Syncrude
Environmental Services

March 28, 2008

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

Dear Sir/Madam:

RE: AURORA MINE - 2007 ANNUAL GROUNDWATER MONITORING REPORT SYNCRUDE CANADA LIMITED

Attached, please find two copies of our Annual Compliance Report for 2007 pursuant to clause 4.6.7 of Approval 26-02-00 under the Environmental Protection and Enhancement Act. We trust that the report is satisfactory at this time.

Yours truly,

Nathalie Berube

Environmental Services and Regulatory Approvals
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1 Introduction

This Syncrude Canada Ltd. report is completed and submitted in compliance with Clause 4.6.7 of Approval 26-02-00 under the Environmental Protection and Enhancement Act. The report outlines and summarizes the results from the 2007 groundwater monitoring program at Syncrude's Aurora North site.

2 Background Information

2.1 Site Location

Syncrude's Aurora North site is located approximately 70 kilometres north of the City of Fort McMurray in the Regional Municipality of Wood Buffalo. Aurora North is a satellite operation for the Mildred Lake Facility. The site is situated on Oilsand leases 10, 12 and 34, Mineral Surface Lease No. 973220. The legal descriptions of various areas are provided in Table 2.1 and shown on Figure 2.1.

Table 2.1: Legal Description of the Aurora Site

Area Description	Sections	Township	Range
Tailings	4 to 9, 16 to 18	96	9
Mine Pit and Dumps	1, 12	96	10
	7, 18, 19	96	9
	1 to 3, 10 to 15, 22 to 24	96	10
Plant	2, 16	96	10

All sections are west of the Fourth Meridian

2.2 Industrial Activity

Overburden and the bitumen-saturated ore body are mined by a truck and shovel fleet. The ore is fed through a crusher and slurry-preparation process. The oilsand slurry is then transported to the Aurora North Plant site, through a hydrotransport pipeline. The bitumen is separated from the sand in primary separation vessels (PSVs). From the PSVs, sand, water and un-recovered bitumen are transported by pipeline to the external tailings pond. An inter-site pipeline transports bitumen froth from the Aurora North PSVs to the Mildred Lake Site. A satellite photograph of the Aurora North site is shown on Figure 2.2.

An on-site natural gas fired co-generator provides electrical power and thermal energy. Hot water, for use in the extraction process, is also imported from the Mildred Lake site via an inter-site pipeline. The Aurora Thermal Block supplies additional hot water.

Overburden material and low-grade oilsand rejects are placed in the Fort Hills and Moose Mountain Dumps, or used for tailings dyke construction.

Depressurization of the basal aquifer, which underlies the ore body, is required to ensure pit floor stability and prevent flooding of the mine. Depressurization is accomplished by pumping a number of wells. Some of the water from these wells is used in the plant and the rest is transported via ditches and sumps to the tailings pond, where it is retained and recycled through the extraction process. Syncrude will begin to pump some of the wells to an aeration pond for treatment and then return the water back to the environment in 2008.

Figure 2.1 – Aurora North and Surrounding Water Users

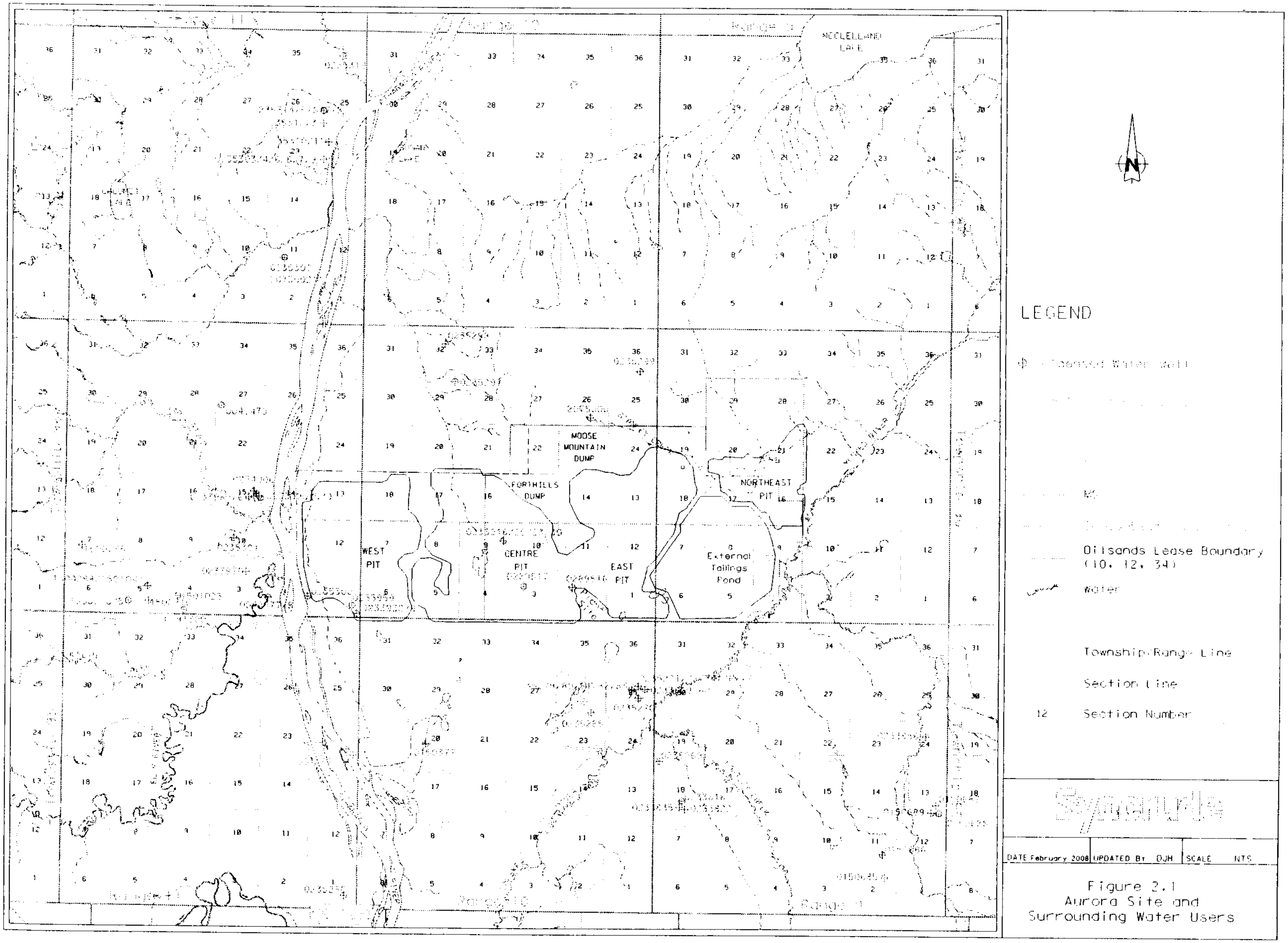


Figure 2.2 – Aurora North 1 m IKONOS Satellite Image, May 2007

2.3 Topography and Drainage

Most of the Aurora North site slopes gently towards the Muskeg River in the southeast. At the northern edge of the site, the Fort Hills rise above 330 metres above mean sea level (mamsl). Originally, natural drainage of the site was controlled by topography. The Muskeg River was the dominant drainage feature. Other minor features include: Stanley Creek at the south edge of the Fort Hills, that flows to the Muskeg River; and Fort Creek, that flows to the Athabasca River, in the northern portion of the Centre Pit.

At present, the topography has been altered by mining activities. The mine pit has been excavated to approximately 220 mamsl, which is approximately 80 metres below original ground. The external tailings pond has been constructed to approximately 30 metres above original ground, the Fort Hills Dump has been built to 350 mamsl, approximately 40 metres above original ground, and the Moose Mountain Dump has been built to 393 mamsl that is approximately 70 metres above original ground.

Site drainage is now predominantly controlled by a series of ditches and sumps. Dirty-water ditches carry water that is retained on site. The dirty-water ditches intercept runoff from the mine, plant, and tailings areas. These ditches also carry depressurization water to the tailings pond. Clean groundwater coming from north of the mine area is intercepted by the East Pit Passage (EPP) and the 1-04 Pond which is then diverted to the Muskeg River through Stanley Creek. The site topography and drainage are depicted on Figure 2.3.

2.4 Regional Hydrogeology

Hackbarth and Nastasa (1979) identified three main hydrostratigraphic units above the Precambrian surface:

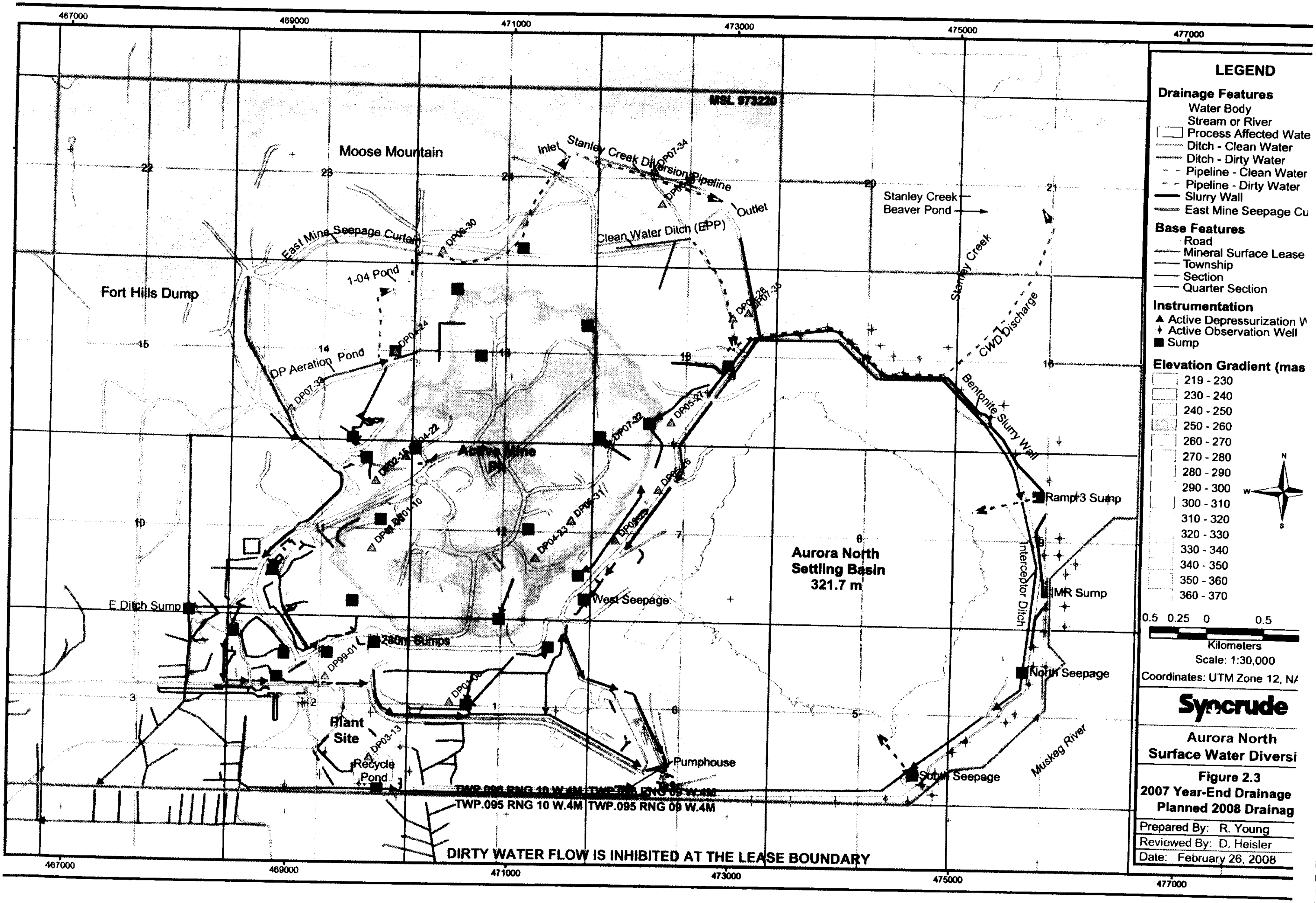
- K-Q Pleistocene and Recent deposits, and Cretaceous formations.
- D2 – Upper Devonian or Woodbend Group.
- D1 – Methy, McLean, and LaLoche Formations

The evaporite sequence separating the D1 and D2 hydrostratigraphic units thins to the east of the Athabasca River and behaves like one unit.

The K-Q unit is characterized as being heterogeneous, with alternating layers of highly contrasting hydraulic conductivities. As a result of the heterogeneity and topographic relief, high vertical hydraulic gradients are observed in this unit. Groundwater flow is typically horizontal in the higher hydraulic conductivity units, and vertical through the lower hydraulic conductivity units. In the upper members of the K-Q unit, groundwater flow is typically controlled by local topography, with discharge to major rivers and tributaries. In the lower members of the K-Q unit, north of Fort McMurray and east of the Athabasca River, groundwater flow is typically westerly from the Muskeg Mountains to the Athabasca River. Water-saturated sands of the Lower McMurray Formation form a regional aquifer, called the basal aquifer. The structural top of the underlying Devonian surface controls the thickness of the aquifer, the thickest parts of the basal aquifer coinciding with Devonian topographic lows.

The D1/D2 hydrostratigraphic unit, north of Fort McMurray and East of the Athabasca River, is characterized as having hydraulic heads similar to the lower members of the K-Q unit (basal water sand).

The regional hydrogeology is described in detail by Hackbarth and Nastasa (1979), and is also discussed in Golder (1996).


LEGEND
Drainage Features
Water Body
Stream or River
Process Affected Wate
Ditch - Clean Water
Ditch - Dirty Water
Pipeline - Clean Water
Pipeline - Dirty Water
Slurry Wall
East Mine Seepage Cu
Base Features
Road
Mineral Surface Lease
Township
Section
Quarter Section
Instrumentation
Active Depressurization W
Active Observation Well
Sump
Elevation Gradient (mas
219 - 230
230 - 240
240 - 250
250 - 260
260 - 270
270 - 280
280 - 290
290 - 300
300 - 310
310 - 320
320 - 330
330 - 340
340 - 350
350 - 360
360 - 370
0.5 0.25 0 0.5
Kilometers
Scale: 1:30,000
Coordinates: UTM Zone 12, N/
Syncrude
Aurora North
Surface Water Diversi
Figure 2.3
2007 Year-End Drainage
Planned 2008 Drainag
Prepared By: R. Young
Reviewed By: D. Heisler
Date: February 26, 2008
Moose Mountain
Fort Hills Dump
MSL 973220
Inlet
Stanley Creek Diversion Pipeline
Outlet
Clean Water Ditch (EPP)
Stanley Creek Beaver Pond
Stanley Creek
CWD Discharge
Bentonite Slurry Wall
Ramp 3 Sump
Interceptor Ditch
MR Sump
North Seepage
South Seepage
Muskeg River
Aurora North Settling Basin
321.7 m
West Seepage
East Mine Seepage Curtain
1-04 Pond
DP Aeration Pond
Active Mine Pit
E Ditch Sump
280m Sumps
Plant Site
Recycle Pond
Pumphouse
TWP.095 RNG 10 W.4M
TWP.095 RNG 09 W.4M
DIRTY WATER FLOW IS INHIBITED AT THE LEASE BOUNDARY
467000
469000
471000
473000
475000
477000

2.5 Regional Surface Water and Groundwater Users

Aurora North is situated in a largely undeveloped area. Albian Sands Energy Inc.'s oilsand mining facility is located immediately to the south. Petro Canada's oilsand mining facility is in development to the north. A commercial sand and gravel pit, Susan Lake Gravel Pit, is in operation in the southwest. There is little demand for potable surface water or groundwater around the Aurora Site due to the lack residential communities in the area. Potable water for the Aurora site is transported from Fort McMurray to site.

The following searches covered the area outlined in Table 2.2, extending over five kilometres from the Aurora North site (MSL Limit). A search was completed for licensed water wells in the surrounding area through the Alberta Environment Groundwater Information System web site. Seventy-Seven (77) wells, including observation and industrial wells were identified within this search area as shown below in Table 2.3. An additional search for licenced surface water/groundwater users was completed through the Northeast Boreal Regional office of Alberta Environment. Twenty-four (24) active approvals for surface water/groundwater use were identified within this search area as shown in Table 2.4. All licenced surface water and groundwater wells do not have coordinates associated with them. Wells that have coordinates are shown on Figure 2.1.

The basal aquifer at Aurora North is being depressurised to allow mining of the entire ore body. Depressurization could influence the water elevation in other wells in the immediate vicinity of the site; however it is not likely to significantly impact the well yield. Wells owned by Total E&P Canada and CNRL are located west of the Athabasca River and are unlikely to be affected by Syncrude's activities because the Athabasca is the sink for groundwater flow in the region. Wells that are screened in the surficial aquifer would also be less affected by mining activities at Aurora North because typically the lateral extent of drawdown in unconfined aquifers is short. These types of wells are not likely to be negatively impacted by activities at Syncrude's Aurora North site. The licenced groundwater users identified in Table 2.4 are "fenceline" approvals for diversion control and use of water, as well as construction, operation, and maintenance of related structures. Activity on the Aurora North site is not expected to negatively impact any of the surrounding licences. The location of all active surface water/groundwater licences around the Aurora site are identified in Figure 2.1.

Table 2.2: Search Area for Surface Water and Groundwater Users

Sections	Township	Range
1 to 36	95	9, 10, 11
1 to 36	96	9, 10, 11
1 to 36	97	9, 10, 11

All Sections are west of the Fourth Meridian

Table 2.3: Summary of Wells Located Around the Aurora Site

Well ID	Owner	Use	Drill Date
0042477	CNRL	Industrial	03/04/02
0042478	CNRL	Observation	03/05/02
0042479	CNRL	Industrial	03/02/02
0150377	Alberta Forestry	Domestic	03/05/90
0150685	Esso	Observation	02/21/90
0150686	Esso	Observation	02/21/90
0150687	Esso	Observation	02/18/90
0150688	Esso	Observation	02/19/90
0150689	Esso	Observation	02/20/90
0233818	Alberta Research Council	Observation	02/18/75*
0233822	Alberta Research Council	Observation	02/08/75
0233835	Alberta Research Council	Observation	02/01/75
0233856	Shell	Observation	08/10/72*
0233859	Shell	Observation	02/02/75*
0233860	Shell	Observation	08/17/75*
0233916	Petrofina	Industrial	02/26/74
0233920	Petrofina	Observation	03/24/74
0233923	Petrofina	Observation	Unknown
0233930	Petrofina	Observation	03/23/74*
0233932	Petrofina	Observation	03/30/74
0233939	Petrofina	Observation	03/30/72*
0233959	Petrofina	Observation	02/01/74
0233976	BP	Observation	03/01/75*
0233982	Alberta Research Council	Observation	01/01/75
0233986	Alberta Research Council	Observation	03/01/75
0233990	Alberta Research Council	Observation	01/01/75
0233995	Alberta Research Council	Observation	03/01/75
0233999	Alberta Research Council	Observation	03/01/75
0234006	Alberta Research Council	Observation	02/01/76
0235269	Shell	Unknown	Unknown
0235270	Shell	Industrial	08/22/75
0235271	Shell	Industrial	10/10/72*
0235272	Shell	Observation	01/01/72
0235274	Shell	Observation	10/01/73
0235276	Shell	Observation	01/01/72
0235277	Shell	Observation	01/01/72
0235279	Shell	Observation	01/01/72
0235280	Shell	Observation	01/01/72
0235281	Shell	Observation	01/01/72
0235282	Shell	Observation	01/01/72
0235283	OBS 439	Observation	01/01/73
0235285	Shell	Industrial	09/07/71*
0235286	Grant Nielson	Unknown	09/19/69*
0235297	INTL Bitumen	Unknown	01/29/01
0235298	INTL Bitumen	Unknown	01/01/27
0235299	INTL Bitumen	Unknown	01/01/28
0235300	Athabasca Oils	Industrial	01/01/14
0235301	Hudson's Bay Oil & Gas	Industrial	01/01/73
0235302	Unknown	Unknown	05/13/75*
0235303	Canstar Oilsands	Observation	09/22/81

0235304	Canstar Oilsands	Observation	09/20/81
0235306	Canstar Oilsands	Observation	09/26/81
0235307	Canstar Oilsands	Observation	09/05/81
0235308	Canstar Oilsands	Observation	09/20/81
0235309	Canstar Oilsands	Other	09/18/81
0235310	Canstar Oilsands	Observation	09/03/81
0235311	Canstar Oilsands	Domestic	09/23/81
0235312	Canstar Oilsands	Domestic	09/01/81
0235313	Canstar Oilsands	Domestic	08/31/81
0235314	Canstar Oilsands	Domestic	09/08/81
0235315	Canstar Oilsands	Observation	09/12/81
0235316	Canstar Oilsands	Investigation	09/14/81
0235317	Canstar Oilsands	Observation	09/08/81
0235318	Canstar Oilsands	Observation	09/15/81
0235319	Canstar Oilsands	Unknown	01/29/82*
0289516	Syncrude	Industrial	04/11/96
0289517	Syncrude	Industrial	04/12/96
0291300	Deer Creek Energy	Domestic	01/15/99
1500035	CNRL	Observation	01/17/04
1500216	Deer Creek Energy	Other	02/05/03
1500220	Deer Creek Energy	Other	02/05/03
1500225	Deer Creek Energy	Unknown	02/05/03
1500289	Deer Creek Energy	Other	02/06/03
1501023	Deer Creek Energy	Observation	02/04/03
1501041	Deer Creek Energy	Other	12/14/03
2075000	Petro Canada	Other	10/16/06
2075002	Petro Canada	Other	10/26/06

Information from Alberta Groundwater Information System Website (February 2008)

* Date Reported shown; Date drilled unknown

Table 2.4: Summary of Active Groundwater and Surface Water Licences

Approval #	Owner	Source
F27570	Syncrude Canada Ltd	Surface Runoff
F27570	Syncrude Canada Ltd	Unnamed Aquifer - Potable
*	Syncrude Canada Ltd	Unnamed Lake - Unclassified
F60131	Shell Canada Limited	Mill Creek
F00071821 *	Shell Canada Limited	Athabasca River
F00071821 *	Shell Canada Limited	Unnamed Aquifer - Unclassified
F00071821 *	Shell Canada Limited	Surface Runoff
*	Shell Canada Limited	Muskeg River
*	Shell Canada Limited	Muskeg River
*	Shell Canada Limited	Muskeg River
F00186157	Shell Canada Limited (Jackpine)	Athabasca River
F00186157	Shell Canada Limited (Jackpine)	Unnamed Aquifer - Unclassified
F00186157	Shell Canada Limited (Jackpine)	Muskeg River
F16192	Regional Municipality of Wood Buffalo	Ells River
F00198976	Deer Creek Energy Limited	Athabasca River
F00198976	Deer Creek Energy Limited	Athabasca River
F00198976	Deer Creek Energy Limited	Athabasca River
27271	Solv-Ex Corporation	Athabasca River
F00151636	True North Energy	Athabasca River
F00186921	Canadian Natural Resources Limited	Athabasca River
F00186921	Canadian Natural Resources Limited	Unnamed Aquifer - Unclassified
F00186922	Canadian Natural Resources Limited	Tar River
F00186923	Canadian Natural Resources Limited	Tar River
F00186924	Canadian Natural Resources Limited	Tar River

Information from Alberta Environment (February 2008); does not include TWP 97

* No Approval Number supplied

2.6 Aurora Site Hydrogeology

There are four main hydrostratigraphic sub-units within the K-Q unit at the Aurora North site:

- **Overburden** Holocene and Pleistocene Deposits (and Cretaceous Clearwater Formation where present).
- **Oilsand** Upper and Middle McMurray Formation bitumen-saturated sands and interbedded clays.
- **Basal Clays** Lower McMurray Formation Clays and silty-clays (referred to as non-water sands in Golder (1996))
- **Water sand** Lower McMurray Formation water saturated sands, basal aquifer

Overburden sub-units vary locally, however most of the Aurora North overburden forms a continuous unconfined to semi-confined aquifer. Pleistocene and Holocene sands blanket most of the site. In some areas, silty or clayey Holocene deposits overlie the sand. Thick deposits of muskeg occur in topographic lows. The Pleistocene sand is generally underlain by till or McMurray Formation oilsand. The Clearwater Formation shales are present over a limited portion of the site, generally to the northwest. The hydraulic conductivities of the Holocene and Pleistocene sands are generally high, in the order of $1x10^{-3}$ to $1x10^{-5}$ m/s. Groundwater flow in the sand is horizontal, with the direction controlled by the local topography and aquifer hydraulic conductivity. Groundwater generally discharges to local creeks.

Oilsand sub-unit forms a regional aquitard, having a hydraulic conductivity in the order of $1x10^{-9}$ m/s. The hydraulic conductivity is significantly influenced by the bitumen saturation. Zones with low bitumen saturation form isolated aquifers of limited vertical and horizontal extent.

Basal Clays, part of the Lower McMurray generally occur directly below the Middle McMurray Formation oilsand and directly above the water sand. The hydraulic conductivity of this unit is typically in the range of $5x10^{-8}$ to $1x10^{-10}$ m/s. This unit acts to increase the effective thickness of the aquitard separating the overburden aquifer and basal aquifer.

Water sand of the Lower McMurray Formation forms a regional aquifer (basal aquifer) east of the Athabasca River. The aquifer is confined between the overlying oilsand or basal clays, and the underlying Devonian, limy shales. Locally, the structural top of the underlying Devonian surface controls the extent of the aquifer.

The hydrostratigraphic subunits of the K-Q unit are depicted on geological cross-sections in Figure 2.4 and Figure 2.5, section locations are shown on Figure 2.1. The Aurora North overburden facies chart is also included as Table 2.5 for reference.

Figure 2.4 - Overburden Cross-Section, Aurora North

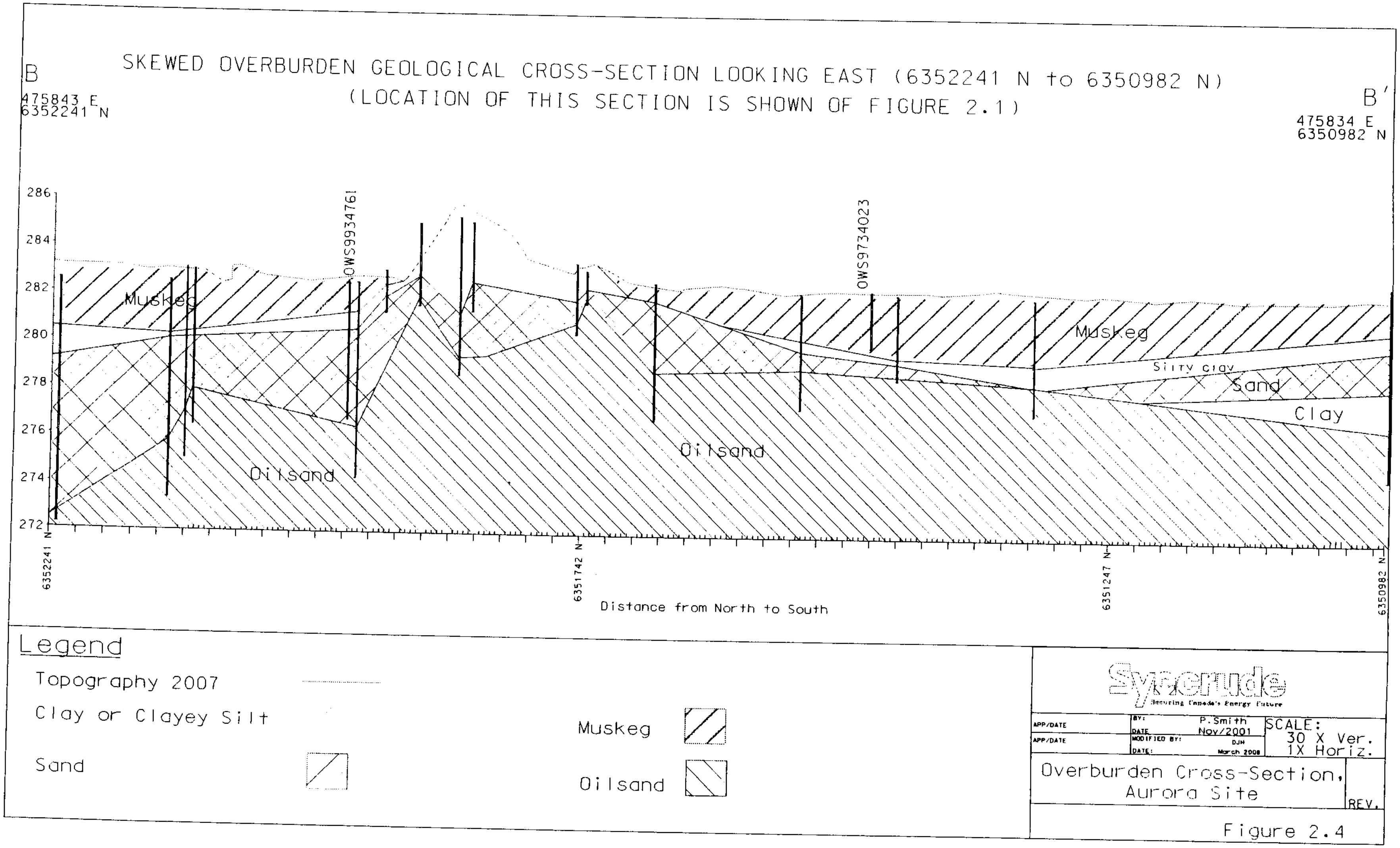


Figure 2.5 - Geological Cross-Section, Aurora North

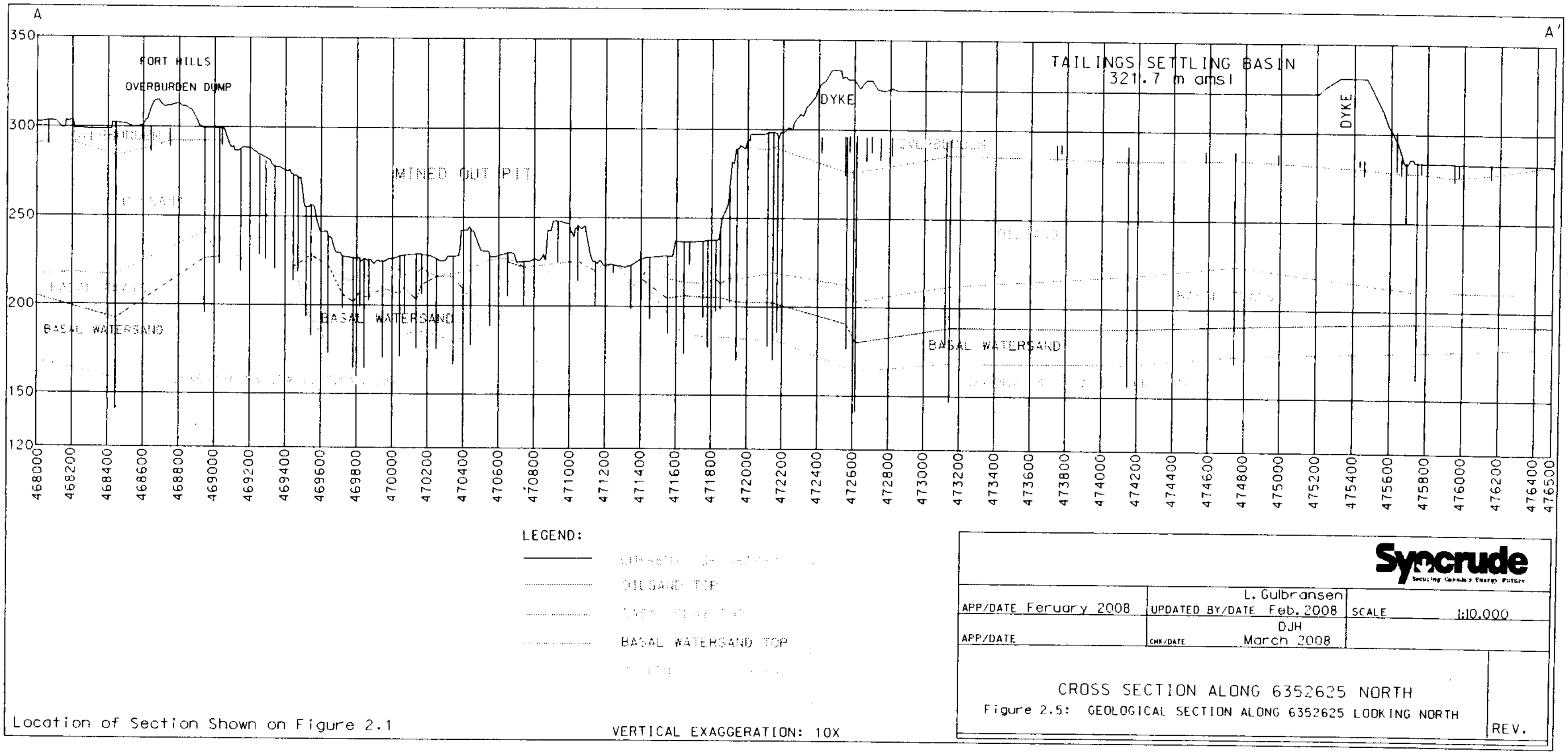


Table 2.5: Aurora - Quaternary Overburden Soils

	Depositional Environment & Soil Type	UNIT	USC Code	DESCRIPTION	% Grav	% Sand	% Fines	Geology Note
HOLOCENE	Muskeg	HO2	PT	Muskeg; plant debris and wood fragments near surface; amorphous peat often at depths >1m. Dark brown to black.	-	-	-	Widespread; near surface; corresponds with vegetation (bl. and white spruce) Often absent on sand ridges of greater than 2m relief above surrounding ground; similar to Base Mine
	Organic Mineral Soil	HO1	PT OL	Mineral Soil with organics; dark brown to black.	-	-	-	Mineral soil; may often be logged as HO2 or HF1
	Colluvium	HE1	CL-ML	Variable, silty-clay matrix with organic debris, possible pebbles or occ. Cobbles, disturbed.	1	43	56	Colluvium, variable lithology depending on locally derived intact soils; expected to be more abundant at the west in gully areas
	Aeolian Sand	HAE	SP SP-SM	SAND, fine grain, uniform, fines up to 20%, occ. organic contamination, often tan colour.	1	80	19	Near surface; Often occurs as veneer on sand ridges with Jack pine. Often very dry; uniform
	Fluvial Sand with fines	HF1	SW-SM	SAND, fine grain, moderately sorted, fines often 25%, usually some organic content, tan-orange colour.	7	69	24	Often occurs near surface immediately above PF sand in areas of minor or zero muskeg thickness; commonly 0.5m-1.5m thick with organics. May also occur as thin beds within muskeg.
	Pond Marl clayey Silt	HL1	OL-ML	SILT, clayey; 20% clay and 15% fine sand, white-cream colour, up to 10% organics, minor gastropods up to 10mm diam., high moisture content.	0	16	84	Occurs within muskeg and at base of muskeg; may also be found above muskeg in present-day sloughs.
	Pond Marl silty Sand	HL2	OL-ML	FINE SAND, silty; tan to cream colour, organics, shell fragments, high moisture content.	3	50	47	Occurs within muskeg and at base of muskeg; may also be found above muskeg in present-day sloughs; slightly coarser than HL1.
	Ridge silty Clay (lacustrine clay)	HX1	CL-CH	CLAY, silty, <12% fine sand; tan-cream colour, firm/dense, moderate moisture content, often oxidized.	0	12	88	Observed in Eastern Lease 34 immediately adjacent to Muskeg River valley along discrete ridges; interpreted as Holocene Lacustrine--likely similar or the same unit as HL3A based on XRD and test pits.
	Lacustrine silty Clay	HL3A	CL	CLAY, silty, with occ. fine sand beds; plastic, dark olive green/black, organic odour, occ. small white/bluish-white gastropod shells, 1mm-8mm. May have fibrous organics and black organic streaks.	0	18	82	East portion of Lease 34 along Muskeg River; usually occurs immediately below base of muskeg in areas of >1m muskeg thickness, usually below 280m.
	Lacustrine silty Sand	HL3B	SC SC-SM	SAND, silty, with some clay; mod. plasticity, dark olive green/black or grey, often has organic odour, small white, bluish-white gastropod shells, 1mm-5mm. May have fibrous organics and black organic streaks. Occ. cm scale clay beds within.	1	57	42	Coarser fraction related to HL3A.
	Oxbow Lake silty Clay	HF2A	CL	CLAY with organics; silty clay with organics and twigs; occ. charcoal fragments.	0	22	78	Commonly observed in eastern lease 34 within 1km of Muskeg River and within Stanley Flats area. Interpreted as oxbow lake/abandoned channel and last phase of fluvial fining upward sequence
	Fluvial silty Sand	HF2B	SC SC-SM	SAND, with CLAY BEDS; fine to med. grain sand interbedded with cm scale clay beds; Clays are light to med. grey clay, firm, well-defined. Sand and clay interbeds are horizontal. Similar to HL3B.	2	61	37	Fluvial sand; same sequence as HF2A but coarser fraction r
	Fluvial Sand	HF2C	SW SW-SM	SAND, fine to coarse grain, may have minor gravel, occ. light grey clay clasts, occ. cm-scale clay beds, occ. organic clasts. Less Sorted and more quartz than PF4 sand.	3	84	13	Fluvial sand with some gravel; same sequence as HF2A but coarser fraction.
	Fluvial gravelly Sand	HF2D	SW, GW SW-SM	SAND and GRAVEL, coarse grain sand and gravel. Less quartz but similar grain size distribution to PF4 and PF5A & B.	38	52	11	Lowermost interval of fining upward fluvial sand sequence.
PLEISTOCENE	Glaciofluvial Sand	PF4	SP SP-SM	SAND, med. grain, uniform to well-sorted, often orange-tan coloured above long-term watertable, often loose.	3	90	7	Widespread; Often occurs above PL clays or PG tills
	Glaciofluvial gravelly Sand	PF5A	SP SP-SM	SAND, gravelly up to 35%, % fines often <8%	17	75	8	Widespread; Often occurs above PL clays or PG tills
	Glaciofluvial sandy Gravel	PF5B	SW, SP GW	GRAVEL, sand from 35% to 65%, %fines often <8%	46	47	7	Often occurs as gravel lag in 0.15m to 1m thick interval directly above Km Top surface or in discrete granular ridges in L12 area.
	Glaciofluvial Gravel	PF3	GW, SW	GRAVEL, sand up to 35%, %fines often <8%	65	30	6	Often occurs as gravel lag in 0.15m to 1m thick interval directly above Km Top surface or in discrete granular ridges in L12 area.
	Glaciolacustrine silty Clay	PL1	CL	CLAY, silty, up to 40% silt, up to 20% fine sand, plastic, green to black	1	21	77	Problematic, may have been dark PG2; may exist in L12 area.
	Glaciolacustrine silty Clay	PL2	CL, CH	CLAY, siltey, up to 40% clay, up to 40% fine sand with occ. med. to coarse sand lens, pink to brownish pink to occ. brown in colour, stiff, plastic	2	26	72	Uncommon; found within well defined zero edge in SE corner of L34. Often occurs immediately below PF sand and above PG1 or KM; distinguised from PL2 by well-defined bedding and occ. Sand lenses.
	Disturbed Glaciolacustrine silty clay	PG2	CL, CH	CLAY, siltey, up to 40% clay, up to 40% fine sand, pink to brownish pink to occ. brown in colour, stiff to very stiff, plastic, disturbed bedding, minor very soft pink or white clay clasts up to 5mm throughout; within sandy silt matrix. Often distorted bedding with occ. pebbles and angular cobbles.	2	28	70	Same as PL2 occurrence. Distinct features are diagnostic clay mm-scale clasts and pink/brown colour; lack of well-defined bedding and unlike PL2.
	Glaciolacustrine Deltaic silty sand	PL3	SP SP-SM	SAND, fine-grain, up to 30% fines, occ. med. to coarse sand up to 20%, often clean with no contamination, very uniform.	1	81	18	Occurs primarily in Stanley Flats area within Eastern L34 and L10. Often occurs within PL2. PL3 has likely been mis-identified as PF1 in the past. PL3 has been observed in outcrop in East pit below PF4 sand.
	Glacial Kame Fluvial sand	PF1	SP SP-SM	SAND, fine to med. grain, uniform to well-sorted, often white, >90% quartz, cm-scale bedding	1	92	7	Fort Hills Kame Sand underlying all Quaternary units except PG1. May have stringers of pink clay within. Has been recorded as PF4 in many holes. Most common above areas with ground elevation >305m.
	Ablation Till	PG3	CL	Variable, silty-clay matrix with angular pebbles and occ. cobbles to pebbly-gravel with 10-20 % fines.	5	38	57	Likley PG2 in most holes that has been confirmed with redrills; may exist to the west.
	Lodgment Till	PG1	SC-SM CL, ML	SAND, fine-grain, silty, up to 50% fines, occ. med. to c. grain sand, poorly sorted, black, angular pebbles up to 5mm, slight bitumen odour, very dense.	6	46	48	Firebag Till; Widespread; always occurs directly overlying Cretaceous where it does occur.
	Rafted Clearwater Clays	PGKC	CL	KC clay clast >0.3m within Quaternary solid unit; interpreted as rafting.				Rafted Clearwater clays found within Quaternary interval
	Rafted McMurray Oil Sand	PGKM	variable	KM clays >0.3m within a Quaternary solid unit; interpreted as rafting.				Rafted McMurray oil sand found within Quaternary interval
	Undifferentiated Pleistocene	PUG	variable	Problematic soil with poorly understood or unknown depositional environment.				Unknown
CRET.	Glauconitic silty Sand; Clearwater Fm.	KCW	CL, SC	Sand, silty with glauconite; wavey laminae often observed				Clearwater Fm; Wabiskaw Member
	Massive Clay; Clearwater Fm.	KC	CH, CL	Undifferentiated Clearwater Clay (e.g. KCA, KCB etc)				Undifferentiated Clearwater clays: e.g. KCA, KCB etc
	Oil Sand; McMurray Fm.	KM		Undifferentiated Oil Sand; Facies 99 in SCL Database				Undifferentiated McMurray Fm; recorded as 99 in database
		SOIL UNIT QUALIFIERS						
		OILY		Bitumen within soil unit, commonly found as "tar balls"				
		KC		Quaternary soil unit with >50 % KC clays as matrix				
		DIST		Disturbed, churned or mildly contaminated by another soil unit, (e.g. pebbles found within churned Kc)				
		QUES		Depth and lithology questionable				

3 Groundwater Monitoring Program

3.1 Program Description

The groundwater monitoring program was first outlined in the "Groundwater Monitoring Proposal for Aurora North Mine" (Kampala 1999) and submitted to Alberta Environment. Several changes to the monitoring network have been implemented since that time, as outlined in subsequent Annual Groundwater Reports. The current network of monitoring sites is shown in Figure 3.1. The proposed program for 2007 was outlined in the 2006 Monitoring Report. The analytical schedule used in 2007 is outlined in Table 3.1.

