Notes: Sand = Pleistocene sand; Oilsand = Cretaceous McMurray formation; Till = Pleistocene till
Coordinates are in the Syncrude mine metric system
Screen intervals are in meters below ground

Table 5.3: Location of Monitoring Wells, East of MLSB (Continued)

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
OW01-01	54903	54165	310.1	12.8	14.4	Sand
OW01-02	54649	54070	305.2	1.4	3.0	Sand
OW01-03	53549	54136	316.4	5.7	7.2	Sand
OW01-04A	53640	54379	316.6	3.8	5.3	Sand
OW01-04B	53642	54378	316.5	8.3	9.8	Sand
OW01-05	53499	54523	317.3	5.8	7.3	Sand
OW01-06	55316	53900	308.3	13.0	14.5	Sand
OW02-01	56799	53579	271.5	3.0	4.5	Sand
OW02-02	56718	53556	272.2	4.3	5.9	Sand
OW02-03	56799	53579	271.1	2.3	3.8	Sand
OW02-04	56705	53611	271.7	5.7	6.0	Sand
OW03-01	52197	54430	313.9	4.6	6.1	Sand
OW03-02	52600	54469	314.2	2.6	4.2	Sand
OW03-03	52650	54281	314.4	4.4	5.9	Sand
OW03-04	52975	54526	312.4	1.5	2.3	Sand
OW03-08	55396	54404	265.5	13.5	15	Sand
OW03-09	55575	54362	265.9	8.9	10.4	Sand
OW03-10	55797	54244	266.7	2.5	4	Sand
OW03-11	56003	54152	267.1	3.1	4.6	Sand
OW03-12	56196	54092	268.4	1.9	0.3	Sand
OW03-14	58124	53001	277.6	7.6	9.1	Sand
OW03-15	58409	53281	271.0	3.7	5.2	Sand
OW03-16	58299	53380	268.1	3.1	4.6	Sand
OW03-17	58167	53288	270.3	1.4	2.9	Sand
OW03-29	56077	53811	274.8	13.0	14.5	Sand
OW04-01	58408	52955	284.0	15.2	16.8	Sand
OW04-02	58405	53128	273.1	10.7	12.2	Sand
OW04-03	58424	53491	269.2	2.9	4.4	Sand
OW04-04	58630	53290	271.4	2.1	3.7	Sand
OW04-05	58009	53237	271.4	8.2	9.7	Sand
OW04-06	56996	53566	271.8	2.1	3.7	Sand
OW04-07	56833	53497	269.6	1.5	3.0	Sand
OW04-08A	54873	54607	273.2	6.1	7.6	Sand
OW04-08B	54870	54604	273.6	15.8	17.4	Sand
OW04-09	54079	54688	306.9	1.5	2.3	Sand
OW04-10	53779	54772	307.2	3.0	4.6	Sand
OW04-11	53586	54920	307.0	3.0	4.6	Sand
SG9923-01	55390	53962	293.9	Seepage East of Highway 63		
SG0122-01	56300	53396	296	Seepage Northeast of MLETB		

Notes: Sand = Pleistocene sand; Oilsand = Cretaceous McMurray formation; Till = Pleistocene till
Coordinates are in the Syncrude mine metric system
Screen intervals are in meters below ground

Figure 5.5: Monitoring Results, East of MLSB



(1) Wells with Background Chemistry
Twenty-five monitoring wells installed in the Pleistocene aquifer show background values in water chemistry. The wells exhibiting these characteristics are OW80-14, OW84-33, OW98-07, OW98-26B, OW99-13, OW99-14, OW99-19, OW99-20, OW99-25, OW01-04 A & B, OW01-05, OW03-01, OW03-02, OW03-03, OW03-04, OW03-09, OW03-10, OW03-11, OW03-12, OW04-03, OW04-08B, OW04-09, OW04-10 and OW04-11. OW98-26B is installed in till, but the chemistry is interpreted as background for this specific unit.

(2) Wells with Elevated Chloride Concentrations
Twenty monitoring wells installed in the Pleistocene sand aquifer have elevated concentrations of chloride and other major ions. Organic tracers of process water including naphthenic acids and DOC are consistent with background levels. The wells exhibiting these characteristics are OW79-19, OW98-19A & OW98-19B, OW98-21, OW98-22, OW98-24, OW98-26A, OW98-28, OW99-12, OW99-18, OW01-02, OW02-01, OW02-02, OW02-03, OW02-04, OW03-15, OW03-16, OW03-17, OW03-29 and OW04-07.

The observed water chemistry of these wells is not consistent with groundwater historically identified as being influenced by process-affected water. The ratio of sodium to chloride and the low concentrations of organics are not consistent with tailings water. The effect is suspected to be due to the natural geo-chemistry of the soil within the region. These wells are commonly located at the outer edge of areas identified as showing influence from process water.

(3) Wells Influenced by Process-affected Water
Figure 5.5 shows water elevations and chloride concentrations for all current wells in this area. Four zones showing influence from process water have been identified (Figure 5.5). Monitoring results for each zone are discussed in the following paragraphs.

5.2.2.1 Sources

5.2.2.1.1 MLSB: Source to all Groundwater Zones and Surface Waters East and South of Facility
Generally, the input of process water into the MLSB pond from the Extraction Plant has gradually increased since 1998; consequently the concentrations of major ions have also risen considerably. Presently, inflows into the MLSB consist of low flow lines from Plant 6 tailings (delivering fine tails), Stream 73 tailings and coke discharge that tend to seal the pores of the bottom material of the MLSB. A transfer of MFT from the MLSB to the WIP occurs yearly to keep a constant fluid balance in the facility.

Samples from TP-2 located in the tailings pond show a decreasing trend since 2003. Samples from the MLSB off-take pipe T0715 indicate a consistent flat trend in the concentration of process related constituents and are still well below the pond concentrations while naphthenic acid indicated a decreasing trend. The concentrations of process related constituents appear generally stable and the lack of flow in the finger drains located at the east toe of MLSB indicates the effectiveness of the MFT in plugging the pores of the MLSB dyke. This is as a result of the presence of MFT and clays in the bottom of the pond that reduce the hydraulic connection between the pond and the tailings dyke. This low hydraulic conductivity between the pond and the seepage water chemistry is confirmed by the no-flow condition of the off-take pipes. However, this also portrays the continuous flushing of the percolating precipitation in the dyke.

5.2.2.1.2 MLETB: Additional Source to Zone C, Seepage Control Pond and Beaver Creek
The MLETB was constructed with hydraulically placed sand, and so when initially placed, the deposit was fully saturated. Characteristics unique to the MLETB have allowed it to drain and flush significantly faster than Syncrude’s other tailings deposits. In particular, the volume of pond water within the MLETB is minimal and has likely been diluted by surface runoff and precipitation over the years. There is therefore no constant or fresh source of process affected water over the entire deposit. The MLETB is also constructed on a foundation having relatively high hydraulic conductivity, and contains a number of finger drains within the foundation of its perimeter.

The evidence indicating that the MLETB has been drained and flushed of contaminants is as follows:

- o The total flow from the finger drains has decreased to zero, indicating that the perimeter of the MLETB has drained, in those locations where the finger drains exist. Currently, all ten finger drains along the north side and the seventeen finger drains along the east side of the MLETB are dry. The only flow from the MLETB is from the toe at ETB-GD (granular drain) section. Flow rates are usually monitored at the finger drains, whereas the ETB drains are only monitored for water level and chemistry. However, the trend of finger drain flow rate from last two years till now has not reported any flow, which is substantiated by the record of no-flow condition from the finger drains this year (Figure 5.6). Syncrude is considering stopping monitoring the finger drains for flow since (the drains are dry) monitoring at the toe is now basically the natural groundwater elevation in the area.
- o The general trend of the standpipes water elevations was slightly lower than previous year and constant in a few locations while the surrounding ditches are virtually dry. Figure 5.7 shows the locations of the standpipes and finger drains, the current elevation of the water table and the original ground elevation in the MLSB relative to the standpipes, finger drains and ditches.
- o The concentration of the major ions sampled from the MLETB appears steady over a five-year period with a slight drop at the later years. This follows a steady state concentration in the MLETB and a subsequent natural attenuation of the contaminant as observed in the declining trend.

With the little or no-flow of process water within the MLETB structure, the flux of water moving beyond the perimeter ditch is expected to decrease, and invariably the potential for influence on the surrounding environment. Provided that the current ditch system is maintained, the flux of contaminated MLETB seepage water reaching the ditch, moving past the ditch and entering Beaver Creek are all expected to decline.

Figure 5.6: MLETB Finger Drain Flows

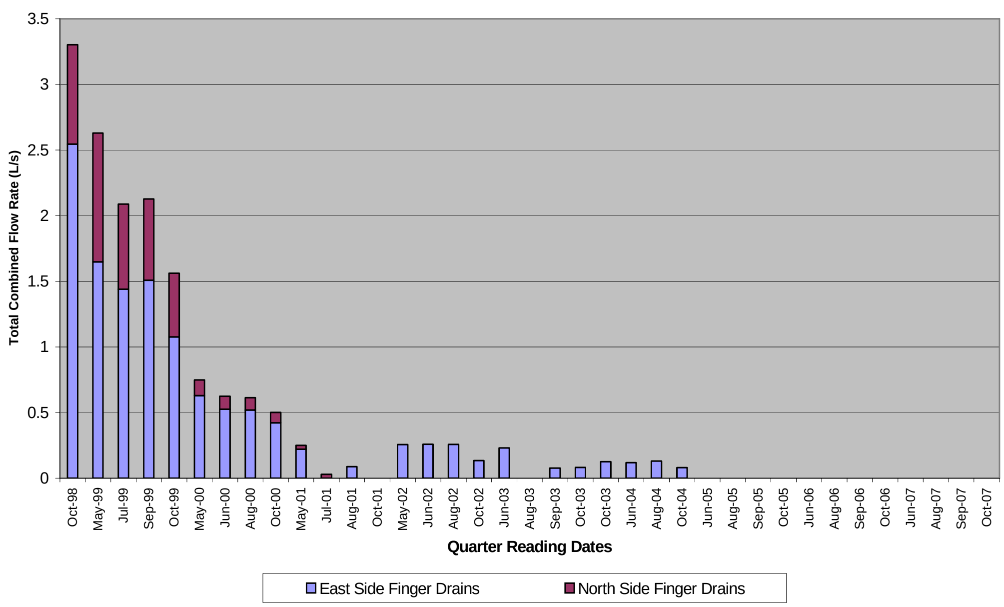


Figure 5.7: MLETB Finger Drains & Standpipes

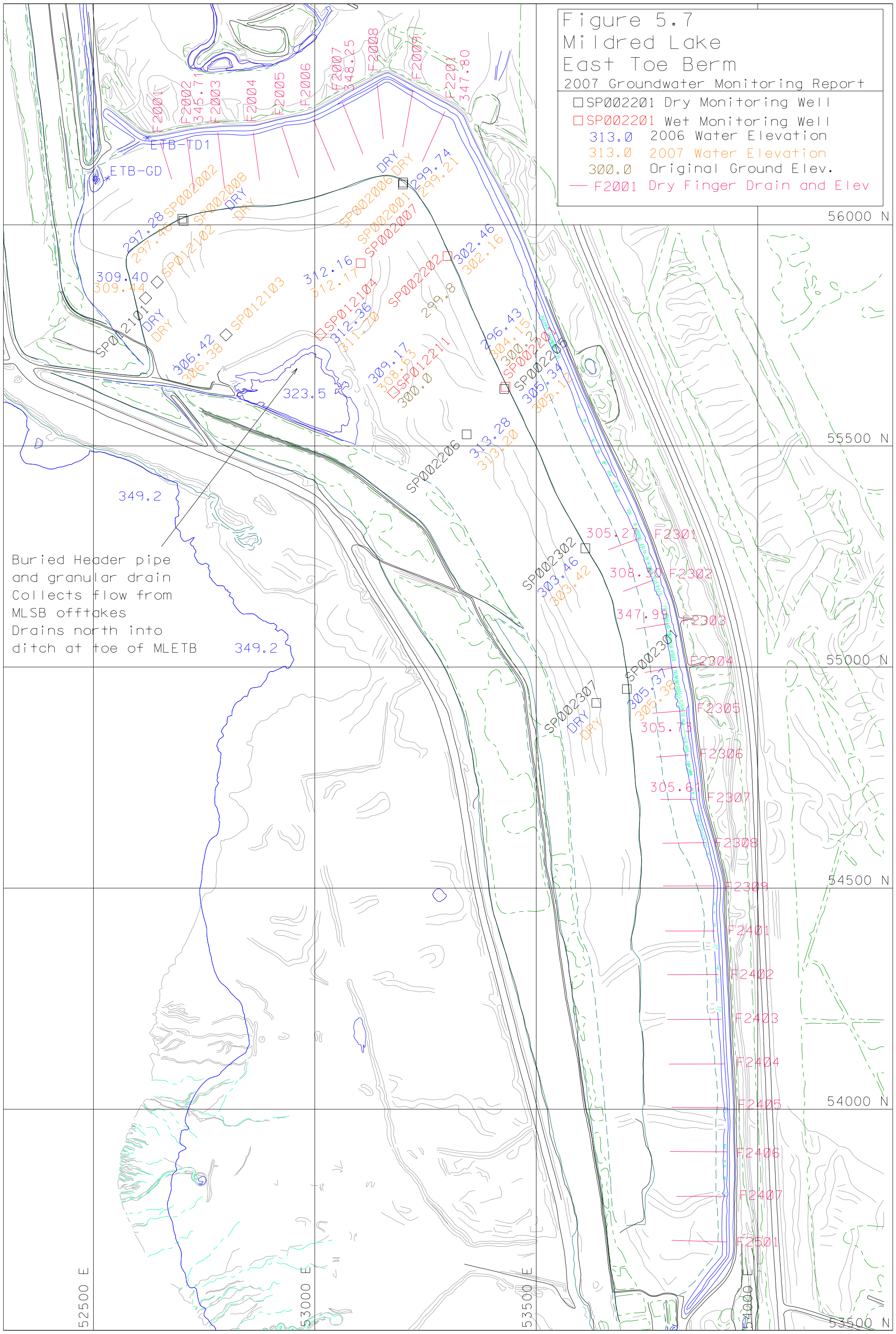


Table 5.4: Summary of Key Chemical Parameters, East of MLSB

Well ID	Sample Date	Conductivity	pH	HCO_3	Cl_2	SO_4	Ca	Na	DOC	Naphthenic Acids
OW79-19	09-Jul-07	949	7.9	291	136	54.9	130	20	5	-
OW84-33	03-Jul-07	535	8.1	325	3	31.4	81.7	9	10	-
OW80-14	29-Nov-07	1060	7.8	411	95	71.1	113	73	12	-
OW98-04	19-Jun-07	835	8.2	269	33	154	90.9	48	5	-
OW98-05	19-Jun-07	2610	8.2	1040	258	151	45.6	515	36	-
OW98-06	19-Jun-07	2200	8.3	931	210	99.4	40.8	435	57	-
OW98-07	21-Jun-07	135	7	11	10	29.5	15.1	3	4	< 1
OW98-08	19-Jun-07	2140	8.2	1080	165	43.6	59.9	422	42	-
OW98-09	25-Jun-07	2300	8.1	983	256	90.9	54.3	489	47	-
OW98-19A	10-Jul-07	698	7.5	247	75	56.7	60	75	19	< 1
OW98-19B	28-Nov-07	1470	7.7	456	167	161	184	82	13	< 1
OW98-20	25-Jun-07	1350	7.9	322	134	168	89.9	172	18	-
OW98-21	25-Jun-07	152	7.1	12	15	18.3	11.7	11	5	-
OW98-22	25-Jun-07	846	7.9	388	62	47.5	86.1	59	14	-
OW98-24	09-Jul-07	678	7.7	226	67	47	93.9	11	6	-
OW98-25	09-Jul-07	1760	7.9	705	215	85.5	89.5	284	20	6
OW98-26A	21-Jun-07	1170	7.9	492	62	173	132	72	13	2
OW98-26B	21-Jun-07	678	8.2	441	11	1	19.5	140	6	-
OW98-27	21-Jun-07	1390	8	610	112	102	67.8	229	22	-
OW98-28	25-Jun-07	1710	7.9	365	341	79.4	132	186	10	-
OW98-28*	25-Jun-07	1710	7.9	365	340	73.9	125	185	8	
OW99-05	19-Jun-07	2270	8.3	1110	178	90.1	38.1	469	63	42
OW99-06	19-Jun-07	2190	8.4	1110	163	30.8	25.8	465	41	53
OW99-08	19-Jun-07	2110	8.4	1070	155	49.8	32.9	450	44	40
OW99-12	04-Jul-07	1490	7.9	552	176	88.4	186	83	18	-
OW99-13	03-Jul-07	547	8.1	325	3	42.1	91.1	4	14	-
OW99-14	21-Jun-07	1020	8	439	88	66.5	112	58	10	-
OW99-15	04-Jul-07	1350	8	683	101	45.3	112	160	23	6
OW99-16	Damaged									
OW99-17	04-Jul-07	2460	8	1100	231	135	93.1	445	62	-

Abbreviations:

Conductivity (µS/cm), Ca – Calcium (mg/l), Cl_2 – Chloride (mg/l), Na – Sodium (mg/l), SO_4 – Sulfate (mg/l), HCO_3 –Bicarbonate (mg/l), DOC – Dissolved Organic Carbon (mg/l), Naphthenic Acids (mg/l), " - " not analyzed

* Duplicate Sample

Table 5.4: Summary of Key Chemical Parameters, East of MLSB (Continued)