Table 3.1: 2007 Analytical Schedule

Parameter	Monitoring Locations	Frequency
Field Conductivity, pH, and Temperature	All	Semi-annually
Major Cations and Anions	All	Semi -annually
Total Dissolved Solids	All	Semi -annually
Total Suspended Solids	All	Semi -annually
Dissolved Organic Carbon	All	Semi -annually
Phenols	All	Semi -annually
Laboratory pH and Conductivity	All	Semi -annually
Metals (Al, As, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn)	All monitoring wells and river locations	Every 5-years**
Metals (Al, As, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn)	Surface samples of dirty water	Annually
Naphthenic Acids	Selected	Annually
Total Extractable Hydrocarbons (TEH)	Selected	Annually
Polyaromatic Hydrocarbons (PAH)	Selected	Annually

** Next analysis for Metals will be done in 2008. New locations to be sampled during first year of monitoring

Selected analysis were conducted at specific monitoring well locations based on the historical data and the proximity of monitoring well locations to potential sources of influence especially at the plant emergency dump pond where prior contamination was detected.

3.2 Sampling Procedures

All monitoring wells are equipped with dedicated inertia pumps. Inertia pumps are used for both purging and sampling. Syncrude contracted the sampling of all monitoring wells to Golder Associates in 2007. The sampling procedures and protocols that Golder and Syncrude follow are presented in Appendix D. The following paragraphs summarise what is covered in the Appendix D.

ALS Laboratory Group conducted all analyses for the two scheduled sampling periods in 2007. Eight blind duplicate samples were collected in the summer, and nine were collected in the fall to ensure that the lab analysis were accurate and repeatable. ALS Laboratory Group analyzed the duplicate samples.

Purging

Static water level measurement was taken prior to well purging. During well purging three well volumes were pumped from the well. Wells that were installed in units of lower hydraulic conductivity were purged by pumping the well dry. The well was then allowed to recover until sufficient water was available for sampling.

Sampling

Latex gloves were worn during sampling to protect the integrity of the sample. Sample bottles were rinsed with well water (with the exception of BTEX bottles, which contain a powdered preservative, $NaHSO_4$). The rinsed bottles were then filled to overflowing and immediately capped. For analyses that require preserved samples, the preservative was added to the bottle when it was approximately half full. Samples for analysis of dissolved species (requiring preservation) were filtered using a single-use 45-micron on-line filter, before the preservative was added. Field measurements for pH, conductivity and temperature were completed after all sample bottles were filled. Sample bottles were labelled and stored in a cooler until they were delivered to the contract laboratory (in person or via courier). Chain of custody paperwork accompanied all samples.

3.3 Summary of Changes Since 2006

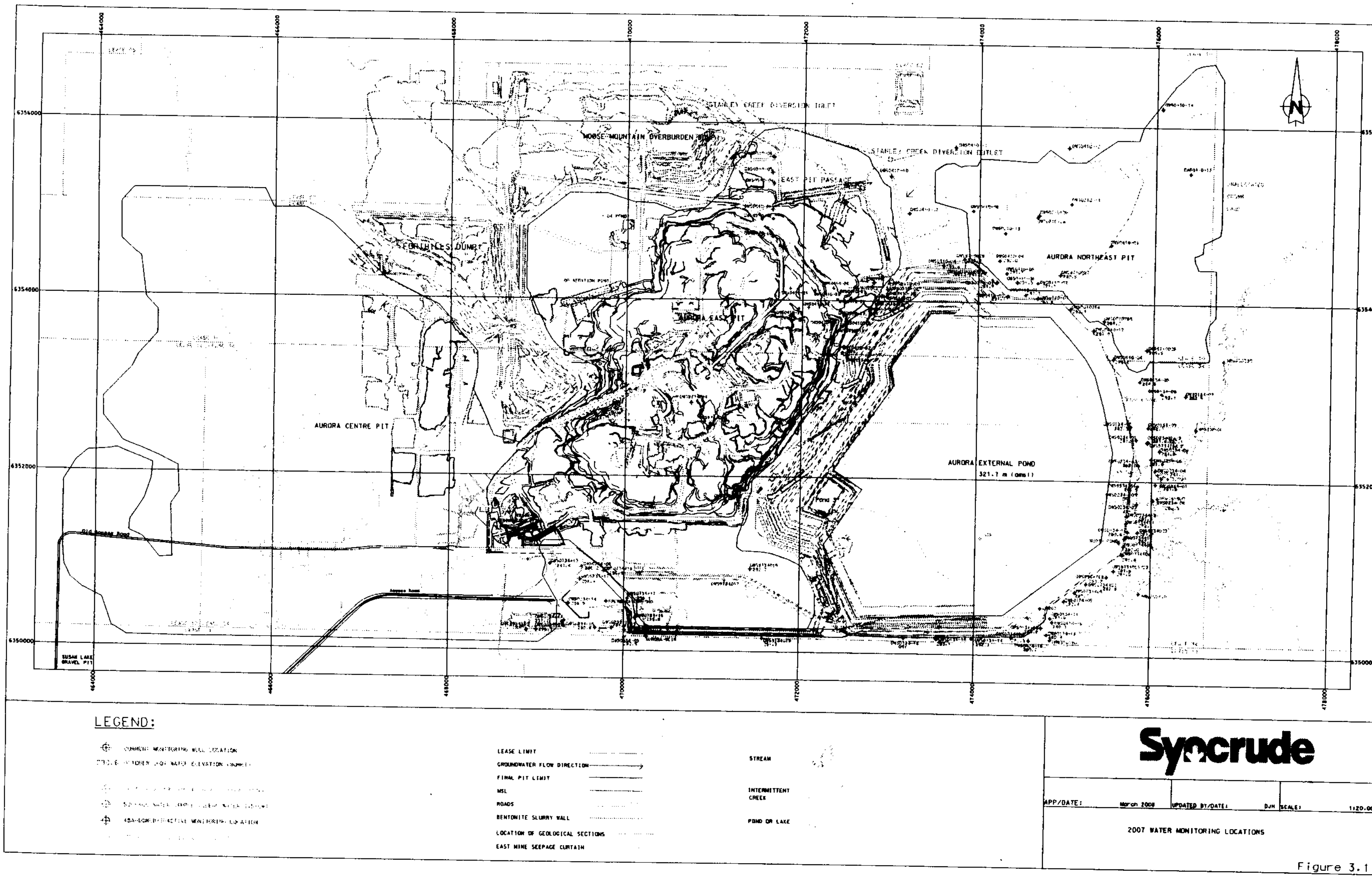
The following changes were made to the groundwater monitoring program in 2007:

- Five additional wells (OWS0734413, OWS0734414, OWS0734416, OWS0734417, and OWS0734418) were installed in the Plant area.
- Nine additional wells (OWS0734400, OWS0734405, OWS0734406, OWS0734407, OWS0734408, OWS0734409, OWS0734410, OWS0734411, and OWS0734412) were installed in the area of South Seepage and along the East Side of tailings.

The following changes will occur in the groundwater monitoring program in 2008.

- Wells OWS0310-01, OWS0410-32 and OWS0410-34 will be abandoned due to the advancement of mine operations.
- East Pit Passage Polishing Pond (EPP-PP) will be converted into a dirty water sump and a new clean water sump will be developed.

Figure 3.1 - Monitoring Locations



3.4 Surface Water within the Dirty Water System

Six locations within the dirty water system (AN-SIPHON, RECYCLPOND, A6202, SOUTHPOND, MRSUMP, RAMP3POND), shown on Figure 3.1, were sampled as part of the groundwater monitoring program in 2007. Additional data from SCL Research is included for the Aurora Tailings Pond (ATP) site. Table 3.2: Summary of Surface Water Chemistry (Dirty Water) provides a summary of active surface sampling locations for the past eight years. Samples from the dirty water system provide an indication of potential contaminant sources. The analytical results from the 2007 sampling are summarized in Table 3.3. Complete results are included in Appendix A and trend plots are included in Appendix B.

Discussion

Generally, the concentration of major ions is increasing in process water. This trend will continue, as water is recycled through the extraction process, dissolving salts from the ore. The majority of ion concentrations have remained lower at the Aurora North site than at Syncrude's Mildred Lake Site, primarily due to the large import of clean water from depressurization wells and surface drainage. The import of captured water has lead to higher concentrations of calcium, magnesium, and potassium in the Aurora process water than at the Mildred Lake Site. All locations within the dirty water system showed little change over the years. The following samples are collected from the seepage sumps and other sources around the tailings pond.

A6202, AN-SIPHON, ATP, and RECYCLPOND

These sample locations assess the water chemistry of the tailings pond and as such all share similar water chemistry. The results are consistent with historical data. The exception is ATP which shows a steady increase in the concentration of naphthenic acids, sulphate and zinc. Additional data collected by Syncrude Research are included in Appendix C.

SOUTH POND

The south seepage pond (sump) receives tailings seepage water, intercepted clean groundwater, as well as mine water (including depressurization water, intercepted shallow groundwater, precipitation, and runoff). The salinity concentrations were in the general range of the previous years.

RAMP 3 POND

Ramp 3 Pond is a sump that receives tailings seepage water, intercepted clean groundwater, and periodically depressurization water. It is located between the 2004 and 2005 cut-off walls (Figure 3.1). Water from this sump is pumped directly over the Aurora Settling Basin and back into the tailings pond.

The construction of a soil-bentonite cut-off wall north and south of Ramp 3 Pond was expected to alter water chemistry in the sump in 2006 and beyond but the chemistry has continued to follow historical trends. As a result, Syncrude expects the water chemistry to continue to resemble diluted process water in 2008. Also with the advancement of the East Pit north, the volume of water reporting to Ramp 3 Pond will continue to increase as more mine water is directed to the sump.

MR SUMP

Active pumping of the MRSUMP stopped in May 2006. Wells in the area have started to show influence from process water, specifically OWS0234-03 and OWS9934761. Active pumping of MRSUMP has resumed mitigating the process water influence. The chemistry in the sump has returned to near historical values. Generally the elevated Chloride and Sodium ions, from process water, have shown a slight increase while the Calcium ions, associated with clean water, have shown a slight decrease. The change in chemistry can be attributed to the installation of the 2005 cut-off wall that is now preventing the influx of clean water from the Muskeg River.

Table 3.2: Summary of Surface Water Monitoring Locations (Dirty Water)

ID	Water Type	1999 Proposal	1999	2000	2001	2002	2003	2004	2005	2006	2007
A6202	Tailings filter drain	-	-	-	-	A	A	A	A	A	A
AN-SIPHON	Siphon Removes water from tailings pond	-	-	-	-	-	A-F	A	A	A	A
ATP*	Tailings pond Surface water	-	-	-	-	-	A-S	A	A	A	A
FWATERPOND	Fresh water pond Water used in plant	-	A	A	A	A	U	-	-	-	-
L6203	Tailings filter drain	-	-	A	A	U	-	-	-	-	-
MRSUMP	Seepage control sump east of the tailings dyke	-	-	-	A-F	A	A	A	A	A	A
NORTHPOND	North Sump Collects tailings seepage water	P	A	A	A	A-S U-F	-	-	-	-	-
PP-1	Collects tailings seepage water	-	A	A	A	U	-	-	-	-	-
RAMP3POND	Ramp 3 Seepage Sump Collects tailings seepage water	-	-	-	-	A	A	A	A	A	A
RECYCLPOND	Recycle Pond Process water used in plant	-	A	A	A	A	A	A	A	A	A
SOUTHPOND	South Sump – Collects tailings seepage water, dirty water from the mine, and depressurization water	P	A	A	A	A	A	A	A	A	A
Total Proposed		2	-	-	-	-	-	-	-	-	-
Total Active		-	5	6	6	5	7	7	7	7	7

P = Proposed, A = Active, R = Replaced, U = Suspended, -F = Fall, -S = Summer
* sampled by SCL research annually

Table 3.3: Summary of Surface Water Chemistry (Dirty Water Major Ions)

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
A6202	24-Jun-07	761	410	286	98	33	16	505	8.0	3335	1780	45
A6202	15-Oct-07	692	395	289	88	30	16	474	8.4	2750	1780	46
ANSIPHON	26-Jun-07	685	402	320	27	17	22	602	8.4	3012	1700	56
ANSIPHON	15-Oct-07	628	388	334	31	17	23	554	8.7	2880	1850	60
ATP	27-JuL-07	691	380	337	21	13	18	613	8.4	2980	0.175^	45
MRSUMP	24-Jun-07	359	108	142	109	25	3	113	8.2	1374	710	18
MRSUMP	15-Oct-07	392	145	164	127	26	3	122	8.3	1290	885	23
RAMP3POND	24-Jun-07	640	238	140	134	24	5	266	8.0	2197	1390	33
RAMP3POND	15-Oct-07	614	265	185	132	24	7	284	8.3	2060	1240	34
RECYCLPOND	26-Jun-07	674	395	317	27	17	23	599	8.5	2979	1700	57
RECYCLPOND	15-Oct-07	649	372	340	32	18	23	548	8.7	2660	1830	60
SOUTHPOND	24-Jun-07	702	321	345	100	31	12	456	8.1	3026	1600	36
SOUTHPOND	15-Oct-07	625	261	451	125	34	13	391	8.2	2490	1730	38
SOUTHPOND*	15-Oct-07	609	263	455	123	34	13	398	8.2	2360	1730	34

Abbreviations: HCO3 - Bicarbonate (mg/l), Cl - Chloride (mg/l), SO4 - Sulphate (mg/l), Ca - Calcium (mg/l), Mg - Magnesium (mg/l), K - Potassium (mg/l), Na - Sodium (mg/l), Cond. - Conductivity (mS/cm), TDS - Total Dissolved Solids (mg/l), DOC - Dissolved Organic Carbon (mg/l)

* Duplicate Sample

^ TDS reported as % weight

3.5 Surficial Aquifer and Surface Water Monitoring

In the fall of 2007 fourteen monitoring wells were added to the fall sampling campaign. Five monitoring wells were installed in the plant area and the remaining nine wells were installed around South Seepage and the East Side of the tailings pond. There were a total of fifty-six active wells during the summer sampling program, and sixty-eight active wells in the fall sampling program. Summer sampling was carried out in June and July. Fall sampling was carried out in October. The following wells were dry for both summer and fall sampling programs: OWS0134-16, OWS0310-01, OWS0410-32 and OWS0410-34. During summer sampling program OWS0134-12 was frozen. During fall sampling program OWS0234-10 was dry. Table 3.4 provides a summary of the status of each monitoring well since 1999.

The groundwater monitoring network focuses on the tailings area, in particular the north and east side where the majority of monitoring wells are located. There were twelve monitoring wells in the vicinity of the plant site during the 2007 sampling programs.

Currently, there are six active surface water sampling locations along the Muskeg River. The East Pit Passage (EPP) polishing pond is also considered as a clean water sampling location and is discharged into Stanley Creek. During 2007 the discharge of clean water to the environment was continuous with only a few reportable incidents of elevated total suspended solids due to construction activities from expanding the clean water collection system. Table 3.5 provides a summary of all active surface water sampling locations outside the dirty water system over the past nine years.

Table 3.4: Status Summary of the Aurora North Monitoring Wells

ID	1999 Proposal	1999	2000	2001	2002	2003	2004	2005	2006	2007
OWS9734004	P	A	A	D	-	-	-	-	-	-
OWS9734006	P	A	A	D	-	-	-	-	-	-
OWS9734008	-	-	-	A-F	D	-	-	-	-	-
OWS9734012	P	A	A	A	D	-	-	-	-	-
OWS9734015	P	A	A	A	A	A	A	A	A	A
OWS973416B	P	A	A	A	R	-	-	-	-	-
OWS9734017	-	A	A	A	D	-	-	-	-	-
OWS9734018	P	A	A	A	A	A	A	A	A	A
OWS9734021	P	A	A	A	A	A	A	A	A	A
OWS9734022	P	A	A	A	A	A	A	A	A	A
OWS9734023	P	A	A	A	A	A	A	A	A	A
OWS9710026	P	A	A	A	A	A	A	A	A	A
OWS9710027	P	A	A	A	A	A	A	A	A	A
OWS9710028	-	-	-	A-F	A	A	A	A	A	A
OWS9834755	P	A	D	-	-	-	-	-	-	-
OWS9934761	P	A	A	A	A	A	A	A	A	A
OWS9934762	P	A	A	A	A	A	A	A	A	A
SP9834-505	-	-	A	A	R	-	-	-	-	-
Well-4	P	P	-	-	-	-	-	-	-	-
OWS0010765	P	P	A	A	A	A	A	A	A	A
OWS0010766	-	-	A	A	A	A	A	A	A	A
OWS0110-01	P	P	P	A	A	A	A	A	A	A
OWS0110-02	-	-	P	A	A	A	A	A	A	A
OWS0110-03	-	-	P	A	A	A	A	A	A	A
OWS0110-04	P	P	P	A	A	A	A	A	A	A
OWS0134-05	-	-	P	A	A	A	A	A	A	A
OWS0134-06	-	-	P	A	A	A	A	A	A	A
OWS0134-07	-	-	P	A	A	A	A	A	A	A
OWS0134-08	-	-	P	A	A	A	A	U-S A-F	A	A
OWS0134-09	-	-	P	A	A	A	A	A	A	A
OWS0134-10	-	-	P	A	A	A	A	A	A	A
OWS0134-11	P	P	P	A	A	A	A	A	A	A
OWS0134-12	-	-	P	A	A	A	U	A	A	U-S A-F
OWS0134-13	-	-	P	A	A	A	U-S A-F	A	A	A
OWS0134-14	P	P	P	A	A	A	A	A	A	A
OWS0134-15	-	-	P	A	A	A	A	A	A	A

P = Proposed, A = Active, R = Replaced, D = Abandoned, U = Suspended, -F = Fall, -S = Summer

Table 3.4: Status Summary of the Aurora North Monitoring WellStatus Summary of the Aurora North Monitoring Wells (continued)

ID	1999 Proposal	1999	2000	2001	2002	2003	2004	2005	2006	2007
OWS0134-16	P	P	P	A	A	A	U	U	U	U
OWS0134-17	-	-	P	A	A	D	-	-	-	-
OWS0234-01	-	-	-	-	A	A	A	A	A	A
OWS023402A	-	-	-	-	A	A	A	A	A	A
OWS023402B	-	-	-	-	A	A	A	A	A	A
OWS0234-03	-	-	-	-	A	A	A	A	A	A
OWS0234-04	-	-	-	-	A	A	A	A	A	A
OWS0234-05	-	-	-	-	A	A	A	A	A	A
OWS0234-06	-	-	-	-	A	A	A	A	A	A
OWS0234-07	-	-	-	-	A	A	A	A	A	A
OWS0234-08	-	-	-	-	A	A	A	A	A	A
OWS0234-09	-	-	-	-	A	A	A	A	A-S U-F	A
OWS0234-10	-	-	-	-	A	A	A	A	U	A-S U-F
OWS0210-11	-	-	-	-	A	U-S A-F	U	U	U	U
OWS021012A	-	-	-	-	A	U-S A-F	U	U	U	U
OWS021012B	-	-	-	-	A	U-S A-F	U	U	U	U
OWS0210-13	-	-	-	-	A	U-S A-F	U	U	U	U
OWS0234-14	-	-	-	-	A	A	A	A	A	A
OWS0234-15	-	-	-	-	A	A	A	A	A	A
OWS0234-16	-	-	-	-	A	A	A	A	A	A
OWS0234-17	-	-	-	-	A	A	A	A	A	A
OWS0310-01	-	-	-	-	-	A-F	A	A	U	U
OWS0310-02	-	-	-	-	-	A-F	U	U	U	U
OWS0310-03	-	-	-	-	-	A-F	U	U	U	U
OWS0310-04	-	-	-	-	-	P	A	A	A	A
OWS0334-06	-	-	-	-	-	P	A	A	A	A
OWS0334-07	-	-	-	-	-	P	A	A	A	A
OWS0334-09	-	-	-	-	-	P	A	A	A	A
OWS0410-01	-	-	-	-	-	-	A	A	A	A
OWS0410-02	-	-	-	-	-	-	A	A	A	A
OWS04103A	-	-	-	-	-	-	A	A	A	A
OWS04103B	-	-	-	-	-	-	A	A	A	A
OWS0410-04	-	-	-	-	-	-	A	A	A	A
OWS0410-05	-	-	-	-	-	-	A	A	A	A
OWS0410-06	-	-	-	-	-	-	A	A	A	A
OWS0410-07	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U

P = Proposed, A = Active, R = Replaced, D = Abandoned, U = Suspended, -F = Fall, -S = Summer

Table 3.4: Status Summary of the Aurora North Monitoring Well(continued)

ID	1999 Proposal	1999	2000	2001	2002	2003	2004	2005	2006	2007
OWS0410-08	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-09	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-10	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-11	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-12	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-13	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-14	-	-	-	-	-	-	A-S U-F	A-S U-F	U	U
OWS0410-17	-	-	-	-	-	-	A	A	A	A
OWS0410-19	-	-	-	-	-	-	A-S U-F	U	U	U
OWS0410-20	-	-	-	-	-	-	A-S U-F	U	U	U
OWS0410-21	-	-	-	-	-	-	A-S U-F	U	U	U
OWS0410-22	-	-	-	-	-	-	A	A	A-S D-F	D
OWS0410-23	-	-	-	-	-	-	A-S U-F	U	D	D
OWS0410-24	-	-	-	-	-	-	A	A	D	D
OWS0410-25	-	-	-	-	-	-	A	A	D	D
OWS0410-26	-	-	-	-	-	-	A	A	U-S D-F	D
OWS0410-27	-	-	-	-	-	-	A	A	D	D
OWS0410-28	-	-	-	-	-	-	A	A	D	D
OWS0410-29	-	-	-	-	-	-	A-S U-F	D	D	D
OWS0410-30	-	-	-	-	-	-	A	D	D	D
OWS0410-31A	-	-	-	-	-	-	A–S U-F	D	D	D
OWS0410-31B	-	-	-	-	-	-	A	A	D	D
OWS0410-32	-	-	-	-	-	-	A	A	U	U
OWS0410-34	-	-	-	-	-	-	A	A	A-S U-F	U
OWS0434-15	-	-	-	-	-	-	A	A	A	A
OWS0434-16	-	-	-	-	-	-	A	A	A	A
OWS0734400	-	-	-	-	-	-	-	-	-	A-F
OWS0734405	-	-	-	-	-	-	-	-	-	A-F
OWS0734406	-	-	-	-	-	-	-	-	-	A-F
OWS0734407	-	-	-	-	-	-	-	-	-	A-F
OWS0734408	-	-	-	-	-	-	-	-	-	A-F

P = Proposed, A = Active, R = Replaced, D = Abandoned, U = Suspended, -F = Fall, -S = Summer

Table 3.4: Status Summary of the Aurora North Monitoring WellStatus Summary of the Aurora North Monitoring Wells (continued)

ID	1999 Proposal	1999	2000	2001	2002	2003	2004	2005	2006	2007
OWS0734409	-	-	-	-	-	-	-	-	-	A-F
OWS0734410	-	-	-	-	-	-	-	-	-	A-F
OWS0734411	-	-	-	-	-	-	-	-	-	A-F
OWS0734412	-	-	-	-	-	-	-	-	-	A-F
OWS0734413	-	-	-	-	-	-	-	-	-	A-F
OWS0734414	-	-	-	-	-	-	-	-	-	A-F
OWS0734416	-	-	-	-	-	-	-	-	-	A-F
OWS0734417	-	-	-	-	-	-	-	-	-	A-F
OWS0734418	-	-	-	-	-	-	-	-	-	A-F
Total Proposed	21	-	-	-	-	4	-	-	-	-
Total Active	-	15	17	34	47	42-S 50-F	79-S 66-F	73-S 66-F	58-S 54-F	56-S 68-F

P = Proposed, A = Active, R = Replaced, D = Abandoned, U = Suspended, -F = Fall, -S = Summer

Table 3.5: Summary of Surface Water Monitoring Locations

ID	Water Type	1999 Proposal	1999	2000	2001	2002	2003	2004	2005	2006	2007
AUR_WEIR	Aurora Weir - Clean water Discharged to Muskeg River	-	A	A	A	A	D	-	-	-	-
CWD-PP	Clear Water Ditch Polishing Pond	-	-	-	-	-	-	A	A	A	D
EPP-PP	East Pit Passage Polishing Pond	-	-	-	-	-	-	-	-	A	A
MR6350190	Muskeg River	-	-	-	A-F	A	A	A	A	A	A
MR6350775	Muskeg River	-	-	-	A-F	A	A	A	A	A	A
MUSK_UPST/ MR6351800	Muskeg River	-	A	A	A	A	A	A	A	A	A
MRT6352090	Tributary to the Muskeg River	-	-	-	A-F	A	A	A	A	A	A
MR6352600	Muskeg River	-	-	-	A-F	A	A	A	A	A	A
MR6353330	Muskeg River	-	-	-	A-F	A	A	A	A	A	A
Total Proposed		0	-	-	-	-	-	-	-	-	-
Total Active		-	2	2	2+5	7	6	7	7	8	7

P = Proposed, A = Active, R = Replaced, D = Abandoned, U = Suspended, -F = Fall, -S = Summer

Typically, the surficial aquifer and natural surface waters around the Aurora North site have very low concentrations of major ions. Interpretation of the analytical results may be simplified by examining chloride concentrations. Chloride is a very good indicator of influence from process water due to its conservative behaviour in groundwater, and low background concentrations in the aquifer. Typically background chloride concentrations are less than 10 mg/l in the surficial aquifer. As a conservative ion in groundwater, chloride is found at the leading edge of a process water plume, arriving before organics or most other ions. Analytical results from the sampling program collected from monitoring wells in 2007 are summarized in Table 3.6. Results for natural surface waters are summarized in Table 3.7. Complete results are included in Appendix A with the trend plots included in Appendix B.

External Tailings Pond Area

An integral part of the external tailings pond design is the perimeter ditch, which was designed to act as a hydraulic sink. The ditch was excavated below the local groundwater table, to create a gradient towards the ditch from both the tailings pond and the surrounding environment. The perimeter ditch flows into sumps at various locations, from which water is pumped back into the tailings pond. The system has operated effectively in most areas over the past nine years and has reduced the import of significant volumes of water from the environment. This imported water becomes part of Syncrude's dirty water inventory, which must be stored. The management of the dirty water inventory continues to be a significant challenge for Syncrude.

During 2007 there were multiple pipeline ruptures along the perimeter ditch system. This caused the perimeter ditch and in some instances the sumps to be filled with tailings sand. This lead to an increase in the water table and reversed the hydraulic gradient of the process contaminated water in the perimeter ditch and sumps towards the Muskeg River. Elevated ion concentrations were observed in areas of the events. The perimeter ditch and sumps have been cleaned out and are now operating properly.

Due to Environmental concerns Syncrude has continued initiatives to reduce water import in 2007. These initiatives included acquiring regulatory approval to discharge basal water back to the environment, construction of horizontal and vertical dewatering wells along the north side of East Pit (East Mine Seepage Curtain) and the addition of two new clean water discharge locations on Stanley Creek. It is expected that these initiatives will reduce the amount of clean water entering the dirty water system.

There are four areas where contamination from process water has been identified beyond the perimeter ditch. These areas are discussed in the following sections. All other monitoring wells continue to indicate background conditions.

In the fall of 2007 thirteen boreholes were drilled to help delineate the aquifer and acquire a better understanding of the geology around South Seepage and along the lower East Side of tailings. Wells were installed in nine of the boreholes where sufficient aquifer thickness was present.

South Seepage Sump Area

The water chemistry of monitoring well OWS0134-11 near the south seepage sump has shown similarity with the type of water influenced by process water. A significant increase in the chloride concentration occurred from 2006 (92 mg/l) to 2007 (178 mg/l). The sodium concentration also increased from previous years samples. The chloride concentrations in monitoring well OWS0434-16 continued to increase in 2007 to 148 mg/l from a value of 62 mg/l in 2006. These concentrations are becoming closer to typical process water concentrations.

Despite the localized change in water chemistry, Syncrude believes that there are adequate measures in place to monitor and control seepage in this area. The south seepage sump is to be operated with a maximum water elevation of 280masml although during 2007 it was operated above the 280masml mark due to the tailing pipeline ruptures and sanding of the perimeter ditch and sump. This elevation is below the mean Muskeg River elevation and approximately equal to the seasonal low river elevation.

In the fall of 2007 eight boreholes were drilled in the area. Four were suitable for monitoring wells installation (OWS0734400, OWS0734405, OWS0734406 and OWS0734407). The wells exhibited chemistry typical of background conditions expect for OWS0734407 that had a chloride concentration of 48 mg/l.

All other monitoring wells in the area exhibit water chemistry typical of background conditions. Syncrude believes that the hydraulic control provided by the sump combined with the limited aquifer thickness in the area; provide reasonable containment of the process water. The location of monitoring wells in this area, and the aquifer isopach are shown on Figure 3.2.

East Side

Process water was identified migrating beyond the perimeter ditch on the east side of the Aurora tailings pond during 2001. The MR Sump was constructed to intercept the seepage and return the water to the perimeter ditch. Since 2002, Syncrude has conducted increased monitoring in the surrounding area to assess the performance of the seepage sump.

In the fall of 2007 five additional monitoring wells (OWS0734408, OWS0734409, OWS0734410, OWS0734411 and OWS0734412) were installed on the southern end of the East Side, just south of the 2005 cut-off wall. The location of the monitoring wells in this area and the aquifer isopach are shown on Figure 3.3. The new monitoring well locations all showed elevated water chemistry with chloride concentrations ranging from 46 mg/l to 223 mg/l. The monitoring wells are located near the North Pond, which did not operate properly in 2007 due to the tailings pipeline ruptures. For a good portion of the year the sump was full of tailings sand and this increased the operational water level. This changed the direction of the gradient from into the perimeter ditch to out towards the Muskeg River. Proper operation of the North Pond in 2008 should lead to a decrease in the chemistry observed in the new monitoring wells. All other monitoring wells in the area exhibit water chemistry typical of background conditions.

In 2005 a cut-off wall was constructed south of Ramp 3. Syncrude is satisfied that the cut-off wall is impeding the influx of clean water but is permitting the egress of process influenced waters. Pumping of the MR Sump to the perimeter ditch has commenced again to mitigate the influence of process water in the area. Elevated water chemistry was observed in OWS0234-03 (91 mg/l chlorides) and OWS9934761 (178 mg/l chlorides). These two monitoring wells are located near the MR Sump. It is believed that the chemistry will return to historical values upon pumping the MR Sump again.

Since the construction of the cut-off wall, groundwater chemistry in the MR Sump has migrated back towards the characteristics of process water. The water chemistry has increased and will continue to trend towards process water throughout 2008. Water chemistry changes have not been noticed in the surrounding wells, both inside and outside of the wall. The current results are near or slightly above the historical values. Syncrude expects to see the effects of prolonged periods with low river levels, typically during winter flow conditions to have less impact on the water table west of the cut-off wall.

North Tailings Area

Groundwater contamination was identified north of the tailings dyke in monitoring well OWS0110-01 in 2003. The monitoring network has since been expanded to identify the extent of the contamination that has now been identified in OWS0110-03, OWS0410-01, OWS0410-02, OWS041003A, OWS041003B, OWS0410-05, and OWS0410-06. These monitoring wells showed an increase in water chemistry and returned to the 2004 or remained at historical levels in water chemistry. OWS0110-01 showed an increase in chloride concentration in the spring but returned to 2006 levels in the fall. All the remaining wells in the area are at historical chemistry values. The location of monitoring wells in this area, and the aquifer isopach are shown on Figure 3.4.

Syncrude's experience and previous chemistry results indicated that the current plume will remain outside of the cut-off wall, and will slowly be diluted by advection, dispersion and potentially degradation of the organic components. The future migration of this plume is expected to be in an overall east or south-easterly direction. There was no increase in the ion concentrations of the surrounding monitoring wells to suggest any migration of the contaminant plume occurred in 2007. There was evidence that the plume is being influenced by additional process water though. The chemistry results from 2007 suggest that process affected water from the tailings pond or perimeter ditch is recharging the plume. Syncrude will be looking into the issue and continue tracking the movement of process affected waters in the area.

At this time, Syncrude does not see the need to immediately recover the plume that remains outside the cut-off wall. The current mining sequence for the Aurora site identifies that the mining of the area north of the tailings pond (Northeast Pit) begins in 2035. The area would have to be dewatered in preparation for mining; therefore recovery of the plume could take place at this time, if it is deemed necessary. In the interim Syncrude will continue to monitor the movement of this plume. Syncrude Research is conducting research on process water constituents including the degradation process within environmental waters.

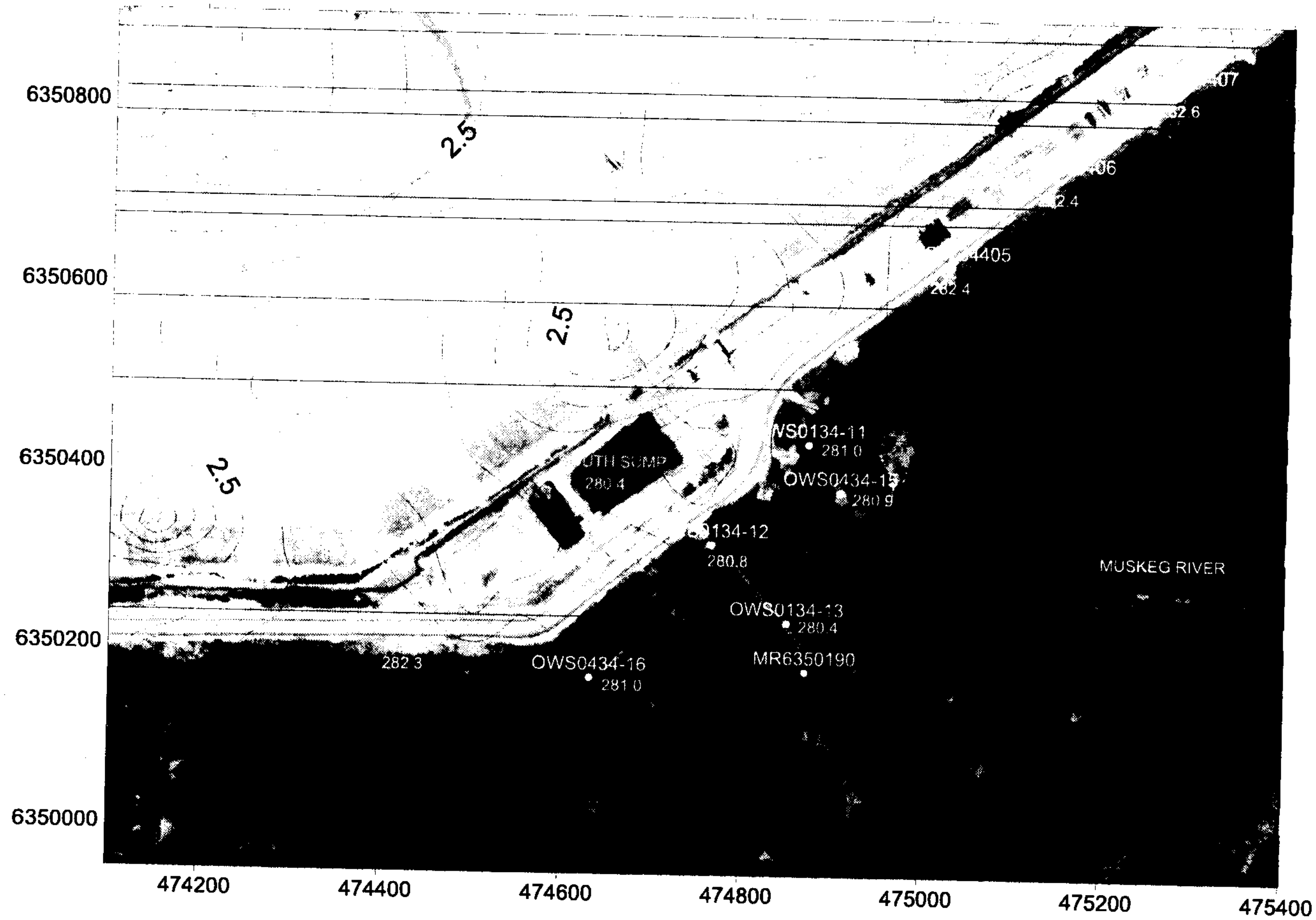
East Pit Passage Area

Dewatering of the overburden in advance of mining operations is carried out with a ditch system. The EPP flows into a polishing pond located to the northwest of the tailings pond. Water is pumped from the polishing pond to the Stanley Creek discharge area. The EPP became fully operational in 2006. The chemistry of the groundwater collected by the EPP was similar to the background water chemistry. The EPP can be seen on Figure 3.1

Muskeg River Monitoring

The Muskeg River was sampled at five locations (Figure 3.1) and in one small inlet (MRT6352090) during 2007. The water chemistry continues to show seasonal variability that corresponds with river flows. The water monitoring has not identified any impact from the Aurora Site facilities.

Figure 3.2 - South Seepage Sump Area Monitoring – aquifer thickness

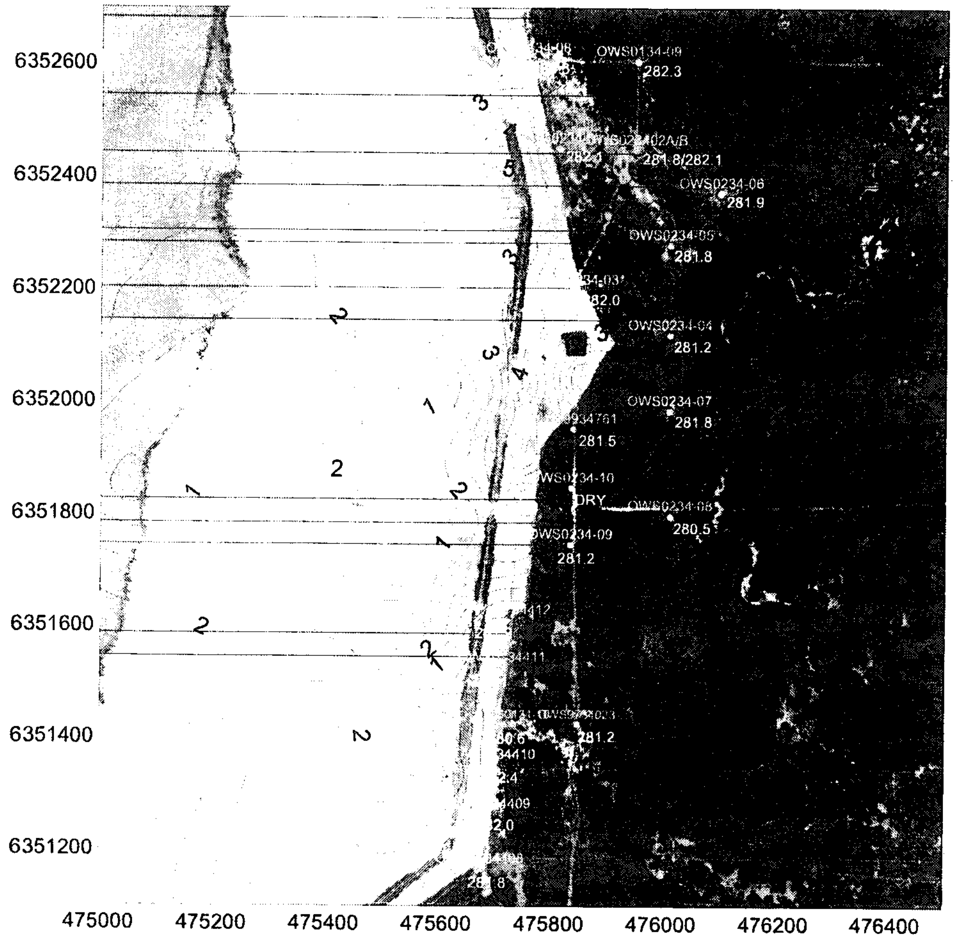


- Geological hole or test pit

Current Monitoring Well Location, Fall 2007 Water Elevation

Contour interval 0.5 metres, aquifer thickness

Figure 3.3 - East Tailings Area Monitoring – aquifer thickness



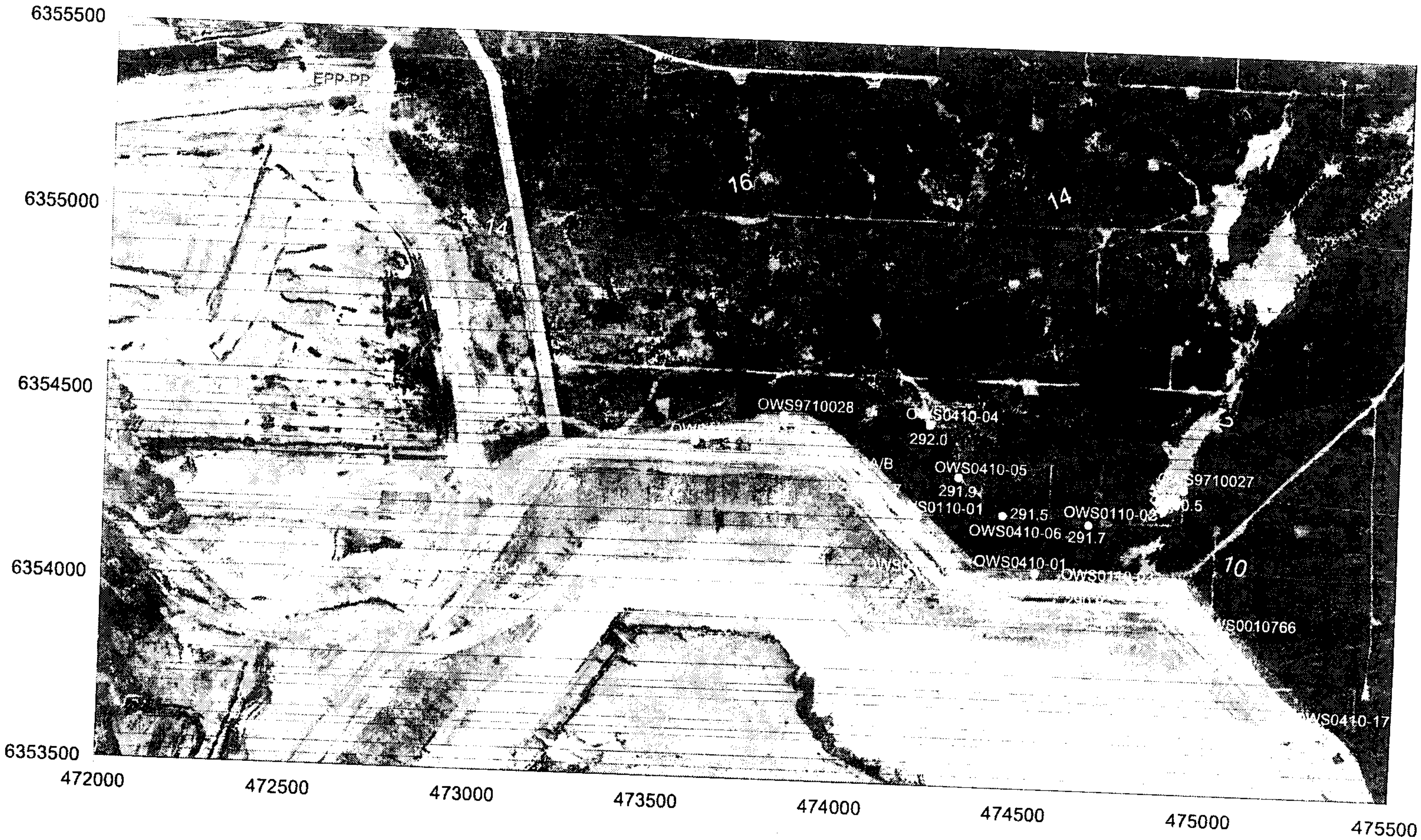
- Geological hole or test pit

Current Monitoring Well Location, Fall 2007 Water Elevation

Soil-Bentonite Slurry Wall

Contour interval 1 metre, aquifer thickness

Figure 3.4 - North Tailings Area Monitoring – aquifer thickness



Current Monitoring Well Location, Fall 2007 Water Elevation

Soil-bentonite Slurry wall

Aquifer isopach, contour interval =1 metre

Plant Area Monitoring

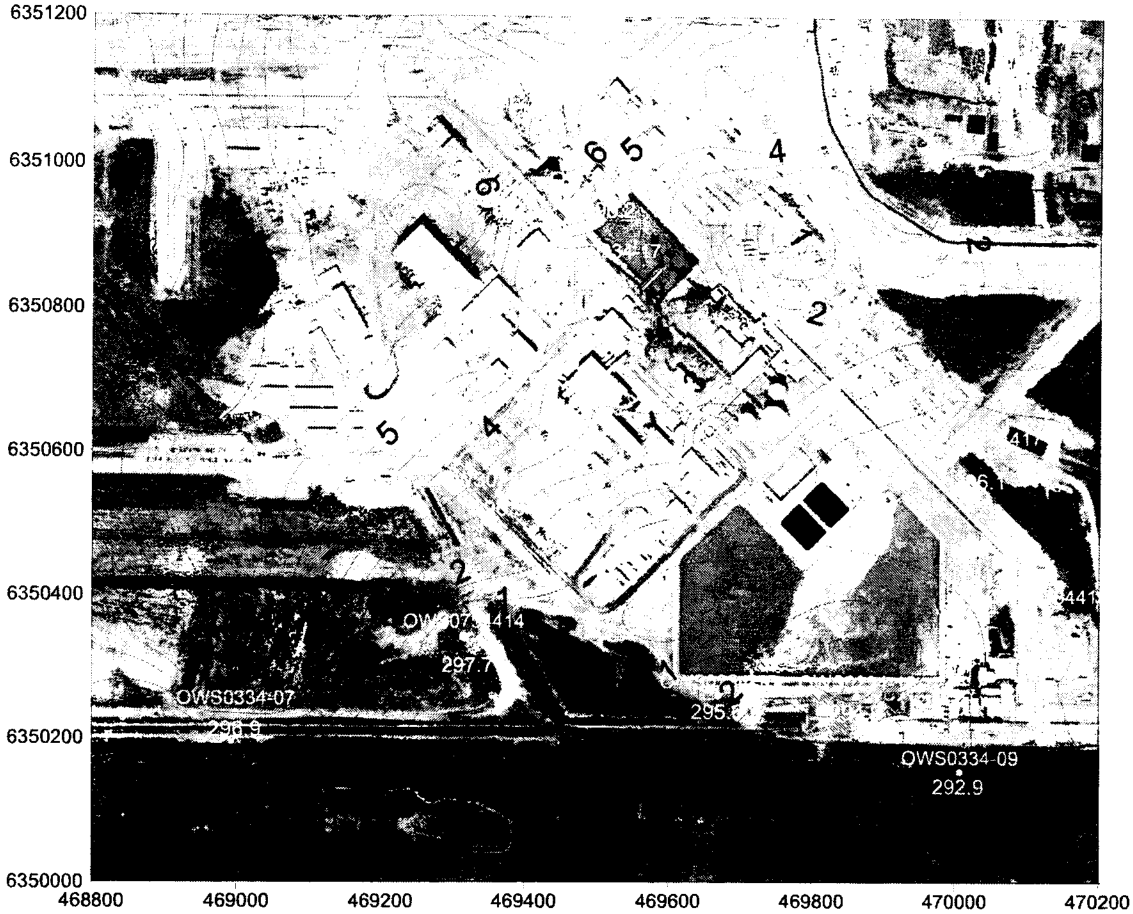
Due to concerns raised by AENV an additional five monitoring wells were installed to bring the well total to twelve in the vicinity of the Aurora Plant site. The new monitoring wells were OWS0734413, OWS0734414, OWS0734416, OWS0734417 and OWS0734418.

Historical monitoring in the plant area has shown higher background concentrations of calcium and sulphate than in other areas. The 2007 chemistry results for monitoring wells OWS0234-15, OWS0234-16, OWS0334-07, OWS0334-09, OWS0734414 and OWS0734417 are consistent with historical trends, indicating background chemistry. All of these wells are located near the boundary between Aurora North and Albian Sands. This shows that process affected water is not migrating offsite.

OWS0234-14, OWS0234-17, and OWS0334-06 continued to show elevated water chemistry and remained similar to the chemistry from 2006. OWS0734413 and OWS0734418 have water chemistry that is similar to the above wells. OWS0234-17 and OWS0334-06 are located adjacent to the emergency dump pond. OWS0734413 and OWS0734418 are located relatively close to the emergency dump pond. The emergency dump pond is located near the Primary Separation Vessels. The emergency dump pond is used as a sump which oilsand-bitumen-water slurry is periodically dumped from the PSVs when the unit have to be shutdown. The emergency dump pond is believed to be the source of contamination identified in the wells because of the bitumen in the pond. OWS0234-14 is adjacent to a ditch, which carries process water from the emergency dump pond to the recycle pond. Local effects on the well should be expected from this shallow ditch. OWS0734416 is located near the Tailings Distributor emergency dump pond. Overall groundwater flow in the plant area is expected to be toward the mine pit. This local contamination is therefore not considered a significant concern.

The underlying geology at the plant site helps to minimize and control the movement of process-affected water. The aquifer thins to the south. The mine area to the north has effectively been dewatered. This limits the movement of groundwater to the south (Figure 3.5). All water collected in the mine pit is considered dirty water and is retained on site. Extensive effort to protect groundwater within the plant site is therefore not considered a priority. Syncrude's current focus is to ensure that the contamination within the plant site is not in any way released to the surrounding environment.

Figure 3.5 - Plant Area Monitoring – aquifer thickness



Ditch from emergency dump to recycle water pond

Aquifer isopach, 0.5 metre contour interval

- Geological hole or test pit

Current Monitoring Well Location, Fall 2007 Water Elevation

Table 3.6: Summary of Groundwater Chemistry (Major Ions)

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
OWS9710026	27-Jun-07	391	<1	1.4	101	14	0.8	4	8	703	370	12
OWS9710026	22-Oct-07	384	<1	0.9	98.9	12.2	0.9	3	7.6	565	354	11
OWS9734015	29-Jun-07	493	5	37.4	137	16.1	0.7	13	7.9	866	480	14
OWS9734015	23-Oct-07	496	5	39.2	146	16	1.5	12	7.1	778	481	12
OWS9734018	29-Jun-07	465	2	3.7	119	16.6	<0.5	4	7.9	617	410	32
OWS9734018	18-Oct-07	440	2	4.5	114	15	1.2	4	7.1	625	407	32
OWS9734021	26-Jun-07	291	1	11.2	85	8.9	0.5	11	7.7	482	320	24
OWS9734021	17-Oct-07	313	3	7.9	94.3	9	<0.5	7	7.5	481	334	29
OWS9734022	26-Jun-07	368	4	3.7	90.4	9.8	1.6	28	7.8	583	370	28
OWS9734022	17-Oct-07	330	6	3.9	89.5	9.2	1	13	7.5	497	388	28
OWS9734023	26-Jun-07	262	2	29.2	82.4	9.7	1.9	9	7.9	470	340	23
OWS9734023	15-Oct-07	414	2	3.9	116	11.6	1.5	7	8.3	606	392	21
OWS9710027	27-Jun-07	291	<1	19.3	81.3	10.8	0.6	3	8	577	290	11
OWS9710027	22-Oct-07	305	2	23.3	90	10.3	1.1	3	7.7	502	317	10
OWS9710028	24-Jun-07	332	<1	1.5	84.9	15	<0.5	5	7.8	597	280	14
OWS9710028	14-Oct-07	281	1	25.5	75.7	12.8	1.3	7	7.7	461	303	12
OWS9934761	25-Jun-07	636	233	276	213	26.7	1.6	176	7.6	2240	1450	32
OWS9934761	15-Oct-07	566	179	221	222	21.9	2.3	143	8.2	1760	1150	31
OWS9934762	28-Jun-07	662	30	6.9	115	17.2	5.2	108	8	1020	630	26
OWS9934762*	28-Jun-07	660	30	6.9	116	17.2	4.9	109	8	1020	620	26
OWS9934762	23-Oct-07	618	20	1.5	112	15.9	3.9	85	7.4	923	588	26
OWS0010765	28-Jun-07	353	<1	1.6	89.2	12.4	0.9	4	8.1	591	360	11
OWS0010765	14-Oct-07	347	2	2.8	91.3	11.9	1.4	6	7.8	509	294	10
OWS0010766	25-Jun-07	284	1	16.9	68.4	10.9	1.2	7	7.8	580	280	10
OWS0010766	14-Oct-07	286	2	25.7	82.9	10.5	1.1	7	7.8	465	295	11
OWS0010766*	14-Oct-07	278	1	30	82.1	10.4	1.3	6	7.8	468	303	10
OWS0110-01	25-Jun-07	591	300	277	196	27.7	2.4	261	7.6	2383	1230	28
OWS0110-01	14-Oct-07	573	215	409	210	27.7	2.5	235	7.7	2060	1390	30
OWS0110-02	27-Jun-07	299	2	29.1	87.7	11.1	0.9	4	8	594	290	9
OWS0110-02	22-Oct-07	283	21	38.6	96	11	2	5	7.8	556	354	11
OWS0110-03	25-Jun-07	574	310	273	210	28.7	2.6	245	7.6	2506	1420	33
OWS0110-03	14-Oct-07	604	304	344	194	25.4	2.6	267	7.6	2320	1530	33
OWS0110-04	25-Jun-07	534	2	139	179	24.9	1.2	5	7.5	1132	710	14
OWS0110-04	14-Oct-07	514	2	171	187	25.6	1.8	8	7.5	991	684	15
OWS0134-05	28-Jun-07	472	<1	1.7	124	14.4	0.6	4	8.1	770	430	14
OWS0134-05	22-Oct-07	463	1	0.7	132	13.6	0.8	3	7.8	676	413	11
OWS0134-06	27-Jun-07	452	1	2.3	121	15.3	2.6	7	8	742	390	11
OWS0134-06	22-Oct-07	444	1	0.5	119	14.3	0.9	4	7.7	652	396	9
OWS0134-07	27-Jun-07	483	1	1.4	121	17.7	<0.5	5	7.9	763	400	13
OWS0134-07	22-Oct-07	469	1	0.7	121	16.7	0.9	4	7.6	685	409	10

Abbreviations: HCO3 - Bicarbonate (mg/l), Cl - Chloride (mg/l), SO4 - Sulphate (mg/l), Ca - Calcium (mg/l), Mg - Magnesium (mg/l), K - Potassium (mg/l), Na - Sodium (mg/l), Cond. - Conductivity (mS/cm), TDS - Total Dissolved Solids (mg/l), DOC - Dissolved Organic Carbon (mg/l)

* Duplicate Sample

Table 3.6: Summary of Groundwater Chemistry (Continued)

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
OWS0134-08	25-Jun-07	545	18	9.5	147	19.7	<0.5	6	7.7	835	520	17
OWS0134-08*	25-Jun-07	543	18	8.5	134	20.8	0.7	8	7.7	833	530	16
OWS0134-08	15-Oct-07	539	26	13.9	159	20.5	2	9	8.2	871	537	17
OWS0134-09	28-Jun-07	465	<1	1.3	110	13.9	0.5	6	8	750	400	14
OWS0134-09	23-Oct-07	496	<1	<0.5	126	13.9	1.2	7	7.5	676	410	10
OWS0134-10	26-Jun-07	370	22	14.9	101	13	1.2	18	7.6	662	380	23
OWS0134-10	15-Oct-07	352	10	6.1	95.4	10.7	3.2	11	7.9	567	412	20
OWS0134-11	26-Jun-07	694	181	8.3	171	27.8	1.7	109	7.7	1653	830	24
OWS0134-11	17-Oct-07	674	172	5.3	177	27.6	1.1	102	7.7	1450	880	23
OWS0134-11*	17-Oct-07	677	178	5	176	27.7	1	102	7.7	1450	880	24
OWS0134-12	17-Oct-07	500	34	38.4	159	23.4	<0.5	11	7.6	883	576	19
OWS0134-13	29-Jun-07	458	3	4.7	103	16.7	0.7	24	8	668	410	20
OWS0134-13	17-Oct-07	448	5	9.8	106	17.9	1.2	30	7.8	675	422	17
OWS0134-14	26-Jun-07	463	1	2.3	99.2	16.4	0.8	18	7.6	731	430	21
OWS0134-14	17-Oct-07	462	1	2.9	116	17	<0.5	14	7.6	677	516	17
OWS0134-15	29-Jun-07	697	6	29.5	169	30.9	<0.5	4	8	1030	660	14
OWS0134-15*	29-Jun-07	692	7	30.8	181	32.6	<0.5	4	8	1020	720	16
OWS0134-15	17-Oct-07	733	10	65.9	206	37.8	<0.5	4	7.6	1140	742	11
OWS0234-01	25-Jun-07	483	5	1.7	129	18.1	0.8	18	7.7	707	670	13
OWS0234-01*	25-Jun-07	484	5	1.8	119	16.4	0.8	9	7.8	706	440	13
OWS0234-01	15-Oct-07	465	2	2.5	125	17	1.6	9	8.3	691	422	14
OWS023402A	28-Jun-07	465	1	2.1	122	15.9	0.6	6	8	760	410	11
OWS023402A	23-Oct-07	481	1	<0.5	122	14.2	1.5	6	7.8	657	399	10
OWS023402A*	23-Oct-07	487	<1	<0.5	122	14.5	1.7	6	7.6	664	397	11
OWS023402B	28-Jun-07	469	1	0.8	120	15.9	<0.5	6	8	763	410	11
OWS023402B	23-Oct-07	488	1	<0.5	123	14.3	1.6	6	7.4	667	398	10
OWS0234-03	25-Jun-07	505	59	2.1	135	17.5	0.9	24	7.7	1037	620	14
OWS0234-03	15-Oct-07	533	91	3.1	152	19.6	1.9	45	8.2	1060	628	18
OWS0234-04	28-Jun-07	496	2	2.2	121	24.6	3.4	10	8	809	420	16
OWS0234-04	23-Oct-07	528	1	<0.5	120	23.3	2.3	8	7.5	700	415	14
OWS0234-04*	23-Oct-07	513	1	<0.5	119	23.3	2.3	8	7.5	697	316	13
OWS0234-05	28-Jun-07	475	1	1.7	121	16.1	0.5	6	8	776	430	11
OWS0234-05	23-Oct-07	479	1	<0.5	123	15	1.5	6	7.5	662	391	11
OWS0234-06	28-Jun-07	490	1	1.4	118	15.8	<0.5	6	8	771	430	12
OWS0234-06	23-Oct-07	498	1	<0.5	127	15.2	1.4	7	7.4	692	418	11
OWS0234-07	28-Jun-07	359	4	14.4	101	10.5	1	6	8	632	350	22
OWS0234-07	22-Oct-07	338	4	5	95.6	8.3	1.8	7	7.6	500	329	21
OWS0234-08	26-Jun-07	505	3	5.6	98.4	24	1.7	18	7.6	728	420	37
OWS0234-08*	26-Jun-07	504	3	3.4	104	23.5	1.9	19	7.6	727	470	39
OWS0234-08	15-Oct-07	480	3	4.5	98.8	18.4	3.4	24	7.6	674	440	37
OWS0234-08*	15-Oct-07	460	3	2.9	98.9	18.8	3.4	24	7.7	668	440	35

Abbreviations: HCO3 - Bicarbonate (mg/l), Cl - Chloride (mg/l), SO4 - Sulphate (mg/l), Ca - Calcium (mg/l), Mg - Magnesium (mg/l), K - Potassium (mg/l), Na - Sodium (mg/l), Cond. - Conductivity (mS/cm), TDS - Total Dissolved Solids (mg/l), DOC - Dissolved Organic Carbon (mg/l)

* Duplicate Sample

Table 3.6: Summary of Groundwater Chemistry (Continued)

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
OWS0234-09	25-Jun-07	947	1	1210	586	96	4.4	21	7.2	3246	2580	9
OWS0234-09	15-Oct-07	779	1	1370	663	99.2	7.5	25	7.7	2610	2740	7
OWS0234-10	25-Jun-07	964	1	1250	632	74.7	2.1	11	7.4	3312	2890	13
OWS0234-14	29-Jun-07	551	117	1250	602	64.3	8.5	129	7.5	3057	2720	27
OWS0234-14	18-Oct-07	454	88	1340	577	61.1	9.3	103	7.4	2880	2560	28
OWS0234-15	3-Jul-07	695	44	1310	650	118	2.9	18	7.5	3658	2740	42
OWS0234-15	18-Oct-07	733	54	1350	651	114	3.1	17	7.5	3000	2790	36
OWS0234-16	3-Jul-07	687	19	1540	620	175	12.7	19	7.3	3857	3000	58
OWS0234-16	18-Oct-07	769	21	1570	626	172	13.5	24	7.3	3250	3080	57
OWS0234-17	29-Jun-07	697	393	481	140	26.3	6.6	537	7.8	2987	1960	47
OWS0234-17	18-Oct-07	903	344	608	145	24	7.5	623	7.9	3390	2230	37
OWS0310-04	24-Jun-07	302	1	4.8	77.8	12.7	<0.5	5	7.9	569	250	11
OWS0310-04	14-Oct-07	290	<1	9.7	75	11	1.5	7	7.8	444	281	12
OWS0334-06	29-Jun-07	726	374	494	135	28	14.7	530	7.9	3040	2010	44
OWS0334-06	18-Oct-07	750	368	717	223	49.8	14	511	7.7	3380	2310	38
OWS0334-07	3-Jul-07	413	2	1240	556	80	7	5	7.7	3036	2320	25
OWS0334-07	18-Oct-07	483	4	1010	493	61.8	7.2	2	7.3	2210	2000	25
OWS0334-09	3-Jul-07	649	2	12.9	40.9	13.5	5.7	167	8	1200	580	16
OWS0334-09	19-Oct-07	624	2	7.5	37.4	12.8	5.6	158	7.7	883	544	14
OWS0410-01	25-Jun-07	621	332	362	173	32.6	1.6	309	7.6	2765	1590	36
OWS0410-01	14-Oct-07	648	325	328	200	27.8	2.2	277	7.6	2430	1590	34
OWS0410-02	25-Jun-07	505	173	258	99.2	22.5	1.9	234	7.7	1869	1320	30
OWS0410-02	14-Oct-07	636	290	312	199	30.7	3	256	7.6	2290	1560	34
OWS041003A	24-Jun-07	594	123	230	190	26	0.6	169	7.7	1988	1020	31
OWS041003A	14-Oct-07	573	143	246	217	31.2	2.7	112	7.6	1610	1070	26
OWS041003B	24-Jun-07	487	99	88.6	158	35.5	4.1	46	7.8	1387	700	16
OWS041003B	14-Oct-07	479	86	95.7	151	33	5.1	46	7.8	1100	732	17
OWS0410-04	27-Jun-07	400	9	58.7	128	19	2.9	13	7.9	709	460	16
OWS0410-04*	27-Jun-07	400	10	58.1	127	19	2.8	13	8.0	705	460	14
OWS0410-04	22-Oct-07	370	16	45.6	114	16.4	1.7	9	7.6	674	423	14
OWS0410-05	27-Jun-07	519	236	232	234	31.7	3.3	150	7.9	2118	1200	29
OWS0410-05	22-Oct-07	532	262	248	214	27.7	1.8	197	7.6	2000	1270	30
OWS0410-05*	22-Oct-07	536	263	240	208	26.7	2	196	7.6	2000	1280	28
OWS0410-06	27-Jun-07	502	228	242	210	28.6	2.9	171	7.9	2079	1190	28
OWS0410-06	22-Oct-07	541	282	298	223	29.1	2.4	225	7.5	2140	1460	30
OWS0434-15	26-Jun-07	422	2	3.2	107	14.6	<0.5	11	7.7	679	370	19
OWS0434-15	17-Oct-07	436	3	4.4	117	16.3	<0.5	10	7.7	641	390	17
OWS0434-16	26-Jun-07	546	82	46.6	162	18.2	<0.5	44	7.7	1099	660	18
OWS0434-16	17-Oct-07	582	144	59.5	180	20	<0.5	87	7.6	1310	844	23

Abbreviations: HCO3 - Bicarbonate (mg/l), Cl - Chloride (mg/l), SO4 - Sulphate (mg/l), Ca - Calcium (mg/l), Mg - Magnesium (mg/l), K - Potassium (mg/l), Na - Sodium (mg/l), Cond. - Conductivity (mS/cm), TDS - Total Dissolved Solids (mg/l), DOC - Dissolved Organic Carbon (mg/l)

* Duplicate Sample

Table 3.6: Summary of Groundwater Chemistry (Continued)

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
OWS0410-17	28-Jun-07	354	2	6.6	93.4	12.4	1.3	4	8.1	597	350	13
OWS0410-17	14-Oct-07	354	1	9	95.3	11.9	2	6	7.9	531	376	9
OWS0734400	24-Oct-07	773	4	2.2	179	31.3	6.1	10	7.1	1010	672	35
OWS0734400*	24-Oct-07	731	4	1.9	178	31.2	5.8	10	7.2	1000	664	35
OWS0734405	19-Oct-07	681	9	386	314	43.5	3.5	12	7.4	1590	988	28
OWS0734406	17-Oct-07	973	12	851	528	83	7	7	7.2	2560	2240	40
OWS0734407	17-Oct-07	680	48	190	246	32.6	2.2	24	7.3	1390	992	23
OWS0734408	19-Oct-07	639	223	176	205	25.5	3.4	164	7.6	1860	1040	29
OWS0734409	23-Oct-07	767	46	90.7	250	28.5	5.8	28	7.4	1290	952	28
OWS0734410	19-Oct-07	619	151	49.8	153	16.8	2.3	126	7.5	1380	896	27
OWS0734411	19-Oct-07	533	67	60.5	173	18.9	1.9	37	7.5	1080	668	19
OWS0734412	15-Oct-07	612	78	184	205	20.6	4.7	86	8.2	1390	908	24
OWS0734413	24-Oct-07	569	175	1440	674	118	13.8	54	7.5	3210	2820	18
OWS0734414	24-Oct-07	992	19	1430	675	117	12.8	54	7.3	2440	2220	58
OWS0734416	24-Oct-07	760	53	1770	709	109	12.7	211	7.2	3320	2850	58
OWS0734417	24-Oct-07	896	12	1440	698	119	13.3	55	7.6	2010	1790	23
OWS0734418	24-Oct-07	722	216	1660	677	61.7	11.9	354	7.3	3930	3590	36

Abbreviations: HCO3 - Bicarbonate (mg/l), Cl - Chloride (mg/l), SO4 - Sulphate (mg/l), Ca - Calcium (mg/l), Mg - Magnesium (mg/l), K - Potassium (mg/l), Na - Sodium (mg/l), Cond. - Conductivity (mS/cm), TDS - Total Dissolved Solids (mg/l), DOC - Dissolved Organic Carbon (mg/l)

*** Duplicate Sample**

Table 3.7: Summary of Surface Water Chemistry (Major Ions)

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
EPPPP	24-Jun-07	287	1	123	115	22	1.4	6	8.1	657	390	10
EPPPP*	24-Jun-07	287	2	117	111	21	1.4	6	8.1	661	430	10
EPPPP	15-Oct-07	273	<1	51	85	16	2.1	5	8.3	513	323	10
MR6350190	26-Jun-07	210	2	4	48	13	0.9	12	8.2	344	230	25
MR6350775	28-Jun-07	215	2	4	49	12	2.1	13	8.3	366	250	27
MR6351800	26-Jun-07	266	2	4	64	15	1.3	9	8.2	401	310	21
MR6351800*	26-Jun-07	267	2	4	64	16	1.1	9	8.2	401	280	23
MR6352600	28-Jun-07	276	2	6	67	15	2.6	10	8.3	465	280	24
MR6353330	27-Jun-07	285	2	4	66	15	<0.5	6	8.2	513	280	23
MRT6352090	28-Jun-07	320	2	4	77	18	2.2	10	8.2	660	280	26

Abbreviations: HCO3 - Bicarbonate (mg/l), Cl - Chloride (mg/l), SO4 - Sulphate (mg/l), Ca - Calcium (mg/l), Mg - Magnesium (mg/l), K - Potassium (mg/l), Na - Sodium (mg/l), Cond. - Conductivity (mS/cm), TDS - Total Dissolved Solids (mg/l),

* Duplicate Sample

4 Basal Aquifer, Groundwater Monitoring

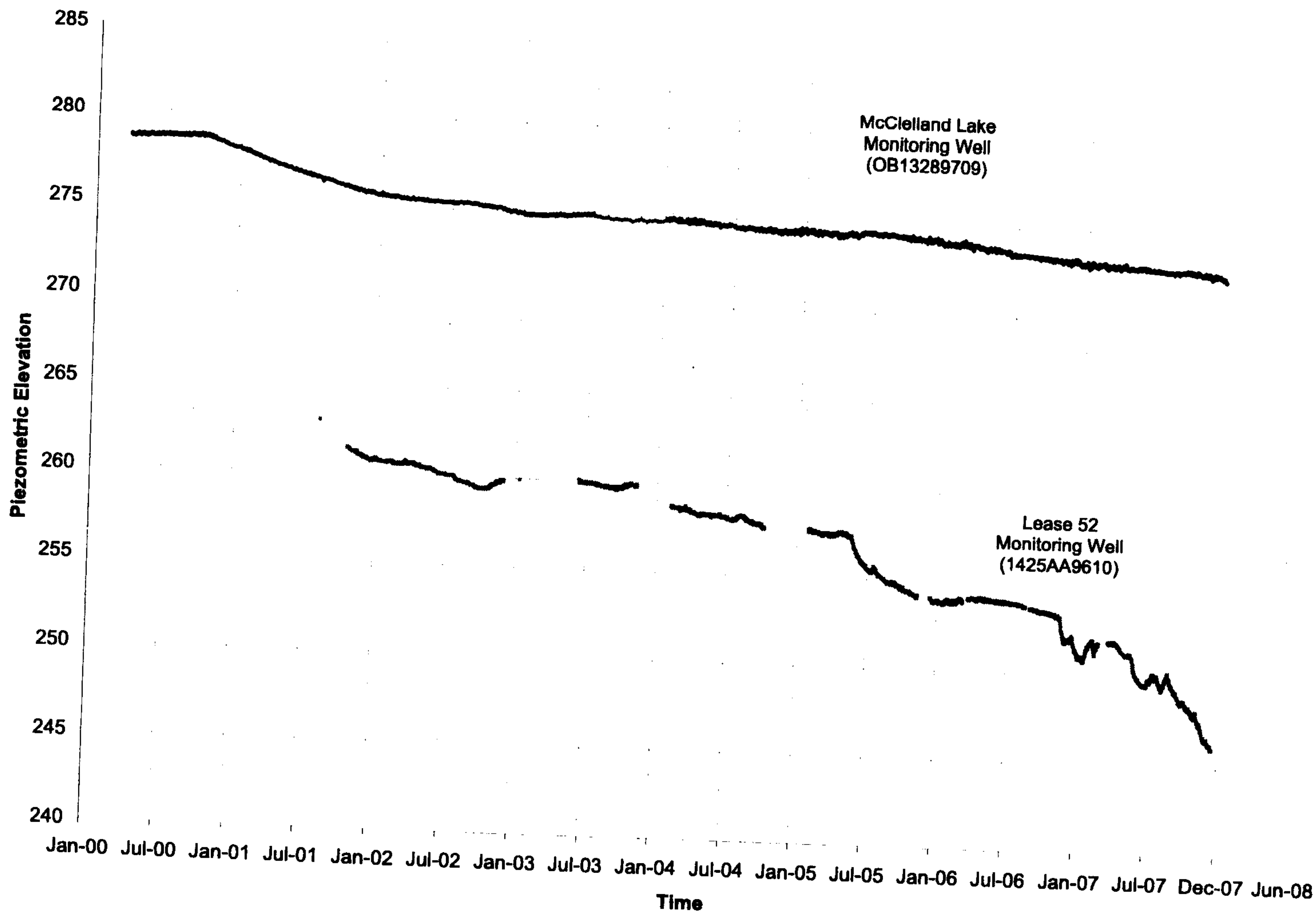
Monitoring the impact of depressurisation of the basal aquifer is conducted regularly for mining purposes and as required under the Water Act. The information is included in this report as requested by Alberta Environment. Locations of all active and inactive depressurisation wells are shown on Figure 2.3. Not all depressurisation wells shown are operating at any one time. Wells operate only in areas where active mining is in progress. Regional basal aquifer monitoring wells are located on Oilsands Lease 52 (1425AA9610) approximately 2.5 km north of the mine pit and near McClelland Lake (OB13289709) approximately 15 km north of the mine pit, Figure 2.1. Both wells are screened in the basal aquifer.

Monitoring on lease 52 began in November 2001. Cumulative drawdown since that time has been approximately 16.96 metres, to 246.05 metres elevation. The rapid drawdown that occurred during 2007 can be accounted for by the installation and pumping of new depressurisation wells in the vicinity of Lease 52.

Near McClelland Lake, the hydraulic head has declined to 272.40 metres elevation, approximately, since the start-up of the Aurora depressurisation in September 2000. Between December of 2006 and 2007, the head declined approximately 0.72 metres. This represents a total drawdown of about 6.15 metres since the start of depressurization (Figure 4.1).

The declining piezometric heads are consistent with predictions made in the Aurora Environmental Impact Assessment (EIA). Groundwater modelling completed for the 1996 Aurora EIA predicted the hydraulic head drop within the basal aquifer in the McClelland Lake area to be between 5 and 10 metres (Figure 3.1.3, page D-40 of the Aurora EIA) after full development of East Pit. East Pit has almost reached full development and the drawdown recorded near McClelland Lake is closer to the full development range than the expected drawdown range of 2 and 5 metres during the initial East Pit development (Figure 3.1.2, page D-39 of the Aurora EIA). The potential impact of this drop in basal hydraulic head on McClelland Lake itself as a result of deep percolation rates was estimated to be in the order of 2.2 mm/year.

Figure 4.1 - Response to Pumping in the Basal Aquifer



5 Proposed Monitoring Program for 2008

Syncrude proposes to monitor the current groundwater wells and surface water sampling locations in 2008. Syncrude may also install new monitoring wells in locations where concern has been noted or a clearer picture of the groundwater chemistry is required. The new wells will be included in the 2008 Groundwater Monitoring Report. Table 5.1 provides a summary of the proposed analytical schedule for 2008.

Table 5.1: Proposed Analytical Schedule for 2008

Parameter	Monitoring Locations	Frequency
Field Conductivity, pH, and Temperature	All	Bi-annually
Major Cations and Anions	All	Bi-annually
Total Dissolved Solids	All	Bi-annually
Total Suspended Solids	All	Bi-annually
Dissolved Organic Carbon	All	Bi-annually
Phenols	All	Bi-annually
Laboratory pH and Conductivity	All	Bi-annually
Metals (Al, As, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn)	All monitoring wells and river locations	Every 5-years (2008)
Metals (Al, As, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Zn)	Surface samples of dirty water	Annually
Naphthenic Acids	Selected	Annually
Total Extractable Hydrocarbons (TEH)	Selected	Annually
Polyaromatic Hydrocarbons (PAH)	Selected	Annually

Table 5.2: Proposed Monitoring Locations for 2008

OWS9734015	OWS0134-13	OWS0410-01	**Surface Water Samples (Clean Water)**
OWS9734018	OWS0134-14	OWS0410-02	MR6350190
OWS9734021	OWS0134-15	OWS041003A	MR6350775
OWS9734022	OWS0134-16	OWS041003B	MR6351800
OWS9734023	OWS0234-01	OWS0410-04	MRT6352090
OWS9710026	OWS023402A	OWS0410-05	MR6352600
OWS9710027	OWS023402B	OWS0410-06	MR6353330
OWS9710028	OWS0234-03	OWS0434-15	1-04-PP
OWS9934761	OWS0234-04	OWS0434-16	-
OWS9934762	OWS0234-05	OWS0410-17	-
OWS0010765	OWS0234-06	OWS0734400	**Surface Water Samples (Dirty Water)**
OWS0010766	OWS0234-07	OWS0734405	
OWS0110-01	OWS0234-08	OWS0734406	A6202
OWS0110-02	OWS0234-09	OWS0734407	SOUTHPOND
OWS0110-03	OWS0234-10	OWS0734408	RAMP3POND
OWS0110-04	OWS0234-14	OWS0734409	RECYCLEPOND
OWS0134-05	OWS0234-15	OWS0734410	MRSUMP
OWS0134-06	OWS0234-16	OWS0734411	AN-SIPHON
OWS0134-07	OWS0234-17	OWS0734412	ATP*
OWS0134-08	OWS0310-01	OWS0734413	-
OWS0134-09	OWS0310-04	OWS0734414	-
OWS0134-10	OWS0334-06	OWS0734416	-
OWS0134-11	OWS0334-07	OWS0734417	-
OWS0134-12	OWS0334-09	OWS0734418	-

* Annual Sampling conducted by SCL research

6 Response to Alberta Environment's Comments from the 2006 Report

This section of the report provides a response to comment from Alberta Environment (AENV) on the 2006 Groundwater Monitoring Report. AENV's comments from 2006 are shown below in italics, Syncrude's response follows.

1. ***"Page 14 – Summary of Changes Since 2005 – Some monitoring wells have been abandoned and removed by the advancement of mine operations. What plans does Syncrude have to replace these monitoring wells?"***

Syncrude has no current plan to replace these wells as the area of concern has been removed by mining operations.

2. ***"Page 16 – MR SUMP – Active pumping of the MR SUMP stopped in May 2006. Should the chemistry in the sump show sign of increasing concentrations, it would be expected that active pumping would once again start."***

Syncrude has observed increasing concentrations in the area and active pumping of the MR Sump has begun again.

3. ***"Page 18 – Table 3.3 – Chemistry results were not provided for the ID – South Pond."***

Table 6.1: Summary of Surface Water Chemistry (Dirty Water Major Ions) - SOUTHPOND

ID	Sample Date	HCO_3	Cl	SO_4	Ca	Mg	K	Na	pH	Cond	TDS	DOC
SOUTHPOND	23-Jun-06	682	264	366	137	37.3	12.7	363	8.1	2320	1600	23
SOUTHPOND	8-Oct-06	717	277	412	168	39.4	12	408	8.1	2590	1750	29

4. ***"Page 23 – Continued increasing concentrations (chloride) in monitor wells OWS0134-11 and OWS0434-16 will require Syncrude to address the matter through some other means in addition to the south seepage sump"***

Syncrude is currently reviewing all information in the area. The noted elevated concentrations seem to be isolated to these two monitoring wells. The aquifer thickness in the area is thin to non existent. Additional boreholes and monitoring wells were drilled and installed in 2007 as detailed in the report.

5. ***"It is our understanding that Syncrude will monitor the current plume that exists outside the cut-off wall. No planned further remedial action is planned because the area will be dewatered in preparation for mining of the Northeast Pit (area immediately north of tailings pond) beginning in 2012. It is our understanding that the isolated plume may provide Syncrude an opportunity to advance the understanding of the potential for degradation of process water constituents within a Pleistocene aquifer. Syncrude shall provide an update on the assessment of viable options for research work and who will conduct the work. AENV supports this initiative provided Syncrude ensures the plume does not migrate past the outer limits of the planned mined out area."***

Syncrude has decided against any research work as "Previous and ongoing studies show that little or no attenuation of constituents in oilsand process affected waters (OSPW) will occur and that most, if not all, the changes being observed in OSPW in groundwater transport in

Pleistocene sands layers will be as a result of dilution and mixing rather than biological or adsorptive processes" Mike MacKinnon, Syncrude Research.

6. ***"Page 28 – The sudden changes in concentrations observed for OWS0334-07 and OWS0234-17 are abnormal and shall be further investigated. Perhaps there was a sampling and/or labeling error."***

The chemical concentrations observed in 2006 are similar to the results from 2007. OWS0334-07 does not show the characteristics of being influenced by process affected waters. The reason for the elevated Calcium and Sulphate is unknown.

7. ***"AENV is supportive of Syncrude's plans that additional monitoring locations may be installed to ensure that process affected groundwater from the plant area does not move offsite."***

Syncrude has installed five monitoring wells in the plant area to provide additional monitoring in the plant area.