Well ID	Sample Date	Conductivity	pH	HCO_3	Cl_2	SO_4	Ca	Na	DOC	Naphthenic Acids
OW99-18	03-Jul-07	928	8.1	258	117	69.7	85.2	91	6	< 1
OW99-19	05-Jul-07	673	8	318	48	24.8	86	34	16	-
OW99-20	05-Jul-07	385	8	214	2	24.9	54.8	4	4	-
OW99-21A	09-Jul-07	272	8.1	162	7	12.7	12.8	48	11	-
OW99-21B	09-Jul-07	715	8	292	24	110	73	57	11	-
OW99-24	18-Jul-07	2730	7.9	1070	352	97.9	49.7	557	41	16
OW99-25	18-Jul-07	561	7.8	284	<1	65.7	87.7	7	7	-
OW99-27	19-Jul-07	2880	8.1	1050	335	207	72.9	506	34	-
OW99-28	19-Jul-07	2810	7.8	784	226	526	169	348	34	-
OW01-01	Dry									
OW01-02	21-Jun-07	1680	7.8	402	297	140	146	147	12	2
OW01-03	21-Jun-07	673	7.6	130	170	54.3	45.8	136	6	2
OW01-04A	Dry									
OW01-04B	21-Jun-07	502	8.1	287	4	37.1	70.3	7	4	-
OW01-05	11-Sep-07	933	7.8	505	2	59.9	167	7	4	-
OW01-06	17-Jul-07	2860	7.9	1200	376	101	51.7	664	61	-
OW02-01	25-Jun-07	1860	7.8	372	274	257	135	223	16	-
OW02-02	25-Jun-07	844	6.8	84	138	114	56.1	72	13	-
OW02-03	25-Jun-07	180	7.6	40	26	12.8	14.1	15	8	-
OW02-03*	25-Jun-07	180	7.6	40	26	13.5	14.5	17	9	
OW02-04	25-Jun-07	1710	7.8	402	324	97.3	192	93	14	-
OW03-01	03-Jul-07	474	7.9	301	2	22.1	78.5	6	20	-
OW03-02	03-Jul-07	667	8	296	5	93.8	106	10	11	-
OW03-03	03-Jul-07	1090	8	304	156	75.2	125	64	9	-
OW03-04	03-Jul-07	567	8.1	328	5	40.5	86.9	7	10	-
OW03-08	09-Jul-07	2120	8	829	258	122	71.5	399	31	10
OW03-09	09-Jul-07	1370	7.5	409	4	467	249	20	12	<1
OW03-10	09-Jul-07	1340	7.4	697	4	249	275	7	8	<1
OW03-10*	09-Jul-07	1340	7.4	690	4	256	283	7	12	
OW03-11	09-Jul-07	1490	7.5	352	6	625	315	3	11	<1
OW03-12	09-Jul-07	608	7.7	296	2	99.3	123	3	9	-
OW03-14	22-Jun-07	1740	7.9	652	196	102	37.1	348	25	3
OW03-15	20-Jun-07	1190	8	450	100	132	112	128	18	4
OW03-16	22-Jun-07	898	7.8	377	55	95.5	95.3	69	11	1
OW03-17	22-Jun-07	1230	7.8	457	75	180	103	156	24	2
OW03-25	28-Nov-07	3560	7.1	218	639	692	370	287	32	-
OW03-28	28-Jun-07	1520	7.8	551	42	378	244	4	20	-

Abbreviations:

Conductivity (µS/cm), Ca – Calcium (mg/l), Cl_2 – Chloride (mg/l), Na – Sodium (mg/l), SO_4 – Sulfate (mg/l), HCO_3 –Bicarbonate (mg/l), DOC – Dissolved Organic Carbon (mg/l), Naphthenic Acids (mg/l), " - " not analyzed

* Duplicate Sample

Table 5.4: Summary of Key Chemical Parameters, East of MLSB (Continued)

Well ID	Sample Date	Conductivity	pH	HCO_3	Cl_2	SO_4	Ca	Na	DOC	Naphthenic Acids
OW03-29	09-Jul-07	1280	7.9	310	242	56.8	156	52	8	<1
OW04-01	20-Jun-07	1010	7.7	299	105	124	76.3	107	8	2
OW04-02	20-Jun-07	2240	8	762	256	248	127	334	23	11
OW04-03	20-Jun-07	601	8.1	335	3	54.7	70.8	37	12	<1
OW04-04	20-Jun-07	1140	8	434	92	127	90.1	143	15	1
OW04-05	10-Jul-07	2190	7.9	737	299	194	121	356	25	<1
OW04-07	10-Jul-07	1420	6.6	99	35	652	195	42	17	<1
OW04-09	11-Jul-07	582	7.7	384	6	2.9	97.3	7	22	-
OW04-10	05-Jul-07	587	8	392	5	3.4	99.5	8	23	-
OW04-11	05-Jul-07	747	7.8	423	5	67.2	133	12	29	-

Abbreviations:
Conductivity (µS/cm), Ca – Calcium (mg/l), Cl_2 – Chloride (mg/l), Na – Sodium (mg/l), SO_4 – Sulfate (mg/l), HCO_3 –Bicarbonate (mg/l), DOC – Dissolved Organic Carbon (mg/l), Naphthenic Acids (mg/l), “ - “ not analyzed
* Duplicate Sample

5.2.2.2 Groundwater Receptors

The pumping remediation strategy east of the MLETB was adopted in 2003. The objective is to intercept and retard the migration of contaminant within the source zone. This has resulted in a considerable improvement in the groundwater quality and the impact is better evaluated from the responses at the adjacent receptors.

The possible receptors of groundwater flow external to MLSB area were grouped into zones as follows:

5.2.2.2.1 Zone A

Zone A is located at the southeast corner of the MLSB (Figure 5.5). Results from 2007 sampling program for this area are consistent with results from previous years with three monitoring wells (OW99-05, OW99-06, and OW99-08) showing a stable, flat trend in major ion and selected metals concentrations in groundwater. This resulted in a receding or shrinking trend of the chloride concentration within the area confirms the improvement of the source mitigation-approach. Syncrude is in the process of replacing monitoring well OW99-07 but this will be completed definitely in 2008, while the rest of the damaged wells were replaced this year.
The groundwater will continue to be monitored and the analysis be completed as per AENV requirements for the tailings area.

5.2.2.2.2 Zone B

Zone B is located at the east of the MLSB and generally southeast of the MLETB, between 52000N and 54500N (Figure 5.5). Results from the seven monitoring wells installed in 2003 to 2004 and the concentration of OW01-04B, OW04-10, and OW04-11 at the exterior location in this zone indicated that the background chemistry within the area is still representative of the low historical concentration trend and these areas show no impact from process-affected water while OW01-04A was dry. Another seven wells (OW99-15, OW99-16, OW99-17, OW98-08, OW98-20, OW01-03 and OW98-27) show influence of process-affected water, which is due to their proximity to the MLSB. However, the trend of the concentrations of major ions and selected metals at these wells are flat and stable. Moreover, the chloride concentration is also retarding and shrinking within these areas. Results from another four wells (OW99-12, OW99-18, OW98-21 and OW98-26B) show a steady flat trend in major ions and selected metals while a slight increase of major ions was noticed at two wells due to their proximity to the MLSB, OW98-

22 and OW98-28 consequently the chloride concentration trend within these areas indicated a forward migration. Moreover, groundwater well OW03-03 is also impacted with increased concentration, which is indicative of some variability in the trending. This area shall be closely monitored in the 2008 in order to stabilize the plume.

The perimeter ditch that serves as the seepage control measure in this area had little or no-flow coming into the ditch at this time, which is due to the lack of flow from the MLSB, the finger drains and the seepage mitigation pumping outflow areas.

5.2.2.2.3   Zone C

Zone C is located at the upper east part of the MLETB. A sump and six pumping wells are located around the MLETB to intercept and return water to the MLETB perimeter ditch. This ditch conveys water to the seepage control pond, from which water is eventually recycled into MLSB. This seepage pumping system was established to target this area, where the ditch is ineffective in capturing seepage due to the thickness of the Pleistocene deposits in the area.

Continuous monitoring of the pumping activity occurred throughout the year at all the seepage pumping locations except at well 2 and sump where there were some repair works carried out at the locations. A total of 3,313 cubic meters of contaminated water was intercepted and recycled while the sump located at the northeast end of the MLETB intercepted 2,104 cubic meters. Five pumping locations were not reporting any flow from the aquifer while flows reporting from well 2 and the sump were considerably low. This confirms the very low flow condition prevailing from the MLETB and the adjoining areas. Consequently, a considerable reduction in concentrations is also expected in the down-gradient wells.

Records of flow rates and pumped volumes are documented from the pumps (Table 5.5). The flow is monitored at the pump locations and where a problem arises with the flow meter or pump performance, an estimation of the flow rate is computed by using the annual (2007) volume based on average flow rates measured manually through 2007, multiplied by the pump-run hours. The performance of the pumps have improved considerably and further plan to lower the pump is being considered in 2008 with a view to capture flows in the aquifer.

The concentrations of major ions, selected metals and naphthenic acid reduced at monitoring well locations OW 98-04, OW99-05, OW99-21A, OW99-21B, OW98-05 and OW01-06 while the chloride concentration plume also shrank. This is a considerably evidence of a reduced impact of the process-affected water resulting from the seepage-pumping exercise, which is an improvement on the time-limiting mitigation approach adopted at the MLSB and the MLETB.
At the southern end of zone C, the process-water affected wells OW03-08 and OW98-25 have been reducing naphthenic acid concentrations between 2004 and 2007. This goes to show that the migration of the plume in this area within such close proximity to MLSB have decelerated considerably due to the effect of the seepage pumps and recycling exercise.
The well rehabilitation program has also improved the well performance and continuous monitoring of the pumps has stabilized the plume considerably in 2007.Despite low flows we shall continue the seepage pumping exercise in 2008.

The background chemistry of wells OW03-09, OW03-10, OW03-11and OW03-12 (which were installed on higher terrain, westward of T-Pit), continue to decrease in concentrations of major ions, selected metals and naphthenic acid since 2004-2007. This is am indication a general improvement in the natural geo-chemistry within the environment. Two other wells OW04-08A and OW04-08B were dry.

Table 5.5: 2007 Zone C Pumping Summary

2007 PUMPING SUMMARY					
ID	**Volume since start-up (m^3)**	**2007 Volume (m^3)**	**2007 Percent Run**	**Average Rate m3/hr**	**Time of Year Operated**
Well 1	9,284	-	-	-	Jan-Dec
Well 2	62,856	3,233	-	0.6	Aug.-Dec.
Well 3	3,705	-	-	-	Jan.-Dec.
Well 4	3,064	80	-	0.08	Jan.-Dec.
Well 5	18,703	-	-	-	Jan-Dec
Well 6	5,262	-	-	-	Jan.-Dec.
Well 7	38,936	-	-	-	Jan.-Dec.
Total		**3,313**			
Sump	9,057	2,104	83%	2.1	Aug.-Dec.

* Assumed pumping rate average, used to calculate volumes from pump hours.

At the north end of Zone C, the concentrations of the major ion and selected metals at these three monitoring wells OW02-01, OW02-03 and OW02-04 increased slightly while that of OW02-02 decreased. The locations are close and the variability in concentration appears to be a natural phenomenon. This shall be further investigated in 2008. However, historical trend has been on the decline in the past. Monitoring well OW04-07 installed in 2004 continues to reflect a decline in chloride and major ions concentrations that might be attributed to the improvement of the seepage pumping mitigation exercise while well OW04-06 was dry in 2006 and 2007.

5.2.2.2.4 Zone E

Zone E is located at the northeast corner of the MLSB. This former sand and gravel pit, now reclaimed, forms a topographic low. In 2004, five new monitoring wells were installed in this area to compliment the four wells installed in 2003. Closer delineation of the direction of flow indicates that groundwater initially flows towards the east and alongside Bridge Creek at its northern limits (to E53000) of the area, but then turns south, towards Beaver Creek near N58000 (Figure 5.5). In late 2007 five piezometers were installed to further delineate the flow directions in this area. However, the chloride concentration of OW08-14 increased while the sulphate concentration decreased at the same well location. The on-going is also going to address this effect as the well location.

The chloride concentration and major ions decreased in wells OW04-01, OW04-02 and OW99-09, OW99-27 and increased in wells OW03-14, OW04-04, OW04-05, OW99-04, OW99-24 and OW99-28. Generally the chloride concentration indicated a stable trend and slight increase of other ions were observed. This area is still being studied. There is also an indication that the loading of major ion concentrations from the source of contamination is decreasing further east in the area. This confirms the time-limiting reduction of the concentration that prevails around the MLSB.

5.2.2.2.5 T-Pit Dewatering Wells (Potential Receptor)

The pit development continues at the T-Pit through 2007 and the pit dewatering activity was accomplished through the use of a pit-floor sump in the T-Pit area in order to mine the granular resource in the area. Dewatering wells (DW03-013, DW03-047 & DW03-017) that were installed in 2003 (with two of them having high salinity) were to be properly abandoned. This high salinity water is believed to be connate water that has been trapped at the top of the Devonian low in this area. The Devonian structural pattern of this area confirms this conclusion.

A conductivity survey conducted by Komex in November 2005 on standpipes SP05-T047 and SP05-T05 identified salinities in excess of 10,000mg/L chloride in these wells. This level of chloride concentration is definitely not related to the MLSB water. The depth at which the high salinity water occurs is 15 m below the ground surface in this area.

Throughout 2007, composite samples (of the T-Pit's pumped release water) were taken and reported to AENV quarterly to ensure compliance with discharge criteria. All data on released water should remain within the allowable water quality limits and that the maximum concentration of chloride at 500 mg/l was not exceeded.

For similar reasons stated above, the 2007 groundwater sampling at the T-Pit was taken at piezometer SP05-T047 while SP05-T05 was destroyed and this will be properly abandoned The results of the major ions and the TDS analysis were similar to those calculated from geophysical (conductivity) survey. Both confirmed high salinity content at these locations. The chemistry from these piezometers is similar to chemistry of Devonian Formation wells in the in-pit area (Table 5.6).

Table 5.6: Comparison of Chemistry at T-Pit versus Lower McMurray & Waterways Formation

	T-Pit Wells	**Lower McMurray & Waterways Formation Monitoring Wells**			
ID	**SP05-T047**	**BML96-03**	**BML96-04**	**BML96-05**	**BML96-09**
Ground Elevation	249.6	299.8	311.7	299.8	299.8
Top of Screen	220.8	234.6	244.9	234.6	234.6
Bottom of Screen	217.8	231.5	241.9	231.5	231.5
Water Quality					
Sample Date	22-Aug-07	13-Jul-07	13-Jul-07	13-Jul-07	12-Jul-07
HCO_3	2510	2400	2750	3140	2780
Cl	13100	8380	20000	2040	11700
SO_4	< 0.5	38.4	9.3	1.7	< 0.5
Ca	39.3	70	164	26.9	121
Fe	< 5	4.41	0.71	6.56	9.01
Mg	81.8	152	327	29.5	207
Mn	< 1	0.38	0.12	1.88	0.75
K	34.6	57.3	62.8	14.6	45
Na	8530	6430	12700	2270	8970
Ion Balance	0.92	1.09	0.97	0.94	1.1
pH	7.6	7.9	7.5	7.7	7.6
Conductivity	36400	23200	51400	9490	34600
TDS	23300	14800	35300	6090	21800

Abbreviations:

HCO_3 –Bicarbonate (mg/l), Cl – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Fe – Iron (mg/l), Mg – Magnesium (mg/l), Mn – Manganese (mg/l), K – Potassium (mg/l), Na – Sodium (mg/l), Ion Balance (cations/anions) Conductivity (µS/cm), TDS – Total Dissolved Solids (mg/l), " - " not analyzed

5.2.2.3 Surface Water Receptors

5.2.2.3.1 Seepage Control Pond

The seepage control pond (SCP) is both a receptor of contaminated water, as well as a potential source to its downstream environment. It collects water from the MLETB and MLSB perimeter ditches, as well as water contained upstream of the lower seepage collection dam. The collected water is eventually pumped back into the MLSB.

The concentrations of major ions at OW99-24, which is located north of the SCP-1 (in S-Pit area), have reduced in 2007 except chloride. This relatively indicated an improvement in the water quality in the SCP and other volume handling activities within the area. The concentrations of major ions within are expected to continually improve as we monitor this area in 2008. Low flow from the MLETB may also contribute to the volume and quality reporting at the SCP.

5.2.2.3.2 Bridge Creek

The concentrations of major ions reduced at OW99-27 except for chloride while the surface water quality sample at the west interceptor ditch (WID) indicated a reduced concentrations of major ions, selected metals and naphthenic acid. This reflected a down-stream effect of the low flow from the MLSB (source).

5.2.2.3.3 Beaver Creek

Beaver Creek is routinely sampled at two locations, downstream of the Lower Seepage Dam (TBC-1B) and at Highway 63 (TBC-3). Both locations continue to show a consistent flat and steady trend except for sodium and chloride at TBC-1B. This observation is as a result the reduced actual volume of seepage into Beaver Creek, following the (no-flow) trend from the finger drains, adjacent sampling locations (SG0122-01) and reported low flow in the dyke.

In 2005 Syncrude submitted a 2004 Ecological Risk Assessment (ERA) of the Lower Beaver Creek report on the evaluation of the current seepage conditions and water quality in March 2004, which recommended that the risk assessment does not indicate the need for active immediate risk management that may constitute risk to wildlife, fish and amphibians. The report also recommended a seasonal monitoring to confirm the risk estimate with the exposure scenarios and further monitoring of water quality, toxicity sediment are also proffered on the benthic invertebrate community and the fish habitat for three years. The report was reviewed by AENV in their letter dated December 07, 2005 with comments for clarification by Syncrude. The response was submitted separately and together with the 2005 Ecological Risk Assessment of the Lower Beaver Creek by March 31, 2006. Similarly, response to the comments from the AENV on the 2005 ERA of the Lower Beaver Creek was submitted separately in June 2006. The 2006 ERA report of the Lower Beaver Creek was submitted in March 31, 2007 (together with another copy of the response on the 2005 report) and the comment from AENV was also received. By March 2008, the final report on the 2007 Ecological Risk Assessment of the Lower Beaver Creek will be submitted accordingly.

5.2.2.3.4 Mildred Lake Reservoir

Mildred Lake Reservoir (MLR) is part of Syncrude's water intake system. In 2007, Syncrude imported 35.95 million cubic meters of water from the Athabasca River for use on site. This water is pumped from the river into the lower camp fresh water pond, and then to MLR. Water is taken from the reservoir having a capacity of 7 million cubic meters to supply plant needs.

The chloride and major ions concentrations at the well locations OW99-05, OW99-06 6 and OW99-08 indicated flat trend at all major ions (similar to 2006), except for a slight increase in chloride at OW99-05 and OW99-06. The chloride trend is generally consistent with the 2006 pattern that indicated a stable trend, which is subsequently expected to begin to shrink. This also corroborates the low flow condition at the MLSB.

Recent trend of surface water monitoring (2004-2007) from the sampling locations around the MRL such as MRL-NW, MRL-NE, MRL-E and MRL-SW indicated a stable trend for all the major ions including chloride. Further monitoring and groundwater analysis will be completed as per AENV requirements for the tailings area in 2006.

The capacity of the reservoir is approximately 7 Mm^3 and with the commissioning of the UE-1 project in 2006, the production rates and the turnover of the MLR water has increased to 35 million cubic meters (2007) which continues to give a lower concentration of the chemistry and larger dilution in the MLR. Organic indicators such as naphthenic acid, dissolved organic carbon and phenols are all consistent with the reference locations, which indicate that the effect of the seepage on the overall water quality in the reservoir is minimal.

The Mildred Lake Reservoir will continue to be used as an industrial facility dedicated to supply water to the plant for the foreseeable future. The MLR water will continue to be turned over, as there are no natural upstream or downstream receivers of the waters within. Syncrude will continue to monitor the water quality in the reservoir annually and will perform further evaluations if a significant change in water quality occurs or if the use of this facility changes.

5.2.3 Recommended Sampling Schedule for 2008

Regular scheduled sampling will continue in 2008 for all wells listed in Table 5.3 and analysis will be completed as per AENV requirements for the tailings area.

5.3 North and West of the Mildred Lake Settling Basin

5.3.1 Background

5.3.1.1 Area Description

The northward advancement of mining in the North Mine area will eventually reach the largely undisturbed western area of the MLSB (Figure 5.9). Currently, a dirty-water ditch surrounds the MLSB, carrying seepage water to the recycle water pond at the south and to seepage control pond. The West Interceptor Ditch (WID) intercepts clean water from the area north and west of the MLSB and discharges it into Bridge Creek to the northeast of the MLSB.

5.3.1.2 Geology

Prior to Syncrude's operation, Beaver Creek flowed through the approximate centre of the MLSB. West of the old Beaver Creek channel, the Clearwater Formation is generally continuous and increases in thickness to the west. On the west side of the MLSB, the Clearwater Formation is approximately thirty meters thick. The Clearwater Formation is capped by five to eight meters of glacial till and glacio-lacustrine clay. A thin layer of muskeg is present in some areas. Isolated pockets of glacio-fluvial sands occur as illustrated on the schematic cross-section, Figure 5.8.

5.3.1.3 Monitoring Network

There are currently three monitoring wells located on the north and west sides of the MLSB (Figure 5.9 and Table 5.7). These wells are installed in the Cretaceous Clearwater Formation (Syncrude lithofacies K_{cc}). Chemical analyses of water from these wells were completed in accordance with AENV requirements for the tailings areas (Appendix A).

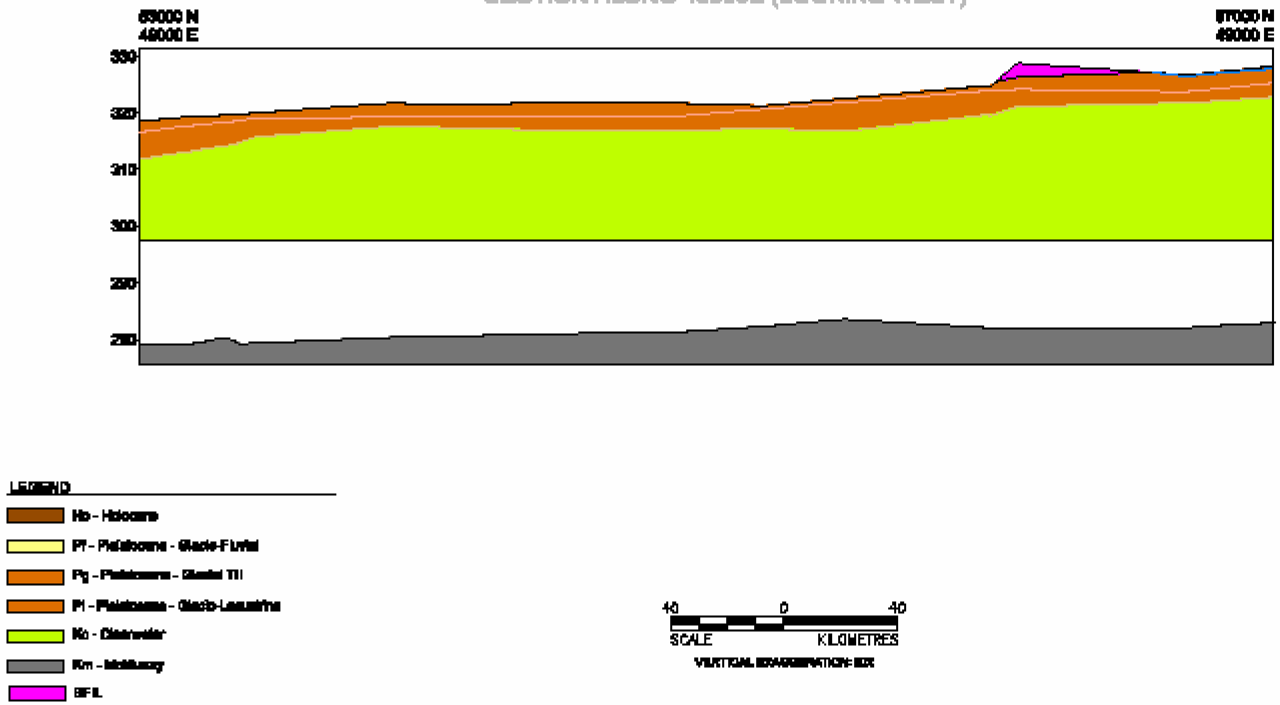
Monitoring west of the MLSB is limited for several reasons. The hydraulic conductivity of the various geologic units is relatively low, thus the risk of significant migration of process water is low. In addition the general hydraulic gradient is from west to east. The area that would experience process-affected water would be limited to the toe of the MLSB. This area will eventually be mined out as the North Mine advances (see final mine limits on Figure 5.9).

Table 5.7: Location of Monitoring Wells, North and West of MLSB

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
OW92-05	57896	49385	326.5	8.5	10.1	KCC
OW92-06	58989	50000	320.3	8.5	10.1	KCC
OW92-08	58690	52002	307.3	8.5	10.0	KCC

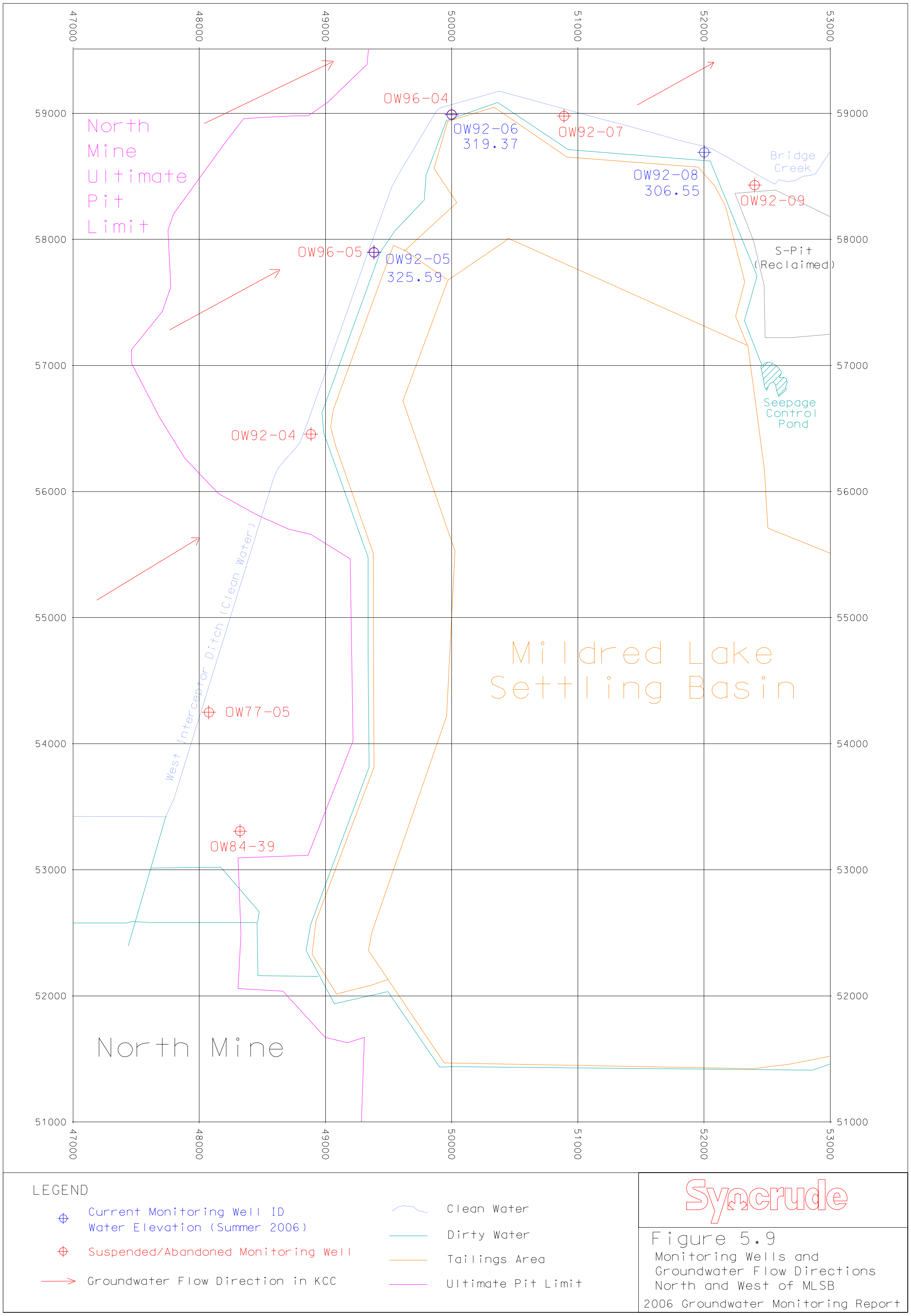
Notes: KCC = Cretaceous Clearwater formation
Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system

Figure 5.8: SCHEMATIC CROSS-SECTION, WEST OF MLSB
SECTION ALONG 49000E (LOOKING WEST)



L:\2006\1348\06-1348-003\3000\Cross-sections\Fig 5-8 Section 49000E West (53000N - 57000N).dwg Aug 30, 2007 - 2:51pm

Figure 5.9: Monitoring Wells and Groundwater Flow Directions, North and West of MLSB



5.3.2 Results and Discussion

Major ion concentrations and other key chemical parameters from 2007 sampling program are summarized in Table 5.8. The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included in Appendix C.

Hydrogeologic conditions north and west of the MLSB are dominated by aquitards with hydraulic conductivities estimated to be less or equals $1x10^{-7}$ m/s. Glacio-fluvial sands occur only in isolated pockets. Natural groundwater flow is in a northeasterly direction following the topography of the area. Locally around the MLSB, shallow groundwater flow is expected to be outward from the tailings structure. Seepage ditches are designed to intercept this outward flow.

Detailed interpretations of the groundwater flow directions are not possible with the limited groundwater-monitoring network within this area. Figure 5.9 shows 2007 water elevations and estimated directions of groundwater flow.

The concentrations of major ions, selected metals and naphthenic acid generally indicated a reducing trend in 2007 including total dissolved solids (TDS) at OW92-05, OW92-06 and OW92-08. In general, the concentration of TDS appears to increase with depth in the cretaceous clearwater formation. Moreover, these high concentrations from the natural geo-chemistry appears to contribute to the increased level of concentration experienced towards the tailings area because the groundwater flow direction is from undisturbed areas to the tailings area and the increased trend occurs up-gradient before the tailings area.

Table 5.8: Summary of Key Chemical Parameters, North and West of MLSB

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Ca	Na
OW92-05	10-Jul-07	1930	8.1	818	203	117	66.3	317
OW92-06	10-Jul-07	10000	8.1	1270	2980	< 0.5	27.4	2150
OW92-08	10-Jul-07	4780	8	1530	72	1340	68.7	1080

Abbreviations:

Cond – Conductivity (µS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Na – Sodium (mg/l), “ - “ not analyzed

* – Duplicate Sample

5.3.3 Recommended Sampling Schedule for 2008

There are no changes proposed for this area in 2008. Annual monitoring of OW92-05, OW92-06 and OW92-08 will continue with analysis completed as per AENV requirements for the tailings area.

5.4 Mildred Lake Reservoir Area

5.4.1 Background

5.4.1.1 Area Description

There are several contractors who provide services to Syncrude with their facilities located on the east side of the Mildred Lake Reservoir (MLR). Highway 63 wraps around the southwest and north sides of the reservoir, while Syncrude's airstrip is located east of Highway 63 on its northeast side. The Syncrude plant site and the Northeast Pond (NEP) are situated on the west and south sides of the reservoir that is utilized as a water intake reservoir for the operation. In 2007, 35.95 million cubic meters of water were imported through the reservoir.

5.4.1.2 Geology

A thin layer of Quaternary deposits, generally less than five meters thick, covers the Clearwater Formation around the MLR. The Quaternary deposits consist of glacio-fluvial sand and/or glacial till. A thin layer of muskeg covers the Pleistocene units in some areas. The glacial till is a sandy-silt to a silty-sand. The lower member of the Clearwater Formation (Wabiskaw Member) underlying the till is an interbedded, glauconitic, fine to medium grained, silty, clayey sand.

5.4.1.3 Monitoring Network

The groundwater monitoring network around MLR consists of three wells east of the reservoir and three wells west of the reservoir. Installation details are summarized in Table 5.9 and locations shown on Figure 5.10. The geology of the screen interval for OW87-03 and OW87-05 has been estimated based on water chemistry from these wells, as well as the geology of the surrounding auger holes and test pits. OW87-03 appears to be screened in glacial till, and OW87-05 in glacio-fluvial sand.

Chemical analyses were completed in accordance with AENV requirements for the tailings area (Appendix A).

Table 5.9: Location of Monitoring Wells, MLR Area

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
OW86-09	49571	55271	310.9	4.6	6.1	Till
OW87-03	50707	54368	307.6	4.6	6.1	Till*
OW87-05	50080	55188	316.1	-	-	Sand*
OW99-09A	51134	53116	307.0	2.1	3.7	Sand
OW99-09B	51138	53115	307.1	6.1	7.6	Sand
OW99-10	50794	53368	310.4	4.6	6.1	Sand
OW05-04	50526	53585	309.3	0.6	1.5	Sand

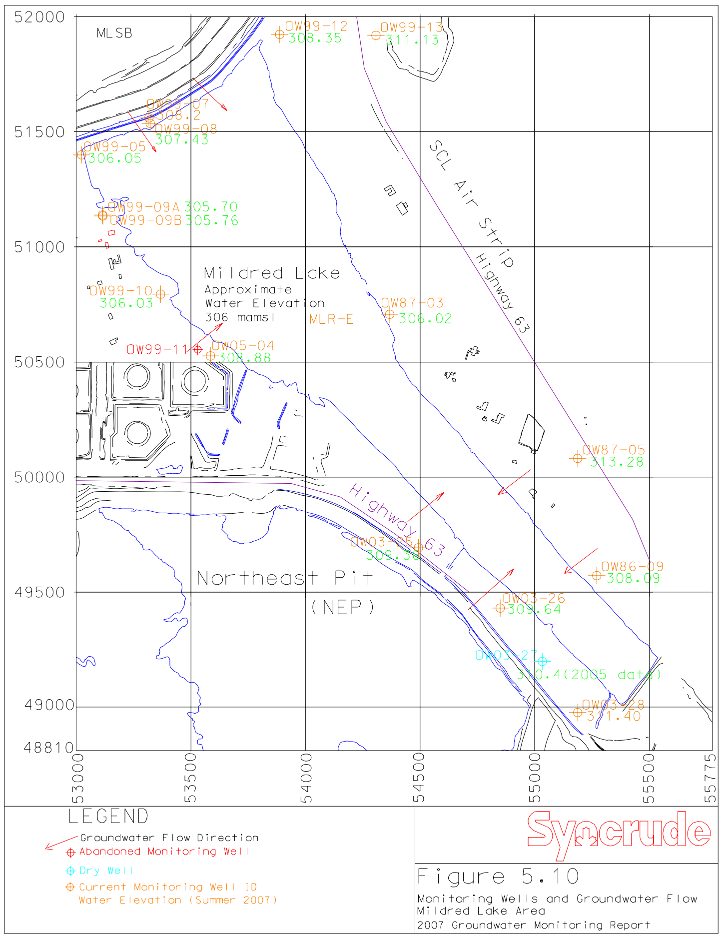
Notes: Sand = Glacio-fluvial sand
Till = Glacial till
Oilsand = Cretaceous McMurray Oilsand
Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system
* Lithology estimated based on water chemistry

5.4.2 Results and Discussion

The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. A summary of key parameters is provided in Table 5.10.

The surficial glacio-fluvial sand is the most significant hydrogeologic unit in the area with the greatest potential to allow contaminant transport. This sand is generally thin and not always saturated. The till and underlying Clearwater and McMurray Formations have significantly lower hydraulic conductivity than the sand.

Figure 5.10: Monitoring Wells and Groundwater Flow, Mildred Lake Reservoir Area



The approximate water elevation in the MLR was 306.5 (mamsl) at the time the readings were taken. Water elevations taken at the time of sampling at the monitoring wells around MLR are shown in Table 5.10. Shallow groundwater flow within the glacio-fluvial sand is generally toward the reservoir (Figure 5.10).

Most of the monitoring wells around MLR indicate that groundwater conditions are generally consistent with historical trends. At the southeast end of the reservoir, OW86-09 indicated a reduction in the concentration of major ions and selected metals in 2007 while OW87-05 and OW87-03 increased slightly in concentration of major ions, which may be due to the higher hydraulic conductivity of the sandy aquifer. Monitoring well OW91-12 was damaged and will be replaced in 2008.

On the west side, OW99-10 showed increases in major ions while the naphthenic acid reduced. This is similar to that found in other areas where dewatering activities are occurring, or simply where the water table has been brought below its natural level for a period of time. However, there is a relative reduction when these key parameters are compared to 2004 data. The interaction of the groundwater with the natural geochemistry within the zone might have resulted in the spike of these constituents as the water returns to its natural elevation. The concentration of the key parameters at OW99-09A, OW99-09B and OW05-04 within the same area reduced and this is similar to the historical trend.
The monitoring of these wells will continue in 2008.