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APPENDIX A: ANALYTICAL DATA AND WATER ELEVATIONS

Aurora – Surface Water Samples (Dirty Water)

ID	A6202		AN-SIPHON		MRSUMP		RAMP3POND	
Sample Date	24-Jun-07	15-Oct-07	26-Jun-07	15-Oct-07	24-Jun-07	15-Oct-07	24-Jun-07	15-Oct-07
Field pH	7.27	9.85	7.68	10.12	7.85	10	7.42	9.1
Field Conductivity	3335	2780	3012	2780	1374	1345	2197	1976
Field Temperature	20.94	9.83	22.09	11.28	19.2	6.37	14.55	7.11
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	761	692	685	628	359	392	640	614
CO_3	<5	25	10	43	<5	<5	<5	8
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	410	395	402	388	108	145	238	265
SO_4	286	289	320	334	142	164	140	185
Ca	97.8	88.1	27.1	30.7	109	127	134	132
Fe	2.24	1.25	3.98	<0.05	0.07	0.52	6.09	4.38
Mg	33.2	29.9	17.2	17.2	24.8	26.4	23.6	24.4
Mn	0.33	0.3	0.15	0.11	0.05	0.16	0.59	0.54
K	16.4	15.7	21.6	23	2.7	2.8	4.9	7.3
Na	505	474	602	554	113	122	266	284
Al		<0.01		0.1		<0.01		<0.01
As		0.003		0.0039		0.001		0.0015
B		1.5		1.88		0.213		0.71
Cd		<0.0001		0.0001		<0.0001		<0.0001
Cr		0.007		0.0083		0.0036		0.0059
Cu		0.0008		0.001		0.0009		0.0006
Pb		0.0001		0.0002		<0.0001		<0.0001
Hg		<0.0001		<0.0001		<0.0001		<0.0001
Ni		0.0124		0.0116		0.0051		0.0088
Zn		0.014		0.008		0.015		0.012
Ion Balance	100	95	99.7	93.2	105	99.7	101	97.6
Lab pH	8	8.4	8.4	8.7	8.2	8.3	8	8.3
Lab Conductivity		2750		2880		1290		2060
TDS	1780	1780	1700	1850	710	885	1390	1240
TSS	6	5	76	45	17	4	207	10
NO_3		<0.1		0.2		<0.1		<0.1
NO_2		<0.05		0.24		<0.05		<0.05
DOC	45	46	56	60	18	23	33	34
Phenols	0.013	0.013	0.008	0.014	0.008	0.01	0.008	0.01
Naphthenic Acid								

APPENDIX A

Aurora – Surface Water Samples (Dirty Water)

ID	RECYCLEPOND		SOUTHPOND	
Sample Date	26-Jun-07	15-Oct-07	24-Jun-07	15-Oct-07
Field pH	7.63	10.35	7.76	10.13
Field Conductivity	2979	2743	3026	2528
Field Temperature	18.96	11.05	17.79	10.63
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method				
HCO_3	674	649	702	625
CO_3	17	45	<5	<5
OH	<5	<5	<5	<5
Cl	395	372	321	261
SO_4	317	340	345	451
Ca	27	32.4	99.7	125
Fe	<0.05	0.24	1.77	0.37
Mg	17.3	17.7	31	33.7
Mn	0.02	0.13	0.45	0.54
K	22.5	23.3	12.3	12.7
Na	599	548	456	391
Al		0.12		0.01
As		0.0037		0.0022
B		1.85		1.34
Cd		0.0002		<0.0001
Cr		0.0081		0.0051
Cu		0.001		0.0009
Pb		0.0001		<0.0001
Hg		<0.0001		<0.0001
Ni		0.0115		0.0111
Zn		0.007		0.01
Ion Balance	100	92.5	99.7	97.6
Lab pH	8.5	8.7	8.1	8.2
Lab Conductivity		2660		2490
TDS	1700	1830	1600	1730
TSS	48	39	149	12
NO_3		0.2		0.1
NO_2		0.24		<0.05
DOC	57	60	36	38
Phenols	0.009	0.014	0.009	0.01
Naphthenic Acid				

Aurora – Surface Water Samples (Clean Water)

ID	EPP-PP		MR6350190	MR6350775	MR6351800	MR6352600	MR6353330	MRT6352090
Sample Date	24-Jun-07	15-Oct-07	26-Jun-07	28-Jun-07	26-Jun-07	28-Jun-07	27-Jun-07	28-Jun-07
Field pH	7.58	9.14	7.11	7.74	7.15	7.35	7.09	7.1
Field Conductivity	778	516	344	366	430	465	513	660
Field Temperature	na	5.84	16.16	18.04	15.09	16.5	15.89	15.07
Sampled By	AW/BS	DB/AW	AW/BS	AW/BS	AW/BS	AW/BS	AW/BS	AW/BS
Sample Method								
HCO_3	287	273	210	215	266	276	285	320
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	1	<1	2	2	2	2	2	2
SO_4	123	51.1	4.4	4.4	4.4	6.1	3.8	4
Ca	115	84.9	48	48.9	64	66.6	66.3	77.1
Fe	0.72	1.69	0.1	0.83	0.51	1.23	1.58	1.54
Mg	21.6	15.5	12.5	11.8	15.3	15.4	15.3	17.9
Mn	0.52	0.48	<0.01	<0.01	<0.01	<0.01	0.13	0.07
K	1.4	2.1	0.9	2.1	1.3	2.6	<0.5	2.2
Na	6	5	12	13	9	10	6	10
Al		0.01						
As		<0.0004						
B		0.047						
Cd		<0.0001						
Cr		0.0005						
Cu		<0.0006						
Pb		<0.0001						
Hg		<0.0001						
Ni		0.0031						
Zn		0.054						
Ion Balance	107	104	111	110	108	108	100	108
Lab pH	8.1	8.3	8.2	8.3	8.2	8.3	8.2	8.2
Lab Conductivity		513						
TDS	390	323	230	250	310	280	280	280
TSS	47	4	<3	<3	6	<3	<3	5
NO_3		<0.1						
NO_2		<0.05						
DOC	10	10	25	27	21	24	23	26
Phenols	0.004	0.004	0.005	0.005	0.004	0.004	0.002	0.005
Naphthenic Acid		<1						

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0010765		OWS0010766		OWS0110-01		OWS0110-02	
Sample Date	28-Jun-07	14-Oct-07	25-Jun-07	14-Oct-07	25-Jun-07	14-Oct-07	27-Jun-07	22-Oct-07
Field pH	7.54	8.61	7.22	8.12	na	8.78	7.58	7.66
Field Conductivity	591	547	580	504	2383	2070	594	591
Field Temperature	5.08	5.25	5.29	5.78	7.05	6.67	5.82	4.86
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	353	347	284	286	591	573	299	283
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	<1	2	1	2	300	215	2	21
SO_4	1.6	2.8	16.9	25.7	277	409	29.1	38.6
Ca	89.2	91.3	68.4	82.9	196	210	87.7	96
Fe	16.3	11.6	8.38	10.8	17.9	16	15.2	22.8
Mg	12.4	11.9	10.9	10.5	27.7	27.7	11.1	11
Mn	0.7	0.46	0.3	0.43	0.4	0.33	0.48	0.88
K	0.9	1.4	1.2	1.1	2.4	2.5	0.9	2
Na	4	6	7	7	261	235	4	5
Al						0.06		
As						0.0008		
B						0.326		
Cd						<0.0001		
Cr						0.001		
Cu						0.0011		
Pb						0.0004		
Hg						<0.0001		
Ni						0.0039		
Zn						0.015		
Ion Balance	97.4	101	92.3	101	98.2	96.1	98.6	98.8
Lab pH	8.1	7.8	7.8	7.8	7.6	7.7	8	7.8
Lab Conductivity		509		465		2060		556
TDS	360	294	280	295	1230	1390	290	354
TSS	616	414	26	54	164	76	478	3210
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	11	10	10	11	28	30	9	11
Phenols	0.002	0.002	0.002	0.003	0.004	0.006	0.001	<0.001
Naphthenic Acid						14		

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0110-03		OWS0110-04		OWS0134-05		OWS0134-06	
Sample Date	25-Jun-07	14-Oct-07	25-Jun-07	14-Oct-07	28-Jun-07	22-Oct-07	27-Jun-07	22-Oct-07
Field pH	6.91	7.81	6.45	8.05	7.54	7.81	7.49	7.69
Field Conductivity	2506	2318	1132	1027	770	716	742	674
Field Temperature	5.91	7.5	7.04	7.33	5.83	6.15	7	4.56
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	574	604	534	514	472	463	452	444
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	310	304	2	2	<1	1	1	1
SO_4	273	344	139	171	1.7	0.7	2.3	0.5
Ca	210	194	179	187	124	132	121	119
Fe	10	20.3	17.7	27.8	2.08	3.33	8.17	10.1
Mg	28.7	25.4	24.9	25.6	14.4	13.6	15.3	14.3
Mn	0.13	0.87	0.59	1.22	0.3	0.33	0.61	0.72
K	2.6	2.6	1.2	1.8	0.6	0.8	2.6	0.9
Na	245	267	5	8	4	3	7	4
Al		0.02						
As		0.0008						
B		0.256						
Cd		<0.0001						
Cr		0.0012						
Cu		0.0009						
Pb		<0.0001						
Hg		<0.0001						
Ni		0.004						
Zn		0.013						
Ion Balance	98.9	91.5	96	98.3	97.3	103	102	100
Lab pH	7.6	7.6	7.5	7.5	8.1	7.8	8	7.7
Lab Conductivity		2320		991		676		652
TDS	1420	1530	710	684	430	413	390	396
TSS	40	44	3680	2980	50	20	187	510
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	33	33	14	15	14	11	11	9
Phenols	0.006	0.007	0.002	0.003	0.003	0.002	0.002	0.002
Naphthenic Acid		18						

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0134-07		OWS0134-08		OWS0134-09		OWS0134-10	
Sample Date	27-Jun-07	22-Oct-07	25-Jun-07	15-Oct-07	28-Jun-07	23-Oct-07	26-Jun-07	15-Oct-07
Field pH	6.97	7.63	6.92	8.87	6.99	8.11	na	10.55
Field Conductivity	763	717	1002	914	750	705	662	549
Field Temperature	5.82	4.54	6.34	6	5.83	3.69	4.62	6.65
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	483	469	545	539	465	496	370	352
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	1	1	18	26	<1	<1	22	10
SO_4	1.4	0.7	9.5	13.9	1.3	<0.5	14.9	6.1
Ca	121	121	147	159	110	126	101	95.4
Fe	7.22	7.43	14.3	24.3	5.23	6.38	5.47	4.98
Mg	17.7	16.7	19.7	20.5	13.9	13.9	13	10.7
Mn	0.4	0.41	0.15	0.64	0.34	0.37	0.22	0.55
K	<0.5	0.9	<0.5	2	0.5	1.2	1.2	3.2
Na	5	4	6	9	6	7	18	11
Al								
As								
B								
Cd								
Cr								
Cu								
Pb								
Hg								
Ni								
Zn								
Ion Balance	96.7	98.5	95.6	102	90.3	95.5	99	100
Lab pH	7.9	7.6	7.7	8.2	8	7.5	7.6	7.9
Lab Conductivity		685		871		676		567
TDS	400	409	520	537	400	410	380	412
TSS	370	186	352	164	39	49	2780	3780
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	13	10	17	17	14	10	23	20
Phenols	0.008	0.002	0.002	0.007	0.001	0.003	0.003	0.008
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0134-11		OWS0134-12	OWS0134-13		OWS0134-14	
Sample Date	26-Jun-07	17-Oct-07	17-Oct-07	29-Jun-07	17-Oct-07	26-Jun-07	17-Oct-07
Field pH	6.39	8.75	8.2	6.65	8.19	6.16	7.96
Field Conductivity	1653	1514	932	668	715	731	711
Field Temperature	5.01	4.73	5.25	3.59	4.98	4.71	5.15
Sampled By	AW/BS	DB/AW	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method							
HCO_3	694	674	500	458	448	463	462
CO_3	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5
Cl	181	172	34	3	5	1	1
SO_4	8.3	5.3	38.4	4.7	9.8	2.3	2.9
Ca	171	177	159	103	106	99.2	116
Fe	11.2	13.5	9.5	15.4	6.4	3.37	7.98
Mg	27.8	27.6	23.4	16.7	17.9	16.4	17
Mn	0.26	0.39	0.44	0.54	0.4	0.29	0.37
K	1.7	1.1	<0.5	0.7	1.2	0.8	<0.5
Na	109	102	11	24	30	18	14
Al		0.03	0.02		0.04		
As		0.0006	0.0004		<0.0004		
B		0.124	0.075		0.182		
Cd		<0.0001	<0.0001		<0.0001		
Cr		0.0013	0.0007		0.001		
Cu		0.0008	<0.0006		<0.0006		
Pb		<0.0001	<0.0001		0.0002		
Hg		<0.0001	<0.0001		<0.0001		
Ni		0.0049	0.004		0.0025		
Zn		0.019	0.011		0.01		
Ion Balance	93.7	97.3	104	98.5	105	92.7	102
Lab pH	7.7	7.7	7.6	8	7.8	7.6	7.6
Lab Conductivity		1450	883		675		677
TDS	830	880	576	410	422	430	516
TSS	1210	1030	1490	536	858	208	796
NO_3		<0.1	<0.1		<0.1		<0.1
NO_2		<0.05	<0.05		<0.05		<0.05
DOC	24	23	19	20	17	21	17
Phenols	0.004	0.009	0.007	0.005	0.005	0.009	0.007
Naphthenic Acid		4	1		2		

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0134-15		OWS0234-01		OWS023402A		OWS023402B	
Sample Date	29-Jun-07	17-Oct-07	25-Jun-07	15-Oct-07	28-Jun-07	23-Oct-07	28-Jun-07	23-Oct-07
Field pH	6.63	8.11	9.86	4.31	6.89	7.36	6.9	7.18
Field Conductivity	1026	1166	838	724	760	687	763	698
Field Temperature	5.35	5.86	4.96	4.31	6.1	4.48	5.14	4.52
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
$HC0_3$	697	733	483	465	465	481	469	488
$C0_3$	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	6	10	5	2	1	1	<5	<5
SO_4	29.5	65.9	1.7	2.5	2.1	<0.5	1	1
Ca	169	206	129	125	122	122	0.8	<0.5
Fe	4.84	4.21	10.5	19.2	7.6	10.6	120	123.
Mg	30.9	37.8	18.1	17	15.9	14.2	0.21	6.14
Mn	0.39	0.35	0.09	0.65	0.41	0.5	15.9	14.3
K	<0.5	<0.5	0.8	1.6	0.6	1.5	0.34	0.4
Na	4	4	18	9	6	6	<0.5	1.6
Al							6	6
As								
B								
Cd								
Cr								
Cu								
Pb								
Hg								
Ni								
Zn								
Ion Balance	91.4	99.3	108	104	99.7	95.4	97.8	94.9
Lab pH	8	7.6	7.7	8.3	8	7.8	8	7.4
Lab Conductivity		1140		691		657		667
TDS	660	742	670	422	410	399	410	398
TSS	196	534	308	145	142	327	127	41
NO_3		<0.1		<0.1		0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	14	11	13	14	11	10	11	10
Phenols	0.005	0.006	0.002	0.008	0.001	0.003	<0.001	0.004
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0234-03		OWS0234-04		OWS0234-05		OWS0234-06	
Sample Date	25-Jun-07	15-Oct-07	28-Jun-07	23-Oct-07	28-Jun-07	23-Oct-07	28-Jun-07	23-Oct-07
Field pH	6.76	10.53	6.94	7.2	6.84	6.59	6.86	7.54
Field Conductivity	1037	1064	809	747	776	700	771	708
Field Temperature	5.71	6.1	6.36	5.62	6.05	4.31	7.41	3.48
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	505	533	496	528	475	479	490	498
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	59	91	2	1	1	1	1	1
SO_4	2.1	3.1	2.2	<0.5	1.7	<0.5	1.4	<0.5
Ca	135	152	121	120	121	123	118	127
Fe	10.4	16.3	7.93	10.6	4.58	7.75	3.23	5.24
Mg	17.5	19.6	24.6	23.3	16.1	15	15.8	15.2
Mn	0.12	0.6	0.44	0.43	0.49	0.53	0.39	0.41
K	0.9	1.9	3.4	2.3	0.5	1.5	<0.5	1.4
Na	24	45	10	8	6	6	6	7
Al				0.01				
As				<0.0004				
B				0.058				
Cd				<0.0001				
Cr				0.0023				
Cu				<0.0006				
Pb				<0.0001				
Hg				<0.0001				
Ni				0.0023				
Zn				0.005				
Ion Balance	92.6	98.6	104	95.8	97.3	97.4	92.1	96.8
Lab pH	7.7	8.2	8	7.5	8	7.5	8	7.4
Lab Conductivity		1060		700		662		692
TDS	620	628	420	415	430	391	430	418
TSS	64	57	110	310	71	103	54	14
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	14	18	16	14	11	11	12	11
Phenols	0.002	0.009	0.003	0.003	0.001	0.004	0.002	0.004
Naphthenic Acid				<1				

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0234-07		OWS0234-08		OWS0234-09		OWS0234-10
Sample Date	28-Jun-07	22-Oct-07	26-Jun-07	15-Oct-07	25-Jun-07	15-Oct-07	25-Jun-07
Field pH	7.17	7.4	5.84	9.93	6.27	8.4	6.53
Field Conductivity	632	531	831	706	3246	2918	3312
Field Temperature	6.87	5.96	3.68	6.57	4.81	7.79	9.98
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS
Sample Method							
HCO_3	359	338	505	480	947	779	964
CO_3	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5
Cl	4	4	3	3	1	1	1
SO_4	14.4	5	5.6	4.5	1210	1370	1250
Ca	101	95.6	98.4	98.8	586	663	632
Fe	1.32	2.25	12.8	14.4	2.52	9.25	8.14
Mg	10.5	8.3	24	18.4	96	99.2	74.7
Mn	0.13	0.26	0.37	1.06	1.6	6.68	1.78
K	1	1.8	1.7	3.4	4.4	7.5	2.1
Na	6	7	18	24	21	25	11
Al							
As							
B							
Cd							
Cr							
Cu							
Pb							
Hg							
Ni							
Zn							
Ion Balance	98.3	101	91	94.2	93.7	103	91.3
Lab pH	8	7.6	7.6	7.6	7.2	7.7	7.4
Lab Conductivity		500		674		2610	
TDS	350	329	420	440	2580	2740	2890
TSS	8	11	3270	5020	762	1200	3220
NO_3		0.1		<0.1		<0.1	
NO_2		<0.05		<0.05		<0.05	
DOC	22	21	37	37	9	7	13
Phenols	0.004	0.006	0.004	0.01	0.002	0.008	0.003
Naphthenic Acid							

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0234-14		OWS0234-15		OWS0234-16		OWS0234-17	
Sample Date	29-Jun-07	18-Oct-07	3-Jul-07	18-Oct-07	3-Jul-07	18-Oct-07	29-Jun-07	18-Oct-07
Field pH	6.39	7.57	6.14	7.65	6.39	8.15	6.88	7.32
Field Conductivity	3057	2977	3658	3100	3857	3284	2987	3461
Field Temperature	9.59	9.58	9.73	8.8	9.02	8.63	21.73	16.75
Sampled By	AW/BS	DB/AW	AW/YW	DB/AW	AW/YW	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	551	454	695	733	687	769	697	903
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	117	88	44	54	19	21	393	344
SO_4	1250	1340	1310	1350	1540	1570	481	608
Ca	602	577	650	651	620	626	140	145
Fe	14.5	15.6	5.49	0.32	7.33	13.8	2.94	3.43
Mg	64.3	61.1	118	114	175	172	26.3	24
Mn	2.92	2.45	6.63	9.26	3.93	4.02	0.42	0.26
K	8.5	9.3	2.9	3.1	12.7	13.5	6.6	7.5
Na	129	103	18	17	19	24	537	623
Al		0.03						0.06
As		0.002						0.0039
B		0.144						1.21
Cd		<0.0001						<0.0001
Cr		0.0047						<0.005
Cu		0.0018						0.0022
Pb		0.0006						0.0004
Hg		<0.0001						<0.0001
Ni		0.032						0.0147
Zn		0.011						0.011
Ion Balance	107	102	108	103	106	102	100	98.2
Lab pH	7.5	7.4	7.5	7.5	7.3	7.3	7.8	7.9
Lab Conductivity		2880		3000		3250		3390
TDS	2720	2560	2740	2790	3000	3080	1960	2230
TSS	292	605	966	364	89	736	103	168
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	27	28	42	36	58	57	47	37
Phenols	0.006	0.008	0.008	0.013	0.012	0.014	0.01	0.007
Naphthenic Acid		11						17

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0310-04		OWS0334-06		OWS0334-07		OWS0334-09	
Sample Date	**24-Jun-07**	**14-Oct-07**	**29-Jun-07**	**18-Oct-07**	**3-Jul-07**	**18-Oct-07**	**3-Jul-07**	**19-Oct-07**
Field pH	7.01	9.06	6.87	7.51	6.9	7.74	7.1	9.69
Field Conductivity	569	472	3040	3443	3036	2265	1200	893
Field Temperature	5.46	5.12	12.93	13.85	13.12	9.57	9.51	4.95
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/YW	DB/AW	AW/YW	DB/AW
Sample Method								
HCO_3	302	290	726	750	413	483	649	624
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	1	<1	374	368	2	4	2	2
SO_4	4.8	9.7	494	717	1240	1010	12.9	7.5
Ca	77.8	75	135	223	556	493	40.9	37.4
Fe	6.51	7.83	9.8	15.3	17.1	14.5	4.87	0.97
Mg	12.7	11	28	49.8	80	61.8	13.5	12.8
Mn	0.64	0.63	0.48	1.08	5.64	3.66	0.51	0.24
K	<0.5	1.5	14.7	14	7	7.2	5.7	5.6
Na	5	7	530	511	5	2	167	158
Al				0.06				
As				0.0058				
B				1.21				
Cd				<0.0001				
Cr				<0.005				
Cu				0.0022				
Pb				0.0001				
Hg				<0.0001				
Ni				0.0216				
Zn				0.013				
Ion Balance	101	101	99.2	101	106	103	96.4	95.2
Lab pH	7.9	7.8	7.9	7.7	7.7	7.3	8	7.7
Lab Conductivity		444		3380		2210		883
TDS	250	281	2010	2310	2320	2000	580	544
TSS	136	71	434	654	686	216	972	444
NO_3		<0.1		0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	11	12	44	38	25	25	16	14
Phenols	0.013	0.007	0.01	0.006	0.006	0.01	0.006	<0.001
Naphthenic Acid				17				

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0410-01		OWS0410-02		OWS041003A		OWS041003B	
Sample Date	25-Jun-07	14-Oct-07	25-Jun-07	14-Oct-07	24-Jun-07	14-Oct-07	24-Jun-07	14-Oct-07
Field pH	7.05	7.73	7.1	8.15	7.26	8.47	7.12	8.9
Field Conductivity	2765	2463	1869	2029	1988	1566	1387	1107
Field Temperature	6.12	8.55	7.77	9.8	7.49	8.73	7.37	5.92
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	621	648	505	636	594	573	487	479
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	332	325	173	290	123	143	99	86
SO_4	362	328	258	312	230	246	88.6	95.7
Ca	173	200	99.2	199	190	217	158	151
Fe	21	24.6	16.7	25.5	21.7	20.3	14.2	14.3
Mg	32.6	27.8	22.5	30.7	26	31.2	35.5	33
Mn	0.55	0.79	0.64	1.15	0.93	0.87	0.81	0.78
K	1.6	2.2	1.9	3	0.6	2.7	4.1	5.1
Na	309	277	234	256	169	112	46	46
Al								
As								
B								
Cd								
Cr								
Cu								
Pb								
Hg								
Ni								
Zn								
Ion Balance	91.6	91.6	91.9	94.3	106	98.9	102	101
Lab pH	7.6	7.6	7.7	7.6	7.7	7.6	7.8	7.8
Lab Conductivity		2430		2290		1610		1100
TDS	1590	1590	1320	1560	1020	1070	700	732
TSS	1320	921	1500	2580	612	560	2100	2850
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	36	34	30	34	31	26	16	17
Phenols	0.006	0.008	0.005	0.007	0.002	0.009	0.002	0.005
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0410-04		OWS0410-05		OWS0410-06		OWS0410-17	
Sample Date	27-Jun-07	22-Oct-07	27-Jun-07	22-Oct-07	27-Jun-07	22-Oct-07	28-Jun-07	14-Oct-07
Field pH	5.38	6.3	7.62	6.98	7.43	6.72	7.1	8.22
Field Conductivity	825	706	2118	2038	2079	2188	597	528
Field Temperature	7.5	3.82	5.77	4.27	5.82	4.41	5.88	6.24
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	400	370	519	532	502	541	354	354
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	9	16	236	262	228	282	2	1
SO_4	58.7	45.6	232	248	242	298	6.6	9
Ca	128	114	234	214	210	223	93.4	95.3
Fe	6.63	9.45	18.4	23	15	29	18.2	22.5
Mg	19	16.4	31.7	27.7	28.6	29.1	12.4	11.9
Mn	0.75	0.76	1.02	0.85	0.86	1.26	1.16	1.48
K	2.9	1.7	3.3	1.8	2.9	2.4	1.3	2
Na	13	9	150	197	171	225	4	6
Al								
As								
B								
Cd								
Cr								
Cu								
Pb								
Hg								
Ni								
Zn								
Ion Balance	107	100	105	101	103	102	98.2	100
Lab pH	7.9	7.6	7.9	7.6	7.9	7.5	8.1	7.9
Lab Conductivity		674		2000		2140		531
TDS	460	423	1200	1270	1190	1460	350	376
TSS	48	16	4580	461	5310	2440	1970	3180
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	16	14	29	30	28	30	13	9
Phenols	0.001	0.002	0.004	0.006	0.005	0.004	0.002	0.002
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0434-15		OWS0434-16		OWS0734400	OWS0734405	OWS0734406	OWS0734407
Sample Date	26-Jun-07	17-Oct-07	26-Jun-07	17-Oct-07	24-Oct-07	19-Oct-07	17-Oct-07	17-Oct-07
Field pH	6.37	7.37	6.37	8.11	7.4	9.35	7.51	8.15
Field Conductivity	679	679	1099	1309	1010	1653	2567	1458
Field Temperature	5.93	6.36	4.49	5.22	7.12	6.24	5.19	4.8
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	DB/AW	DB/AW	DB/AW	DB/AW
Sample Method								
HCO_3	422	436	546	582	773	681	973	680
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	2	3	82	144	4	9	12	48
SO_4	3.2	4.4	46.6	59.5	2.2	386	851	190
Ca	107	117	162	180	179	314	528	246
Fe	6.53	9.05	11.2	5.75	14	21	11.9	53.1
Mg	14.6	16.3	18.2	20	31.3	43.5	83	32.6
Mn	0.31	0.32	0.58	0.63	1.45	5.36	7.09	2.99
K	<0.5	<0.5	<0.5	<0.5	6.1	3.5	7	2.2
Na	11	10	44	87	10	12	7	24
Al					1.3	1.12	0.11	0.49
As					0.0023	0.0036	0.0021	0.0032
B					0.055	0.081	0.06	0.085
Cd					0.0003	0.0004	<0.0001	<0.0001
Cr					0.0045	<0.005	0.0008	0.0025
Cu					0.0018	0.0047	0.0021	0.0021
Pb					0.0036	0.0026	0.0009	0.0044
Hg					<0.0001	<0.0001	<0.0001	<0.0001
Ni					0.015	0.0539	0.0425	0.0239
Zn					0.039	0.05	0.035	0.024
Ion Balance	99.7	104	94	97.1	94.2	102	99	97.6
Lab pH	7.7	7.7	7.7	7.6	7.1	7.4	7.2	7.3
Lab Conductivity		641		1310	1010	1590	2560	1390
TDS	370	390	660	844	672	988	2240	992
TSS	1130	562	2680	4460	7610	13300	8460	9280
NO_3		<0.1		<0.1	0.1	<0.1	<0.1	<0.1
NO_2		<0.05		<0.05	0.07	<0.05	<0.05	<0.05
DOC	19	17	18	23	35	28	40	23
Phenols	0.006	0.009	0.003	0.005	0.012	0.016	0.028	0.022
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS0734408	OWS0734409	OWS0734410	OWS0734411	OWS0734412	OWS0734413	OWS0734414	OWS0734416
Sample Date	19-Oct-07	23-Oct-07	19-Oct-07	19-Oct-07	15-Oct-07	24-Oct-07	24-Oct-07	24-Oct-07
Field pH	7.56	8.2	7.42	6.76	9.48	7.97	7.82	7.55
Field Conductivity	1934	1332	1417	1090	1380	3234	2471	3386
Field Temperature	4.48	7.27	5.53	5.89	10.05	7.04	8.52	8.05
Sampled By	DB/AW	DB/AW	DB/AW	DB/AW	DB/AW	DB/AW	DB/AW	DB/AW
Sample Method								
HCO_3	639	767	619	533	612	569	992	760
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	223	46	151	67	78	<5	<5	<5
SO_4	176	90.7	49.8	60.5	184	175	19	53
Ca	205	250	153	173	205	1440	1430	1770
Fe	24.5	19.4	7.91	67.7	99.5	674	675	709
Mg	25.5	28.5	16.8	18.9	20.6	98.5	64.4	159
Mn	2.06	1.2	0.66	3.2	2.86	118	117	109
K	3.4	5.8	2.3	1.9	4.7	10	5.23	17.2
Na	164	28	126	37	86	13.8	12.8	12.7
Al	0.16	0.13	0.58	3.34	0.23	54	54	211
As	0.003	0.0008	0.0024	0.0055	0.0061	5.1	0.25	1.1
B	0.11	0.189	0.222	0.082	0.213	0.0039	0.0014	0.0025
Cd	0.0001	<0.0001	<0.0001	0.0007	<0.0001	0.086	0.09	0.182
Cr	<0.005	0.0013	<0.005	<0.005	0.0023	0.0003	0.0001	0.0002
Cu	0.003	0.0011	0.0019	0.0062	0.002	0.012	0.0024	0.004
Pb	0.0008	0.0004	0.0009	0.012	0.0042	0.0258	0.0099	0.0047
Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0154	0.0013	0.0074
Ni	0.046	0.0059	0.0118	0.0502	0.0255	<0.0001	<0.0001	<0.0001
Zn	0.018	0.008	0.016	0.062	0.03	0.039	0.0244	0.0206
Ion Balance	95.7	103	94.3	99.6	98.3	0.069	0.019	0.04
Lab pH	7.6	7.4	7.5	7.5	8.2	104	98.7	106
Lab Conductivity	1860	1290	1380	1080	1390	7.5	7.3	7.2
TDS	1040	952	896	668	908	3210	2440	3320
TSS	4030	3550	5540	10400	14700	2820	2220	2850
NO_3	<0.1	<0.1	<0.1	0.1	<0.1	35400	10100	26800
NO_2	<0.05	0.08	<0.05	<0.05	<0.05	0.2	0.1	0.1
DOC	29	28	27	19	24	<0.05	<0.05	0.09
Phenols	0.009	0.016	0.01	0.008	0.009	18	58	58
Naphthenic Acid						0.004	0.012	0.013

Aurora – Surficial Aquifer Monitoring Wells

ID	OWS0734417	OWS0734418	OWS9710026		OWS9710027		OWS9710028	
Sample Date	24-Oct-07	24-Oct-07	27-Jun-07	22-Oct-07	27-Jun-07	22-Oct-07	24-Jun-07	14-Oct-07
Field pH	8.08	6.85	7.24	7.47	7.52	7.21	7.06	8.97
Field Conductivity	2001	3944	703	637	577	567	597	476
Field Temperature	7.57	8.07	4.86	5.92	5.44	4.83	4.89	6.62
Sampled By	DB/AW	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	896	722	391	384	291	305	332	281
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	12	216	<1	<1	<1	2	<1	1
SO_4	1440	1660	1.4	0.9	19.3	23.3	1.5	25.5
Ca	698	677	101	98.9	81.3	90	84.9	75.7
Fe	47.6	29.3	14.1	19.7	9.4	16	5.49	5.2
Mg	119	61.7	14	12.2	10.8	10.3	15	12.8
Mn	4.85	4.52	0.59	0.79	0.57	0.66	0.52	0.44
K	13.3	11.9	0.8	0.9	0.6	1.1	<0.5	1.3
Na	55	354	4	3	3	3	5	7
Al	0.29	0.01						
As	0.0024	0.0011						
B	0.064	0.133						
Cd	0.0002	<0.0001						
Cr	0.0013	0.0015						
Cu	0.0016	0.0029						
Pb	0.0014	<0.0001						
Hg	<0.0001	<0.0001						
Ni	0.0315	0.0212						
Zn	0.03	0.004						
Ion Balance	105	104	99.2	96.5	98.5	99.2	104	100
Lab pH	7.6	7.3	8	7.6	8	7.7	7.8	7.7
Lab Conductivity	2010	3930		565		502		461
TDS	1790	3590	370	354	290	317	280	303
TSS	3520	6880	184	438	65	65	249	11
NO_3	0.1	<0.1		<0.1		<0.1		<0.1
NO_2	<0.05	0.1		<0.05		<0.05		<0.05
DOC	23	36	12	11	11	10	14	12
Phenols	0.015	0.005	0.001	0.004	<0.001	0.002	0.019	0.004
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

APPENDIX A

ID	OWS9734015		OWS9734018		OWS9734021		OWS9734022	
Sample Date	**29-Jun-07**	**23-Oct-07**	**29-Jun-07**	**18-Oct-07**	**26-Jun-07**	**17-Oct-07**	**26-Jun-07**	**17-Oct-07**
Field pH	6.85	6.62	6.63	8.99	6.49	8.28	6.6	9.59
Field Conductivity	866	833	617	692	482	536	583	518
Field Temperature	5.66	6.31	6.03	4.9	2.88	4.34	3.88	3.63
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method								
HCO_3	493	496	465	440	291	313	368	330
CO_3	<5	<5	<5	<5	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5	<5	<5
Cl	5	5	2	2	1	3	4	6
SO_4	37.4	39.2	3.7	4.5	11.2	7.9	3.7	3.9
Ca	137	146	119	114	85	94.3	90.4	89.5
Fe	15.7	14.9	16.3	17.2	2.79	4.87	3.84	4.17
Mg	16.1	16	16.6	15	8.9	9	9.8	9.2
Mn	0.85	0.67						
K	0.7	1.5	<0.5	1.2	0.5	<0.5	1.6	1
Na	13	12	4	4	11	7	28	13
Al								
As								
B								
Cd								
Cr								
Cu								
Pb								
Hg								
Ni								
Zn								
Ion Balance	97.2	101	96.4	96.8	109	107	106	103
Lab pH	7.9	7.1	7.9	7.1	7.7	7.5	7.8	7.5
Lab Conductivity		778		625		481		497
TDS	480	481	410	407	320	334	370	388
TSS	1500	967	628	168	1180	140	3320	1470
NO_3		<0.1		<0.1		<0.1		<0.1
NO_2		<0.05		<0.05		<0.05		<0.05
DOC	14	12	32	32	24	29	28	28
Phenols	0.012	0.01	0.012	0.013	0.004	0.007	0.004	0.01
Naphthenic Acid								

Aurora – Surficial Aquifer Monitoring Wells

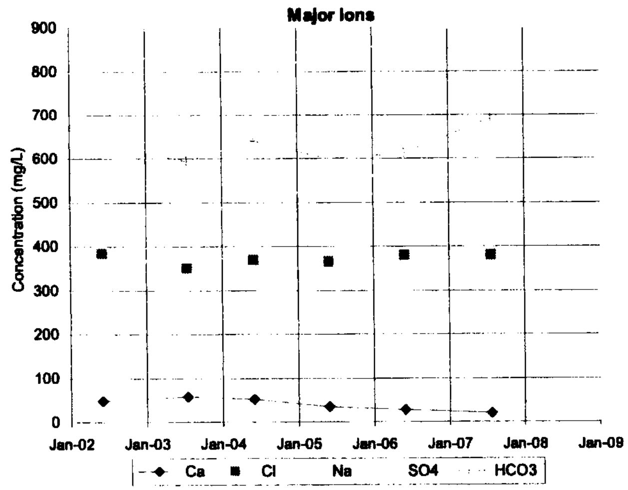
ID	OWS9734023	OWS9734023	OWS9934761	OWS9934761	OWS9934762	OWS9934762
Sample Date	26-Jun-07	15-Oct-07	25-Jun-07	15-Oct-07	28-Jun-07	23-Oct-07
Field pH	6.63	9.45	6.61	9.89	7.12	7.76
Field Conductivity	470	646	2240	1703	1145	951
Field Temperature	5.28	7.47	5.77	4.98	4.74	3.93
Sampled By	AW/BS	DB/AW	AW/BS	DB/AW	AW/BS	DB/AW
Sample Method						
HCO_3	262	414	636	566	662	618
CO_3	<5	6	<5	<5	<5	<5
OH	<5	<5	<5	<5	<5	<5
Cl	2	2	233	179	30	20
SO_4	29.2	3.9	276	221	6.9	1.5
Ca	82.4	116	213	222	115	112
Fe	0.8	5.11	1	5.63	6.15	5.6
Mg	9.7	11.6	26.7	21.9	17.2	15.9
Mn			0.21	0.57	0.33	0.34
K	1.9	1.5	1.6	2.3	5.2	3.9
Na	9	7	176	143	108	85
Al						
As						
B						
Cd						
Cr						
Cu						
Pb						
Hg						
Ni						
Zn						
Ion Balance	108	99.5	90.2	101	101	99.5
Lab pH	7.9	8.3	7.6	8.2	8	7.4
Lab Conductivity		606		1760		923
TDS	340	392	1450	1150	630	588
TSS	320	264	60	44	88	114
NO_3		<0.1		<0.1		0.3
NO_2		<0.05		<0.05		<0.05
DOC	23	21	32	31	26	26
Phenols	0.003	0.012	0.005	0.016	0.006	0.007
Naphthenic Acid						

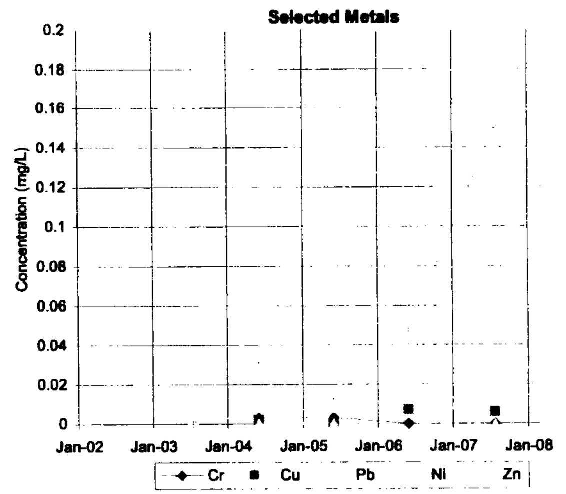
2007 TEH and PAH parameters

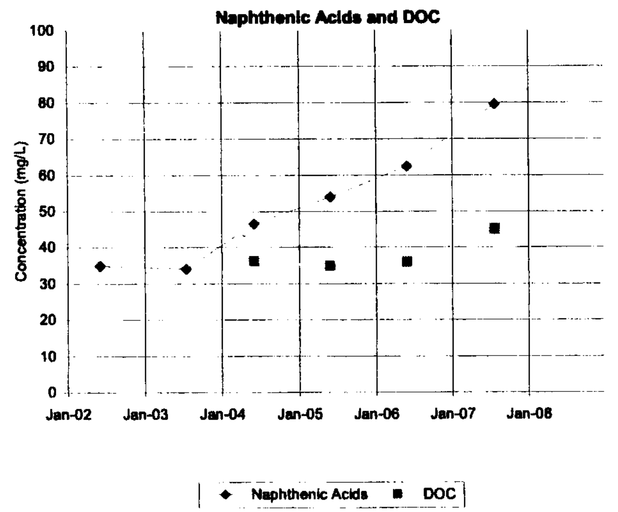
	OWS0110-01	OWS0110-03	OWS0134-11	OWS0134-12	OWS0134-13	OWS0234-04	OWS0234-14	OWS0234-17	OWS0334-06	EPP-PP
TEH (C11-C30)	<0.05	<0.05	17	<0.05	120	<0.05	5	2.3	1.3	<0.05
Naphthalene	<0.00001	<0.00001	0.00002	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Acenaphthene	<0.00001	<0.00001	0.00009	<0.00001	0.00096	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Fluorene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Phenanthrene	<0.00001	<0.00001	0.00015	0.00002	0.0015	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Anthracene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Fluoranthene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Pyrene	<0.00001	<0.00001	0.00004	<0.00001	0.0011	0.00002	<0.00001	<0.00001	<0.00001	<0.00001
Benzo(a)anthracene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chrysene	<0.00001	<0.00001	0.00002	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Benzo(b)fluoranthene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Benzo(k)fluoranthene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Benzo(a)pyrene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Indeno(1,2,3-cd)pyrene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dibenzo(a,h)anthracene	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Acridine	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Quinoline	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001

APPENDIX B: HISTORICAL TREND PLOTS

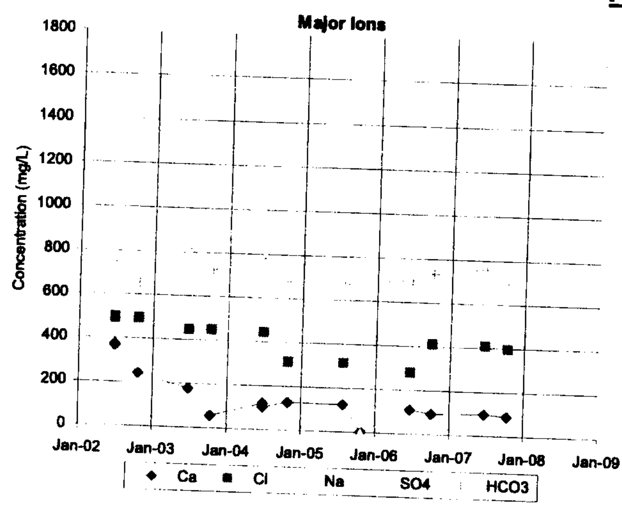
ATP

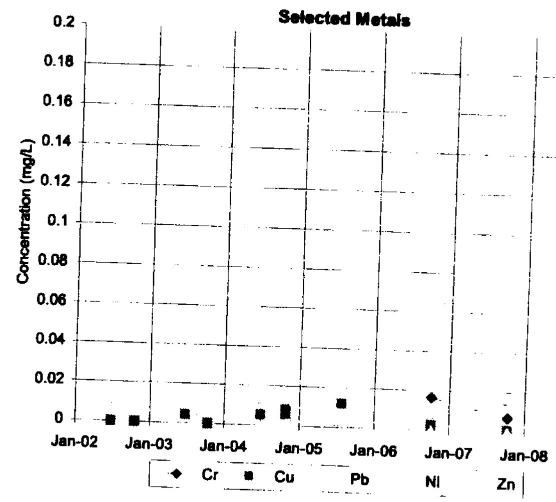

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09
Ca Cl Na SO4 HCO3

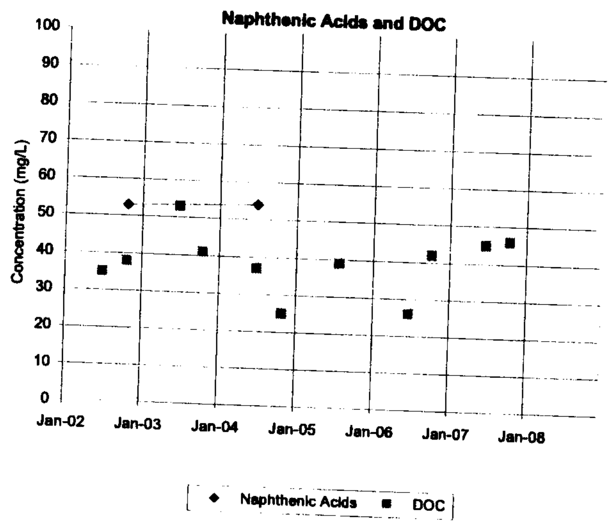

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Cr Cu Pb Ni Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Naphthenic Acids DOC