Table 5.10: Summary of Key Chemical Parameters, MLR Area

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Ca	Na	TDS	Water Elevation*
OW86-09	29-Jun-07	1140	7.8	240	218	62.6	113	56	780	308.09
OW87-03	29-Jun-07	1070	8.2	604	54	35.1	58.6	158	630	306.02
OW87-05	29-Jun-07	2240	8	753	391	64.4	204	117	1410	313.28
OW99-09A	04-Jul-07	494	8	280	12	21.6	67.1	22	310	305.70
OW99-09B	04-Jul-07	577	8	298	20	39	79.2	17	370	305.76
OW99-10	04-Jul-07	2820	7.7	621	363	574	377	166	2070	306.03
OW05-04	04-Jul-07	697	8.1	483	1	4.8	70.5	41	430	307.88

Abbreviations:

Cond – Conductivity (μS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Na – Sodium (mg/l), TDS – Total Dissolved Solids (mg/l)

* Reservoir elevation approximately 306.5 m

** Resample

5.4.3 Recommended Sampling Schedule for 2008

Sampling will continue for all wells around MLR and the analysis will be completed in accordance to AENV requirements for the tailings area.

5.5 Sulphur Blocks

5.5.1 Background

5.5.1.1 Area Description

The sulphur block area is located in the northwest part of the plant area and south of the MLSB. The Phase I sulphur block facility was constructed immediately west of the tailings road, east of the Coke Cell 4 on a compacted clay pad. The Phase II sulphur block facility is located on top of the Coke Cell 4. Coke Cell 4 was capped with compacted clay fill to isolate the coke from the sulphur block. Shallow ditches around the sulphur blocks carry runoff to the north mine ditch, which flows into the recycle water pond. Peripheral trapezoidal ditches were provided on the circumference of the sulphur blocks. Most sections of the drains are provided with geo-membrane liner, which is placed on a well-compacted clay base.

In 2004, construction of the east half of the Phase III sulphur block pad was completed and it is located to the west of the Coke Cell 4, within the eastern mined-out portion of the North Mine (Figure 5.11). The engineered foundation was constructed of a combination of mine waste, rejects and Clearwater clay in compacted lifts. Pouring on the sulphur block foundation commenced in late 2004, comprising of east and west (phase III) sulphur blocks.

5.5.1.2 Additional Research Initiatives

In May 2004, Syncrude applied to the AENV to begin a second sulphur storage research program designed to refine, gather data and investigate the feasibility of storing sulphur long-term below ground. This research program builds on experience gained from the first sulphur research storage program started in 1999 with the pouring and covering of two smaller blocks adjacent to the northwest corner of MLSB.

Approval for this second research program was obtained in December 2004 to pour 4 pilot blocks, each 23m x 23m x 3m (approximately 3,000 tonnes each). The research sulphur block program commenced in 2005 with the blocks located immediately to the south of the Phase III (Figure 5.11) production sulphur block and both are instrumented with piezometers, standpipes, gas probes, settlement plates, multi-port sampler, lysimeter and thermistors. The pilot four blocks were poured by trucks in the first half of 2005 and then covered with varying thicknesses of soil material. The present research program is being conducted with support from the University of Saskatchewan and monitoring is in progress. A prototype of the buried block was located close to the pilot blocks.

5.5.1.3 Geology

In the sulphur block area for Phases I and II, the Clearwater Formation is thin, covered by glacial till and underlain by McMurray Formation oilsand. Isolated glacio-fluvial sand deposits also occur. Various fills have been placed over the insitu material during the construction of the coke cells, sulphur pads, and roads. Figure 5.12 shows a schematic cross-section through this sulphur block area.

The Clearwater Formation, glacial till and McMurray Formation of the Phase III sulphur block area have been mined out to the limestone elevation. The engineered foundation was then constructed over the base of the mined-out pit using of a combination of mine waste, rejects and Clearwater clay. Lifts were placed in compacted thicknesses of 5m, 2m, 1m and 0.75m to minimize deformation and to provide a low permeability (63m thick) foundation for the sulphur blocks. A veneer of K_{CW} clay and McMurray Formation Marine clay material and liners were included in the upper portion of the foundation. Figure 5.13 shows a schematic cross-section through the Phase III sulphur block area.

5.5.1.4 Monitoring Network

There are six monitoring wells located around the Phase I and II sulphur blocks. Six vibrating wire piezometers (VP's) were also installed in 2003, within local basal muds, watersands and the compacted fill zones of the constructed platform, at three locations to the west of the Phase III sulphur block (Table 5.12 and Figure 5.11). Additional three VP's were installed in 2007 to provide adequate instrumentation for groundwater purposes. So far, these instruments have shown steady and un-saturated conditions since installation, with the exception of one installed below a watersand unit. One vibrating wire piezometer located at the toe of the constructed platform, has the least amount of coverage that reads a partially saturated condition (VP030046-1) where the water table is equivalent to the elevation of the watersand unit (Appendix C).

It is expected that the Phase III instrumentation will continue to indicate dry conditions for an extended period of time, due to the low permeability of compacted fill materials in which the piezometers are installed. This is typical of readings measured in Syncrude's compacted overburden dykes and dumps. It is suggested that observation wells may not be installed in the Phase III area until such time that piezometric levels begin to rise and then the installation of a groundwater monitoring well will be necessary. This will specifically be after water begins to infill the well for sampling, then monitoring of groundwater flow patterns will commence once the piezometric levels have risen.

Existing wells are listed in Table 5.11 and shown in Figure 5.11. The wells are installed in a variety of insitu and fill materials. Chemical analyses were completed on the wells in accordance with AENV requirements for the Phase I and II sulphur areas.

Table 5.11: Location of Monitoring Wells, Sulphur Block Areas

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
SMW92-03R	51193	50566	303.2	2.8	4.3	Muskeg/KM
SMW92-04	50715	50519	305.7	1.4	2.9	Muskeg/Till
SMW92-06	50893	50733	305.7	1.5	4.5	Sandy fill/KM
SMW94-01	51233	50227	308.1	8.5	10	Muskeg/Sand
SMW94-02	50742	50211	305.7	4.6	6.1	Sand
SMW02-01	51303	50601	304.8	7.4	9.0	KM

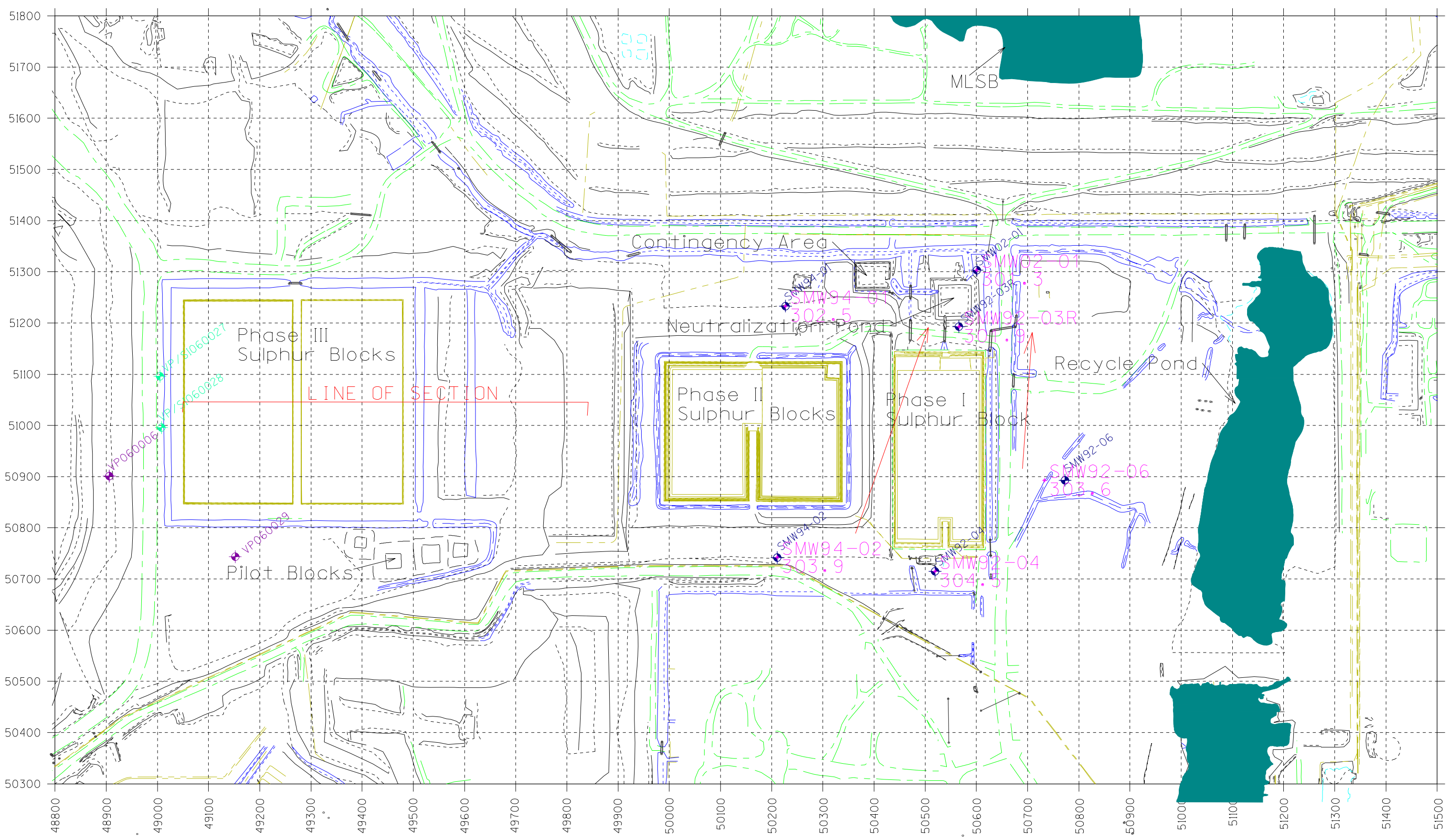
Notes: Sand = Pleistocene sand
KM = Cretaceous McMurray Formation
Till = Pleistocene till
Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system

Table 5.12: Location of Vibrating Wire Piezometers, Phase III Sulphur Block Area

Well ID	Northing	Easting	Ground Elevation	Tip Elevation	
				Depth	Lithology
VP030046-1	51299	48137	256.7	10.7	Overbank Mud
VP030047-1	51237	48359	267.4	20.0	Insitu KM
VP030047-2	51237	48359	267.4	13.9	Kc Fill
VP030048-1	50900	48291	266.0	23.1	Basal Watersand
VP030048-2	50900	48291	266.0	17.6	Overbank Mud
VP030048-3	50900	48291	266.0	9.4	KM/Kc Fills contact
VP060006-1	50900.85	48906.13	305.175	16.11	Fill/core
VP060006-2	50900.85	48906.13	305.175	46.12	Fill/core
VP060006-3	50900.85	48906.13	305.175	60.71	Pond Mud
VP060027-1	51096.06	49004.96	316.61	68.3	Pond Mud
VP060027-2	51096.06	49004.96	316.61	71.93	Pond Mud
VP060028-1	50996.0	49007.71	316.19	67.05	Watersand
VP060028-2	50996.0	49007.71	316.19	71.63	Pond mud
VP060029-1	50743.46	49152.02	316.20	3.05	Settlement Liner Lift
VP060029-2	50743.46	49152.02	316.20	7.62	Buffering Liner Lift
VP060029-3	50743.46	49152.02	316.20	23.77	Controlling Liner Lift

Notes: KM = Cretaceous McMurray Formation
Kc = Clearwater clay
Piezometric tip elevations are in metres below ground
Coordinates are in the Syncrude mine metric system

Figure 5.11: Monitoring Wells and Groundwater Flow Directions, Sulphur Block Area



Note:
All Vibrating wire piezometers listed in Table 5.12 are west of the drawing extents near the toe of the platform built to support the Phase III Blocks

LEGEND

SMW92-06 - Monitoring Well with Water Elevation

VP060029 - Vibrating Wire Piezometer; **SI060028** - Slope Indicator Instrument

Figure 5.12: Schematic Cross-Section, Phases I and II Sulphur Block Area

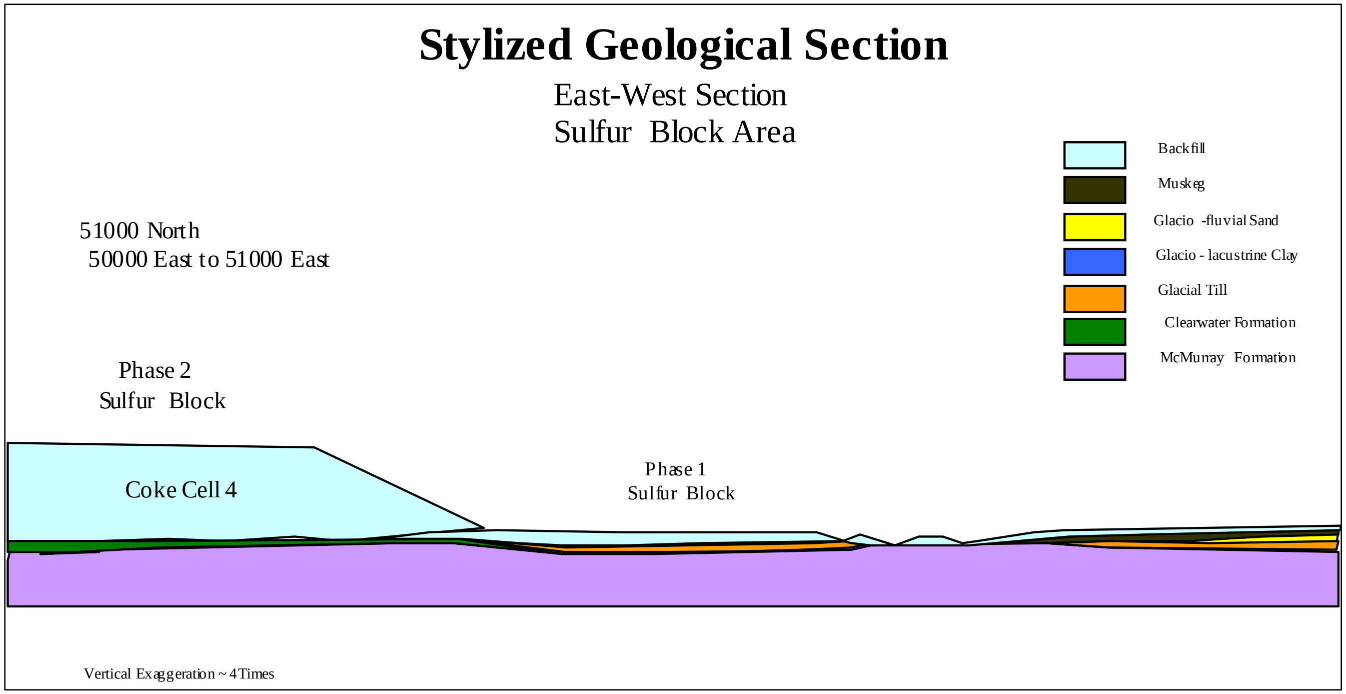
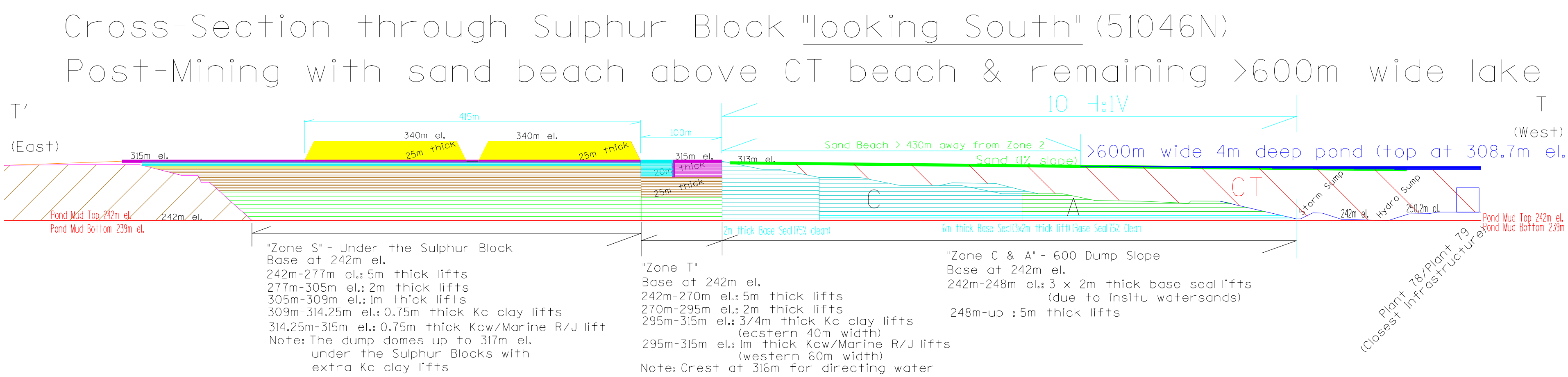


Figure 5.13: Schematic Cross-Section, Phase III Sulphur Block Area



5.5.2 Results and Discussion

The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. A summary of key chemical parameters is provided in Table 5.13.

The various fill materials, ditching, holding ponds, and coke cells complicate the hydrogeological conditions in the sulphur block area. The principal reason for monitoring groundwater in this area is to identify the impacts that the sulphur blocks have on groundwater quality.

Ditching and holding ponds are provided around the Phase I, II and III sulphur blocks and these are linked to a secondary drain that empties to an existing neutralization pond via an existing ditch. The open trapezoidal ditches (drains) are founded on well-compacted (subgrade) clay that maintained a side slope of 3H: 1V. This is overlain with 100mm (PF_4) sand and compacted to 95% standard proctor density. The perimeter drains run along the sides of the sulphur blocks while the drains at Phase III sulphur block were lined with a minimum of 60-millimeter thick geo-membrane and overlain at the bottom-width section of the drain with a non-woven geo-textile material. The flow gradient in the drain is at about 0.5% at most sections. General groundwater flow directions and water elevations from 2007 are shown on Figure 5.11.

The primary risk to groundwater quality around the sulphur storage area is a reduction in pH. To date, there has been no reduction in the pH of the groundwater that would indicate an acidic influence from sulphur storage. In fact, commencing in 2000, the pH began to climb from an average of 6.8, increasing to an average of 7.6 over the past two years in the area. Generally, the pH of the runoff water from the sulphur blocks is very close to neutral pH value in 2006, which indicated a major improvement from 2005 values. If the pH of the groundwater is reduced, there is a potential to mobilize metals that are stable at reduced pH levels. In 2007, almost all the wells are in close to neutral pH except SMW92-03R, which reduced by 0.02 to a pH reading of 7.2. However, the concentration of major ions and the selected metals reduced at this well still confirms the stability of the metals at the well. Also, the concentration of major ions and selected metals at other locations reduced except at SMW92-06, which indicated an increase in sulphate concentration which calls for an increased house keeping within this area. Syncrude have intensified the maintenance of the sulphur block areas and the geo-membrane lined drains, which appear to have attenuated the high sulphate concentration at most section within the sulphur area.

Further comparison of the 2006 and 2007 data continues to improve in concentration from well to well when compared to the trend in the past. Groundwater monitoring well SMW94-02 was repaired in 2007 and read accordingly. The monitoring well SMW94-02 that was damaged will be repaired in 2008.

Table 5.13: Summary of Key Chemical Parameters, Sulphur Block Area

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Ca	Na	TDS	As
SMW92-03R	07-Jul-07	6530	7.2	1820	84	2890	615	971	5870	0.0089
SMW92-04	07-Jul-07	1500	7.9	423	44	460	216	98	1110	< 0.0004
SMW92-06	07-Jul-07	1620	7.6	703	73	304	242	48	1130	< 0.0004
SMW94-01	07-Jul-07	1450	7.7	745	94	98.2	113	174	900	0.0005
SMW94-02	29-Nov-07	1500	7.4	737	88	85.1	124	165	941	0.0006
SMW02-01	07-Jul-07	1310	7.9	967	2	2.1	13.6	314	850	< 0.0004

Abbreviations:

Cond – Conductivity (µS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Na – Sodium (mg/l), TDS – Total Dissolved Solids (mg/l), As – Arsenic (mg/l), " - " not analyzed

5.5.3 Recommended Sampling Schedule for 2008

Annual sampling of all wells listed in Table 5.11 will continue in 2008. All wells will be sampled with analysis completed in accordance to AENV requirements.

5.6 Southwest Sand Storage Facility

5.6.1 Background

5.6.1.1 Area Description

The Southwest Sand Storage Facility (SWSS) footprint covers approximately twenty-six (26) square kilometers. Currently, only one tailings line transports the coarse tailings slurry from the extraction plant to the SWSS. A perimeter road runs along the west, north, and east sides of the SWSS. A dirty water ditch is located between the toe of the SWSS and the perimeter road. Tailings pump-houses are located on the north and east sides of the SWSS along the perimeter access road. The SWSS decant system carries water and fines from the south end of the SWSS through a gravity-flow pipeline to the WIP.

The external sump, located northeast of the SWSS, still holds tailings sand, although it is no longer in use. Syncrude Closure and Reclamation group started to place sand in the small compartment of the external sump in an attempt to cap the MFT material in preparation for future reclamation work. The placement of the sand in the external sump started in late November and is on-going. The western half of this structure has been reclaimed. The AOSTRA Road passes around the south end of the SWSS. The Special Waste Interim Storage Area (SWISA) is located just east of the east perimeter road. The SWISA site is discussed in Section 5.7 of this report. North of the SWSS is the W1-Dump, a disposal area for overburden material being removed in the North Mine. The W1-Dump is expanding and will eventually cover the north portion of the SWSS perimeter road and will butt into the northeast corner of the SWSS tailings dyke.

5.6.1.2 Geology

The geologic sequence found below the SWSS typically consists of muskeg, glacio-lacustrine clay, till, Clearwater Formation clays, and McMurray Formation oilsand. North of the SWSS, a buried glacio-fluvial channel is incised into the Clearwater Formation and underlies the till. An east-west cross-section north of the SWSS is shown in Figure 5.14.

The glacio-fluvial sand and gravel north of the SWSS are heterogeneous. The deposit consists of lenses of well- to poorly-sorted silt, sand, and gravel. The till varies in thickness from one to ten meters across the area. The till is typically a silty-clay, however it may contain lenses of glacio-fluvial sand up to one meter thick. A glacio-lacustrine clay unit overlies the till in most of the area. The clay has a lower sand and gravel content than the underlying till. A thin layer of muskeg covers most of the area with thicker deposits in topographically low areas.

5.6.1.3 Surface Water Source

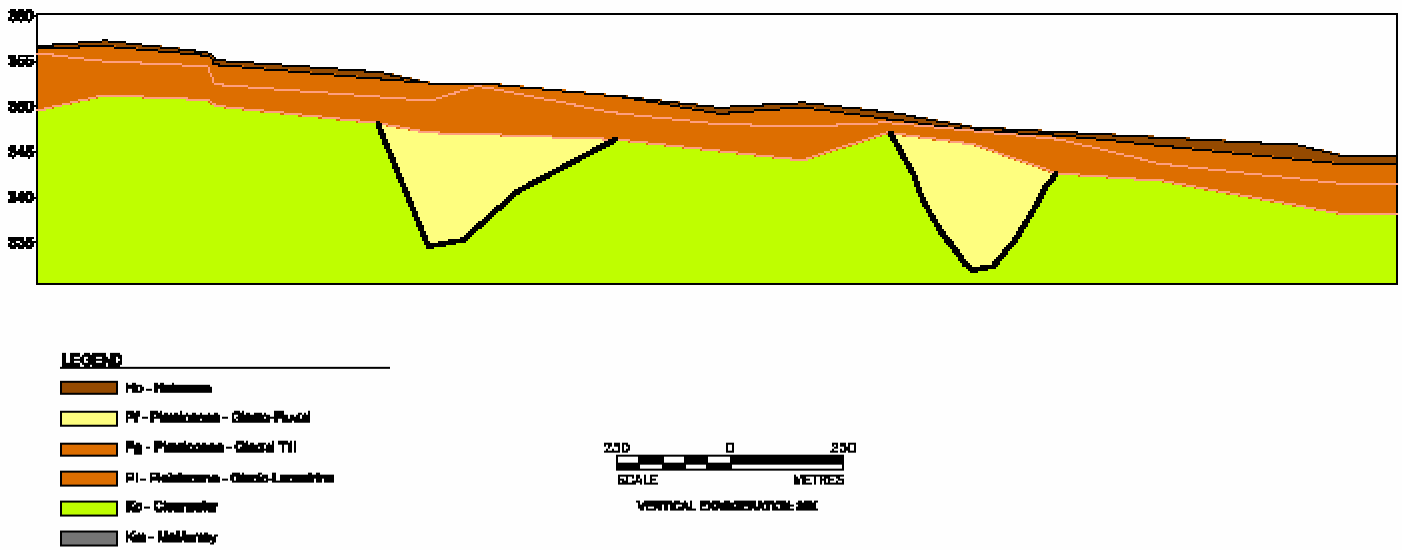
As discussed in Section 5.1, two surface water samples are taken in 2007 from - one from the pond (SWSS-DC) and from the off-take (DFW-3101) both located at the north end of the facility to represent seepage water chemistry coming from the SWSS. The concentrations of the major ion and naphthenic acid decreased at SWSS-DC except for sodium which slightly increased while sodium, chloride and bicarbonate slightly increased at the off-take DFW-3101.However, naphthenic acid concentration decreased at this source.

5.6.1.4

5.6.1.5 Monitoring Network

There are currently twenty active monitoring wells located around the SWSS (Table 5.14). Four additional wells are located around the nearby SWISA, which are discussed in Section 5.7. Chemical analyses were completed in accordance with AENV requirements for the tailings areas (Appendix A).

Figure 5.14: SCHEMATIC CROSS-SECTION, NORTH OF SWSS
SECTION ALONG 51000N (LOOKING NORTH)



L:\2006\1346\06-1346-003\3000\Cross-sections\Fig 5-14 Section 49800 North-20X.dwg Aug 30, 2007 – 2:54pm

Table 5.14: Location of Monitoring Wells, SWSS Area

Well ID	Northing	Easting	Ground Elevation	Screen Interval			Comments
				Top	Bottom	Lithology	
KL89-01B	49881	42730	353.8	5.7	7.2	Sand	
OW91-07A	50499	43193	349.3	6.1	7.6	Till/Sand	
OW91-10R	48387	44006	350.3	8.5	9.8	Till	
OW91-11	48168	44558	345.0	5.5	7	Till	
OW91-12	45142	48049	340.7	4	5.5	Till	
OW91-13	47627	44372	349.7	4.6	6.1	Clay/Till	
OW91-15	46553	43973	352.4	5.5	7	Till	
OW91-16	46145	43847	353.7	7	8.5	Till	
OW92-01A	44577	43272	364.2	4.4	5.9	Till	
OW92-02A	44186	43154	366.4	4.3	5.8	Till	
OW92-03A	43683	42997	370.7	3.3	4.8	Till	
OW94-09	42820	42666	374.1	3.7	5.2	Clay/Till	
OW96-01	48949	39622	370.2	11.3	12.8	Till	
OW96-02	50101	42904	351.7	11.4	12.9	Sand	
OW98-14	45622	43667	356.2	6.4	7.9	Till	Replaced OW91-17
OW98-15	49803	41299	360.5	8.4	9.9	Sand	Replaced OW91-01A
OW99-29	47898	39328	373.6	2.7	4.3	Till	
OW99-30	46901	39050	381.0	3.1	4.6	Till	
OW99-31	45899	38752	390.4	4.6	6.1	Till	
OW03-23	42121	41445	385.5	2.9	4.4	Clay	

Notes: Till = Pleistocene till
Sand = Pleistocene fluvial sand
Clay = Pleistocene lacustrine clay
Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system

5.6.2 Results and Discussion

The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. A summary of key chemical parameters for the monitoring wells is provided in Table 5.15.

The glacio-lacustrine clay deposit present in most areas has a low hydraulic conductivity (10^{-8} to 10^{-10} m/s). This minimizes the risk of process water influencing groundwater quality around the SWSS. The hydraulic conductivity of the underlying till has been estimated at 10^{-9} m/s, however this unit has a more variable grain size, consequently higher hydraulic conductivity may be expected at some areas.

The buried Pleistocene channel north of the SWSS is the most significant hydrogeologic feature in this area, having a hydraulic conductivity in the range of 10^{-4} to 10^{-5} m/s. Overall groundwater flow around SWSS is toward the northeast, following the topography. Locally around the SWSS, there may be flow outward from the tailings structure. It is expected that the toe ditch will intercept shallow flow.

Within the buried glacio-fluvial channel, the flow is southeasterly through the western portion, and then it follows the channel toward the northeast, then west. Artesian conditions are present through much of the channel. A portion of the G-Pit channel northeast of the SWSS is currently used as a source of granular material. Dewatering of the channel began in 1999 and it is still on-going, with a view to reduce the pressure within the aquifer. In 2008 Syncrude plans to install 9 dewatering wells and 6 piezometers at the north and south limbs of the G-Pit channel in line with mine plan. Figure 5.15 shows water elevations observed in 2007 and the interpreted groundwater flow directions.

Table 5.15: Summary of Key Chemical Parameters, SWSS Area

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Ca	Na	TDS
KL07-01B	09-Nov-07	1920	7.8	844	157	163	170	197	1200
OW91-07A	12-Jul-07	2160	7.9	1140	132	150	145	312	1430
OW91-07B	Damaged								
OW91-10R	27-Jun-07	4130	8.2	1400	299	702	13.6	941	2750
OW91-11	26-Jun-07	1640	8.1	925	32	133	46.2	299	1140
OW91-12	11-Sep-07	3590	7.6	703	208	1270	353	423	2880
OW91-13	26-Nov-07	3030	7.4	1140	13	989	376	160	2600
OW91-15	27-Jun-07	3560	8	1330	156	700	34.7	706	2410
OW91-16	27-Jun-07	3690	8.2	1770	282	245	6.4	838	2410
OW92-01A	27-Jun-07	4440	7.9	655	9	2230	372	621	3840
OW92-02A	02-Aug-07	4970	8	1150	43	1850	65.5	1070	4140
OW92-03A	27-Jun-07	4220	7.9	968	38	1850	273	559	3550
OW94-09	27-Jun-07	2860	8	722	9	1030	231	342	2230
OW96-01	28-Jun-07	3330	8.2	1430	9	710	33.9	803	2340
OW96-02	28-Jun-07	1450	8	865	20	105	106	187	870
OW96-02	28-Jun-07	1450	7.9	863	20	103	105	188	880
OW98-14	Dry								
OW98-15	28-Jun-07	845	7.8	572	2	16.4	117	23	500
OW99-29	28-Jun-07	1630	7.8	725	2	346	143	207	1120
OW99-30	29-Jun-07	3400	7.7	830	10	1360	273	447	2760
OW99-31	28-Jun-07	1200	8.4	738	4	43	2.7	304	750
OW03-23	12-Jul-07	1410	8	908	5	97.5	73.9	203	916

Abbreviations:

Cond – Conductivity (µS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Na – Sodium (mg/l), TDS – Total Dissolved Solids (mg/l), " - " not analyzed

* Duplicate Sample

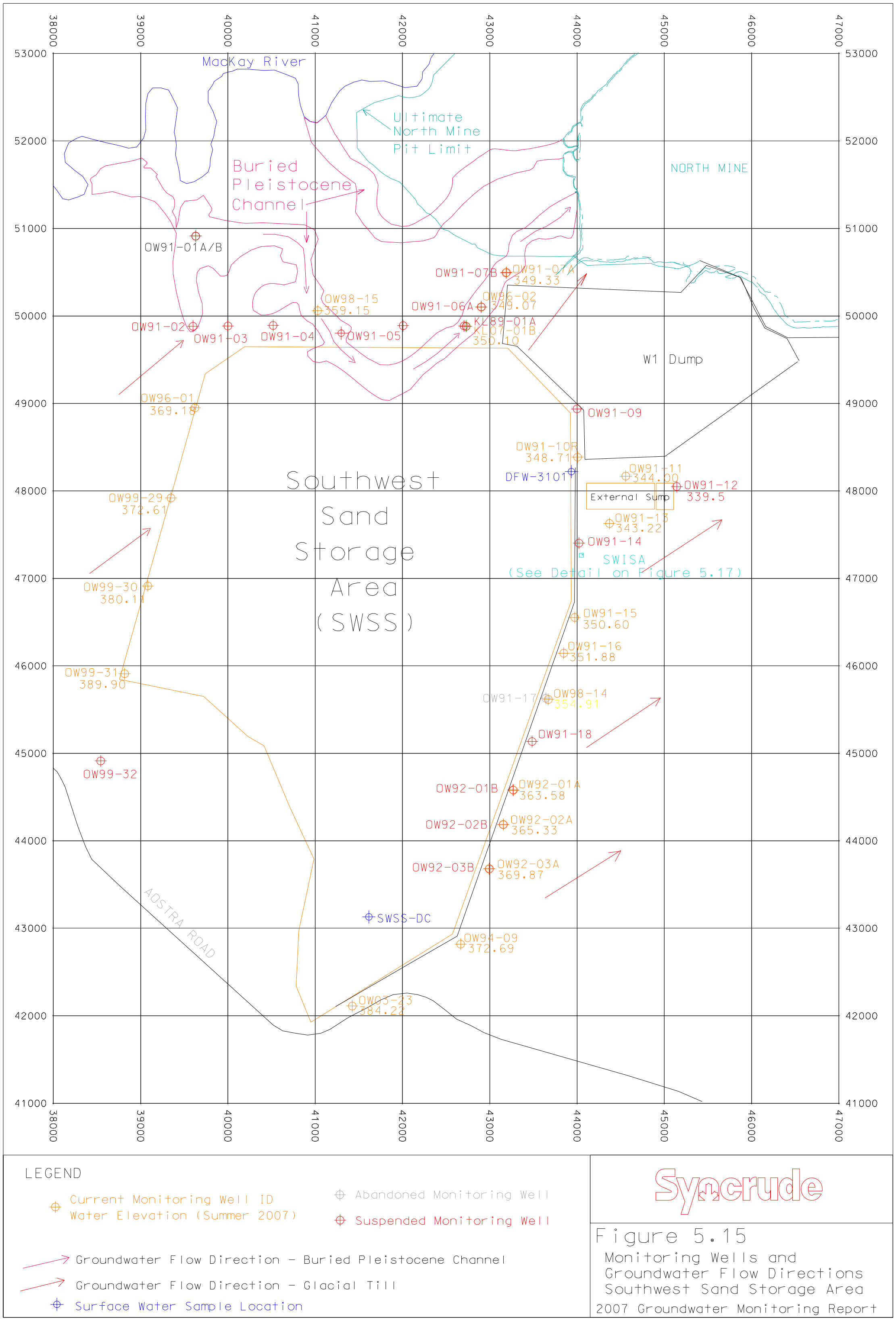
There are three active monitoring wells located within the buried channel northeast of the SWSS. OW96-02 and OW91-07A, OW91-07B and KL07-01B (which replaced KL89-01B). These are located at 600m and 1100m respectively from OW96-02 (northeast of the SWSS). Monitoring wells OW91-07B would be replaced in 2008 due to obstructions within the area.

The concentrations of chloride in the three sampled wells OW96-02, OW91-07A and KL07-01B reduced generally in 2007 and the concentrations of major ions in these wells are below the concentrations the in Syncrude's process water. In addition, any suspected seepage into this channel flows toward the gravel pit, where it is captured by dewatering and retained on site.

As most of the G-Pit channel will be mined out as the North Mine advances west, seepage into the south and north limbs of the buried channel will exhibit an hydraulic gradient towards the opened G-Pit /exposed mine pit area which (naturally flows toward the pit and away from MacKay river) will be dewatered into our dirty water system as dictated by the water quality. Moreover, there is no hydraulic connection between Mackay River and the buried G-Pit (south limb) channel, which can be confirmed from past studies.

Monitoring well OW98-15 is located approximately 150 meters northwest of the SWSS, within the buried channel. This well was installed in 1998 to replace OW91-01A, also located in the buried channel, but further from the SWSS. Results from 2006 and 2007 indicated a reduction of the major metals and this is consistent with the past years. This goes to represent a general water quality in the buried channel since it is an upstream monitoring well that serves as the background quality within the G-Pit area while OW98-15 shows no influence from the SWSS.

Figure 5.15: Monitoring Wells and Groundwater Flow Directions, SWSS



The groundwater well OW99-30 is installed at the upstream to the groundwater flow direction at the southwest location of the SWSS. This well has a high concentration of sulphate while OW99-31 has a lower concentration of major ions in the same vicinity. This confirms that the background groundwater chemistry in glacial till around the SWSS varies significantly, which appears to be the result of the variability in the composition of the till and of the hydraulic conductivity. The monitoring wells in the zones of higher hydraulic conductivity tend to have lower TDS and this is comparable with past trends.