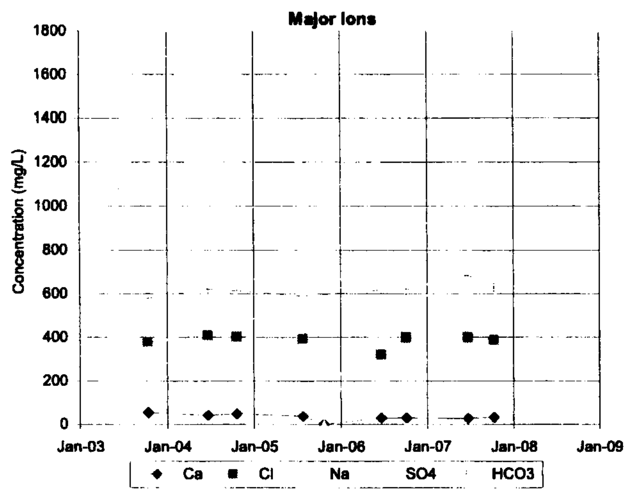
A6202

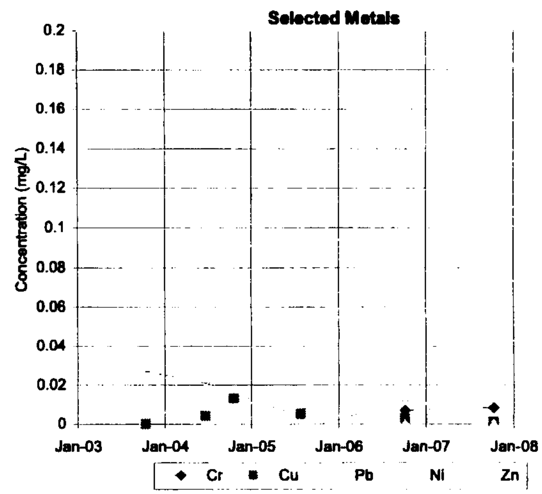

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Ca
Cl
Na
SO4
HCO3

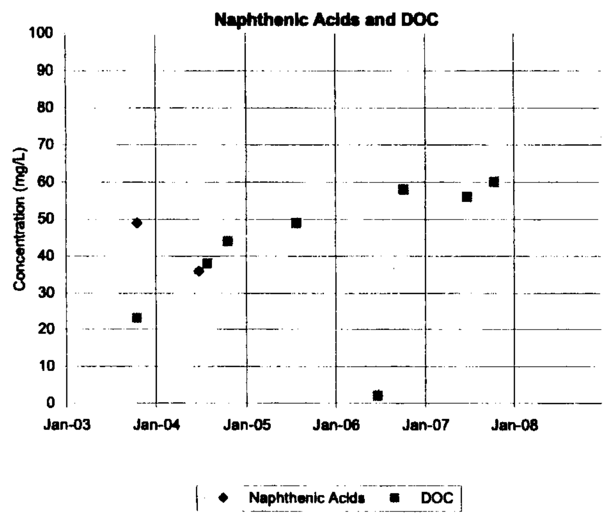

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

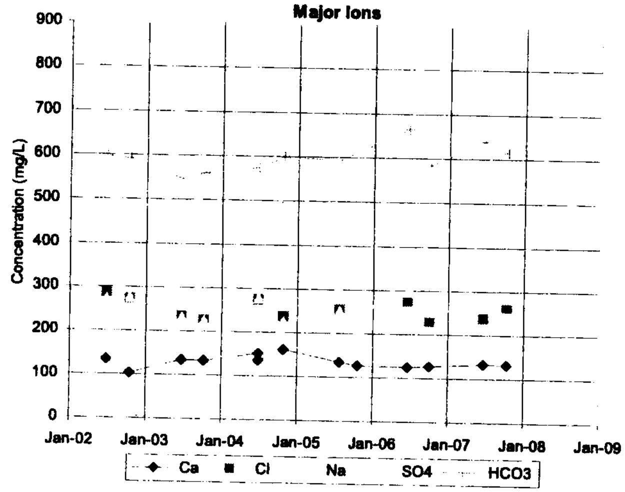
AN-SIPHON

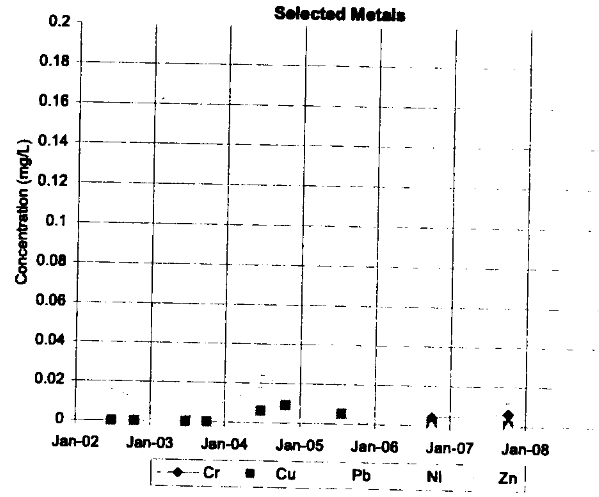

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Ca
Cl
Na
SO4
HCO3

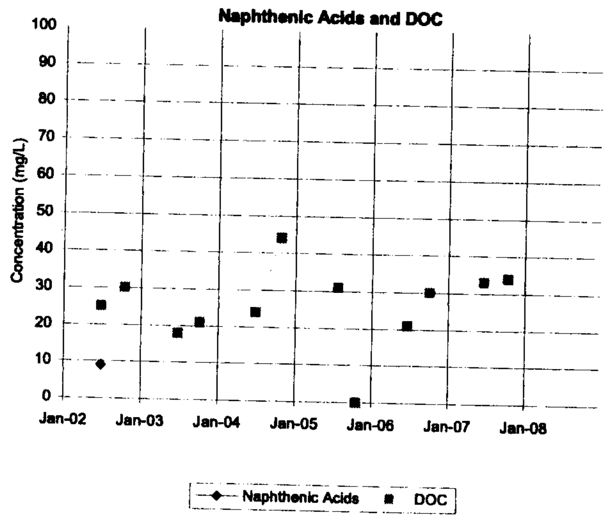

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

RAMP3POND

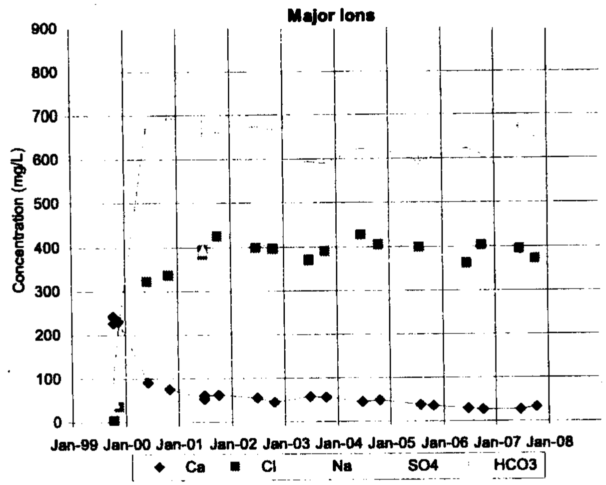

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Ca
Cl
Na
SO4
HCO3

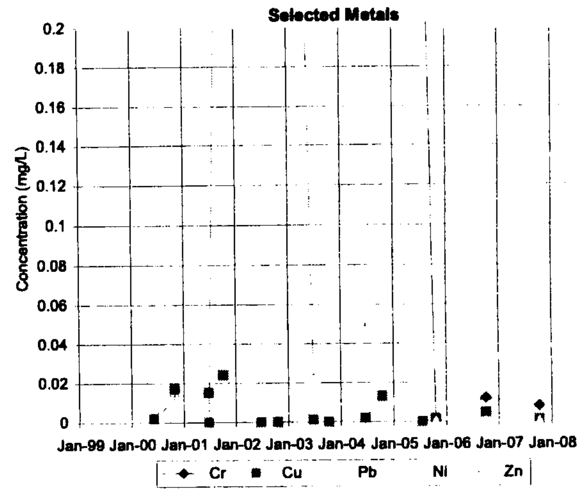

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

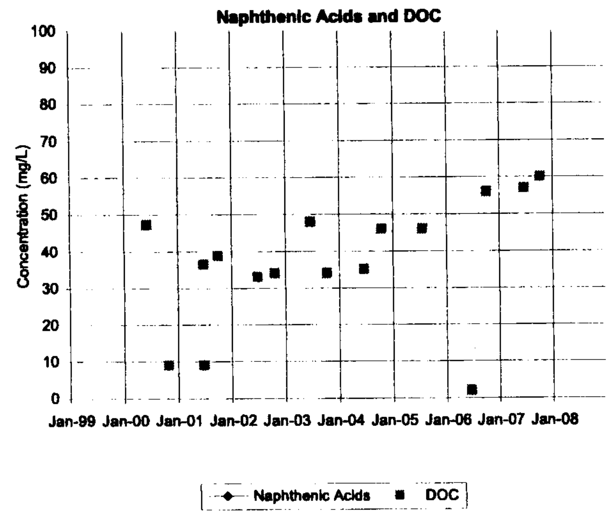

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

Aurora – Surface Water Samples (Dirty Water)

RECYCLEPOND



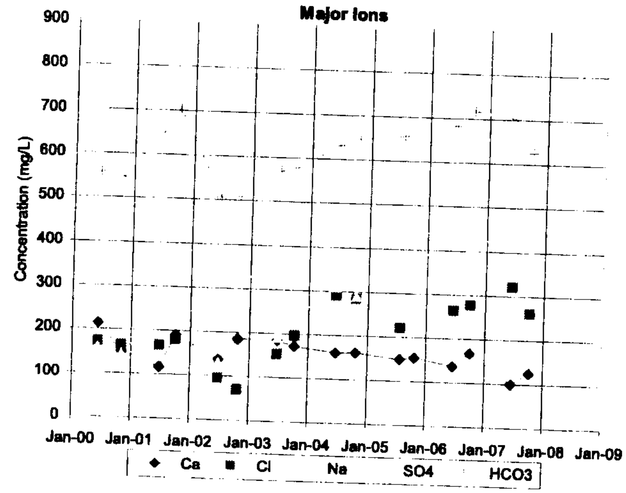


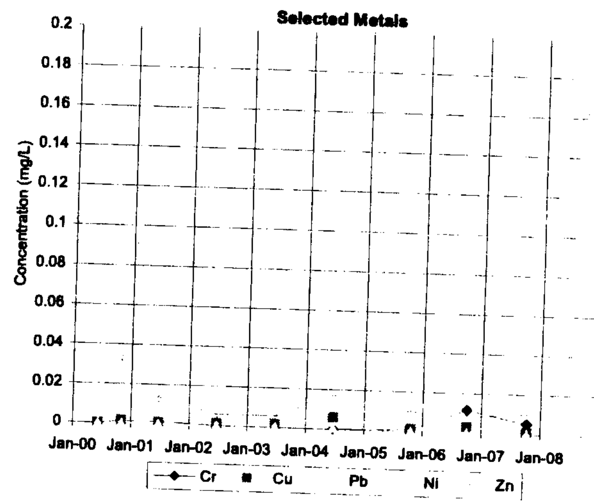


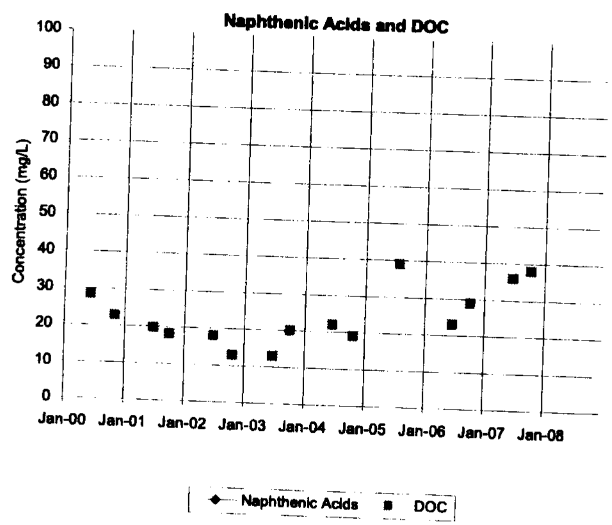
Aurora – Surface Water Samples (Dirty Water)

APPENDIX B

SOUTHPOND

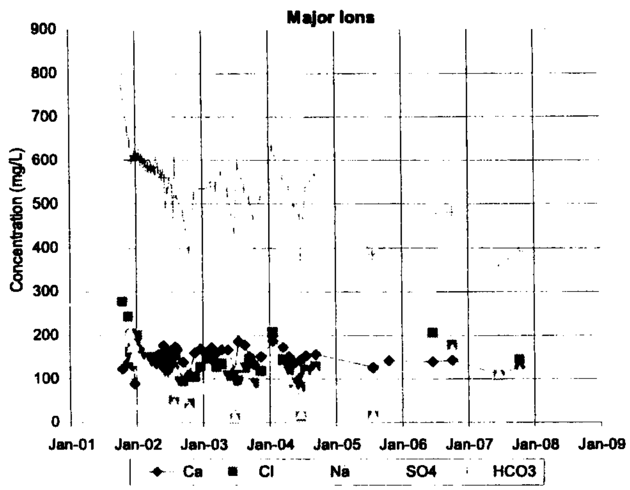


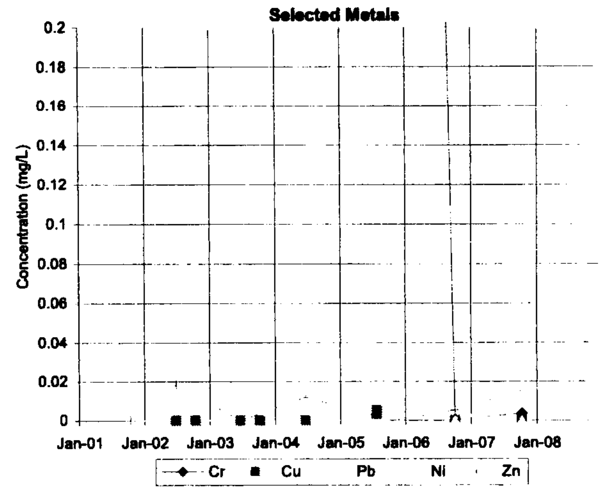


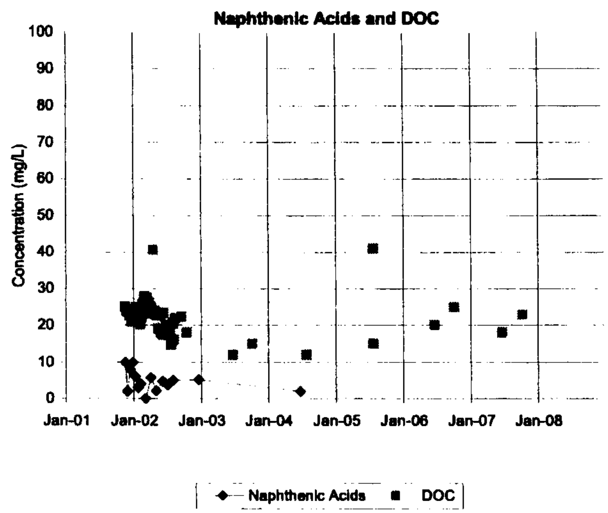


Aurora – Surface Water Samples (Dirty Water)

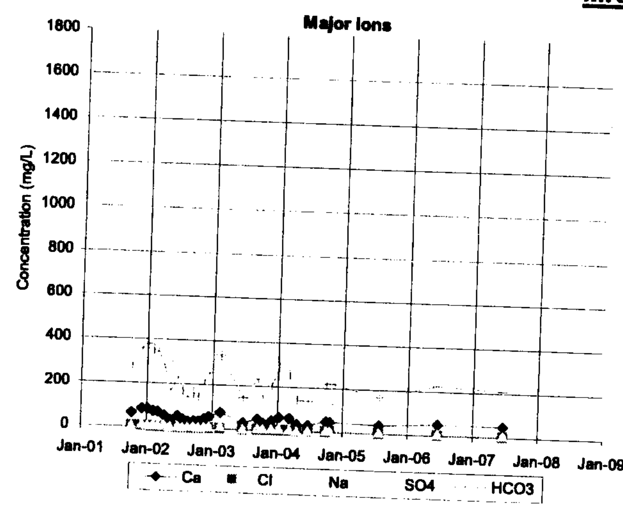
MRSUMP

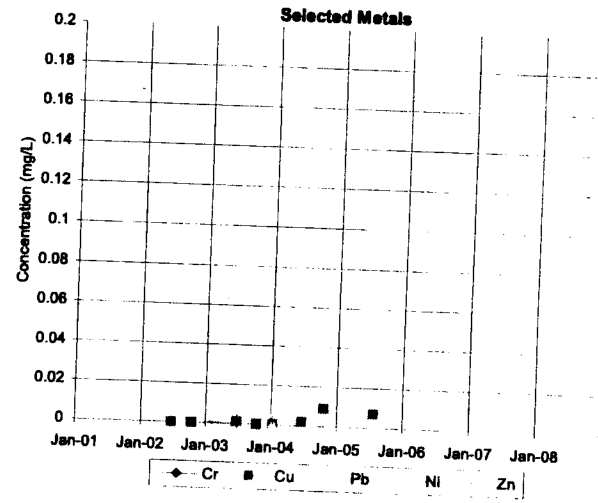


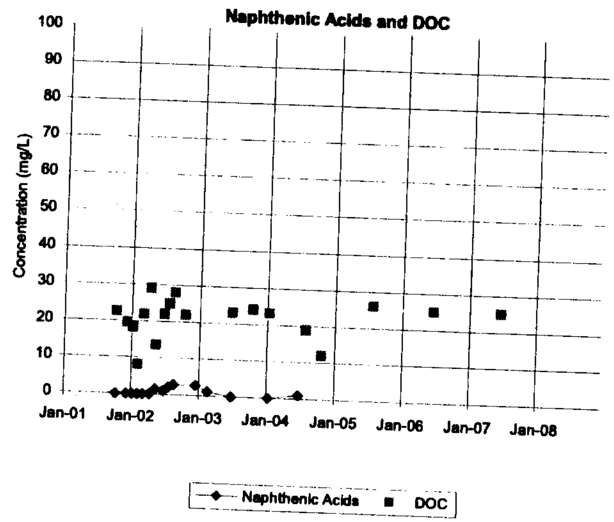




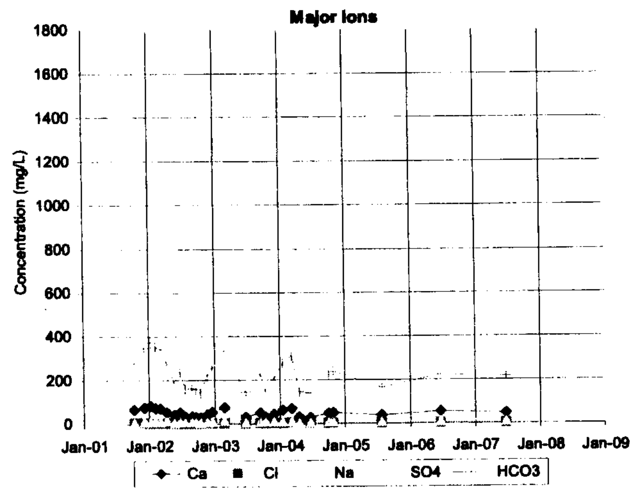
MR6350190

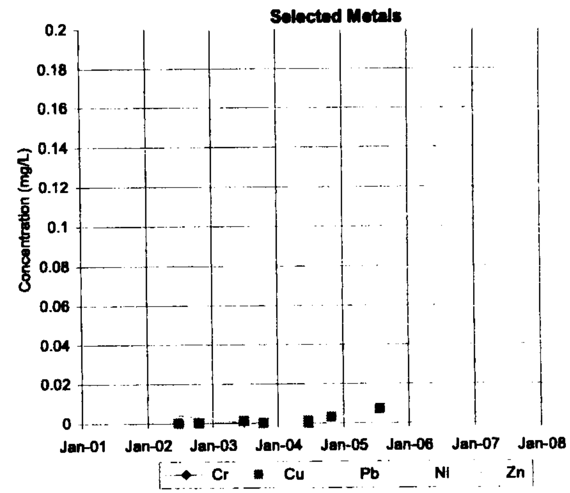

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09
Ca Cl Na SO4 HCO3

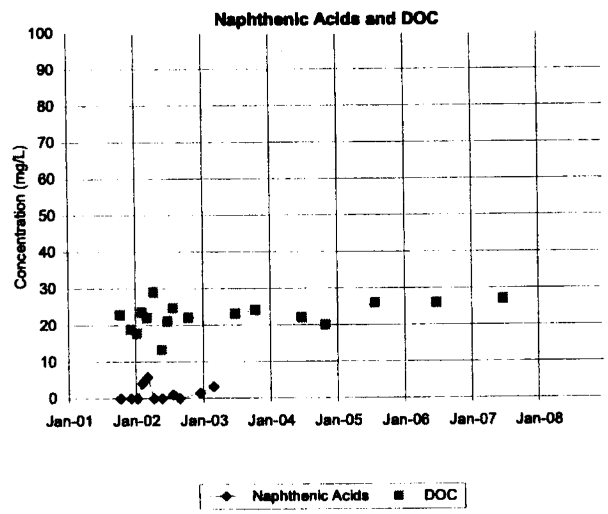

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Cr Cu Pb Ni Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Naphthenic Acids DOC

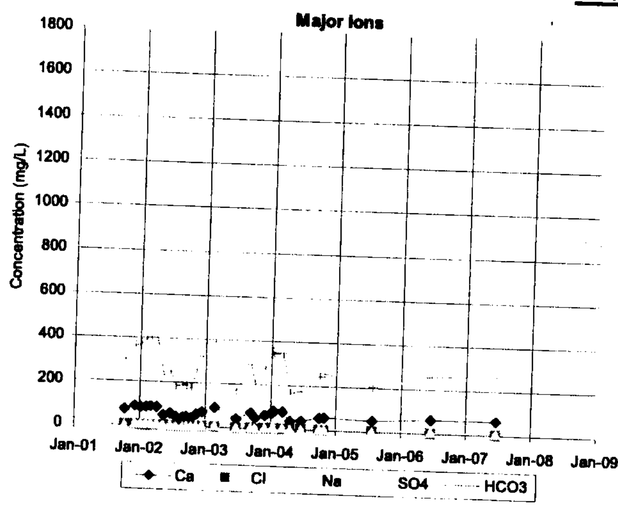
MR6350775

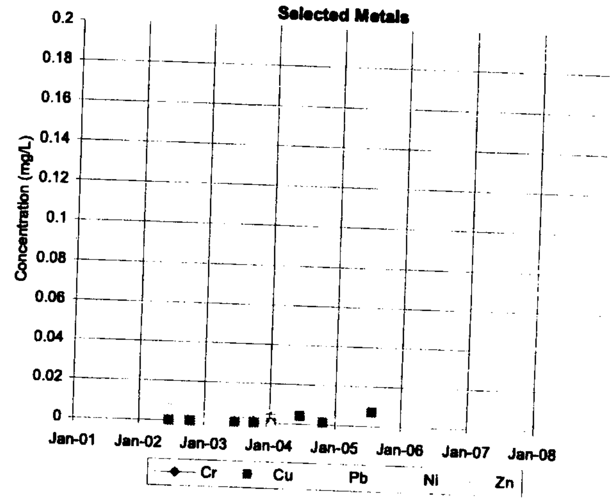

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09
Ca Cl Na SO4 HCO3

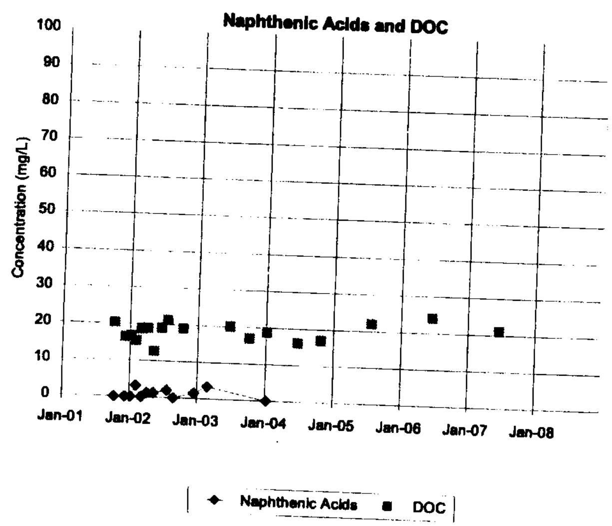

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Cr Cu Pb Ni Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Naphthenic Acids DOC

MR6351800

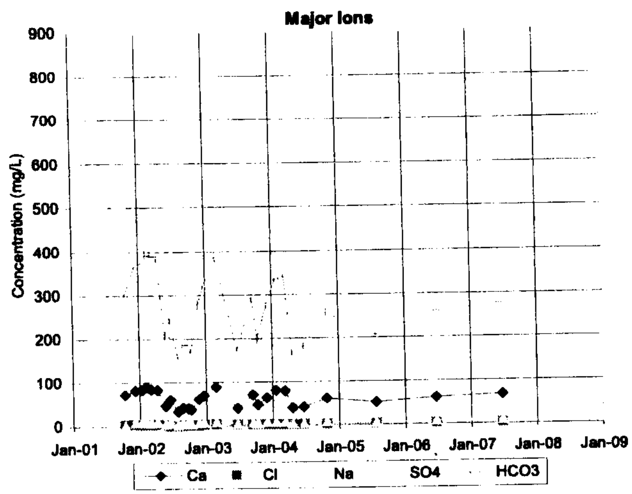

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09
Ca Cl Na SO4 HCO3

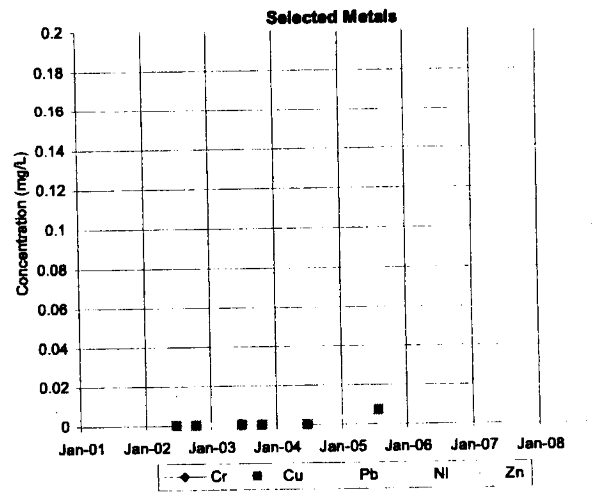

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Cr Cu Pb Ni Zn

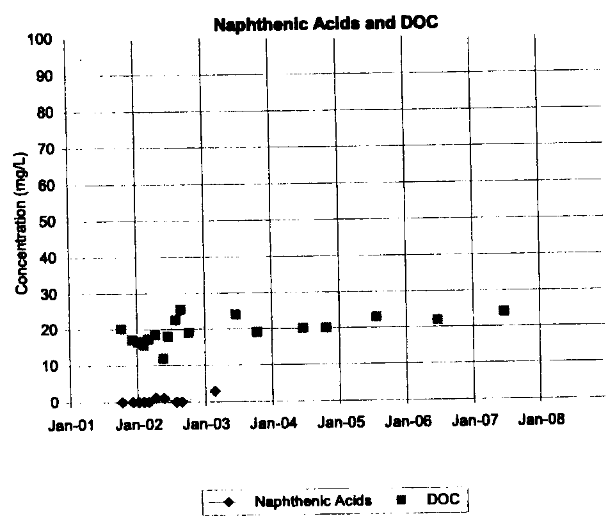

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08
Naphthenic Acids DOC

Aurora – Surface Water Samples (Clean Water)

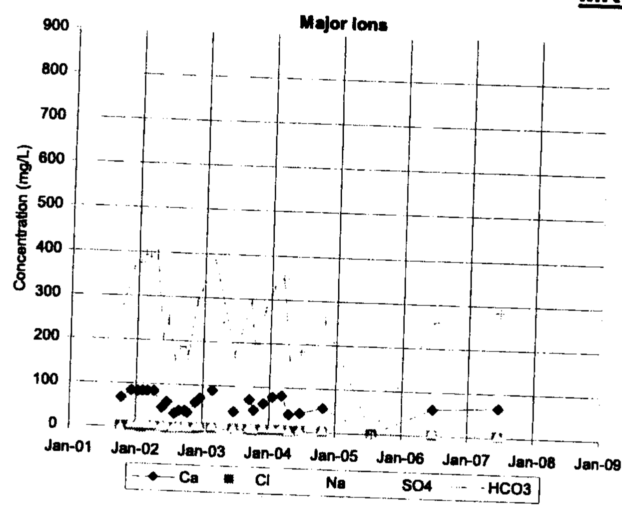
MR6352600

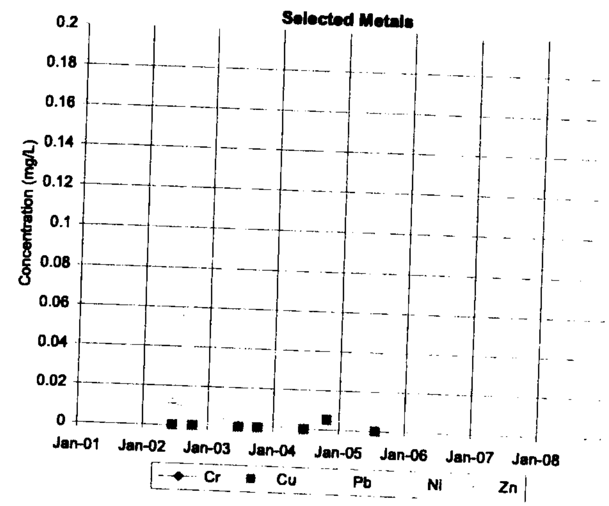


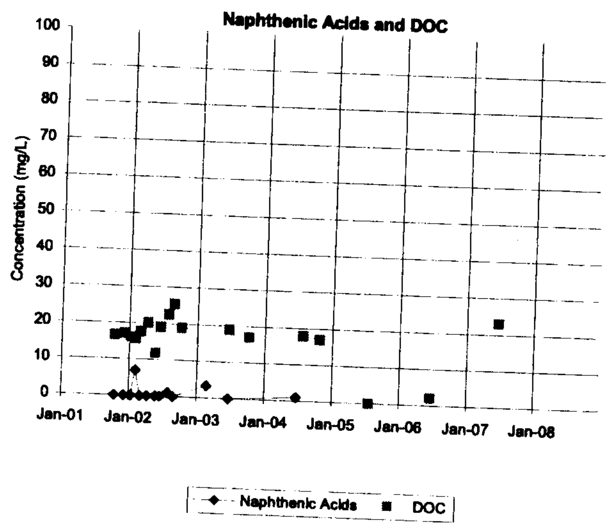




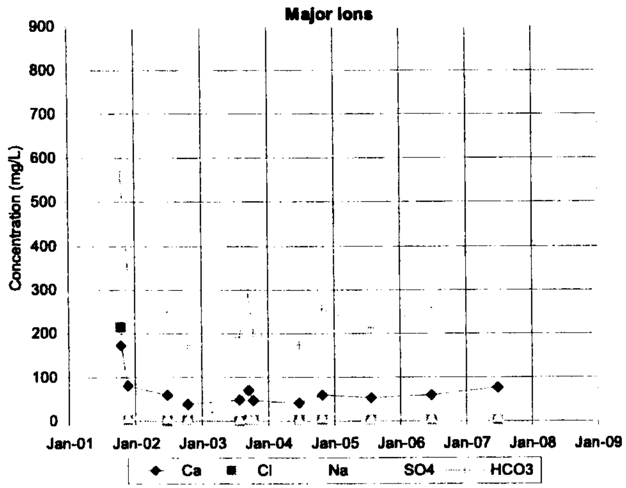
MR6353330

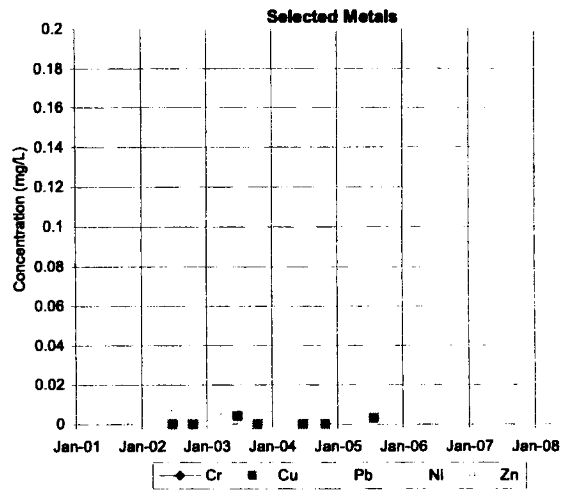

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Ca
Cl
Na
SO4
HCO3

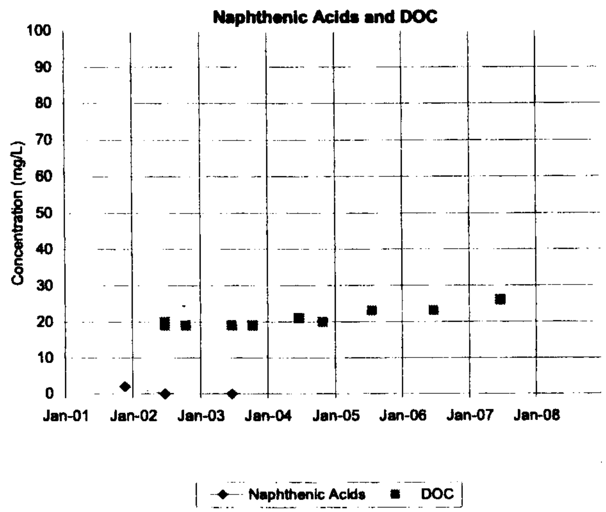

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

MRT6352090


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Ca
Cl
Na
SO4
HCO3

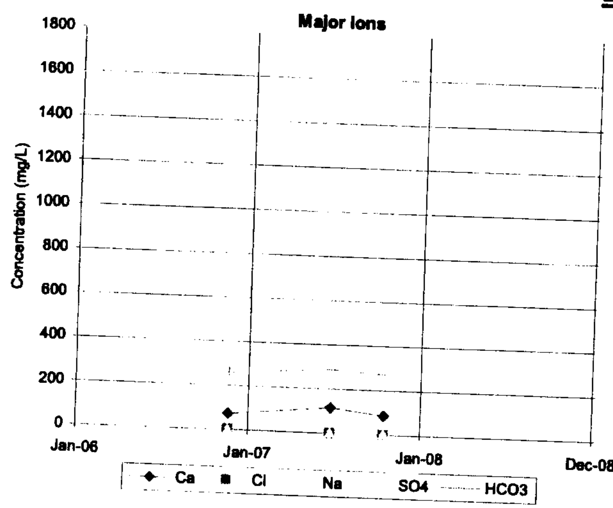

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

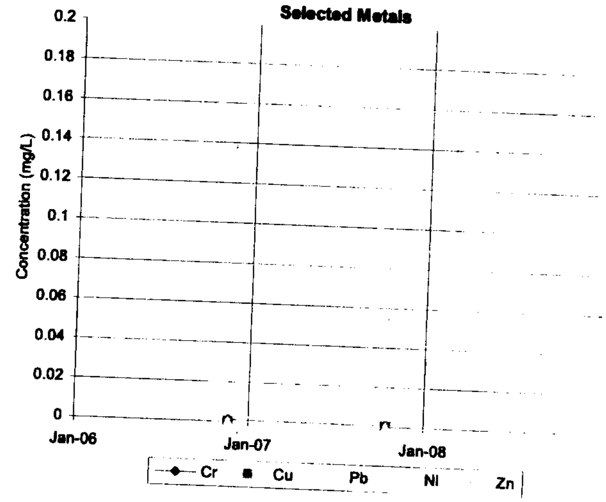

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

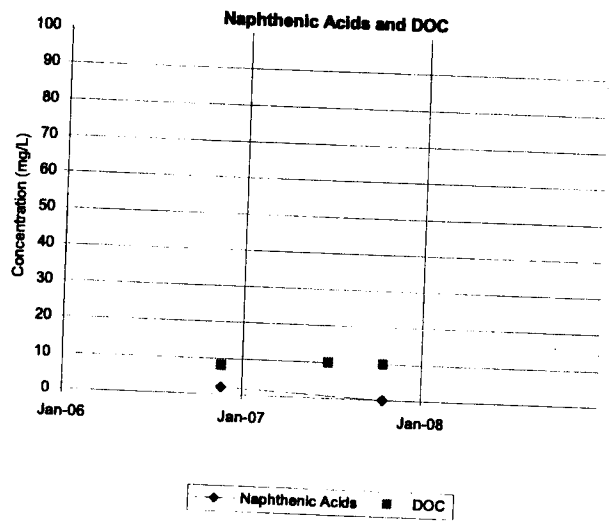
Aurora – Surface Water Samples (Clean Water)

APPENDIX B

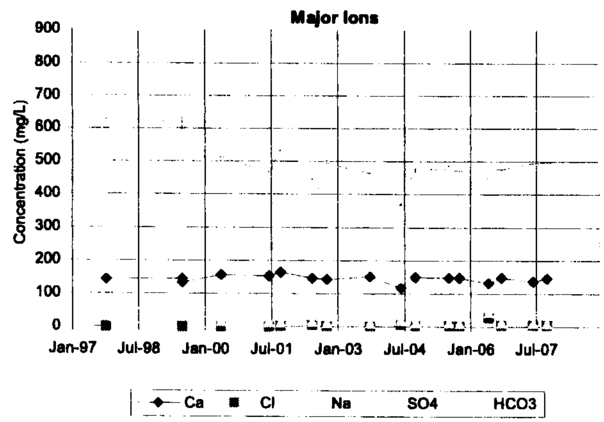
EPP-PP

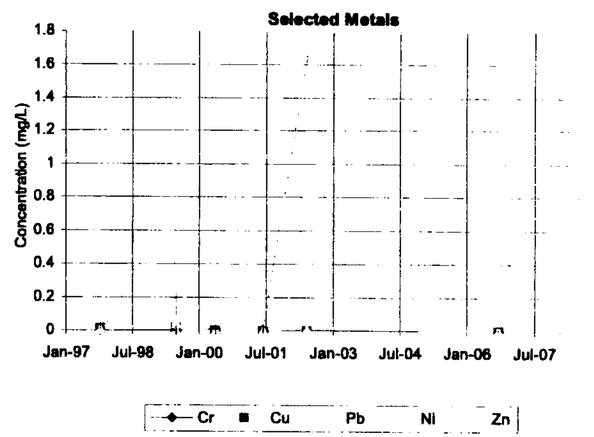


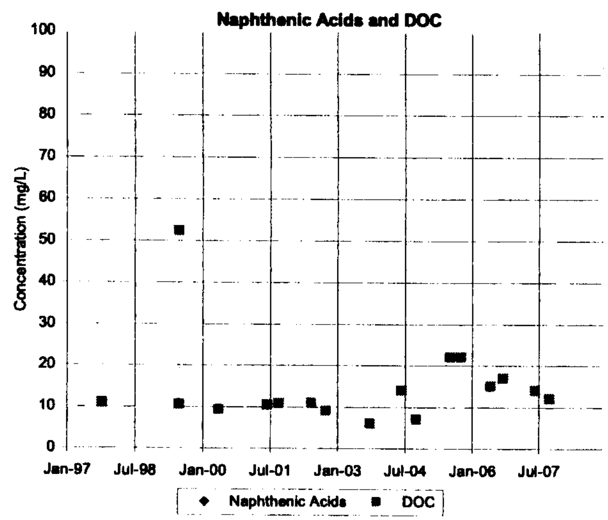


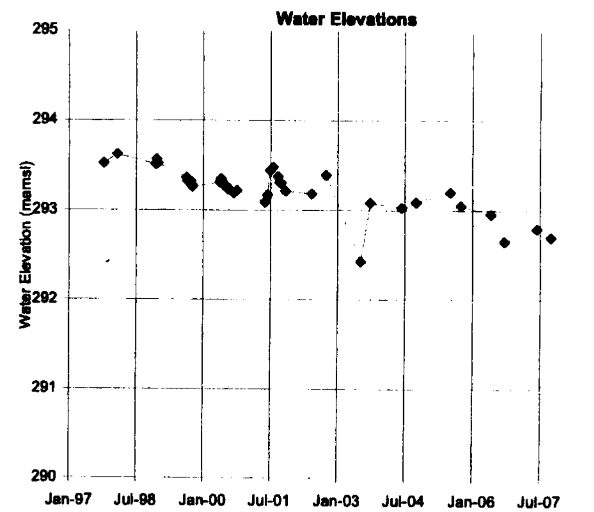


OWS9734015

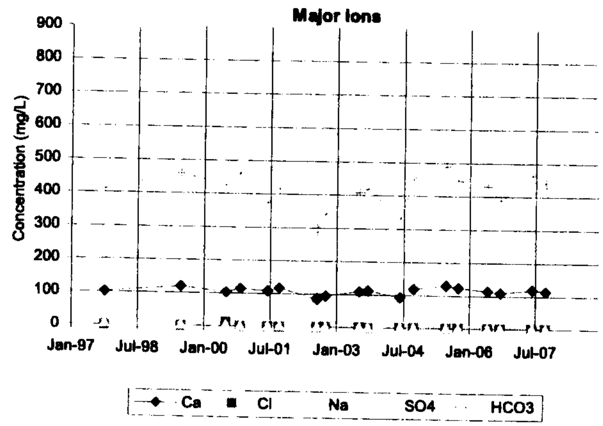

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

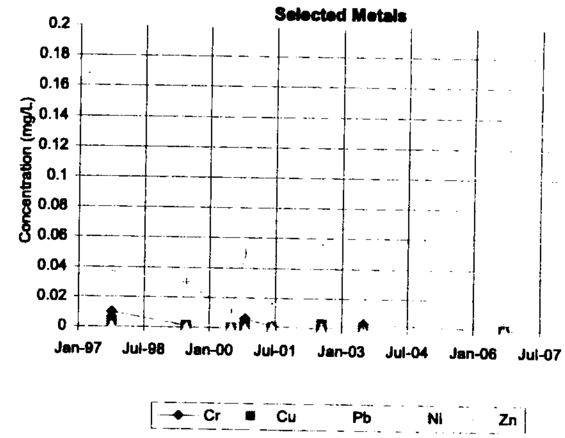

Selected Metals
Concentration (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

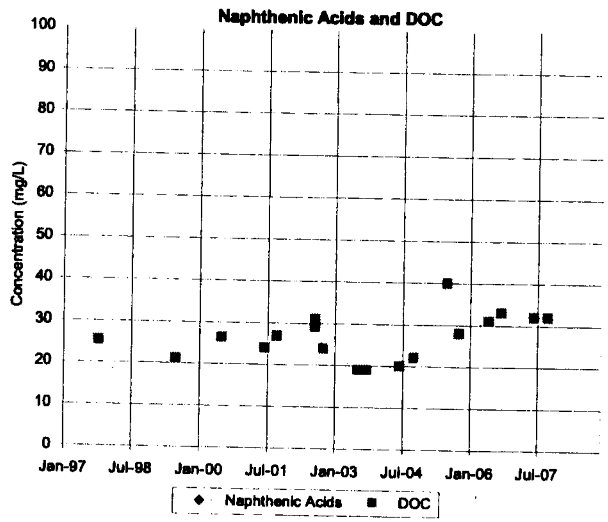

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

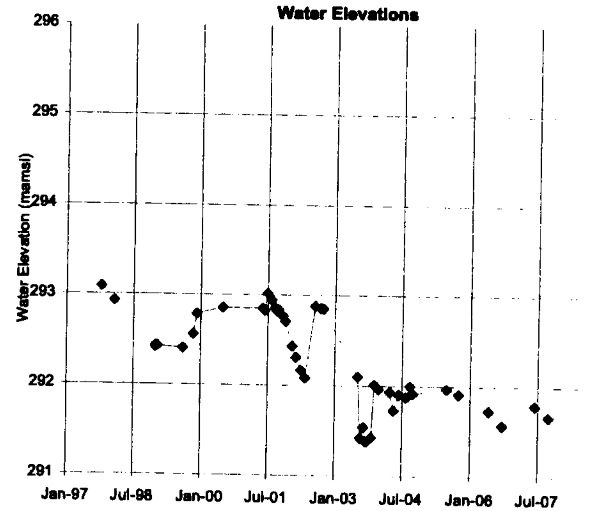

Water Elevations
Water Elevation (mamsl)
295
294
293
292
291
290
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS9734018


Major Ions
900
800
700
600
500
400
300
200
100
0
Concentration (mg/L)
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

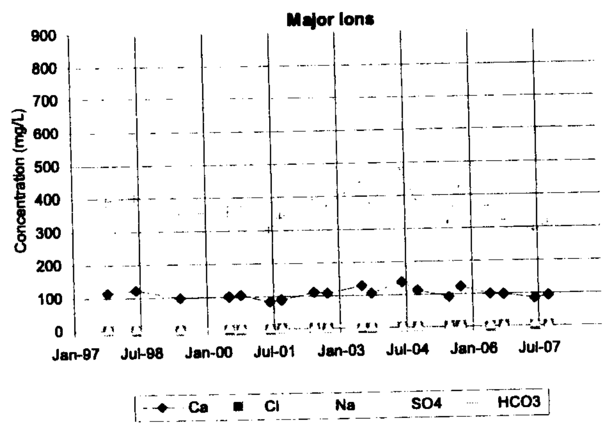

Selected Metals
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Concentration (mg/L)
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