In 2004 well OW91-12 indicated a gradually increase in chloride concentration. It was unclear at that time if the change in chemistry could be linked to seepage of process affected water, as concentrations remained low and the neighboring external sump has not been active for years. Reclamation that commenced in 2005 is on-going at the sump close to the monitoring well OW91-12 and this well has indicated a slight increase in 2007 when compared to 2004. Since this well had started to contain water again, it might be necessary to continue to monitor this trend over some time period in subsequent sampling program. This will indicate the prevailing groundwater quality in the area.

The groundwater chemistry around the SWSS as indicated by other monitoring wells not specifically discussed, are consistent with historical data. These show no indication of influence from process water.

5.6.3 Recommended Sampling Schedule for 2008

Due to the continuing expansion of the W1-Dump, Syncrude has replaced well KL89-01B that was damaged with KL07-01B and OW91-07B will be replaced in 2008.

Annual sampling of all the wells will continue as per AENV requirements for the tailings area.

5.7 Class II Flue Gas Desulphurization (FGD) By-Products Landfill

5.7.1 Background

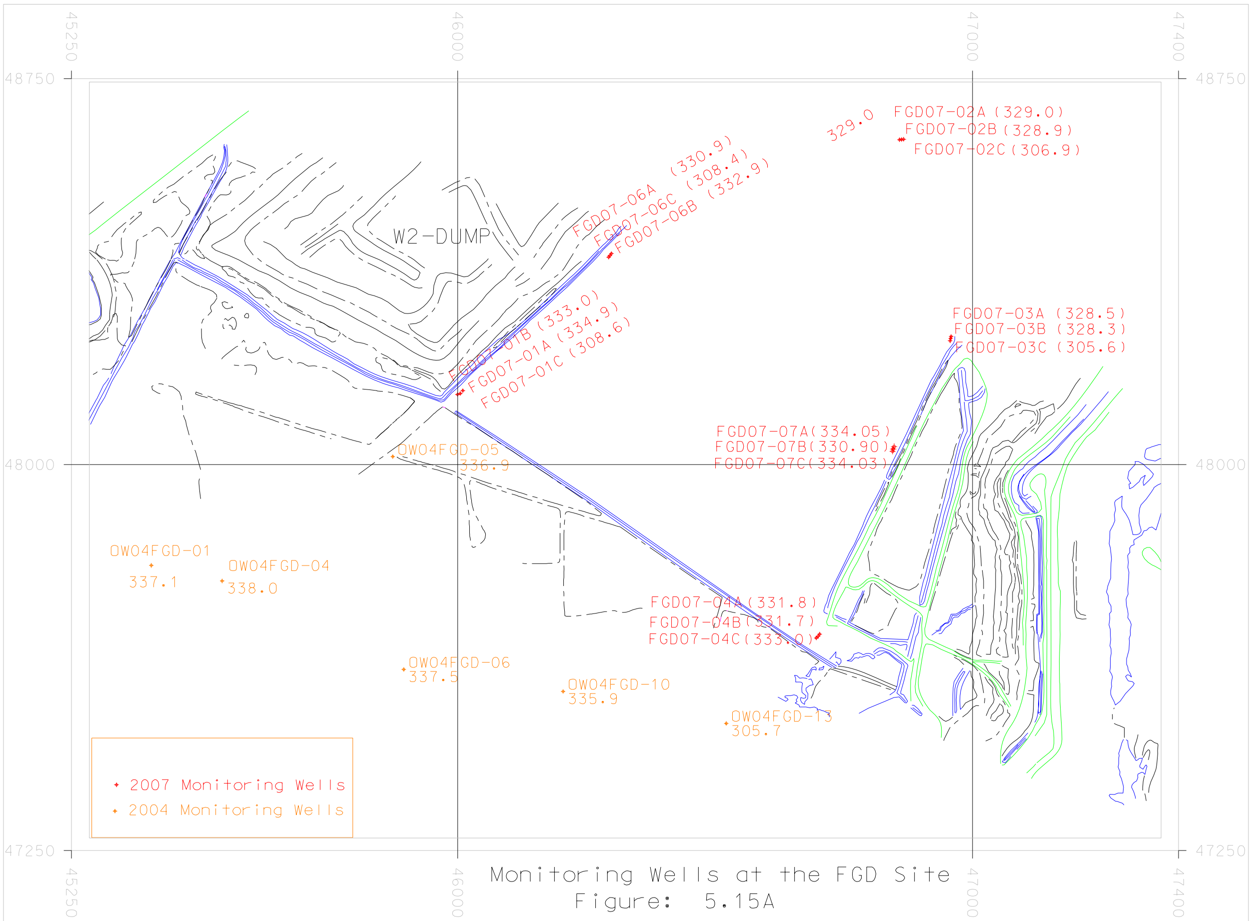
5.7.1.1 Area Description

Syncrude plans to operate a new flue gas de-sulphurization (FGD) project, which is part of its emission reduction project. The FGD by-product consists of moisture-conditioned, silt –sized powdery material that is to be transported and compacted within the proposed landfill site. The by-product will be placed in a proposed landfill (110 hectares) located between eastern side of SWSS (300m away) and the overburden dump W2. The proposed landfill shall be founded on a 3m thick clay liner underlain by another 3m reconstituted native clay, placed and compacted in lifts to prevent contaminant migration. Syncrude would carry out a groundwater monitoring program within this area and include this in the annual groundwater monitoring program when the facility is in operation. However, Syncrude has collected the background groundwater quality of the proposed site for inclusion in this report in 2007.The landfill FGD facility which will have a 25 years lifespan will be completed in 2009.Currently, the project has been phased out starting with one half of the site.

Geology

The proposed landfill site is has a thin Holocene layer underlain by Pleistocene (Pl) deposit with a thickness ranging from 1.5- 4m. This layer is underlain by a glacio- fluvial / till layer ranging in thickness of 0.5m to greater than 6m. Both materials consist of silty clay to clay, having low to high plasticity. The bedrock underlining the glacial till consists of the Clearwater formation (K_{CC}) which mainly clay shale with variable silt and fine sand content, having an average thickness of 26m at the proposed site. Underlying the Clearwater formation is the McMurray formation (K_{M}). A site layout is shown in Figure 5.15A.

Figure: 5.15A: Flue Gas Desulphurization (FGD) Landfill Site



Monitoring Wells at the FGD Site
Figure: 5.15A

Surface water Sources

Run-off from the natural areas to the proposed FGD landfill site is not anticipated but perimeter ditches shall be provided around the base of the landfill to intercept surface run-off and upland overland flows. There is also a proposed storm water retention pond that will capture extreme flood flows to be located at the northeast corner of the proposed landfill and supported with sumps, pumps and flow pipelines.

Monitoring Network

The half of the site which has been cleared and completed with monitoring wells in the three stratigraphic units include monitoring wells installed during preliminary investigation design (installed in 2004) and additional background monitoring wells installed in October 2007. The wells are monitored and chemical analyses were completed in accordance with AENV Standards for Landfills in Alberta (May 2004).

The complete result of the analysis, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. A summary of key chemical parameters for the monitoring wells is provided in Table 5.15A.
The shallow and medium depth wells were generally installed in geologic units comprising Pleistocene clays (PL) and Pleistocene glacial tills (PG). The deepest wells were installed in the Wabiskaw member of the Clearwater Formation (Kcw). This unit is glauconitic fine sand that occurs directly above the McMurray Formation at this site. All lithologic descriptions are based on the Syncrude overburden geologic Facies Chart (see Table 5.14A).

5.7.2 Results and Discussion

The concentration of major ions at the groundwater monitoring wells FGD04-01, FGD04-04, FGD04-06, FGD04-05 and FGD04-10, located up-stream of the groundwater flow direction indicated a low range of values which may represent concentrations from natural environment while the concentration of chloride in FGD04-01 was naturally high and this may be from the unit which the well was installed or lenses of high chloride silty-clay soil in pockets of the K_{CC}.

Table 5.16A: Location of Monitoring Wells, FGD Landfill Area

Well ID	Northing	Easting	Ground Elevation	Screen Interval			Comments
				Top	Bottom	Lithology	
FGD04-01	47804.00	45404.90	339.00	16.8	18.3	Screen in Kcc	
FGD04-04	47774.10	45542.60	338.90	3.3	3.8	Screen in PL2	
FGD04-05	48015.50	45873.70	337.20	1	1.5	Screen in PL2	
FGD04-06	47602.00	45895.00	338.10	4.6	6.1	Screen in PG1	
FGD04-10	47559.30	46204.60	336.40	0.91	3.05	Screen in PL2	
FGD07-1A	48143.4	46009.64	336.16	1.2	2.7	Screen in PL2	
FGD07-1B	48136.37	45999.59	336.29	4.2	5.6	Screen in PL2	
FGD07-1C	48138.02	46005	336.29	28.7	30.2	Screen in Kcc	
FGD07-2A	48630.83	46857.98	331.16	1.1	2.8	Screen in PL2	
FGD07-2B	48631.56	46861.86	331.22	1.5	3.0	Screen in PL2	
FGD07-2C	48631.97	46866.03	331.34	27.1	28.6	Screen in Kcc	
FGD07-3A	48248.74	46958.07	330.36	0.6	2.1	Screen in PL2	
FGD07-3B	48244.79	46957.4	330.39	2.1	3.7	Screen in PL2	
FGD07-3C	48240.57	46956.3	330.58	24.4	25.9	Screen in Kcc	
FGD07-4A	47670.64	46702.9	333.52	24.4	25.9	Screen in PL2	
FGD07-4B	47666.83	46699.76	333.52	24.4	25.9	Screen in PL2	
FGD07-4C	47663.28	46696.32	333.6	26.2	28.7	Screen in Kcc	
FGD07-6A	48403.07	46293.1	334.59	0.9	2.4	Screen in PL2	
FGD07-6B	48406.02	46295.3	334.69	2.7	4.3	Screen in PL2	
FGD07-6C	48409.78	46298.28	334.8	27.0	28.5	Screen in Kcc	
FGD07-7A	48026.05	46844.46	333.04	1.8	3.4	Screen in PL2	
FGD07-7B	48030.13	46845.65	333.11	2.7	4.3	Screen in PL2	
FGD07-7C	48035.01	46847.32	333.21	25.2	26.7	Screen in Kcc	

Notes: Till = Pleistocene till
Sand = Pleistocene fluvial sand
Clay = Pleistocene lacustrine clay
Screen intervals are in meters below ground

The other downstream monitoring wells indicated similar low concentration of major ions in the Pleistocene units while those wells in the deeper till units indicated high chloride concentration. The concentrations of major ions, selected metals and naphthenic acid are naturally and generally low including total dissolved solids (TDS) at all the wells installed in the surficial aquifer Pleistocene units.

In general, the concentration of TDS appears to increase with depth in the cretaceous clearwater formation. Moreover, these high concentrations from the natural geo-chemistry appears to contribute to the increased level of concentration experienced towards the proposed landfill area because the groundwater flow direction is from undisturbed areas to the proposed area.

5.7.3 Recommended Sampling Schedule for 2008

Sampling will continue for all wells around proposed landfill in 2008 and the analysis will be completed in accordance to AENV requirements for the landfill area.

Table 5.17A: Summary of Key Chemical Parameters, FGD Landfill Area

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Ca	Na	TDS
FGD04-01	26-Jul-07	7490	8.3	2430	1530	69.2	17.1	1840	4970
FGD04-04	26-Jul-07	3900	7.8	765	14	1920	595	410	3750
FGD04-05	26-Jul-07	1060	7.7	710	2	53.9	127	69	665
FGD04-06	26-Jul-07	1290	8.1	839	13	58.2	71.6	231	876
FGD04-10	26-Jul-07	2090	7.8	602	7	778	309	168	1700
FGD07-01A	11-Jan-07	2470	7.6	704	33	883	440	194	2100
FGD07-01B	31-Oct-07	2480	7.9	1280	179	72.9	72.2	516	1640
FGD07-01C	11-Jan-07	9160	7.5	1330	2650	115	54	2000	5300
FGD07-02A	11-Jan-07	1030	7.8	558	17	101	114	87	700
FGD07-02B	11-Jan-07	1330	7.8	659	26	167	91	165	888
FGD07-02C	11-Jan-07	15600	7.6	1520	4920	52.7	72.6	3340	9310
FGD07-03A	31-Oct-07	1570	8.2	527	63	346	110	160	1120
FGD07-03B	30-Oct-07	1440	7.9	526	18	313	82.7	170	1020
FGD07-03C	11-Jul-07	6140	8.1	938	1570	117	26.7	1290	3590
FGD07-04A	30-Oct-07	701	7.8	450	2	25.2	103	16	556
FGD07-04B	30-Oct-07	781	7.9	497	4	31	107	31	540
FGD07-06A	11-Jan-07	1610	7.9	638	9	414	225	108	1210
FGD07-06B	31-Oct-07	2450	7.5	623	6	954	381	188	2040
FGD07-06C	11-Jan-07	8590	7.6	1310	1810	895	63.8	1990	5530
FGD07-07A	31-Oct-07	1020	7.8	531	5	137	132	62	722
FGD07-07B	31-Oct-07	1180	7.9	521	7	225	147	76	944

Abbreviations:

Cond – Conductivity (μS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Na – Sodium (mg/l), TDS – Total Dissolved Solids (mg/l), “ - “ not analyzed

* Duplicate Sample

5.8 Special Waste Interim Storage Area

5.8.1 Background

5.8.1.1 Area Description

The Special Waste Interim Storage Area (SWISA) is located east of the SWSS. Hazardous waste is temporarily stored within a secure building at this site prior to being transported off site. An asphalt pad surrounds the storage building. A chain-link fence with barbed wire arming and a locked access gate prevents unauthorized entry into the area.

5.8.1.2 Geology

The geologic sequence underlying the SWISA consists of muskeg, glacio-lacustrine clay, till, Clearwater Formation clays, and McMurray Formation oil sand. A schematic cross-section through the area is shown on Figure 5.16.

5.8.1.3 Monitoring Network

There have been no changes to the monitoring network around the SWISA over the past year. There are four active monitoring wells (Table 5.16 and Figure 5.17). Analysis was completed in accordance with the requirements for the SWISA area.

Table 5.18: Location of Monitoring Wells, SWISA

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
OW98-10	47268	44083	349.4	5.5	7.0	Till
OW98-11	47297	44054	349.6	4.9	6.4	Till
OW98-12	47236	44041	349.7	5.2	6.7	Till
OW98-13	47269	43992	350.6	4.9	7.9	Till

Notes: Till = Pleistocene till
Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system

5.8.2 Results and Discussion

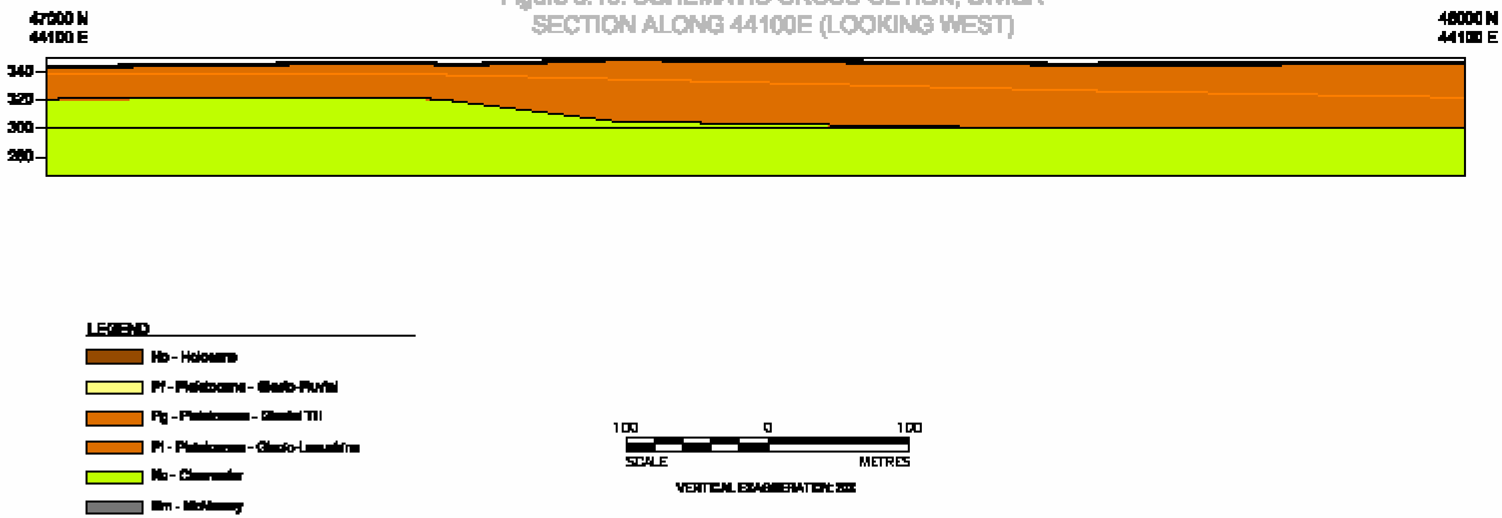
The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. Table 5.17 provides a summary of the chemical parameters in this area.

The surficial glacio-lacustrine clay deposit has a low hydraulic conductivity (10^{-9} to 10^{-10} m/s). The low hydraulic conductivity of the clay and underlying units would provide very good containment in the event of a spill. In surrounding areas, the hydraulic conductivity of the underlying till has been estimated at 10^{-9} m/s. The Clearwater Formation Clays are estimated to have a hydraulic conductivity in the range of 10^{-8} to 10^{-13} m/s.

The direction of groundwater flow in the till is toward the northeast. This is consistent with the topographic slope of the area. The direction of groundwater flow and static water elevations from 2006 are shown on Figure 5.17.

The major ion, selected metals and naphthenic acid concentrations observed in 200 in the monitoring wells around the SWISA site have reduced slightly except chloride which increased slightly at OW98-10, OW98-12 and OW98-13. The general trends of the concentrations have been flat and are generally consistent with historical data. The variability observed in the concentration of sulphur at OW98-11 will be closely monitored in the next sampling season. However, the phenol concentration was virtually constant except at OW98-13.This will also be noted in 2008 sampling program.

Figure 5.18: SCHEMATIC CROSS-SETION, SWISA
SECTION ALONG 44100E (LOOKING WEST)



L:\2006\1348\06-1348-003\3000\Cross-sections\Fig 5-18 Section 44100 East.dwg Aug 30, 2007 - 2:55pm

Figure 5.17: Monitoring Wells and Groundwater Flow Directions, SWISA

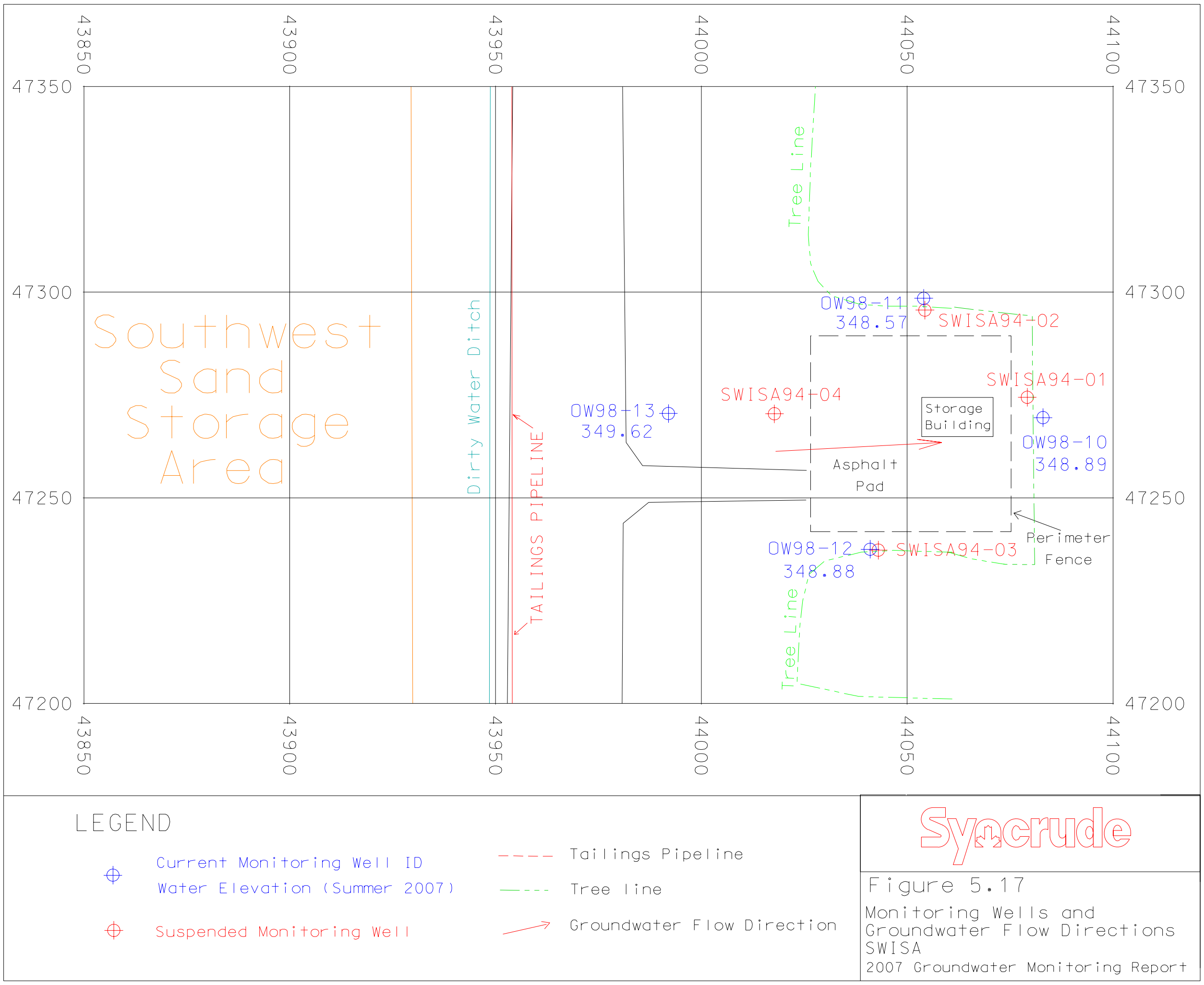


Table 5.19: Summary of Key Chemical Parameters, SWISA

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Na	Phenols
OW98-10	27-Jun-07	1610	8.1	859	65	118	249	< 0.001
OW98-11	26-Jun-07	2820	7.8	765	41	964	328	0.001
OW98-12	27-Jun-07	1240	8.1	806	29	14.6	231	< 0.001
OW98-13	26-Jun-07	2840	7.9	1090	75	578	560	0.01

Abbreviations:

Cond – Conductivity (µS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Na – Sodium (mg/l), Phenols (mg/l)

* Duplicate Sample

5.8.3 Recommended Sampling Schedule for 2008

There are no changes proposed for this area in 2008. Annual sampling of all wells listed in Table 5.16 will continue with analysis completed as per requirements for the SWISA.

5.9 In-Pit Tailings

5.9.1 Background

5.9.1.1 Area Description

Syncrude's original mine pits continue to be used for tailings disposal. The West In-pit (WIP) is located west of Highway 63. The Southeast Pond (SEP) and the Northeast Pond (NEP), both contained within the East In-pit (EIP) are east of Highway 63. These two ponds have now merged. They were initially hydraulically connected through a gravity drainage channel flowing north to south.

There are many facilities and activities surrounding the in-pit tailings areas as shown in Figure 5.18. The WIP is surrounded by reclaimed overburden and muskeg dumps (DW30) to the south, the Highway Berm (current location of Highway 63) to the east, the South West Dam to the west, and Coke Cell 5 to the north. Bordering the EIP are the Highway Berm to the west, the North Closure Dam to the northwest, the highway corridor and plant site to the north, the EIP Boundary Dyke and future northbound Highway 63 corridor to the east (located directly west of the Syncrude/Suncor property line), and a reclaimed overburden dump to the south.

WIP is primarily used as a settling pond for mature fine tailings (MFT) and thin fine tails (TFT) transferred from other tailings areas, including the SWSS, SEP and MLSB. Deposition of coarse tailings and composite tailings into the EIP began in August of 1999 and is ongoing. Sand placement in the NEP will progress till 2010 while placement at the SEP will continue up to 2013.

5.9.1.2 Geology

The geology of the Base Mine typically consists of Devonian limestone underlying the McMurray Formation. The limestone varies from competent limestone to a weathered paleosol. The Lower McMurray Formation is discontinuous, and varies in lithology from pond muds to coarse sands. The sand can be bitumen saturated, but is commonly water saturated. The Middle McMurray member is the main ore body of the mine. These sands are generally well saturated with bitumen and interbedded with clays. The Upper McMurray is continuous, typically composed of fine-grained sand and clays, and the bitumen saturation is highly variable. In most areas, the Upper McMurray averages from five to ten meters in thickness. In areas where the Upper McMurray channels have been cut into Middle McMurray, the Upper member may be over thirty meters thick.

The Clearwater Formation conformably overlies the Upper McMurray. Near the centre of the WIP, the Beaver Creek channel cuts through the Clearwater Formation into the Upper McMurray. West of the Beaver Creek channel, the Clearwater Formation increases in thickness to approximately twenty meters at the west end of the WIP. Anywhere from one to five meters of glacio-lacustrine clay and till overlies the Clearwater clays.

Within the pits, dragline mining (though not in use anymore) typically removed everything above the Devonian, leaving only pockets of pond muds and other uneconomic materials. Waste consisting of clays and rock contaminated ore were cast in-pit by the dragline, forming piles on the pit floor.

Located to the north of the EIP (NEP area) and south of the MLR are the McMurray oilsand units, Clearwater Formation and overlying glacial tills, glacio-fluvial and muskeg materials that remain in-situ. The permeable glacio-fluvial units at surface have variable thickness, but in most areas extend only down to an elevation of 309m, giving an average thickness of 3 meters.

5.9.1.3 Monitoring Network

There are four remaining wells at depth situated around the in-pit areas, and five shallow wells were installed in surficial glacio-fluvial units between the NEP and MLR (Table 5.18). At the time of installation, each of these shallow wells was dry. They are intended for future monitoring, once tailings are deposited above the in-situ oil sand in the NEP (after 2010). These wells will be sampled in 2007 to represent the background data, provided there is sufficient water to sample.

Chemical analyses were completed in accordance with AENV requirements for all the remaining BML wells.

Table 5.20: Location of Monitoring Wells, In-Pit Tailings Areas

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
BML96-03	44882	49741	311.3	54.6	57.6	DW LS
BML96-04	50066	49816	311.9	78.18	81.1	DW LS
BML96-05	49126	55184	311.7	66.8	69.8	DW LS
BML97-09	49592	50100	299.8	65.2	68.3	KM WS
OW03-24*	49856	54324	310.8	0.7	1.6	Sand
OW03-25*	49693	54492	310.7	1.5	2.2	Sand
OW03-26*	49430	54850	311.6	1.7	2.4	Sand
OW03-27*	49198	55033	312.8	1.5	3.1	Sand
OW03-28*	48977	55187	313.6	1.6	3.1	Sand

Notes: KM WS = Cretaceous Lower McMurray Formation – Watersand
DW LS = Devonian Waterways Formation – Limestone
Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system
* background chemistry for future monitoring

5.9.2 Results and Discussion

The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. A summary of key chemical parameters for the area is provided in Table 5.19.

The BML wells of the in-pit groundwater monitoring are restricted to deep flow paths (44 to 81 meters) through the Lower McMurray Formation water sand and Devonian Waterways Formation (limestone). Basal water sand is present in isolated pockets around the Base Mine, significantly limiting the potential for migration of process water from the in-pit tailings deposits. Fractures exposed in the mine pit have been clay filled and the hydraulic conductivity of the limestone is appears to be low.

These wells were installed using the conventional rotary-mud drilling technique and then flushed with clean water to remove the drilling mud. Low hydraulic conductivity and depth of the wells has made it very challenging to effectively purge these wells.

Improved purging procedure since 1999 has dramatically improved the quality of the sampling. Consequently, the results since then have been more consistent even in 2007. Analysis for naphthenic acids in the past has indicated that the Lower McMurray Formation and underlying limestone have background naphthenic acid concentrations in the range of 8 to 35 mg/l.

<u>BML96-03</u>
BML96-03 is installed in limestone. The hydraulic conductivity of the limestone at this location is extremely low; the well recovers very slowly and has not reached a static level since it was installed in 1996. In 2004, this well was purged, where it is typically not due to its slow rate of recovery. The water chemistry of this well is considered saline and the 2007 results are consistent with historical data, though there is a slight increase in the major ion concentrations while the concentration of TDS decreased.

BML96-04

BML96-04 is also installed in limestone. This well recovers very slowly, however the static water elevation does not appear to be changing. The water chemistry is considered saline and the 2007 results are consistent with historical data.

The concentration of the major ions reduced considerably and indicated an improvement in the groundwater quality.

BML96-05

BML96-05 is located between the Mildred Lake Reservoir and the northeast mine quadrant. After an initial drop due to neighboring mining activities (ending 1999), the hydraulic head remained relatively consistent (at 286m). Over the past year, the head has increased to 287.7m and is expected to continue climbing given the rapid rate of rise in the NEP over the past couple years and its forecast infilling (head to 310m) by the end of 2010. The water chemistry at this location is also saline and consistent with historical data, though there is a continual reduction in the major ion concentrations and the TDS in 2007.

BML97-09

The hydraulic head of BML97-09 is likely the result of expected in-situ pressures within an isolated watersand unit at the base of mining, after the effect of pit dewatering and mining (from historical mining to the south). The head has been stable for a number of years and does not seem to be influenced at all by the rising WIP pond, or mining to the north. The water chemistry is consistent with historical data.

Two (OW03-25 and OW03-28) out of the three wells in this area actually had sufficient water to sample for chemical analysis while OW03-27 remains dry. Since the hydraulic heads of these wells are higher than both the NEP and the MLR, it is obvious that neither body of water currently influences the head in these wells. The chemistry of these wells is shown below in Table 5.19. These wells do not contain the saline water typical of the basal wells, but they continue to indicate a reduction in their background concentrations.

Table 5.21: Summary of Key Chemical Parameters, In-Pit Tailings Areas

Well ID	Sample Date	Cond.	pH	HCO_3	CO_3	Cl_2	SO_4	Ca	Na	TDS
BML96-03	13-Jul-07	23200	7.9	2400	<5	8280	38.4	70	6430	14800
BML96-04	13-Jul-07	51400	7.5	2750	<5	20000	9.3	164	12700	35300
BML96-05	13-Jul-07	9490	7.7	3140	<5	2040	1.7	26.9	2270	6090
BML97-09	12-Jul-07	34600	7.6	2780	<5	11700	<0.5	121	8970	21800
OW03-25	28-Nov-07	3560	7.1	218	<5	639	692	370	287	2470
OW03-26	28-Jun-07	2410	7.9	443	<5	75	975	378	95	1980
OW03-28	28-Jun-07	1520	7.8	551	<5	42	378	244	4	1140

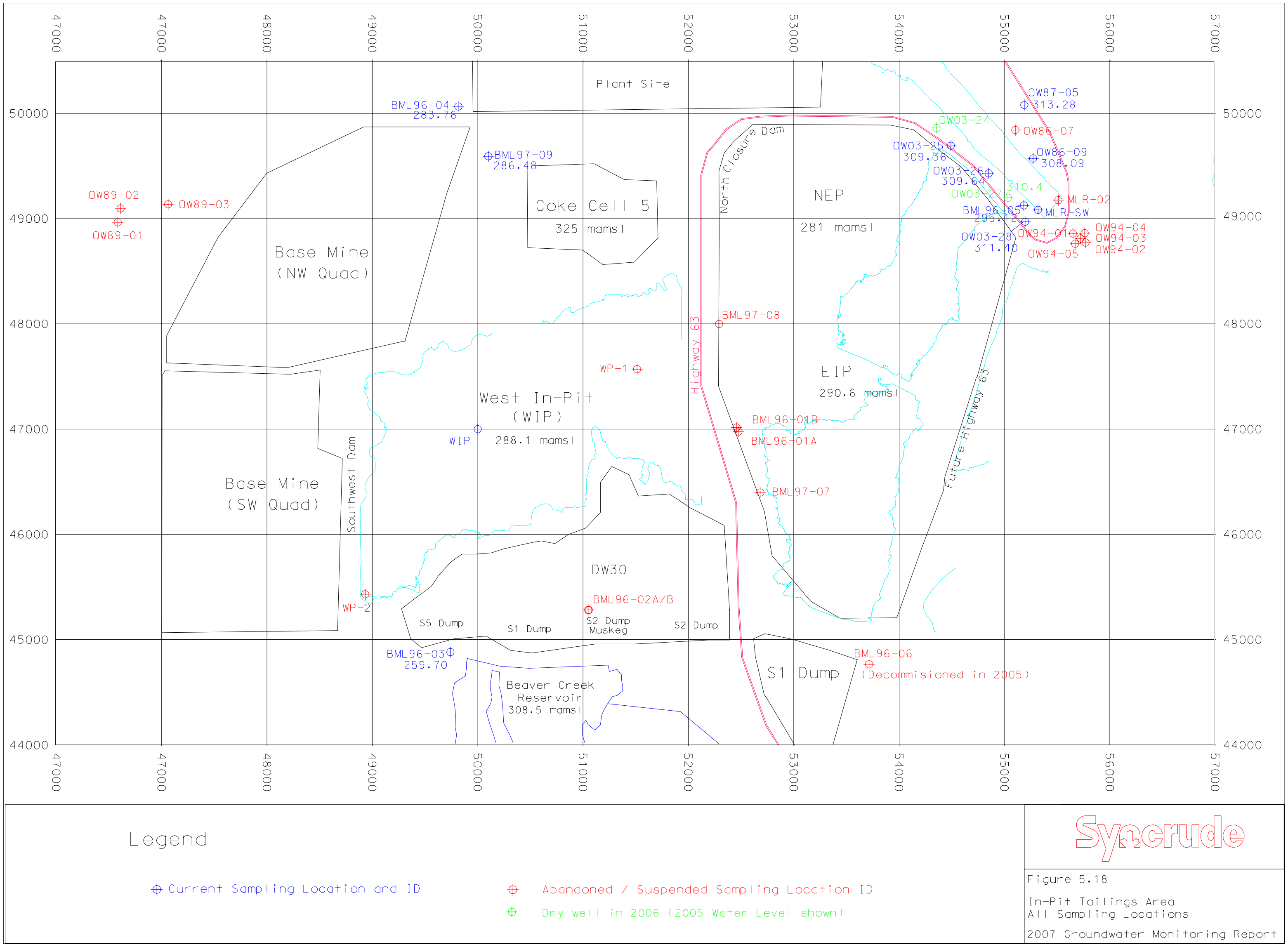
Abbreviations:

Cond – Conductivity (μS/cm), HCO_3 – Bicarbonate (mg/l), CO_3 – Carbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Na – Sodium (mg/l), TDS – Total Dissolved Solids (mg/l) , " - " not analyzed

5.9.3 Recommended Sampling Schedule for 2008

Annual sampling of the wells listed in Table 5.18 will take place in 2008. Analysis will be completed in accordance with AENV requirements for the tailings areas.

Figure 5.18: Monitoring Wells, In-Pit Tailings Areas



5.10 Sewage Lagoons

5.10.1 Background

5.10.1.1 Area Description

Syncrude's sewage lagoons are located in the Athabasca River valley, immediately west of the river and north of Syncrude's fresh water intake sedimentation basin (Figure 5.19). The sewage lagoons were constructed with low permeability liners to minimize the risk of groundwater contamination. After water completes its cycle through the lagoons, it is discharged into the Athabasca River.

5.10.1.2 Geology

In the sewage lagoon area, a sequence of nine to fourteen meters of Holocene alluvial deposits overlay the Devonian limestone. The alluvial deposit consists of interbedded sands, silts, and clays with organic material throughout. The Devonian surface rises from west to east.

5.10.1.3 Monitoring Network

There have been no changes to the monitoring network around the sewage lagoons; it consists of three wells (Figure 5.20). One well is located up-gradient and two are located down-gradient of the lagoons. All the three wells are installed in the recent alluvial deposit. The location and installation details are provided in Table 5.20.
Chemical analyses were completed in accordance with AENV requirements for the sewage area, including analysis for trace metals (Appendix A). Additional analysis for DKN and NH_4 was also completed (see Appendix B).

Table 5.22: Location of Monitoring Wells, Sewage Lagoon Area

Well ID	Northing	Easting	Ground Elevation	Screen Interval		
				Top	Bottom	Lithology
OW98-16	47527	57855	236.1	3.0	6.1	Holocene alluvial
OW98-17	47563	58079	237.9	1.8	4.9	Holocene alluvial
OW98-18	47641	58058	237.4	8.2	9.8	Holocene alluvial

Notes: Screen intervals are in meters below ground
Coordinates are in the Syncrude mine metric system

5.10.2 Results and Discussion

The complete analytical results, water elevations, as well as sampling and purging methods are included in Appendix B, while trend plots are included Appendix C. A summary of key parameters is provided in Table 5.21.