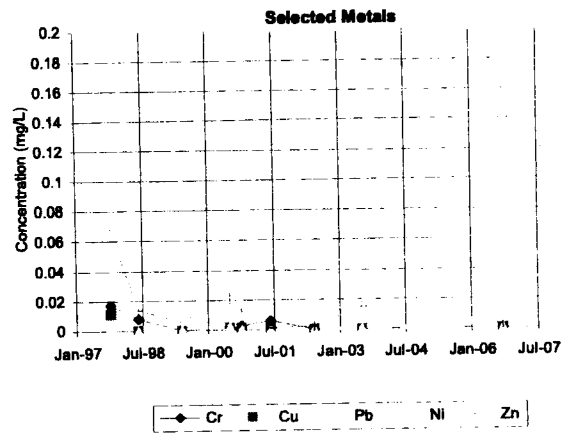

Naphthenic Acids and DOC
100
90
80
70
60
50
40
30
20
10
0
Concentration (mg/L)
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

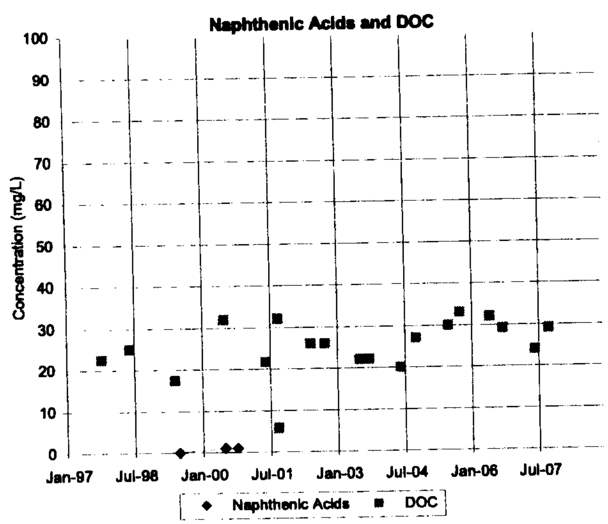

Water Elevations
296
295
294
293
292
291
Water Elevation (mamsl)
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

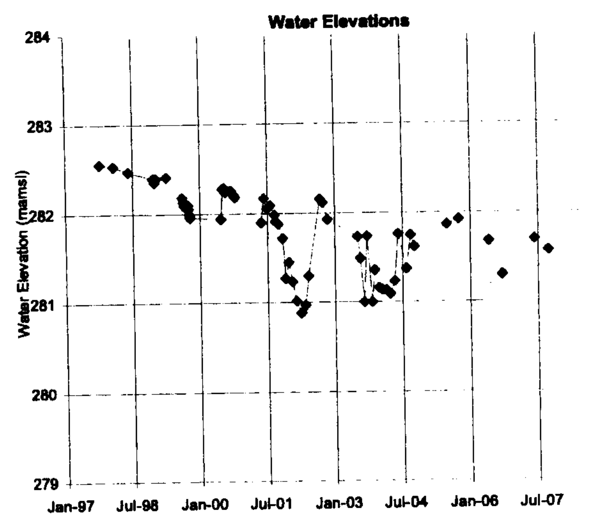
Aurora – Groundwater Monitoring Wells

OWS9734021

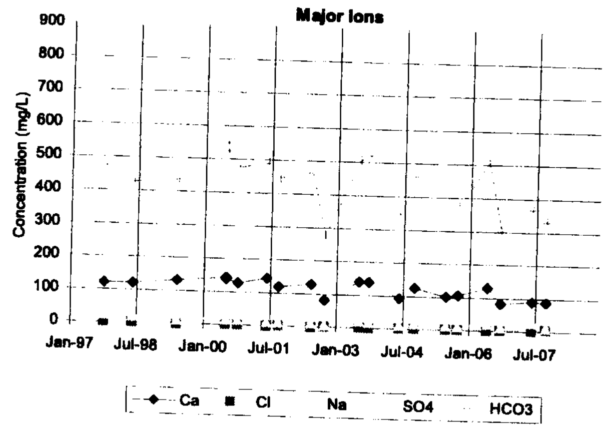


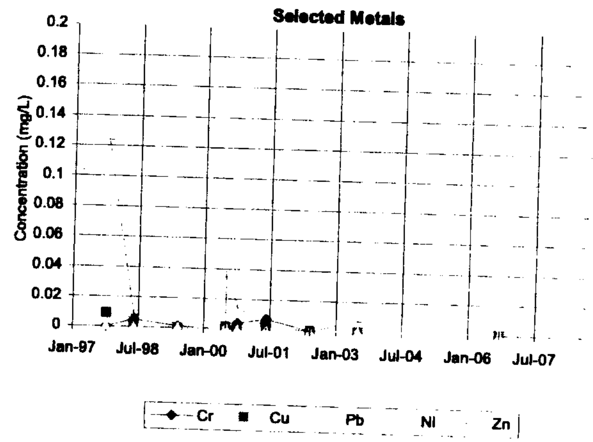


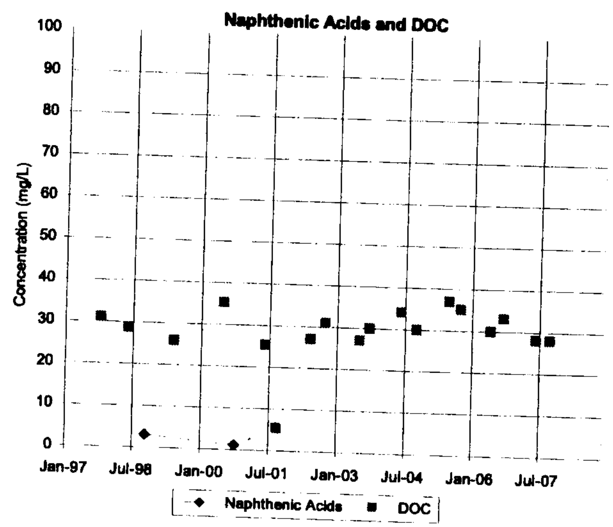


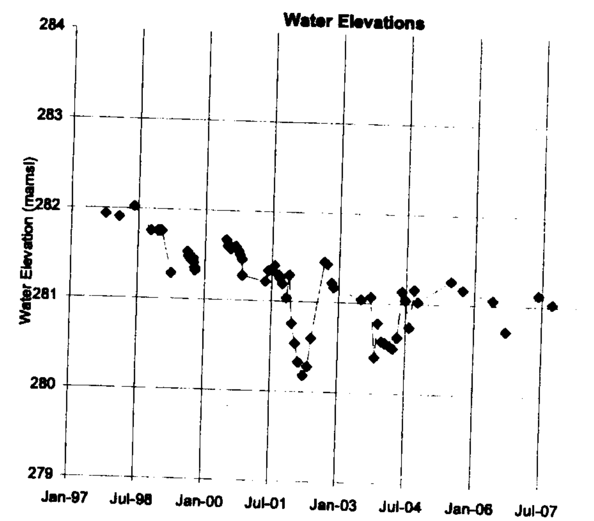


OWS9734022

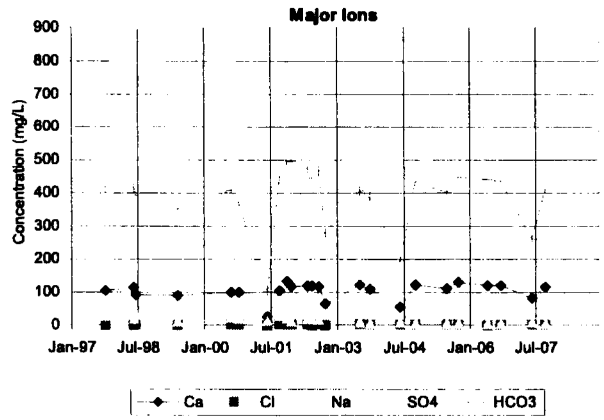

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

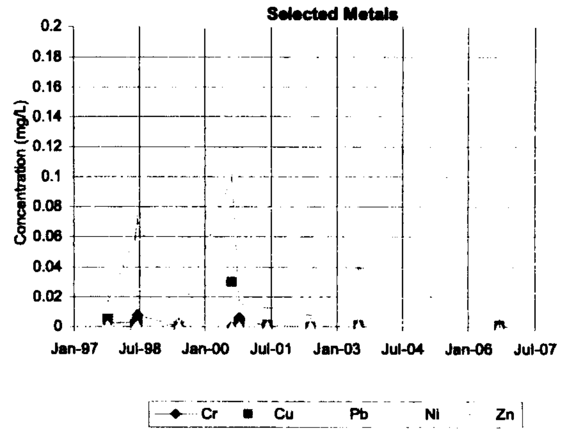

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC


Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS9734023


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
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Jul-98
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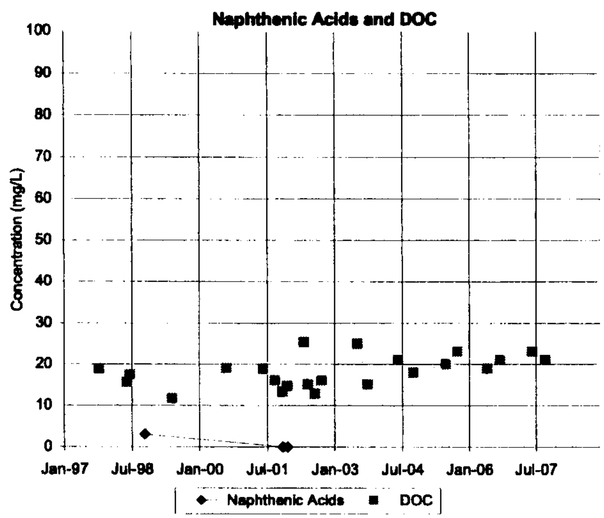
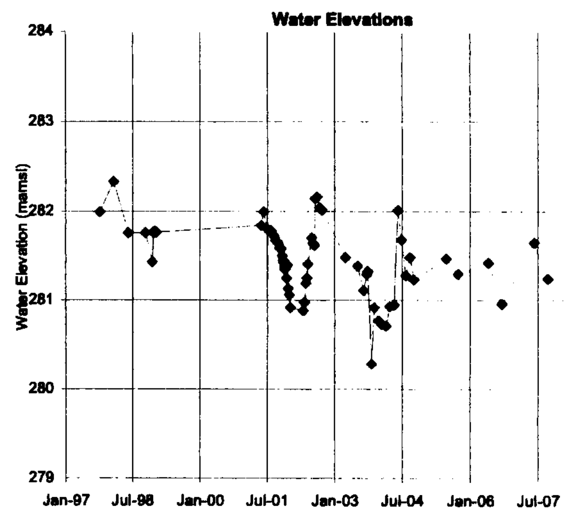
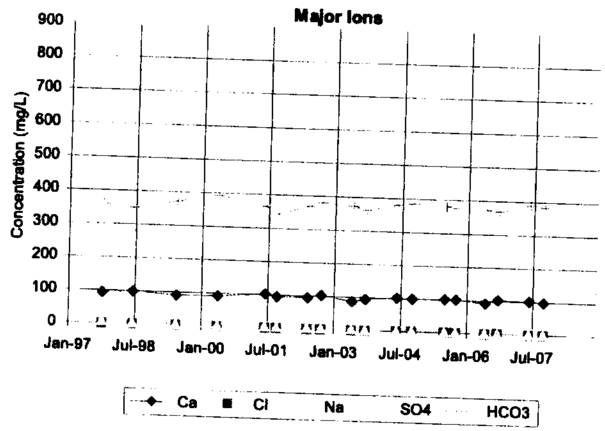
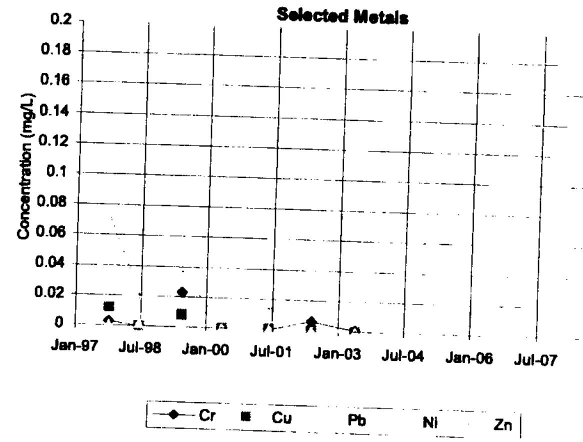
Jul-07
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS9710026


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
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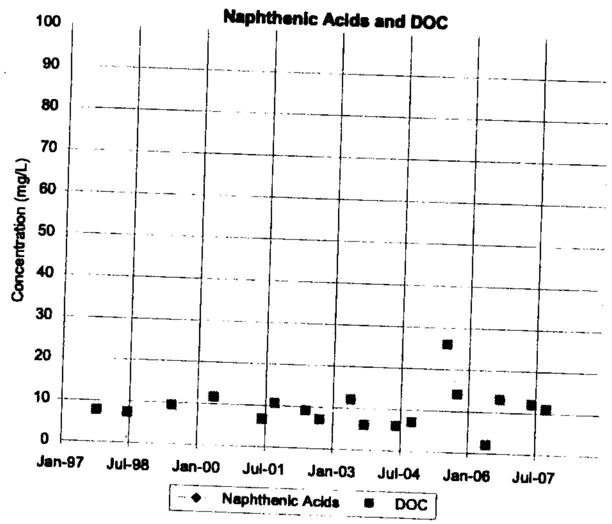
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
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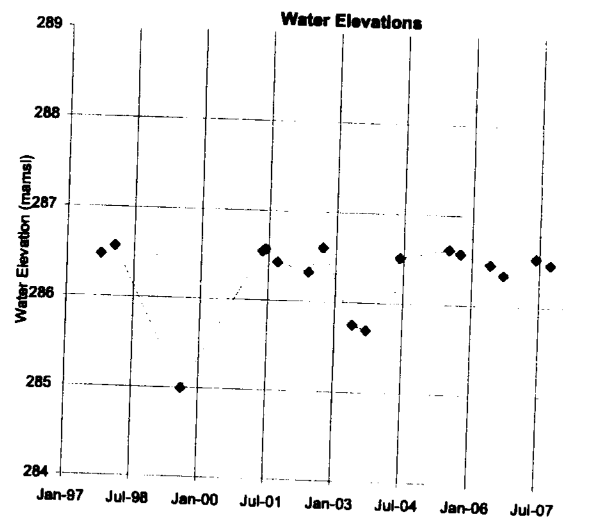
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
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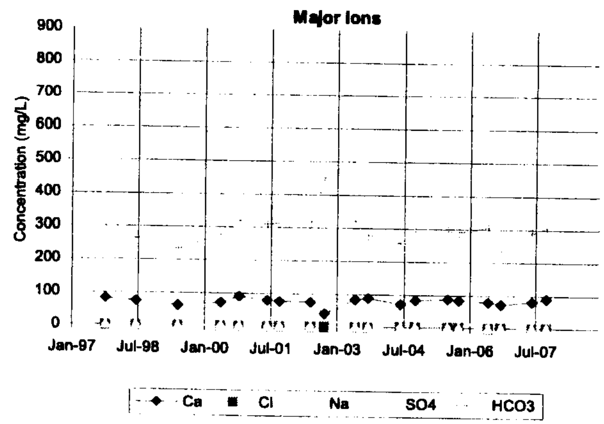
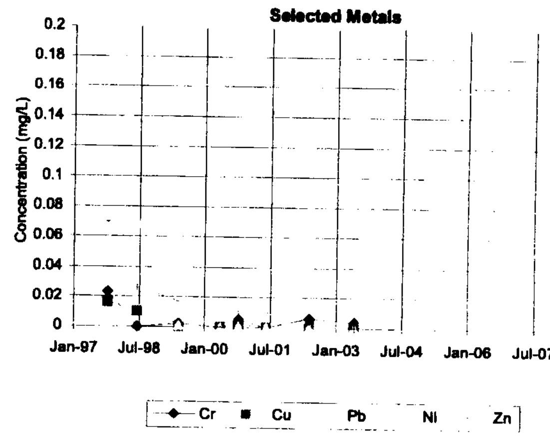
288
287
286
285
284
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS9710027


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
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Jul-98
Jan-00
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Jul-04
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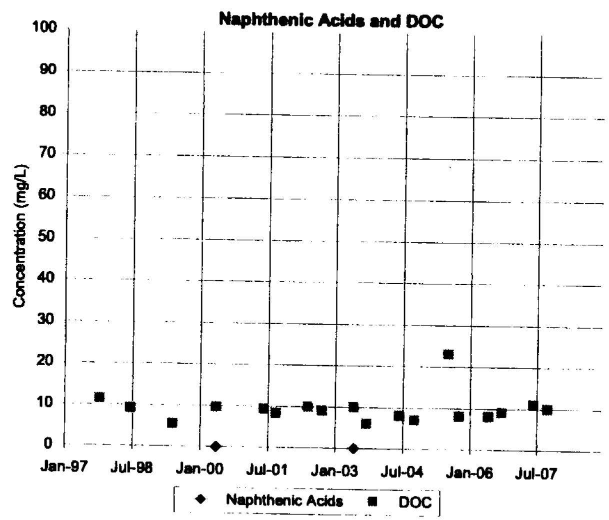
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
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Jul-98
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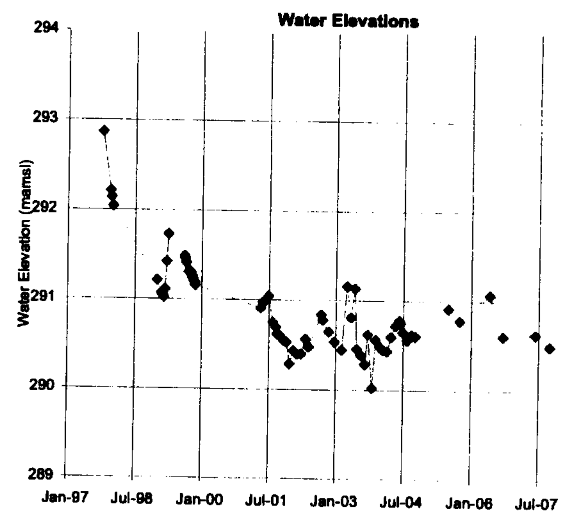
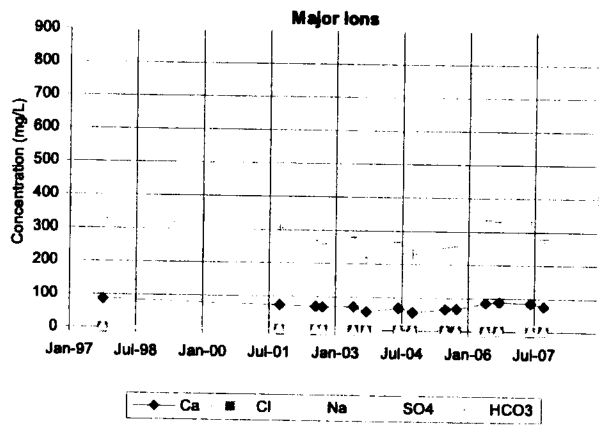
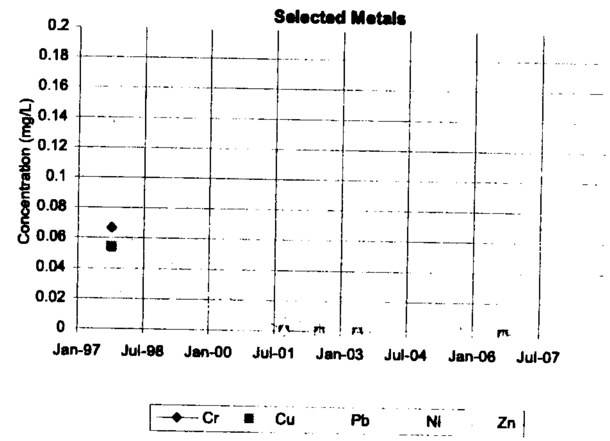
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS9710028


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
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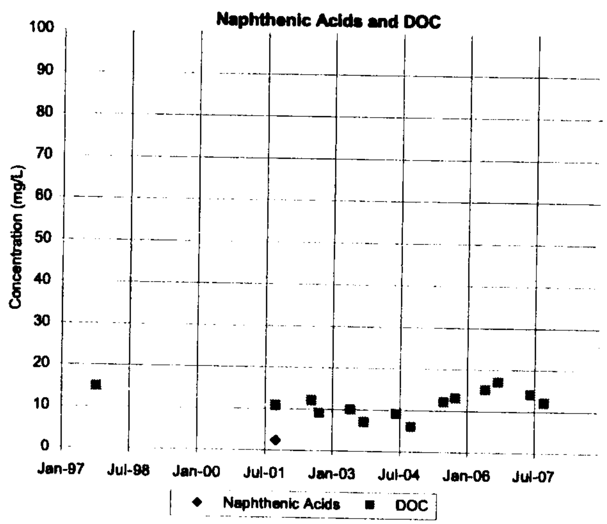
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
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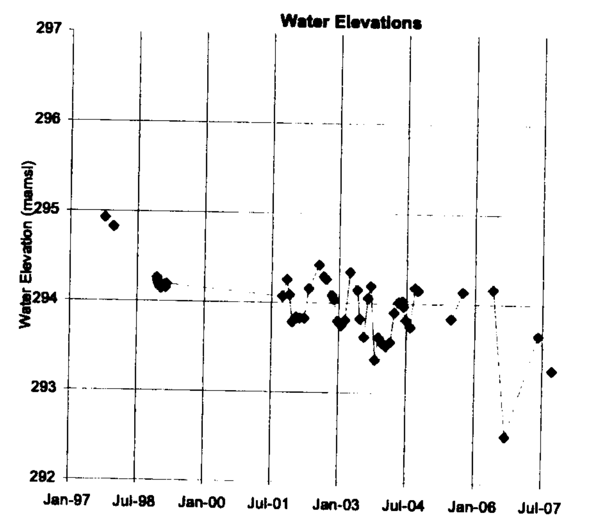
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
297
296
295
294
293
292
Jan-97
Jul-98
Jan-00
Jul-01
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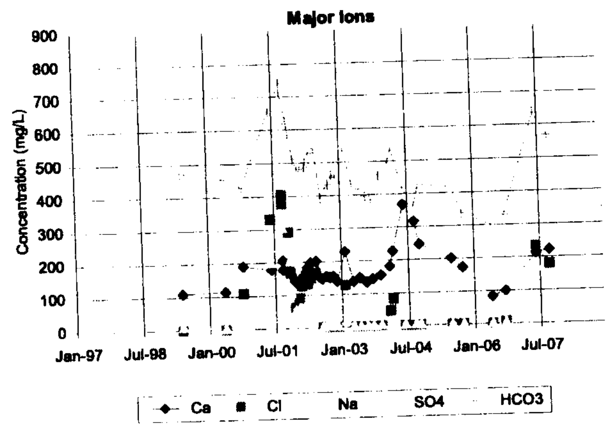
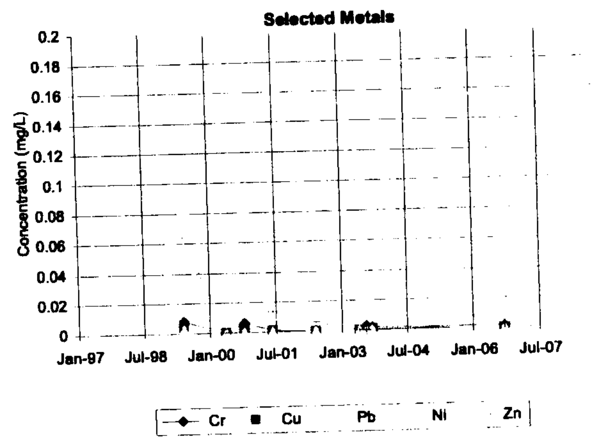
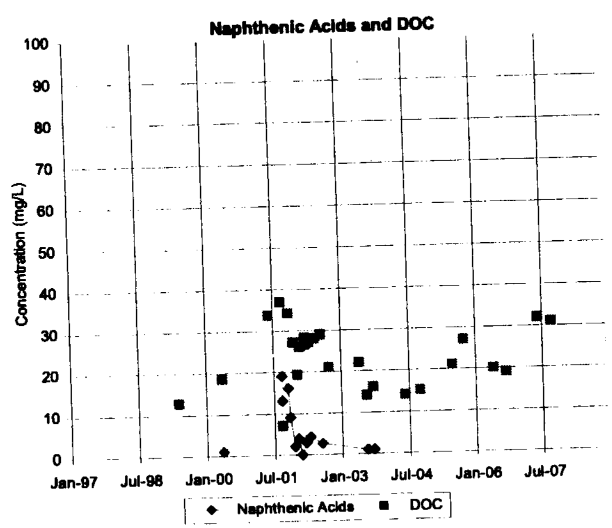
Jul-04
Jan-06
Jul-07

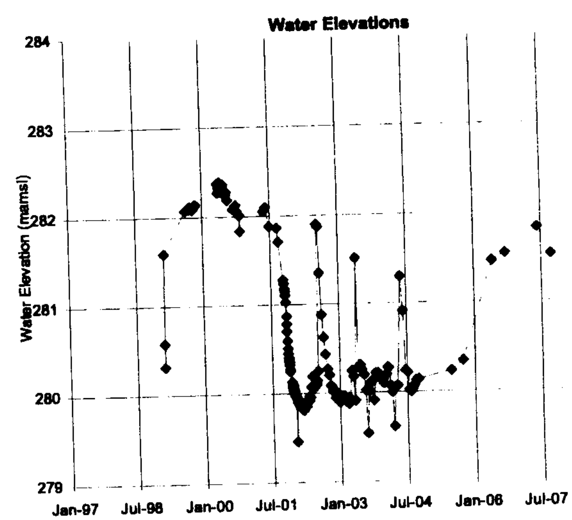
Aurora – Groundwater Monitoring Wells

OWS9934761









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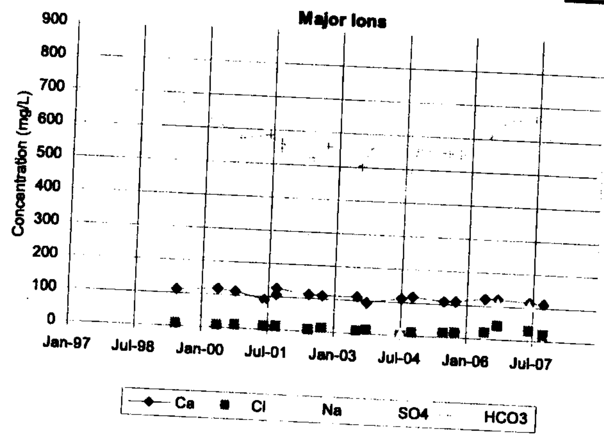
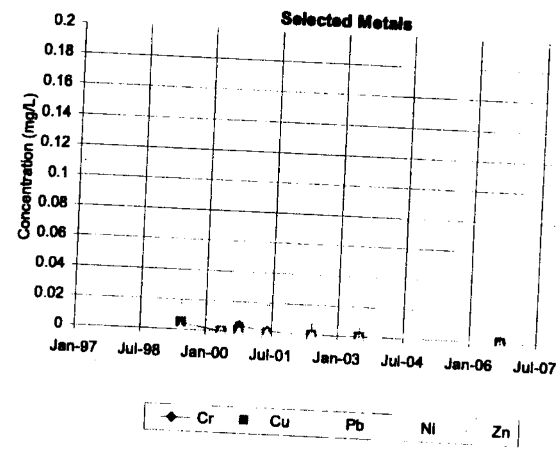
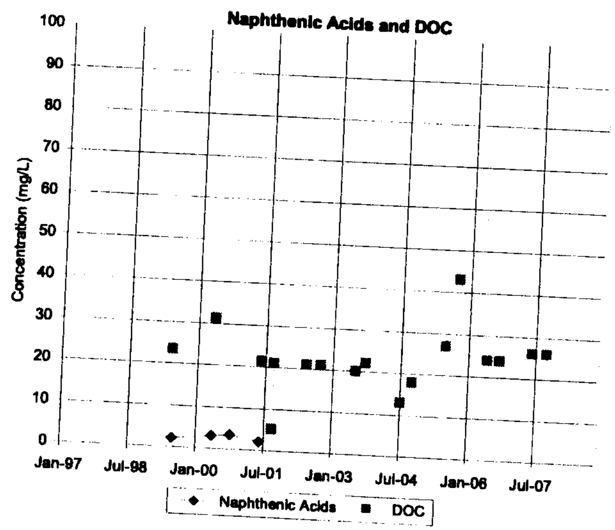
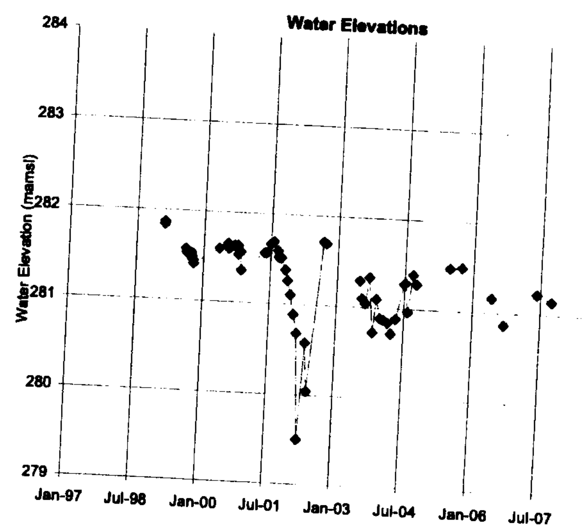

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

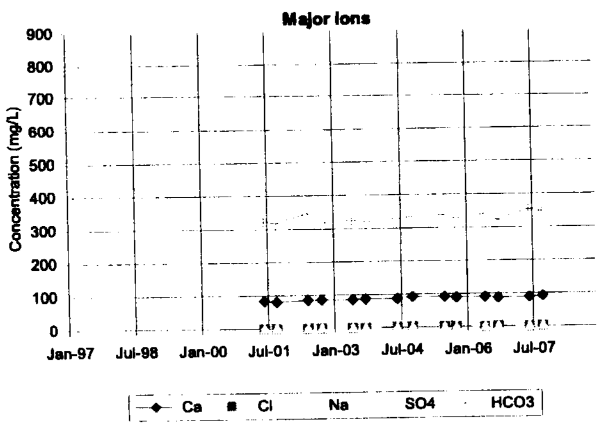

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

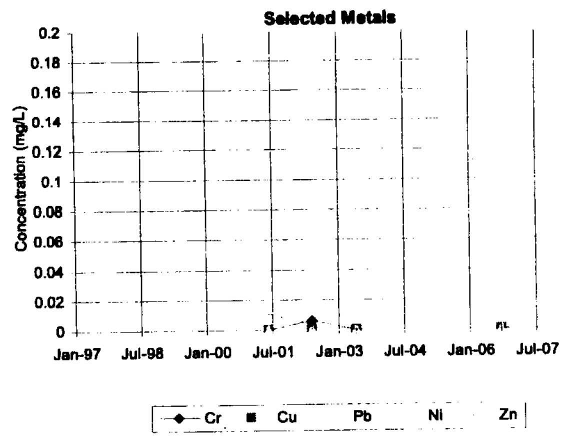

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

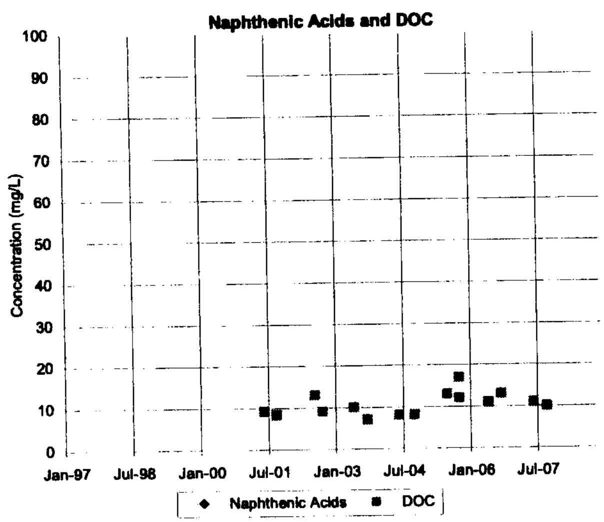

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

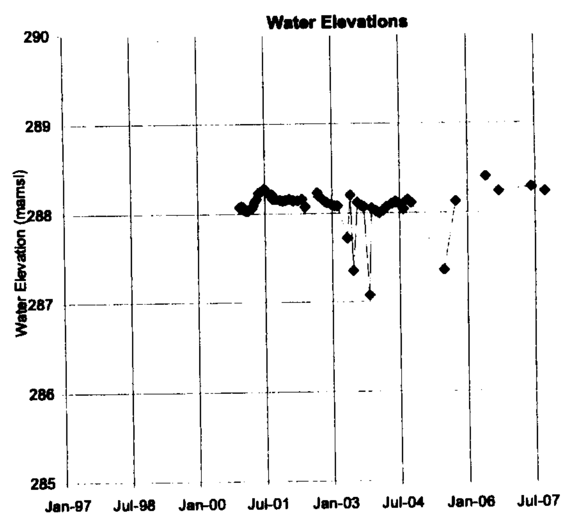
Aurora – Groundwater Monitoring Wells

OWS0010765









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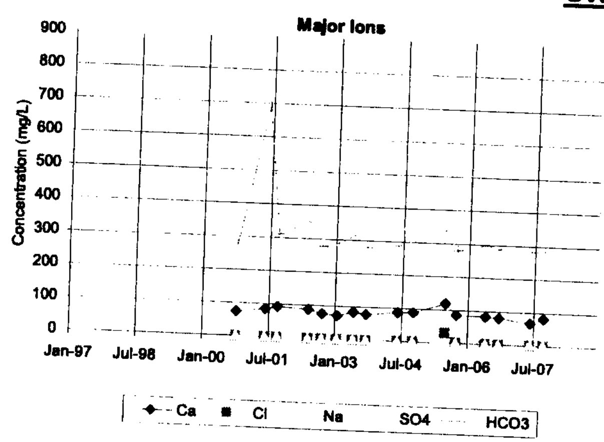
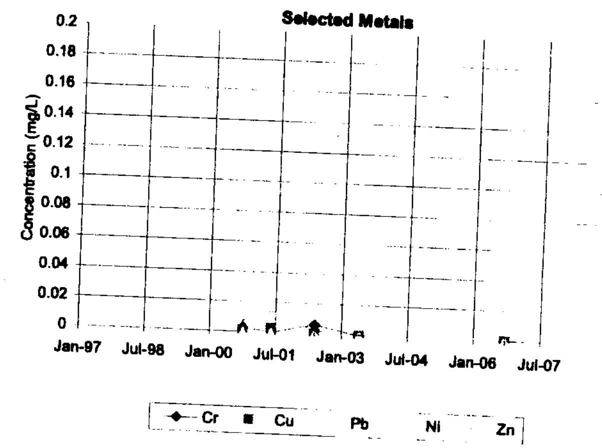
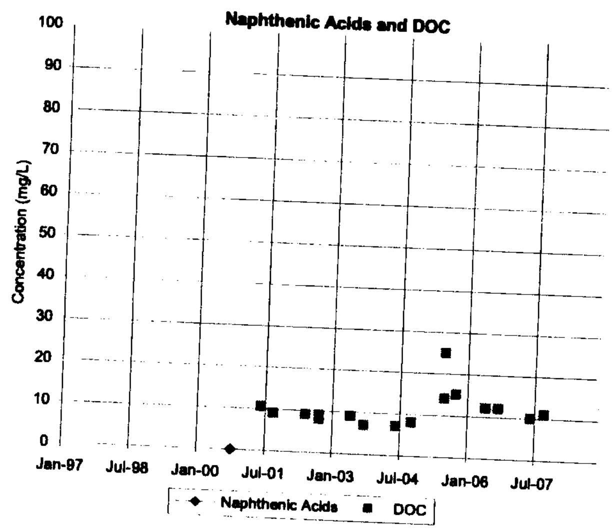


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3



Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn



Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
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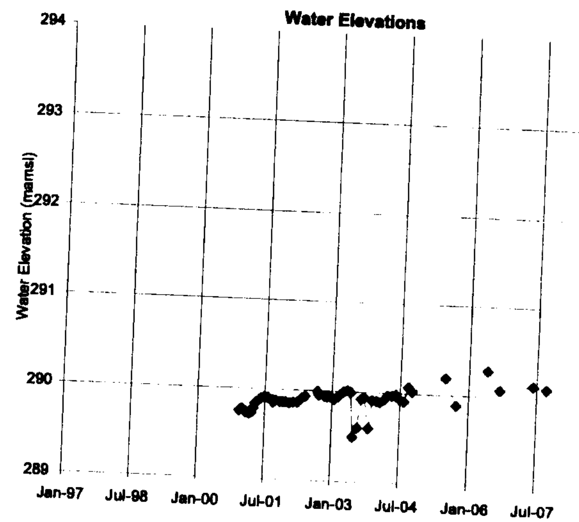
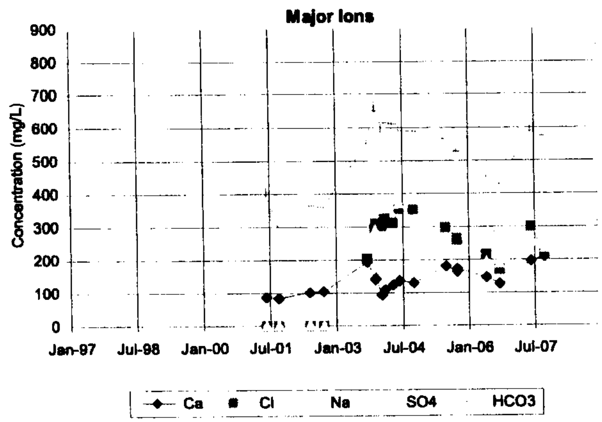
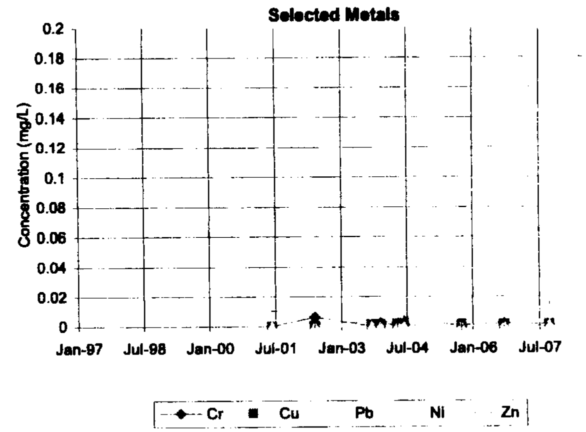
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

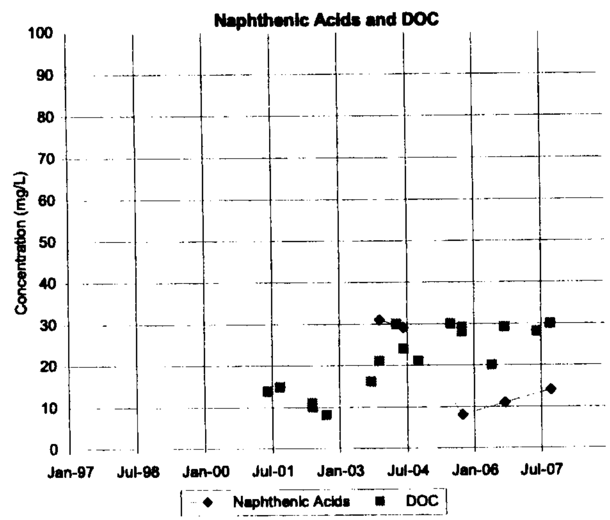


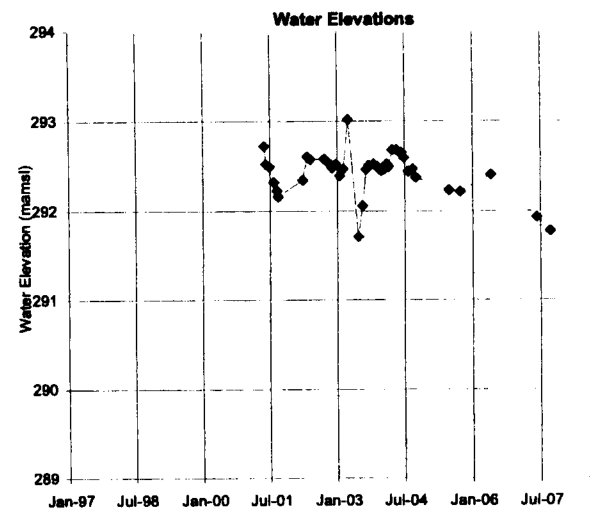
Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0110-01


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97
Jul-98
Jan-00
Jul-01
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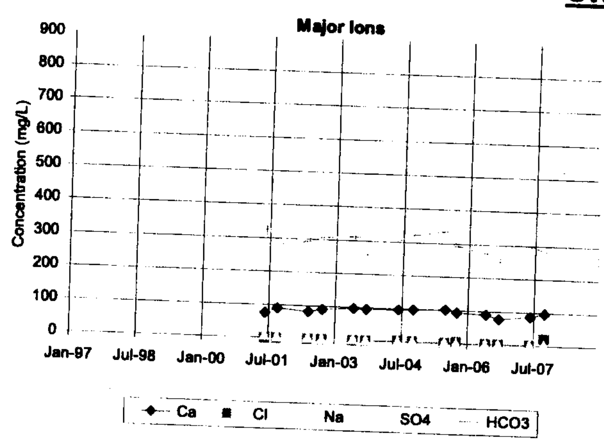
Jul-04
Jan-06
Jul-07

OWS0110-02


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
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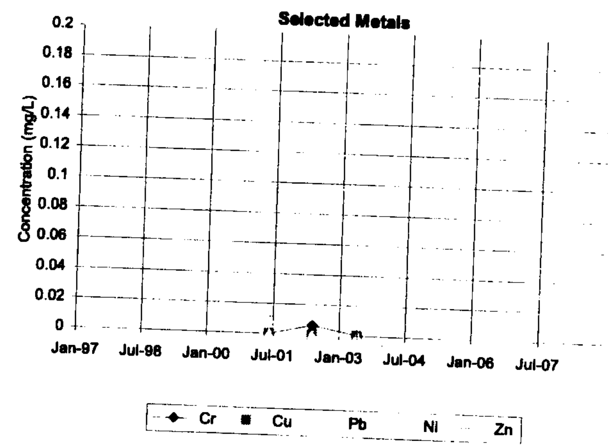
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
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0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
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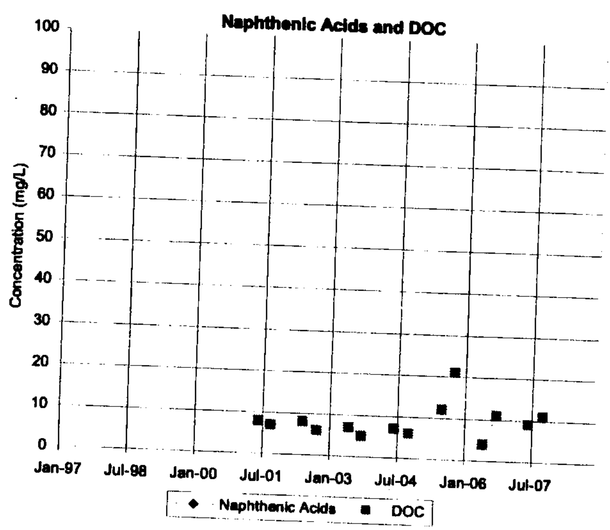
Jul-07
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
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Jul-98
Jan-00
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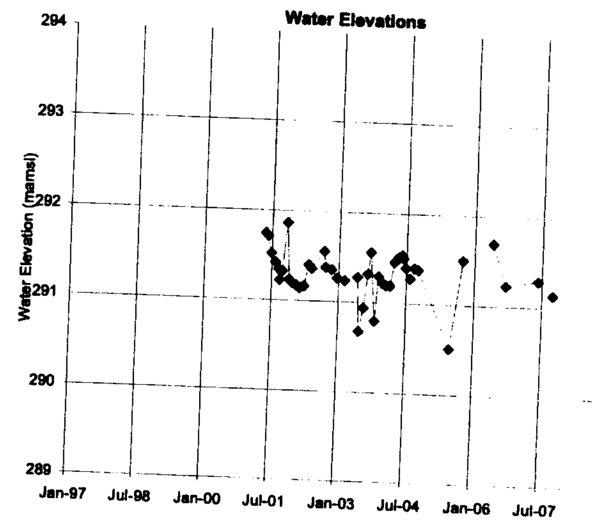
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
294
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291
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Jan-97
Jul-98
Jan-00
Jul-01
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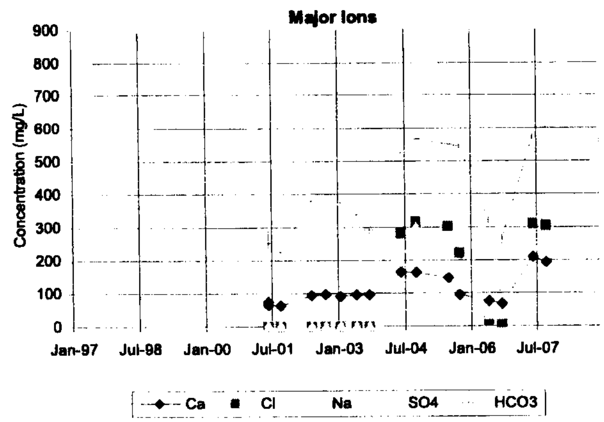
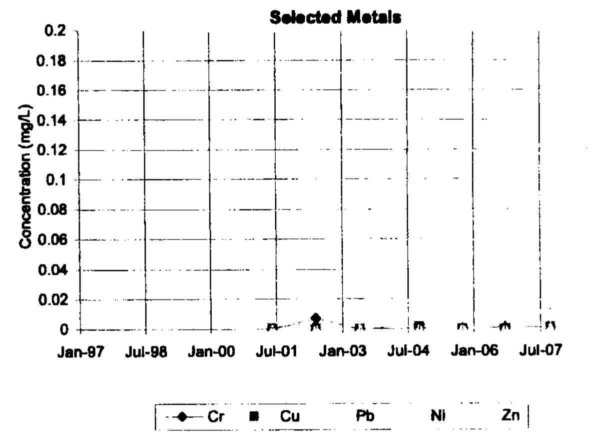
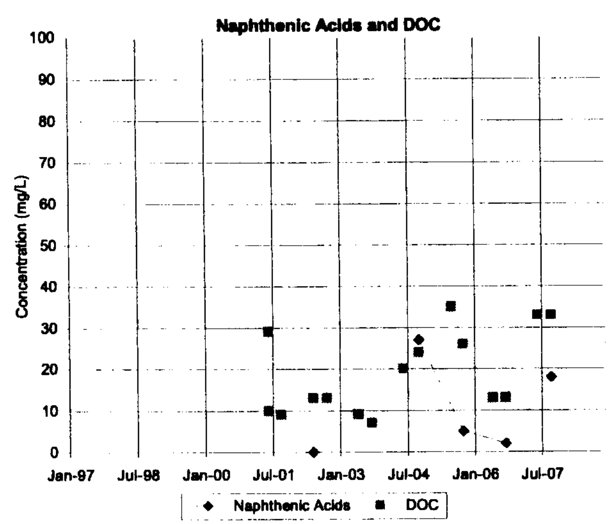
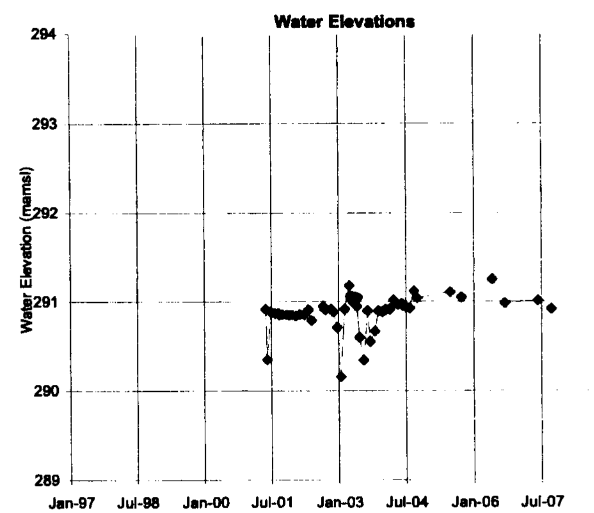
Jul-04
Jan-06
Jul-07

OWS0110-03

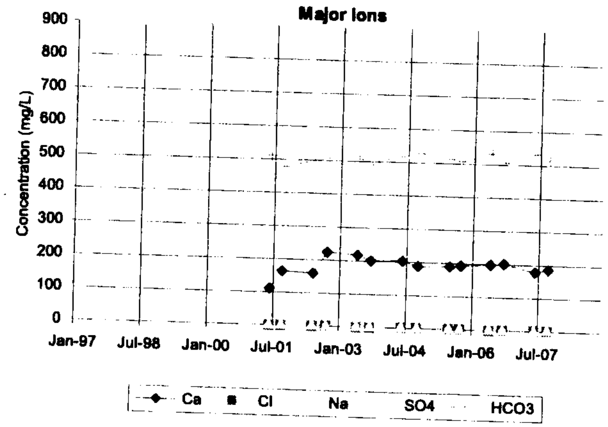

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

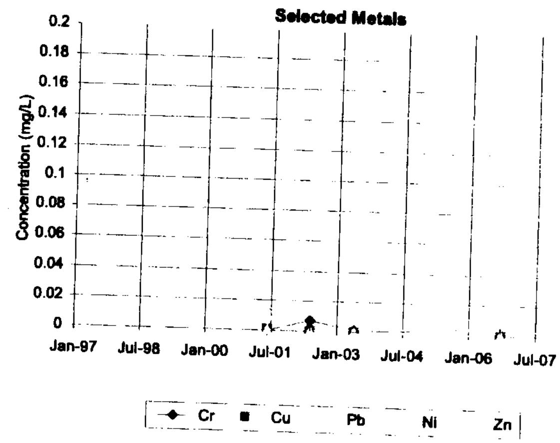

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

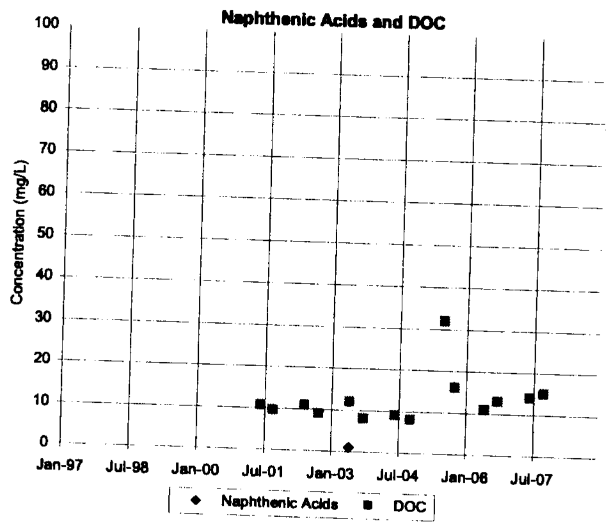

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

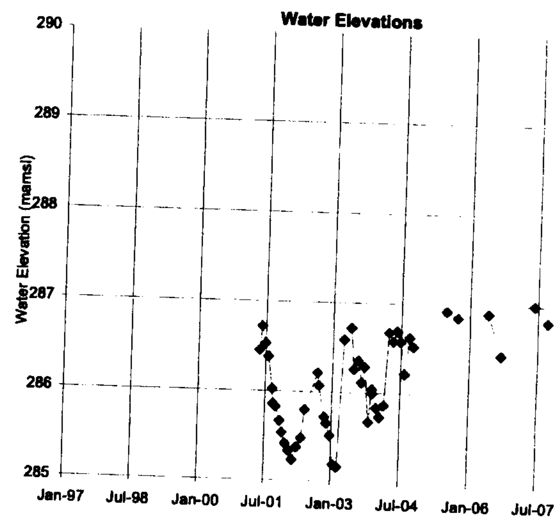

Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0110-04

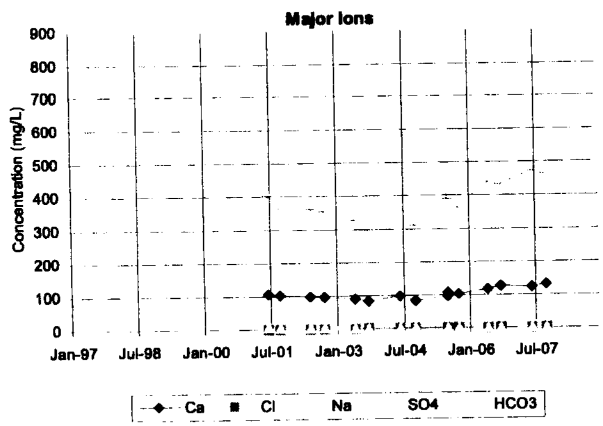

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

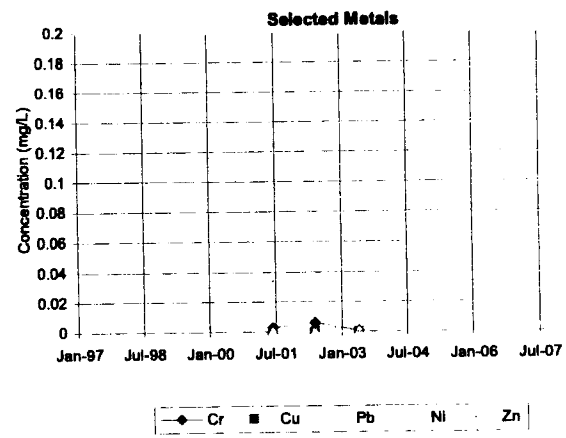

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

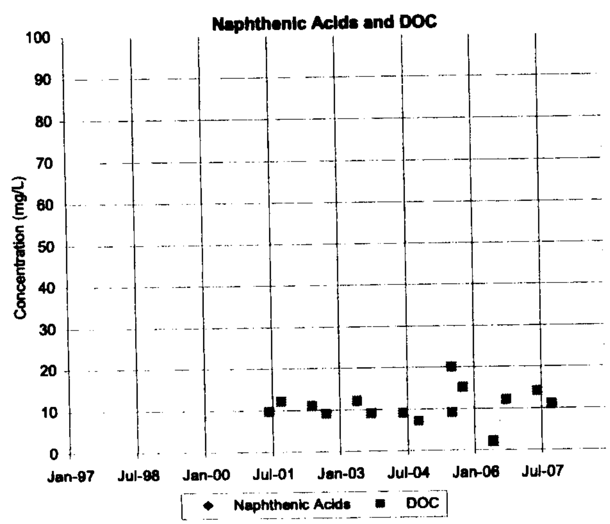

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

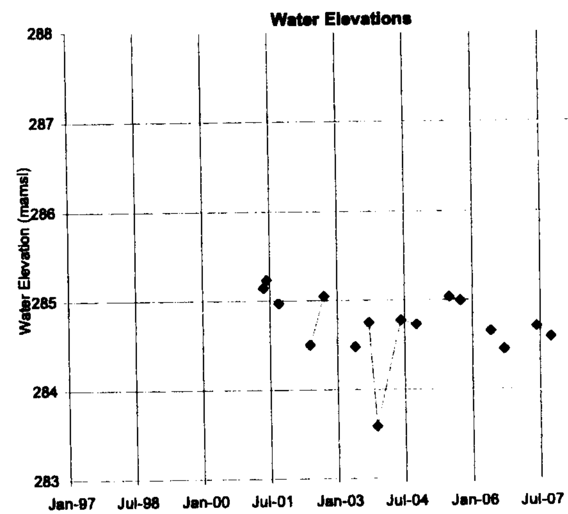

Water Elevations
Water Elevation (mamsl)
290
289
288
287
286
285
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-05

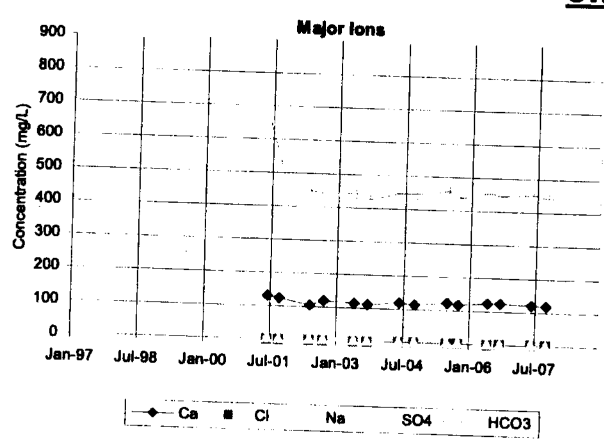

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

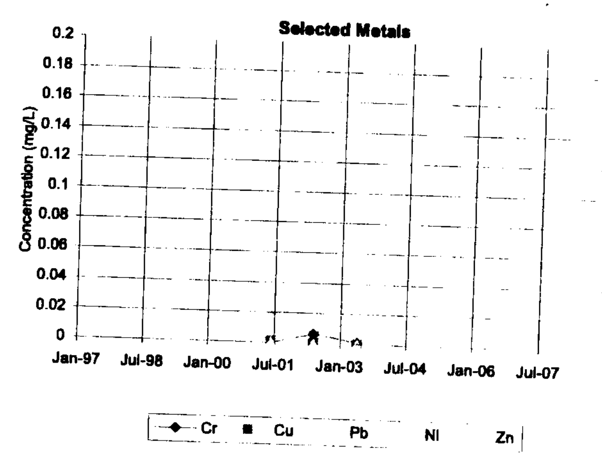

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

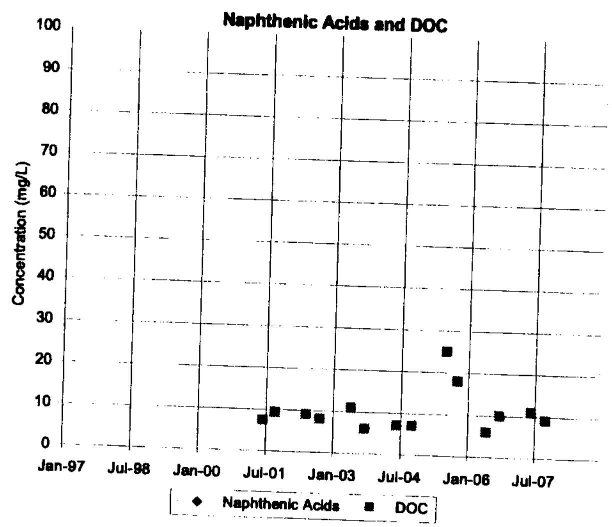

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

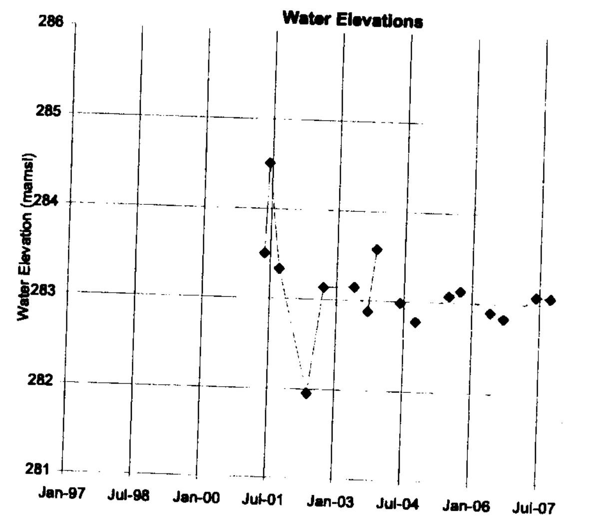

Water Elevations
Water Elevation (mamsl)
288
287
286
285
284
283
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-06

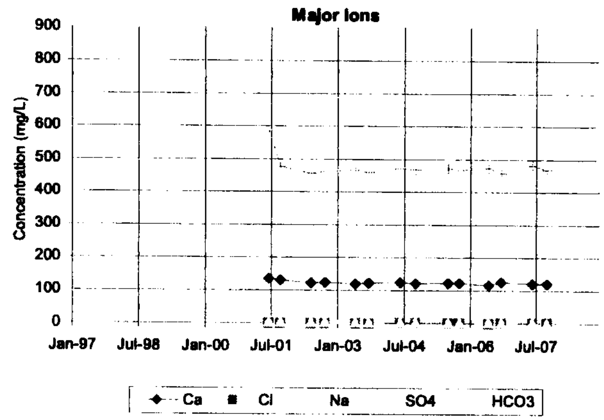

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

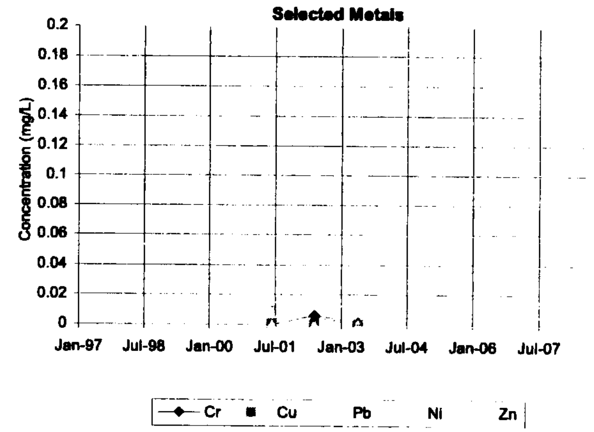

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

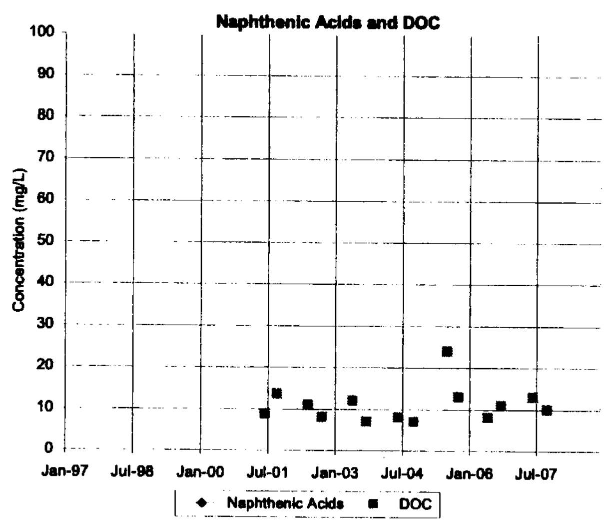

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

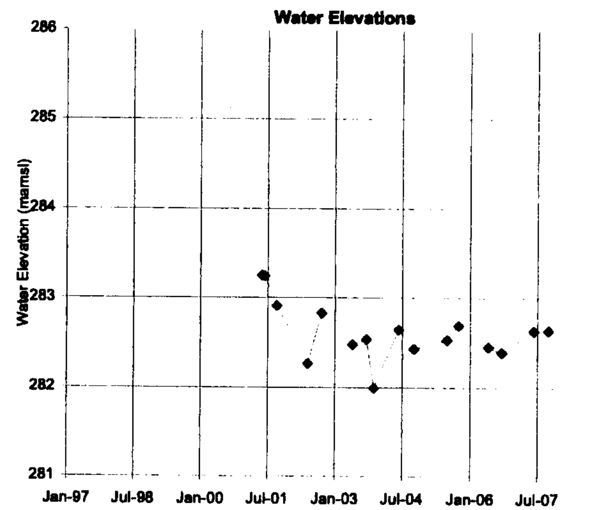

Water Elevations
Water Elevation (mamsl)
286
285
284
283
282
281
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-07

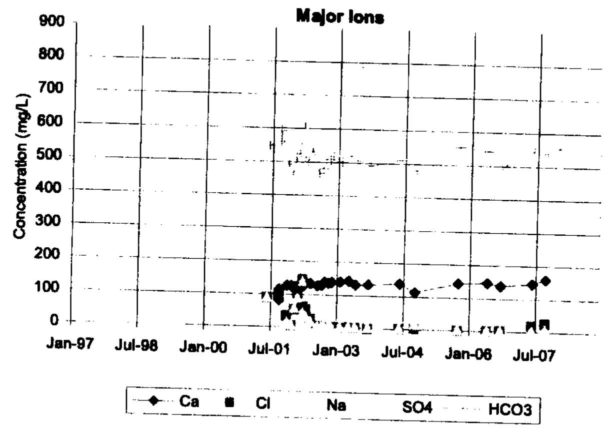

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

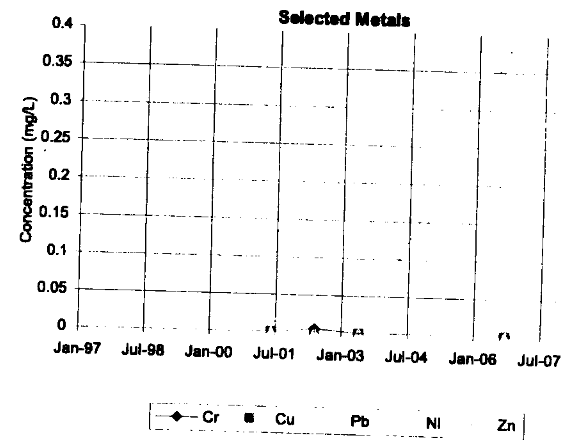

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

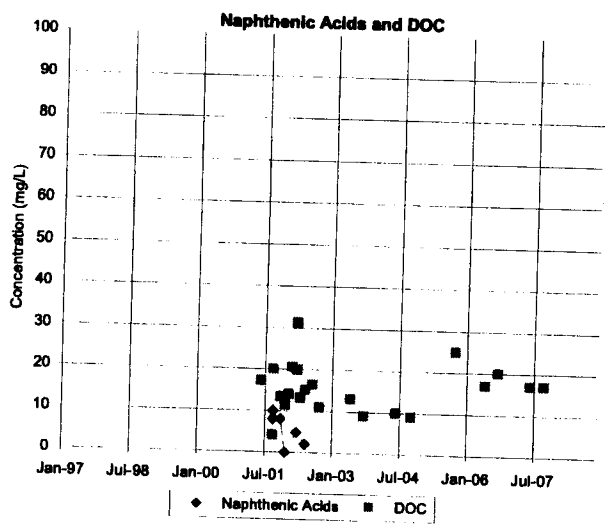

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

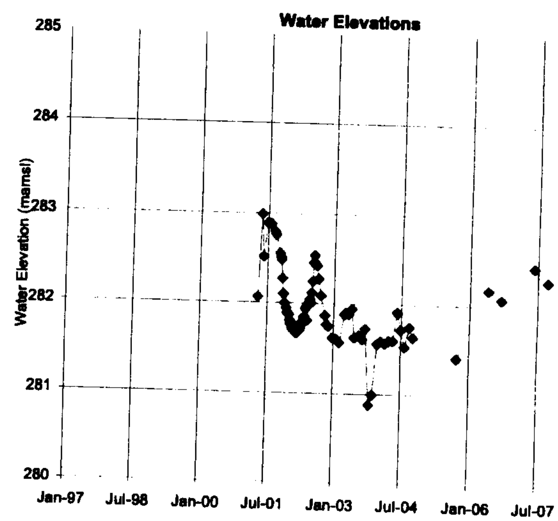

Water Elevations
Water Elevation (mamsl)
286
285
284
283
282
281
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-08

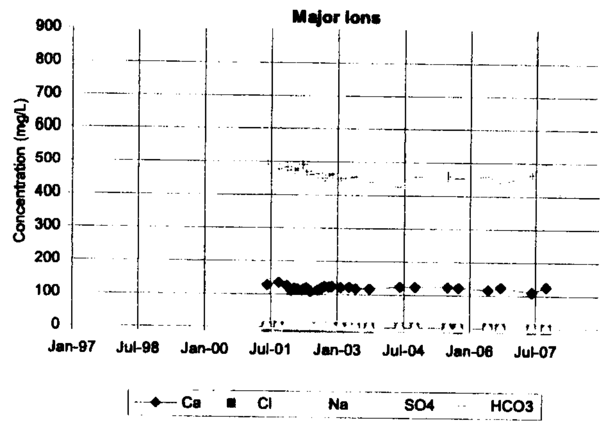

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

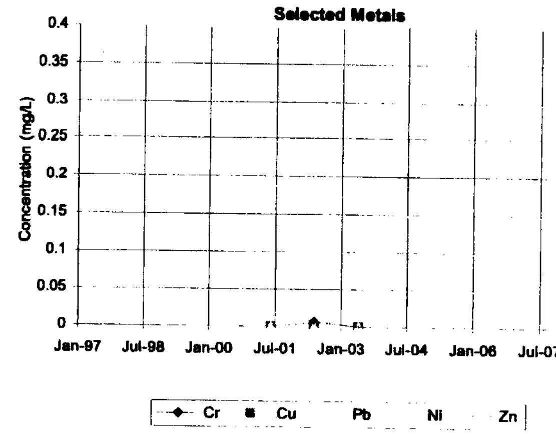

Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

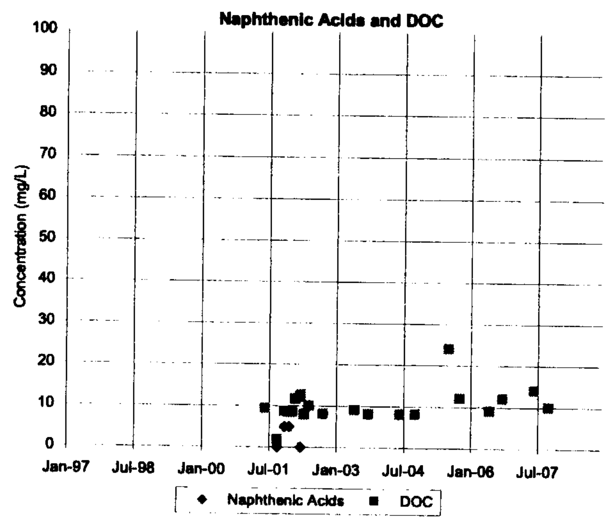

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

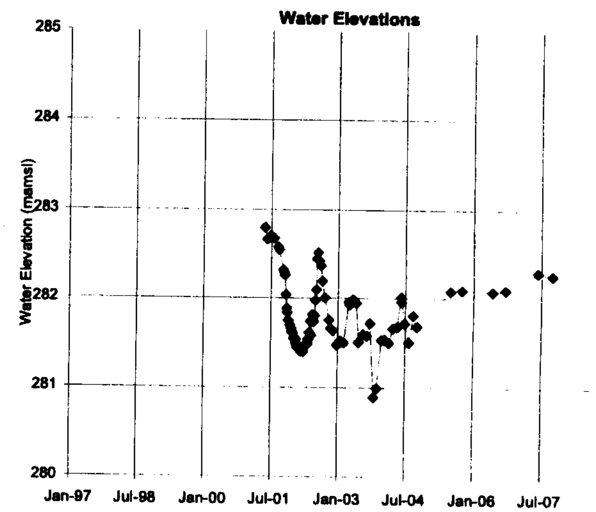

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-09

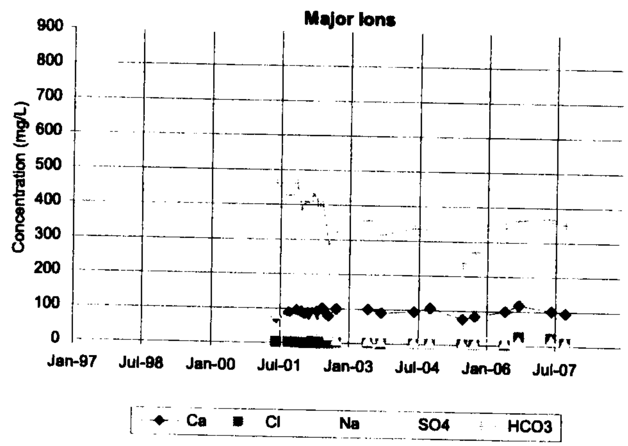

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

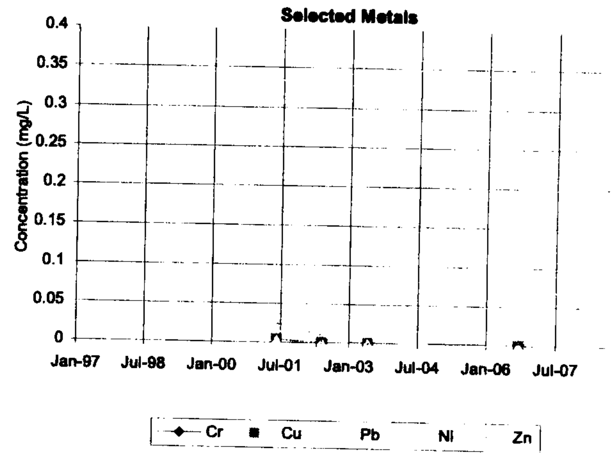

Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

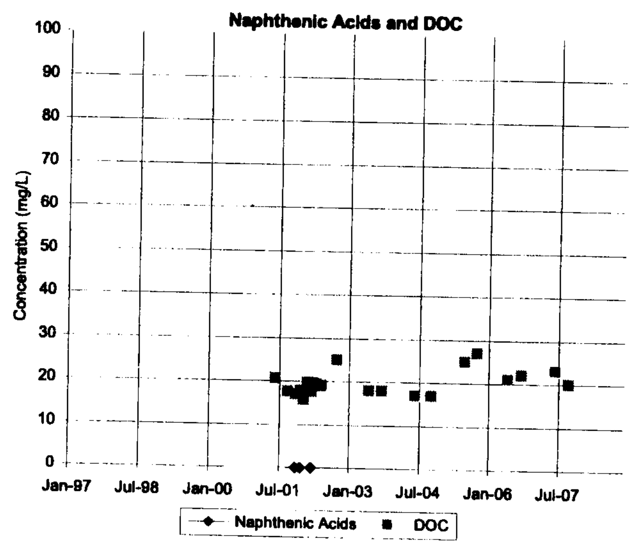

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

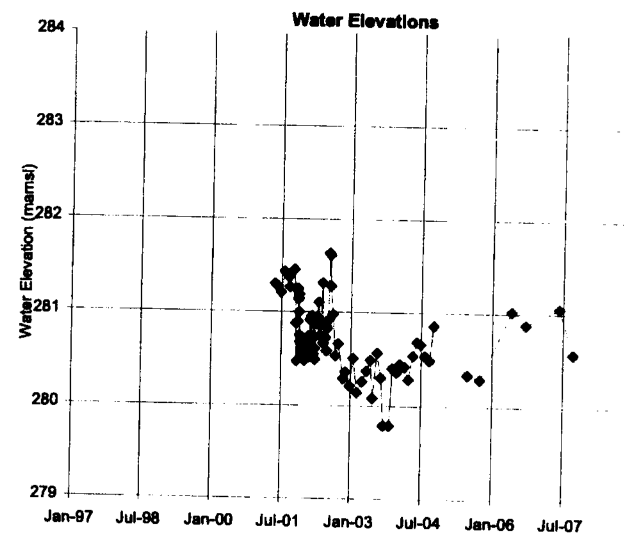

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-10

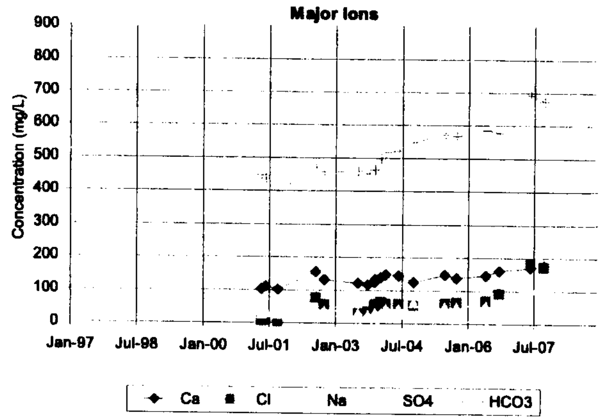

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

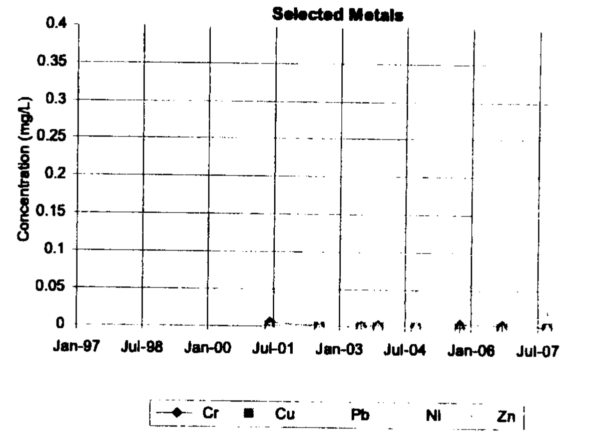

Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

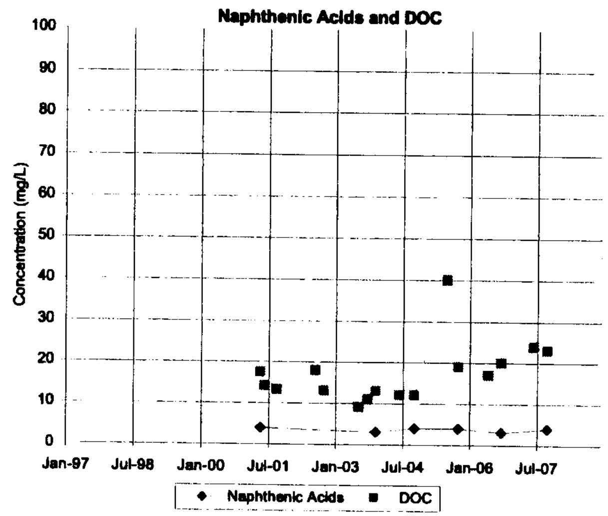

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

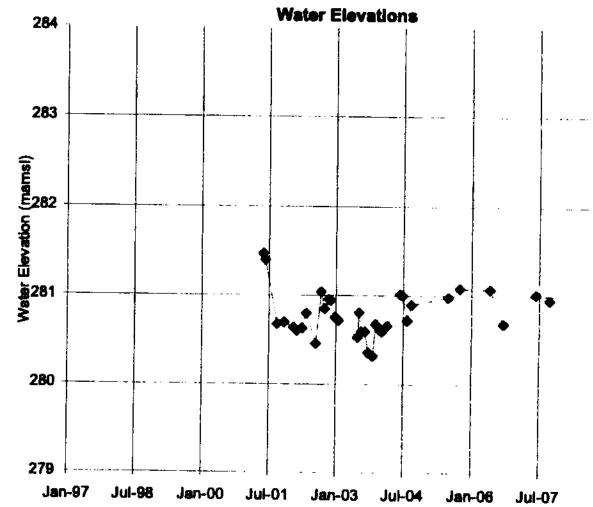

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-11

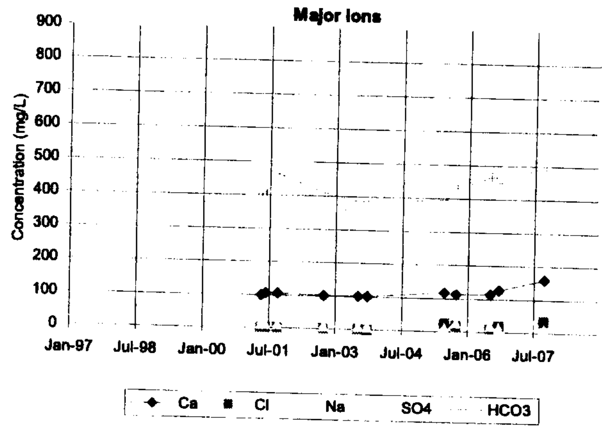

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3


Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

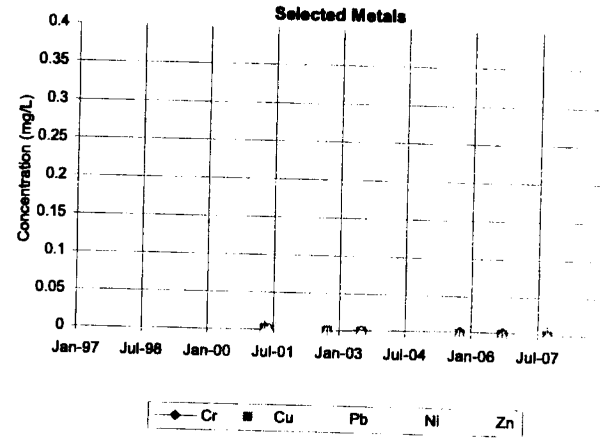

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC


Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

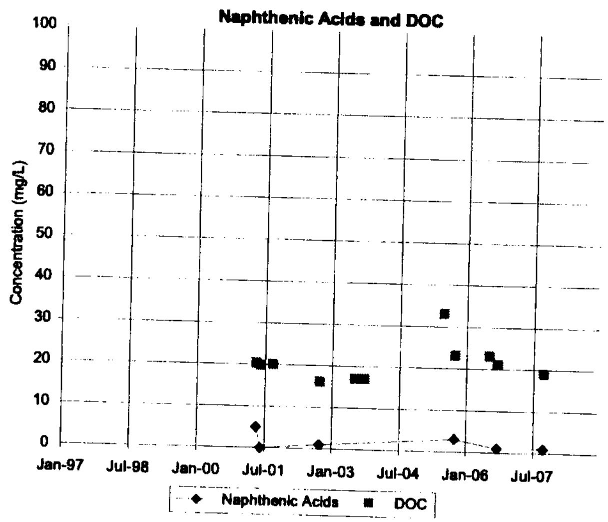
OWS0134-12



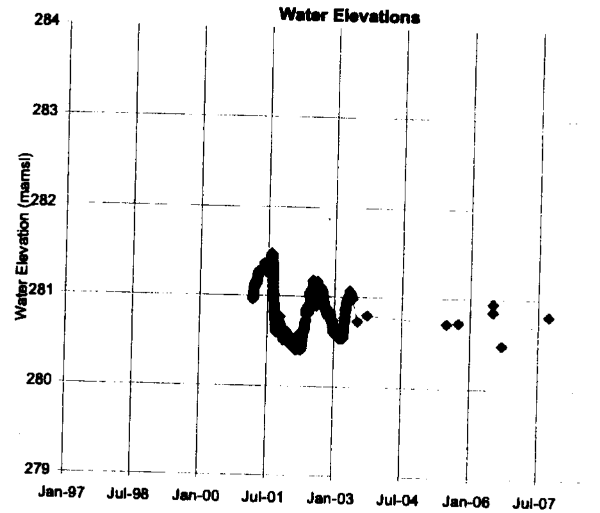
Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3



Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

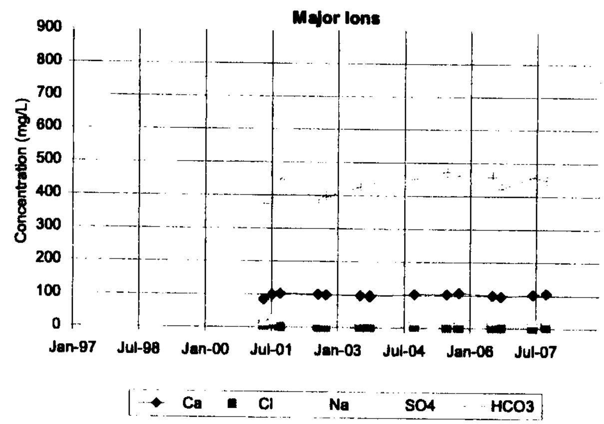


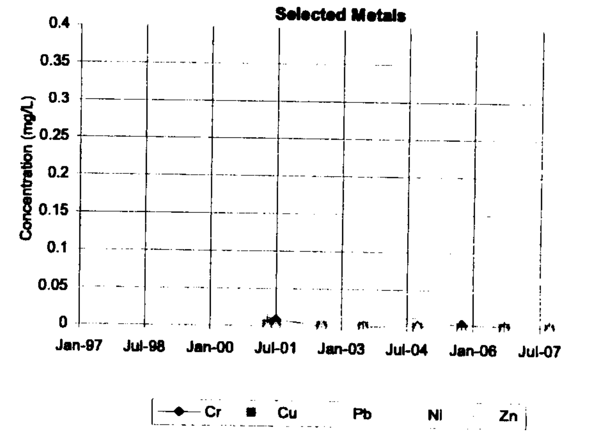
Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

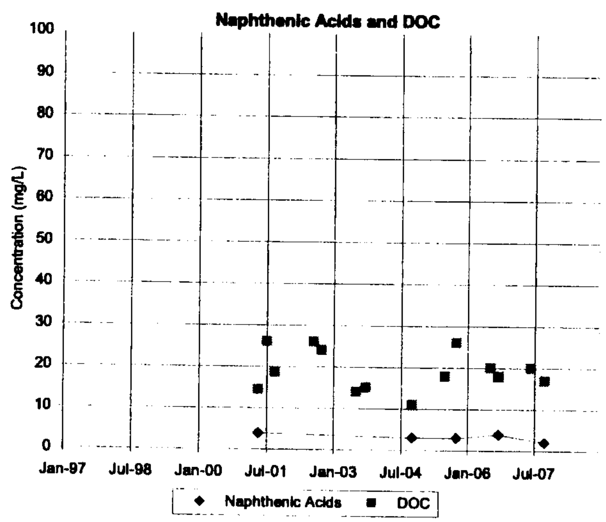


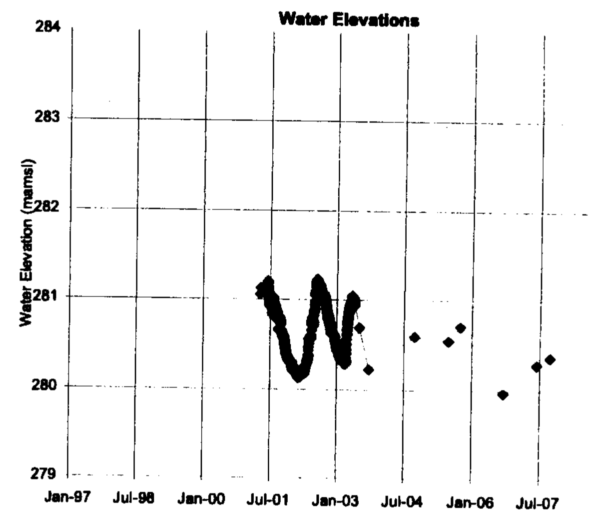
Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-13