The Holocene alluvial deposit in the Athabasca River valley has a highly variable hydraulic conductivity. The underlying limestone is assumed to have a low hydraulic conductivity. Significant fluctuations in groundwater elevations have been observed around the sewage lagoons. The fluctuations are attributed to changing water levels in the Athabasca River. Groundwater flow is interpreted as being from the southwest to the northeast, however this may be reversed when the river level changes dramatically. Water elevations and the direction of groundwater flow are shown on Figure 5.20.

The upstream nitrogen compounds in the form of TKN (OW98-16) and invariably total nitrogen have reduced in concentration considerably and may appear to reflect the natural nitrogen cycle balance in the environment, which are consistent with the historical data. The current monitoring program has not identified any impact from the sewage lagoons.

Table 5.23: Summary of Key Chemical Parameters, Sewage Lagoon Area

Well ID	Sample Date	Cond.	pH	HCO_3	Cl_2	SO_4	Ca	Fe	TKN	NO_3	NO_2	DOC	Water Elevation
OW98-16	06-Jul-07	1140	7.1	644	77	5.7	134	54.9	13.2	< 0.1	< 0.05	80	234.18
OW98-17	06-Jul-07	1840	7.7	802	69	371	340	4.79	0.5	2.1	< 0.05	10	233.89
OW98-18	06-Jul-07	1340	7.7	749	76	66.8	205	12.5	1.3	< 0.1	< 0.05	19	233.92
OW98-18*	06-Jul-07	1340	7.8	738	76	66.6	2.6	13.6	1	< 0.1	< 0.05	18	

Abbreviations:

Cond – Conductivity (µS/cm), HCO_3 – Bicarbonate (mg/l), Cl_2 – Chloride (mg/l), SO_4 – Sulfate (mg/l), Ca – Calcium (mg/l), Fe – Iron (mg/l), TKN – Dissolved Kjeldahl Nitrogen (mg/l), NO3 – Nitrate (mg/l), NO2 – Nitrite (mg/l), DOC – Dissolved Organic Carbon (mg/l)

* Duplicate Sample

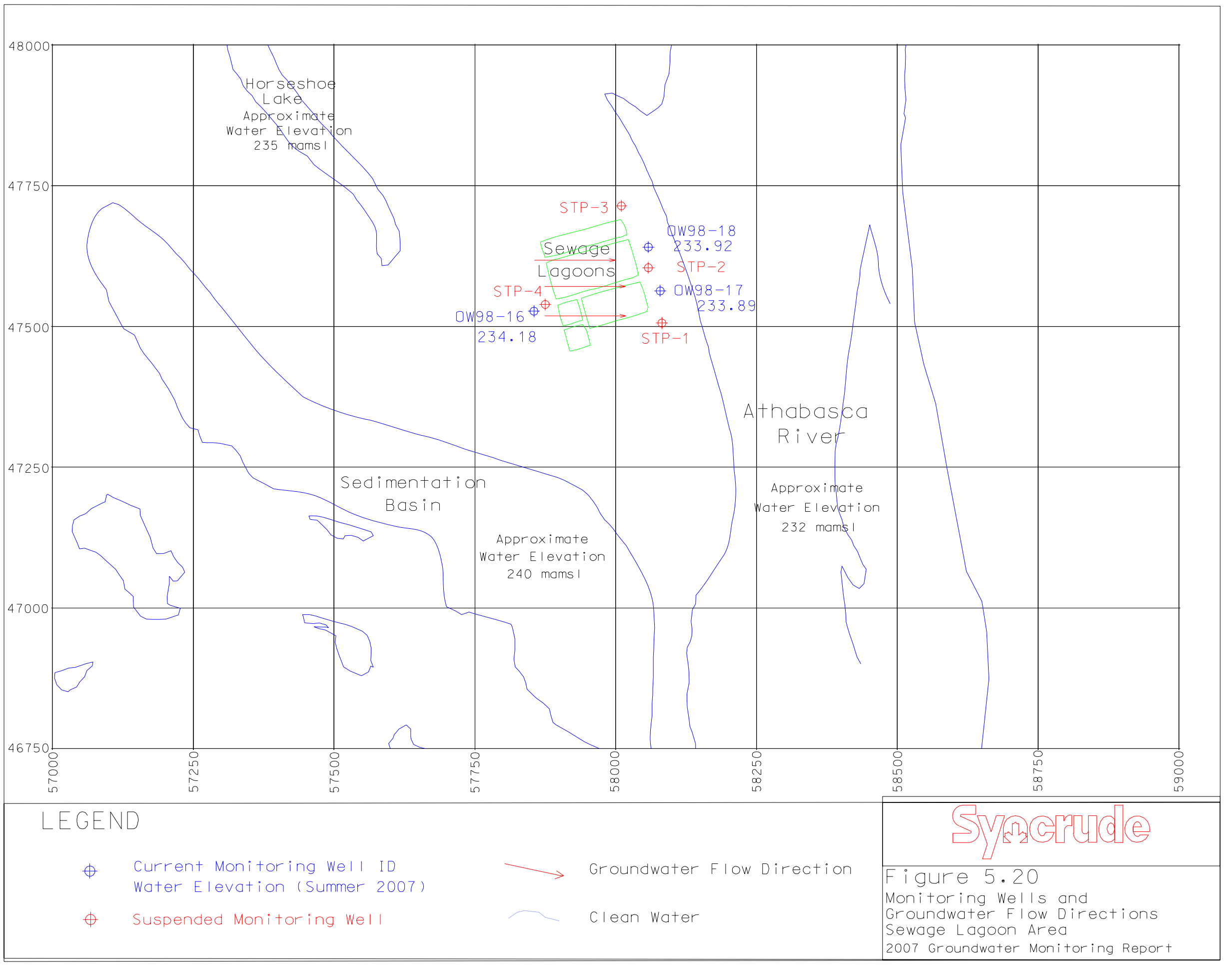
5.10.3 Recommended Sampling Schedule for 2008

Annual monitoring for the three wells in the area will continue with the analysis completed in accordance AENV requirements for the sewage lagoon area in 2008.

Figure 5.19: 2006 Air Photo of the Sewage Lagoon Area

Note:
2007 Photo Mosaic of this area
is not available

Figure 5.20: Monitoring Wells and Groundwater Flow Directions, Sewage Lagoon Area



6 Response to AENV Comments on 2006 Groundwater Report

The following section provides direct responses to or a clear reference to a section of this report that addresses questions raised by AENV to Syncrude's 2006 Groundwater Monitoring Report. AENV question/comments are shown in *italics.*

1.QUALITY ASSURANCE AND CONTROL

- *Pages 12-13 – Relative percent differences (RPD) of greater than the acceptable standard of 20% were observed for some samples without an explanation given.*
  Explain why and how this can be corrected.

Response:

Generally the acceptable RPD should be in the range of 20%. There are two approaches to evaluating field duplicates; the first being the relative percent difference between two sample results and the second approach utilizes the absolute difference between the results. The appropriateness of the two approaches depends on the concentration of the analyte relative to the detection limit for the analyte in the sample (Zeiner, S.T., 1994: Realistic Criteria for the evaluation of field duplicates sample results) (Appendix A). For example, analytes such as Phenols, with very low detection limits generally yield very high RPD values. Syncrude proposes to use the RPD method for those analytes such as major ions with high detection limits and the absolute method for analytes with values below the detection limit. Syncrude has reviewed the sampling protocol in the field, which has reflected a considerable improvement in the RPD of the sample results in 2007. We shall continue to ensure high standards in field sampling protocol in all our monitoring programs.

2. SURFACE WATER SAMPLES

- *Section 5.1 Surface Water Samples- pages 14-19 – As the re-use and recycling of process water continues along with the stripped sour water being directed to the wastewater control system, there is concern over increasing ammonia and naphthenic acid concentrations. Consequently, AENV is recommending that in addition to ammonia and naphthenic acid being analyzed in surface water samples, ammonia and naphthenic acid shall be included as groundwater monitoring parameters for those wells in areas potentially affected by seepage waters containing ammonia and naphthenic acid concentrations (MLSB, WIP, SWSS)*

Response:

Syncrude shall conduct the recommended groundwater sampling analysis at the areas with potential of ammonia and naphthenic acid beginning with the 2008 sampling program.

3. EAST OF MILDRED LAKE SETTLING BASIN (MLSB)

Page 27-Well water chemistry is grouped into three categories: wells with background chemistry; wells with elevated chloride concentrations and wells influenced by the process –affected water. Please detail what is considered elevated in terms of values for chloride and other major ions.

Wells with background chemistry – page 27- Please explain why monitoring wells OW80-14 and OW03-03 clearly show increasing concentrations not reflective of background chemistry.

Wells with elevated chloride concentrations – page 27- Monitoring wells OW79-19, OW98-19B OW01-02, OW02-04 and OW03-29 indicate increasing concentration and if it is not due to process-affected water then what is it due to?

Zone A – Page 32

- *It is our understanding that destroyed monitoring well OW99-07 will be replaced in 2007.*

Zone C – Pages 33-34

- *The pumping system shall continue to be effective in capturing seepage and reducing the migrating plume for Zone C. Syncrude shall address the operating challenges with the pumping system such that it results in better performance. It is imperative that the pumping system operates on a continuous basis.*
- *At the north end of Zone C, monitoring well OW02-04 indicated an increase in concentration not a decrease as indicated on page 34- last paragraph*

Zone E- Page 35

- *Information provided indicates that source mitigation at the MLSB, upper section of Zone E, shall be intensified. Explain in greater detail how beaching activity in 2007n around the north end of Zone E at the MLSB will improve source mitigation. What are Syncrude plans in managing the impacts that have already occurred?*
- *Detail the additional monitoring that will be conducted alongside the beaching improvement. Will additional groundwater monitoring wells be completed or will there be an increased frequency of sampling in the area?*

Response:

The wells that are identified as having elevated chloride concentrations are wells with Chloride slightly over 100 mg/L, which is approximately background in this area. This classification was introduced by Syncrude and was intended to be used as an early warning to identify areas of potential contamination.

Based on this classification, OW80-14 (95 mg/L) is just getting above the 100 mg/L and OW03-03 (78.0 mg/l (2006, and 156 mg/L in 2007) is now showing impact of the advancing plume. In addition, OW79-19, OW98-19B, OW01-02, OW02-04, and OW03-29 show increasing trend. This is because of their proximity to the tailings dyke. This trend will be monitored in future.

The destroyed well OW99-07was planned to be replaced this year in 2007, however, poor access conditions and obstruction within the area required postponing the replacement until 2008.

Going by the 100-mg/L-chloride contour at this zone (Figure 5.5), the beaching activity carried out in 2007 did not make much improvement to the trend of the plume in this zone.
Syncrude has installed more piezometers (zone E) to study the groundwater flow in more detail in this area. This information will be used to formulate a mitigation plan for current situation.

SEEPAGE CONTROL POND

Seepage Control Pond – Pages 36-37

- *In consideration of the continued rise in chloride concentration at OW99-24, explain what source mitigation will be conducted to stem the migration of contaminants downstream.*

Beaver Creek – Page 37

- *AENV will be providing comments regarding the 2006 Beaver Creek Ecological Risk Assessment report and associated groundwater monitoring in a separate letter.*

Response:

The present no-flow and plugging up at the MLSB is expected to indicate a source mitigation improvement in this area, which should reflect in the well OW99-24 with other major ions reducing except chloride. This area shall be monitored more close for consistent trend in 2008.

4. NORTH AND WEST MILDRED LAKE SETTLING BASIN

- *Page 42- OW92-06 – Provide an explanation why the chloride concentration has increased in the monitoring well completed opposite the Clearwater Formation. It would be expected that fairly stable concentration would occur.*

Response:

The high chloride concentration observed at OW92-06 in 2006 is considered anomalous. The 2007 chloride concentration has returned to previous levels. This may be as a result of local flow conditions. Syncrude will continue to monitor this area closely.

5. SULPHUR BLOCKS

- *Syncrude shall continue its 2006- implemented intensified maintenance of the sulphur block areas and the geo-membrane lined drains to ensure quick flow to avert ponding of the surface water in the drains and the potential for increased sulphate concentrations.*
- *Further investigation of monitoring well SMW92-03R results are required to determine the substantial sulphate increase in 2006.*
- *It is our understanding that damaged monitoring well SMW94-02 will be replaced in 2007.*

Response:

Syncrude has intensified the maintenance activity within the sulphur block areas and the monitoring wells in this area are all active including SMW94-02, which was repaired.

6. SOUTHWEST SAND STORAGE (SWSS) AREA

- *Page 58- It is our understanding that damaged monitoring wells KL89-01B and OW91-07B will be replaced. Other wells planned for replacement include OW91-07A and OW91-10R*

Response:

Monitoring well KL89-01B has been replaced with KL07-01B.Monitoring well OW91-07B was not replaced in 2007 due to obstruction within the area (see section 5.6.2). This well will be replaced in 2008.

7. IN-PIT TAILINGS AREA

- *Figure 5.18 shall be updated to match the terminology (DW30, EIP) used in the text to describe the area.*
- *It is our understanding that the five shallow surficial wells installed between the NEP and MLR will be sampled in 2007 to obtain background data provided there is sufficient water.*
- *Explain why OW03-25 has high ion concentration (chloride) as compared to the other two shallow wells (OW03-26 & OW03-28) in the same vicinity.*

Response:

Monitoring wells OW03-25, OW03-26 and OW03-28 are currently active monitoring sites and have been reported since 2004. The concentration of chloride at OW03-25 reduced drastically which is an improvement on the variability of the chemistry within the area.

8. CLASS II FGD BY-PRODUCTS LANDFILL

- *Future groundwater reporting shall include monitoring results associated with the submission of the recently approved landfill location (18 monitoring wells at six sites).*

Response:

Monitoring wells installed in 2004 and 2007are being monitored for background groundwater quality and the results are reported in this Report under Section 5.7.

7 Proposed 2008 Monitoring Program

Proposed changes for each specific monitoring area have been included in the section of the report relating to that area. This section provides a summary and compilation of all proposed changes for the 2008 monitoring program.

A complete list of all sampling locations for 2008 is provided in Table 7.1 while the proposed analytical schedules for 2008 are presented in Table 7.2. Each location will be sampled between May 1 and August 31.If any well installation is damaged; it will be repaired as soon a possible or replaced during the next drilling program.

Syncrude is proposing to continue monitoring the sites that are presented in the 2007 groundwater monitoring report. However, if during the sampling program in 2008 there are wells or off-take pipes that are found to be dry, they will be substituted by the nearest monitoring site and AENV will be notified accordingly.

Table 7.1: 2007 Monitoring Locations by Area

Area (# of locations)	2007 Sampling Locations				
Surface Samples, Dirty Water (9)	ETB-TD1		ETB-GD	TP-2	
	B3005	T0715	SCP-1	SWSS-DC	DFW-3101
	WIP	-	-	-	-
Surface Samples, Clean Water (8)	WID	BRC	TBC-1B	TBC-3	MLR-NW
	MLR-NE	MLR-E	MLR-SW	-	-
East of MLSB (81)	OW79-19	OW80-14	OW84-33	OW98-03	OW98-04
	OW98-05	OW98-06	OW98-07	OW98-08	OW98-09
	OW98-19A	OW98-19B	OW98-20	OW98-21	OW98-22
	OW98-24	OW98-25	OW98-26A	OW98-26B	OW98-27
	OW98-28	OW99-05	OW99-06	OW99-07**	OW99-08
	OW99-12	OW99-13	OW99-14	OW99-15	OW99-16
	OW99-17	OW99-18	OW99-19	OW99-20	OW99-21A
	OW99-21B	OW99-24	OW99-25	OW99-27	OW99-28
	OW01-01	OW01-02	OW01-03	OW01-04A	OW01-04B
	OW01-05	OW01-06	OW02-01	OW02-02	OW02-03
	OW02-04	OW03-01	OW03-02	OW03-03	OW03-04
	OW03-08	OW03-09	OW03-10	OW03-11	OW03-12
	OW03-14	OW03-15	OW03-16	OW03-17	OW03-29
	OW04-01	OW04-02	OW04-03	OW04-04	OW04-05
	OW04-06	OW04-07	OW04-08A	OW04-08B	OW04-09
	OW04-10	OW04-11	SG9923-01	SG0122-01	-
	SP05-T047	SP05-T05	-	-	-
N & W of MLSB (3)	OW92-05	OW92-06	OW92-08	-	-
Mildred Lake Reservoir (7)	OW86-09	OW87-03	OW87-05	OW99-09A	OW99-09B
	OW99-10	OW05-04	-	-	-
Sulphur Blocks (6)***	SMW92-03R	SMW92-04	SMW92-06	SMW94-01	SMW94-02^{+}
	SMW02-01	-	-	-	-
SWSS (20)	KL07-01B^	OW91-07A	OW91-10R	OW91-11	OW91-12^{+}
	OW91-13	OW91-15	OW91-16	OW92-01A	OW92-02A
	OW92-03A	OW94-09	OW96-01	OW96-02	OW98-14
	OW98-15	OW99-29	OW99-30	OW99-31	OW03-23
SWISA (4)	OW98-10	OW98-11	OW98-12	OW98-13	-
In-Pit (9)	BML96-03	BML96-04	BML96-05	BML97-09	OW03-24*
	OW03-25*	OW03-26*	OW03-27*	OW03-28*	-
Sewage Lagoons (3)	OW98-16	OW98-17	OW98-18	-	-

Notes:
* Sampling for background information
** Groundwater monitoring wells to be replaced due to damage or mine activity encroachment
*** Number, location & timing of new installations for Phase III sulphur block are yet to be determined
^ New well replacement
$^{+}$ Repaired well

Table 0.2: 2007 Analytical Schedule

Areas	Parameters	Frequency
All	Electrical Conductivity, pH	Annually
All	Major Ions (Ca, Cl_2, Mg, Na, K, SO_4, HCO_3, CO_3)	Annually
All	DOC	Annually
All	TDS, TSS	Annually
Tailings/Sewage	Trace Metals (Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Zn)	Once every 3 years (2009)
SWISA/Sulphur	Trace Metals (Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Zn)	Annually
Sewage	Nitrate, Nitrite	Annually
SWISA	Phenols	Annually

Appendix A: License Requirements and Amendments

Appendix B: Analytical Results and Water Elevations

Appendix C: Historical Trend Plots