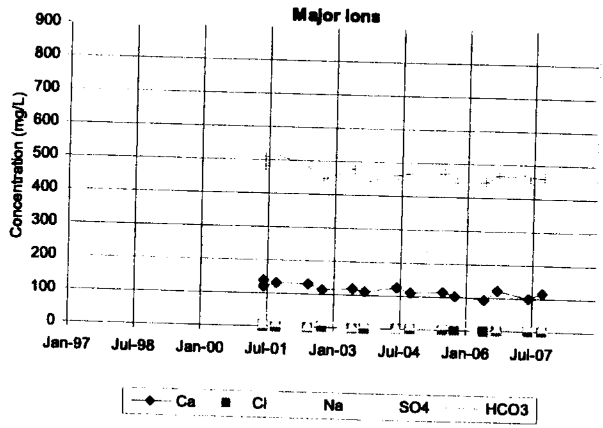

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

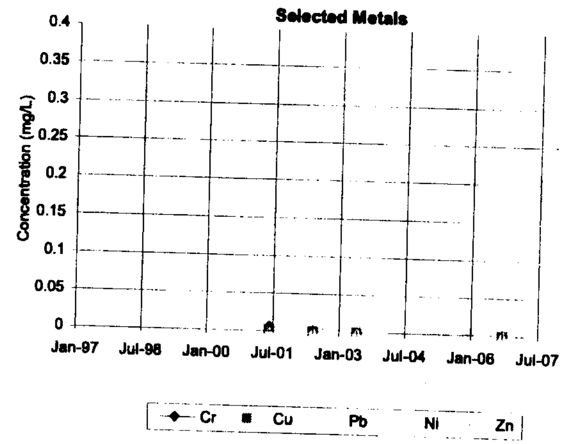

Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

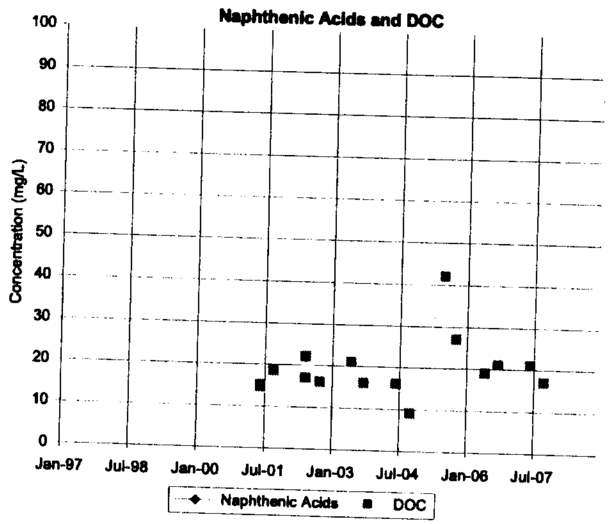

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

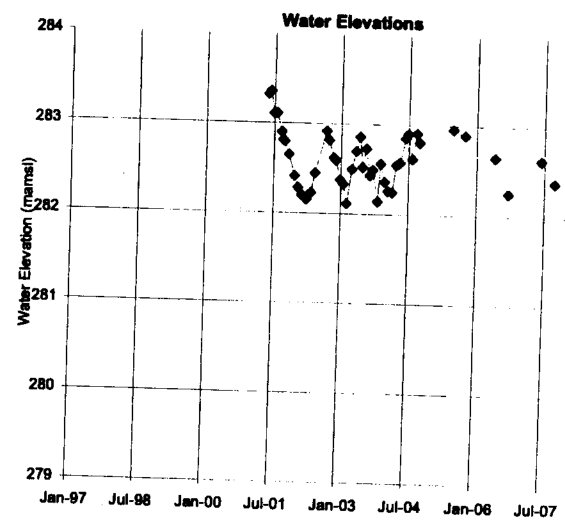

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-14

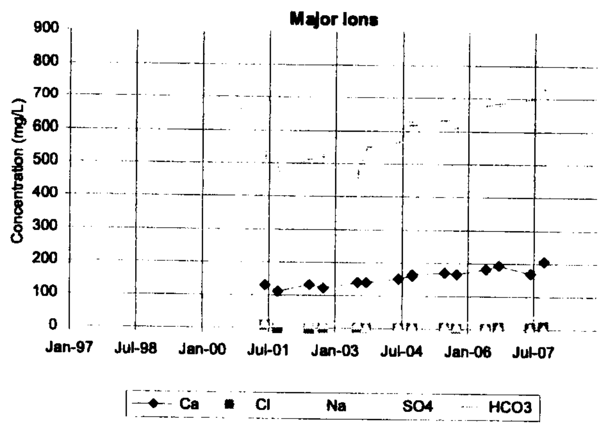

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

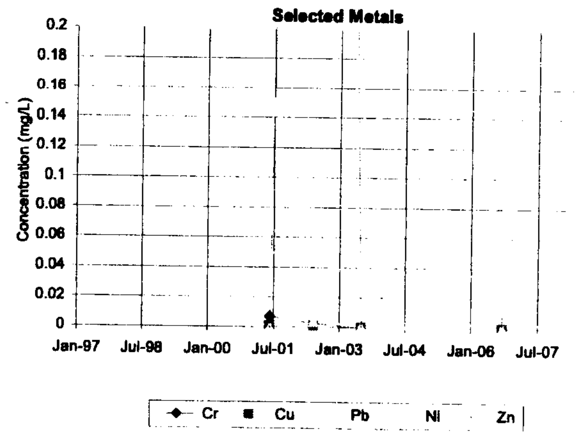

Selected Metals
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

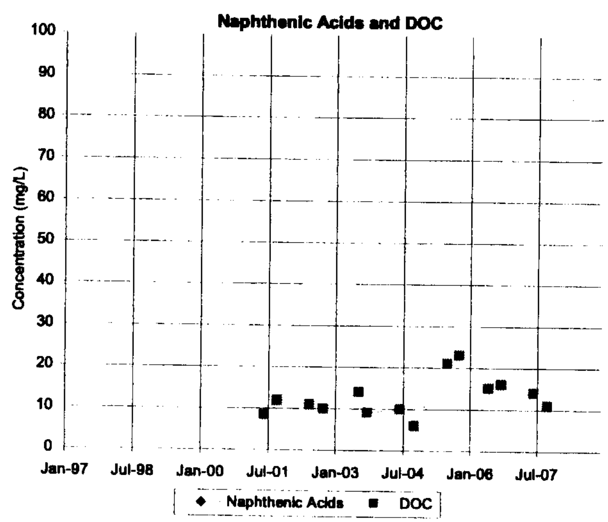

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

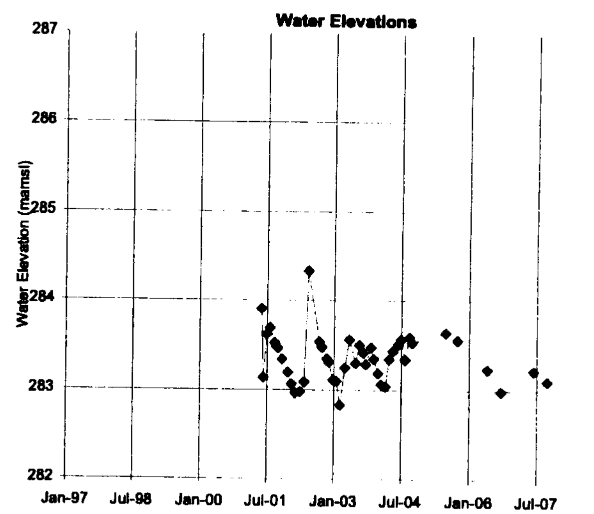

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0134-15

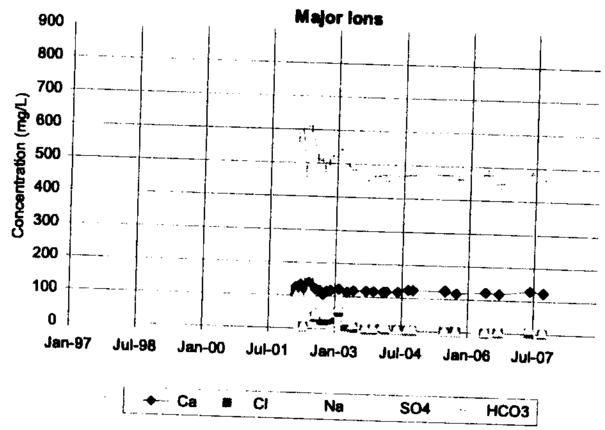

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

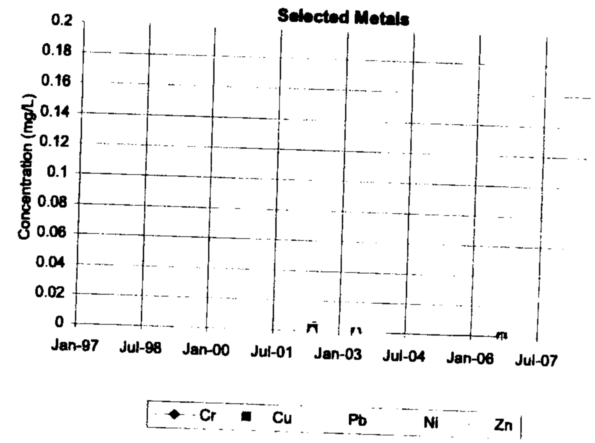

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

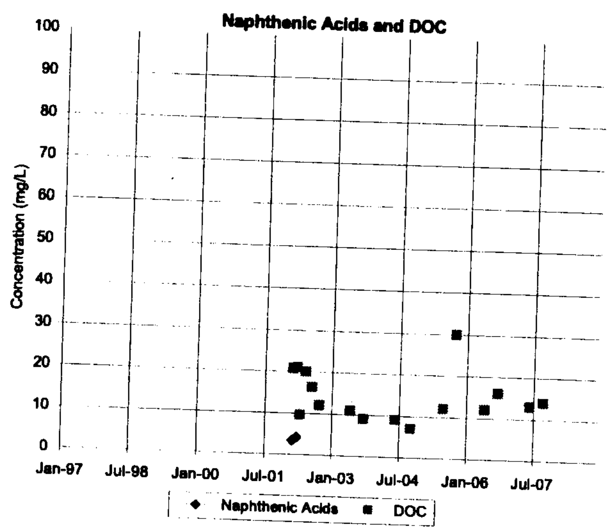

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

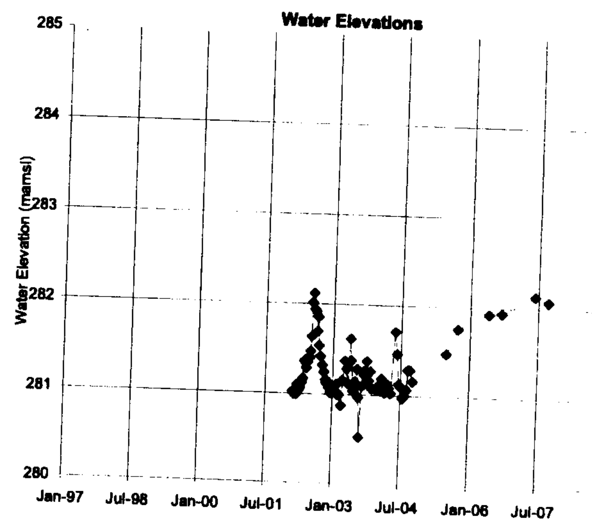

Water Elevations
Water Elevation (mamsl)
287
286
285
284
283
282
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-01

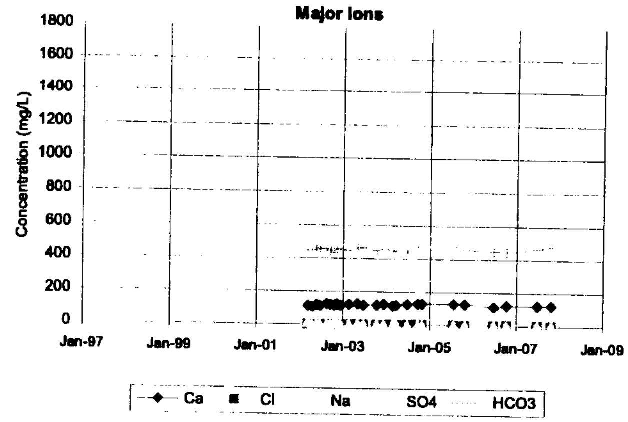

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

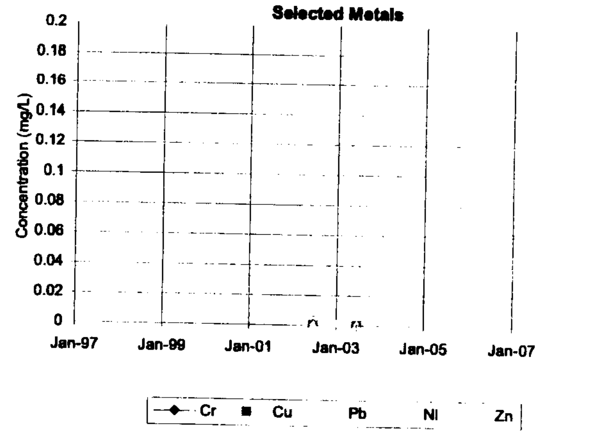

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

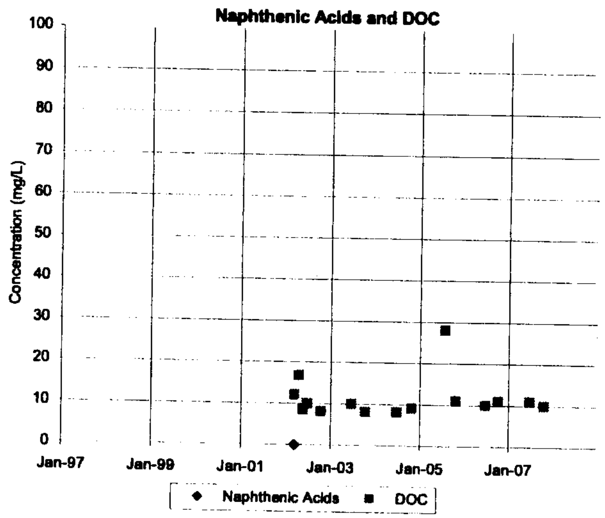

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

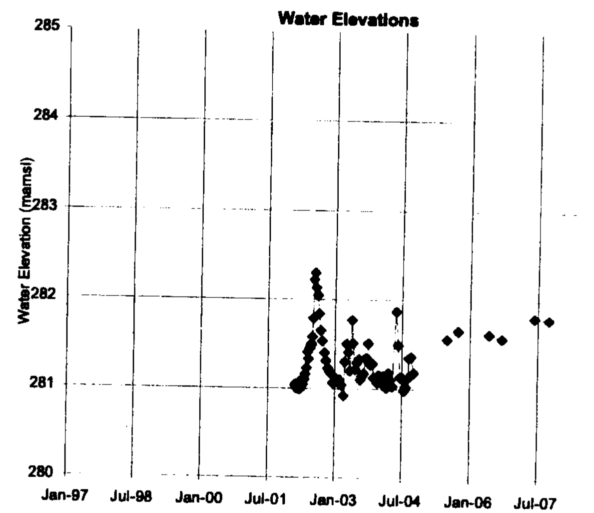

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-02A

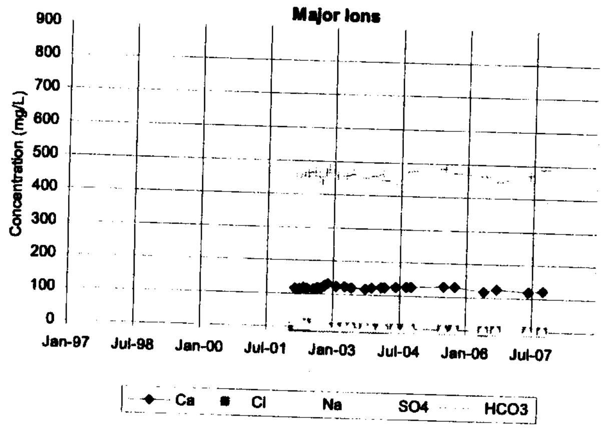

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Ca
Cl
Na
SO4
HCO3

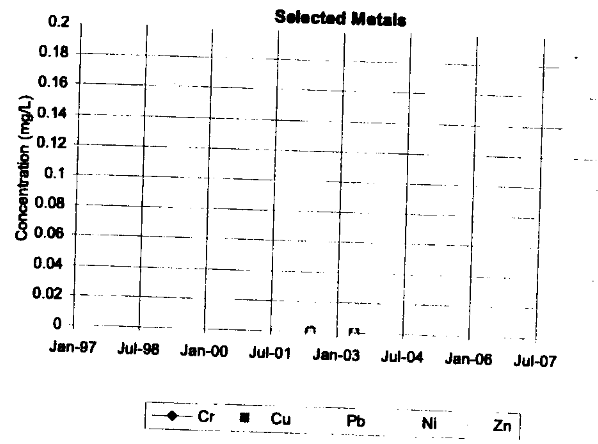

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Cr
Cu
Pb
Ni
Zn

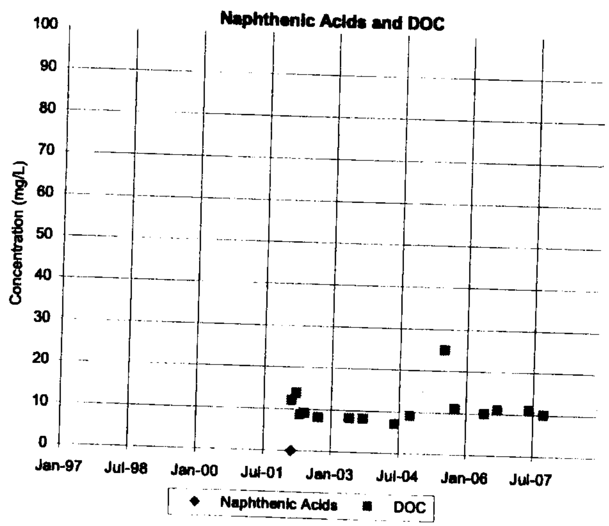

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Naphthenic Acids
DOC

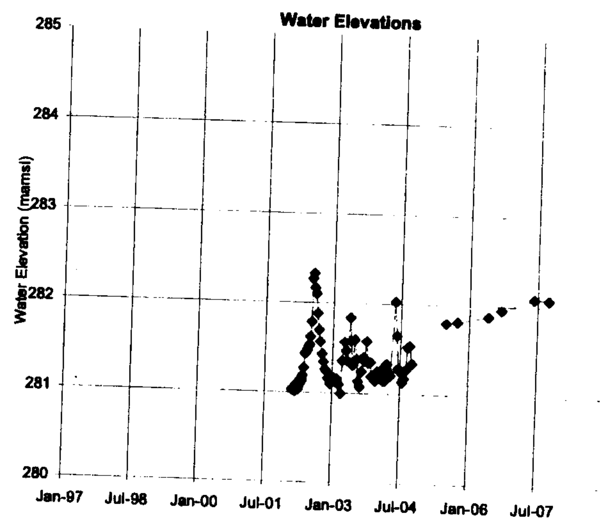

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-02B

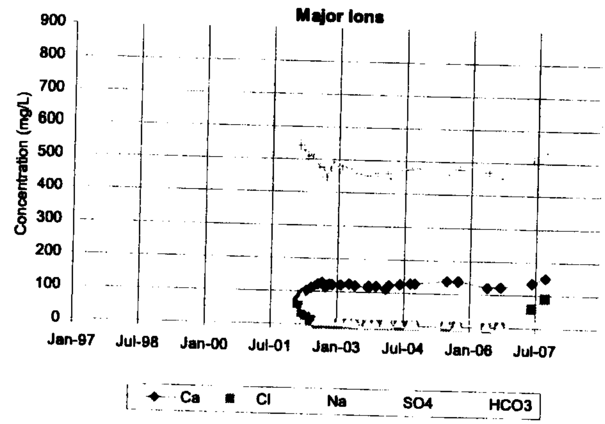

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

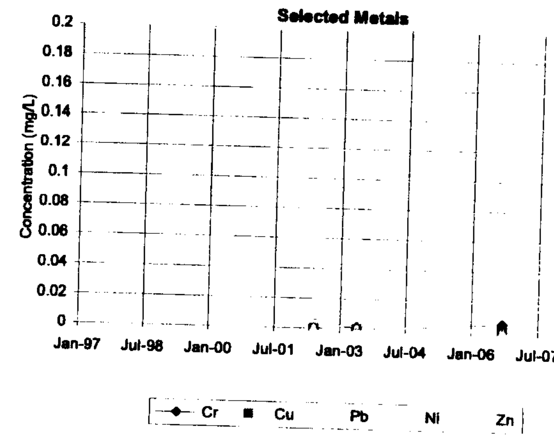

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

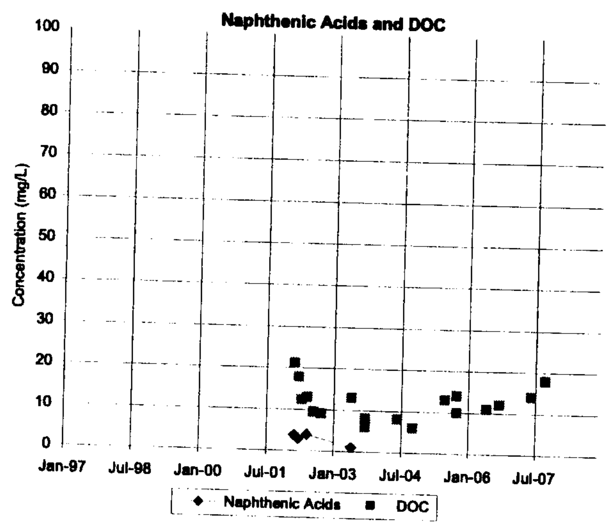

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

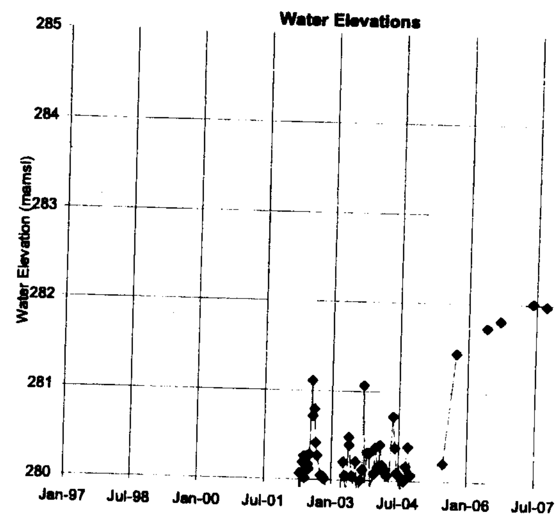

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-03

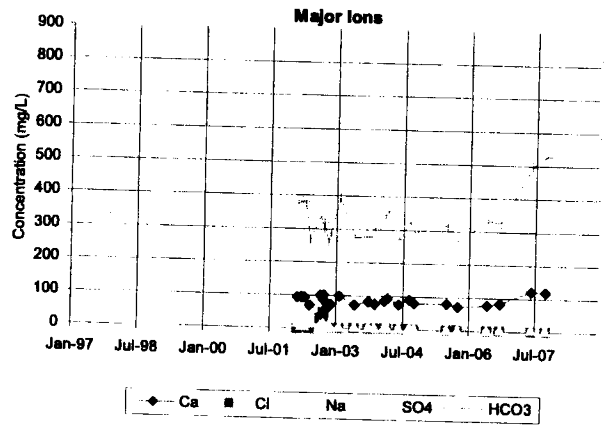

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

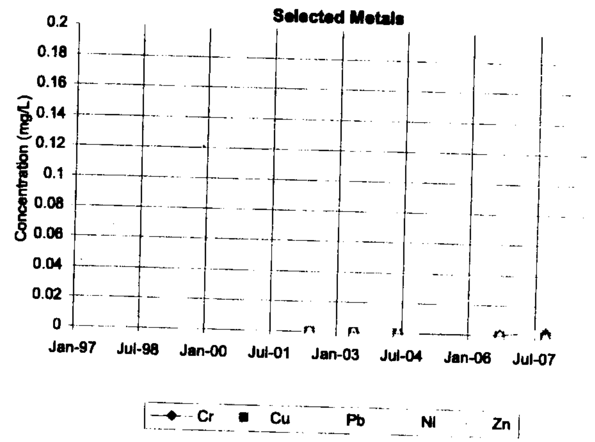

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-04


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
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Jan-97
Jul-98
Jan-00
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Jul-04
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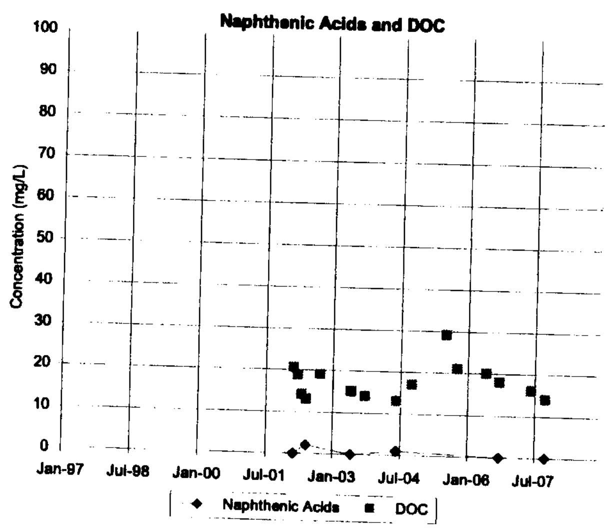
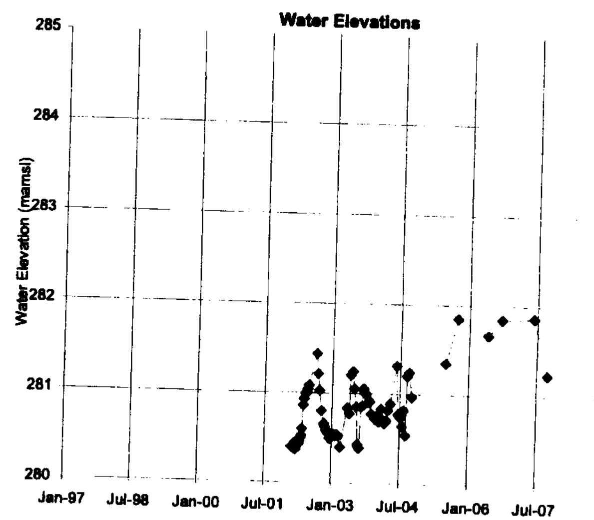
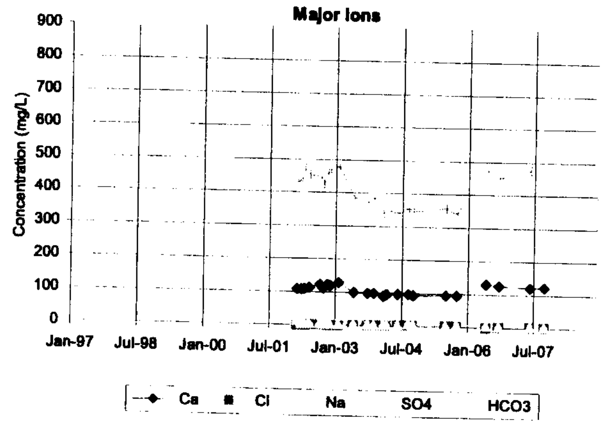
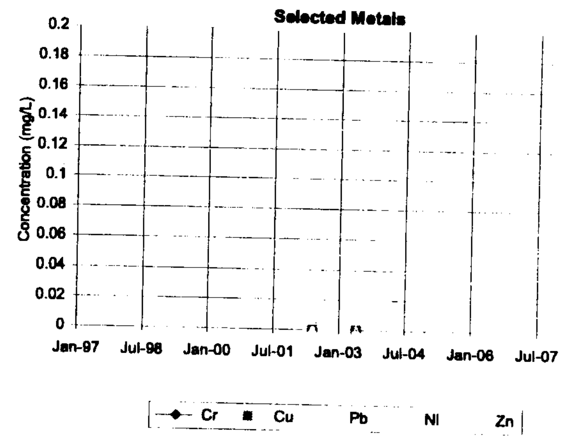
Jul-07
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-05


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
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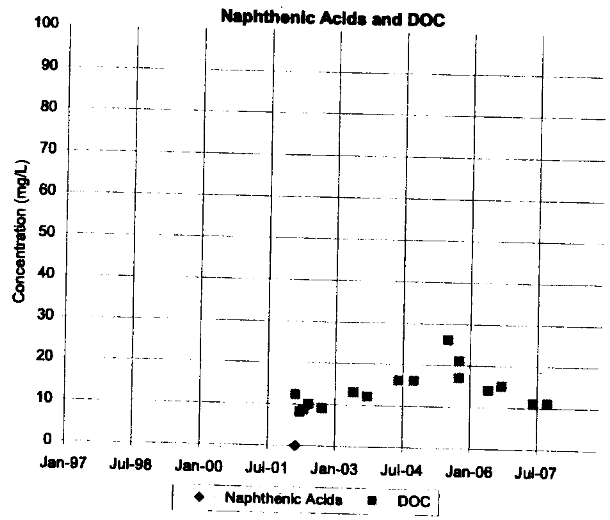
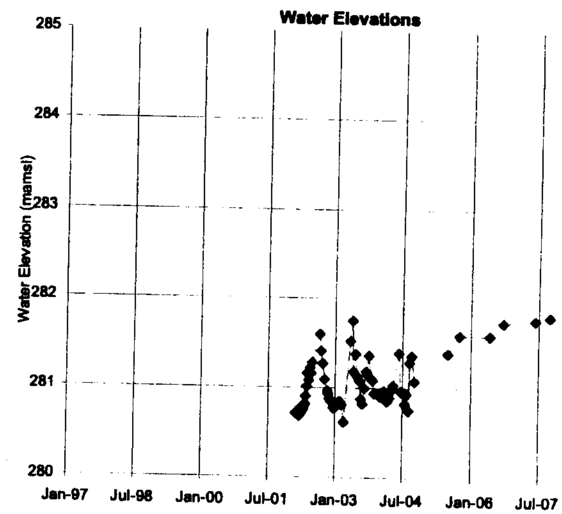
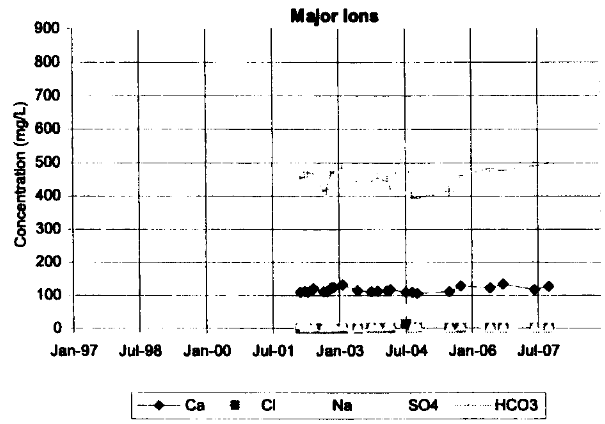
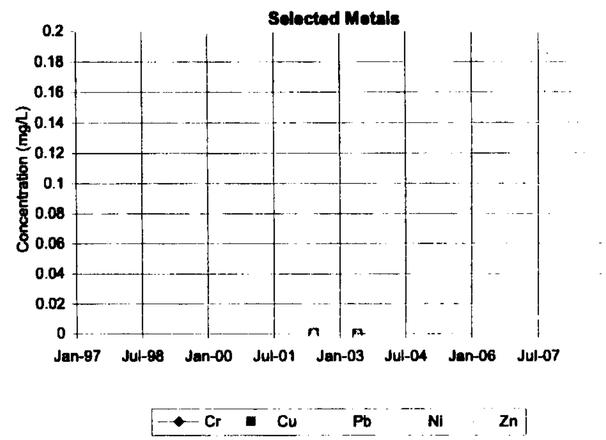
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

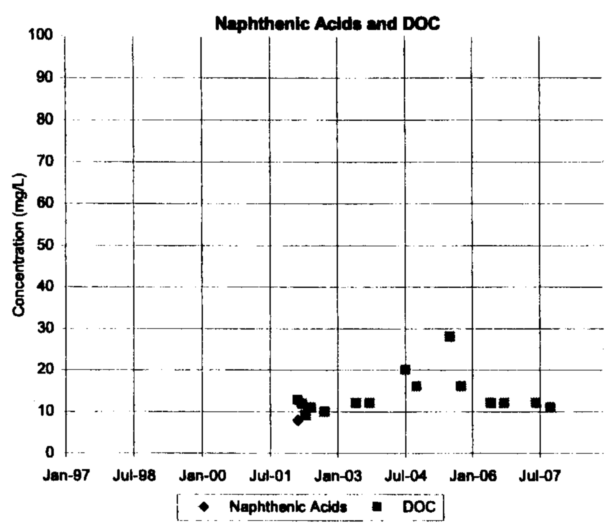

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

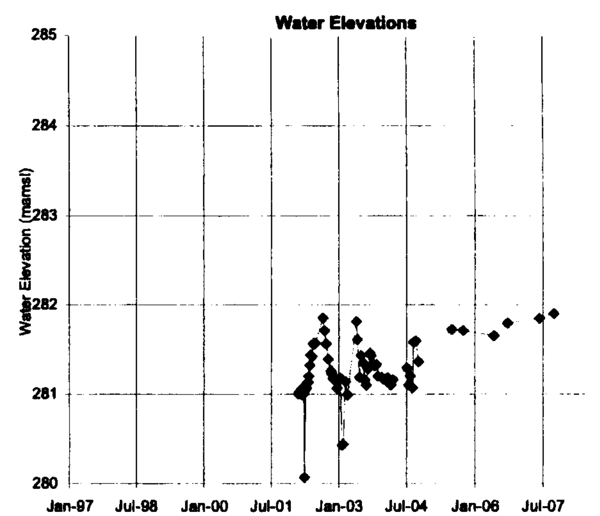

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-06

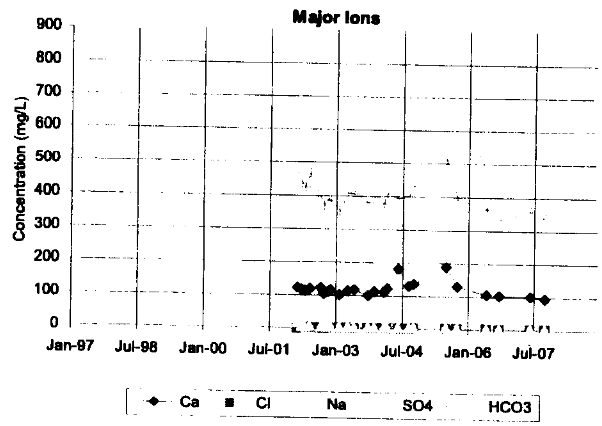

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

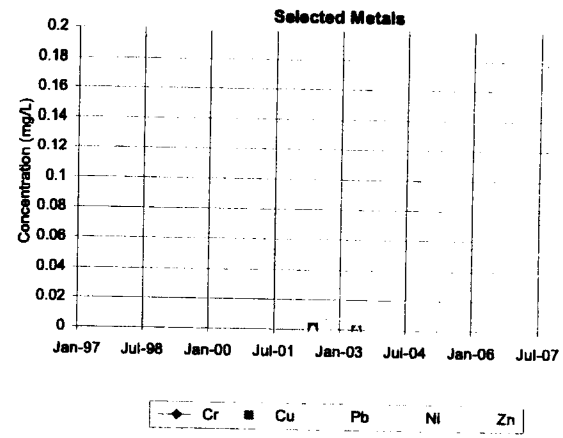

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

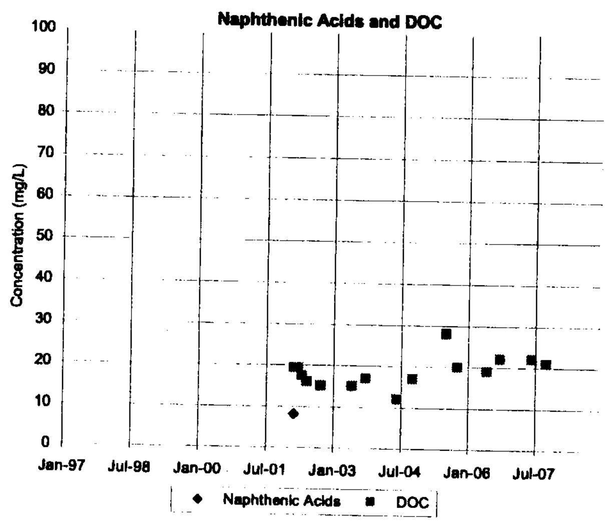

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

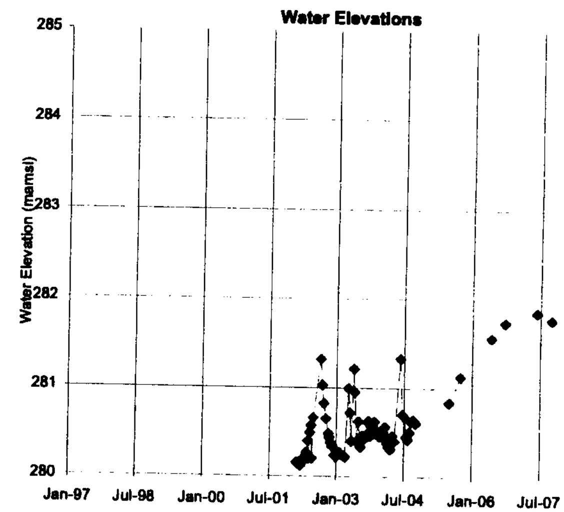

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0234-07

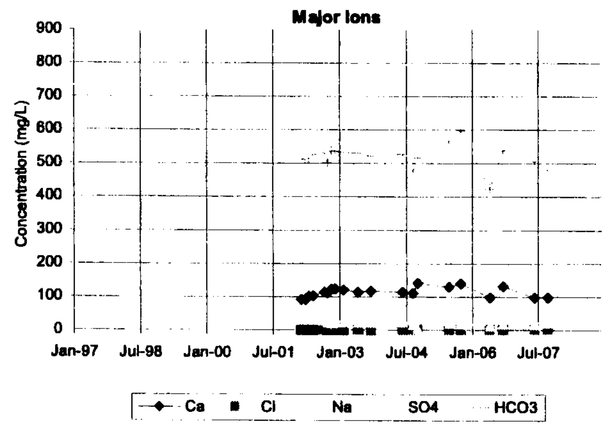

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

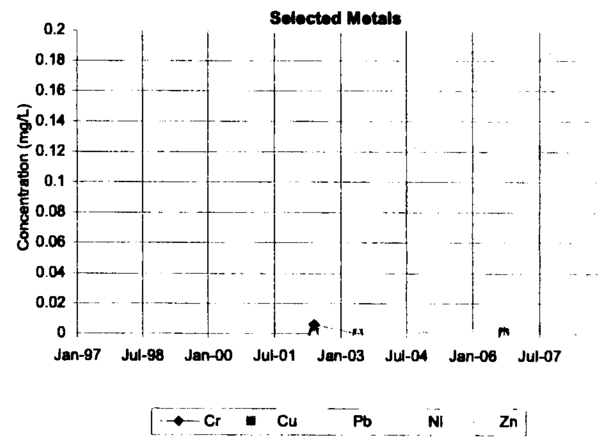

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

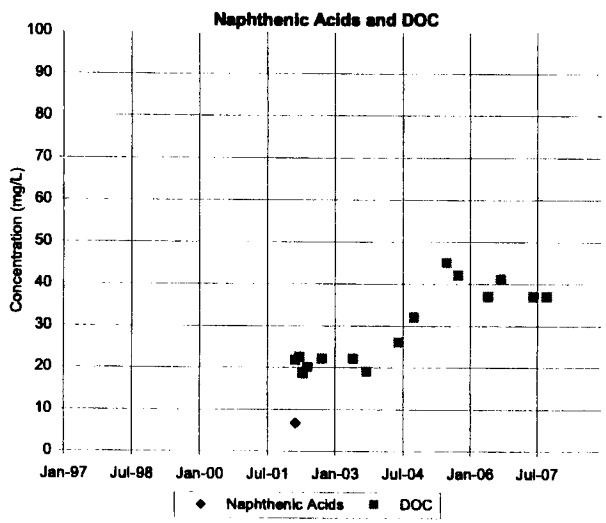

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

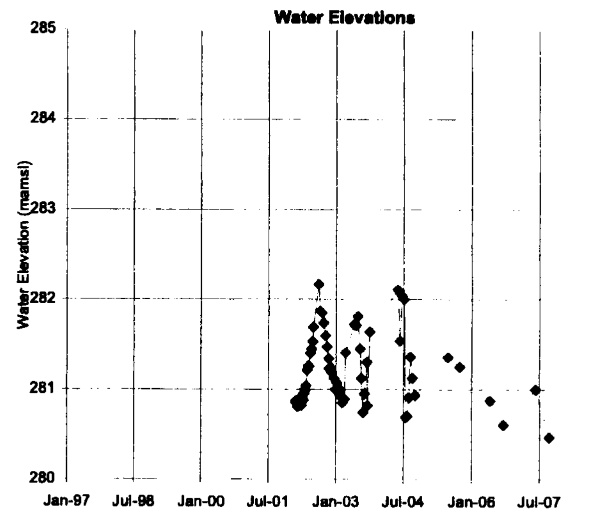

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-08

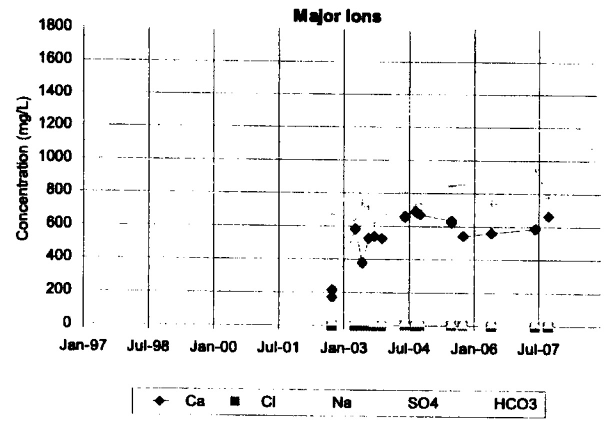

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

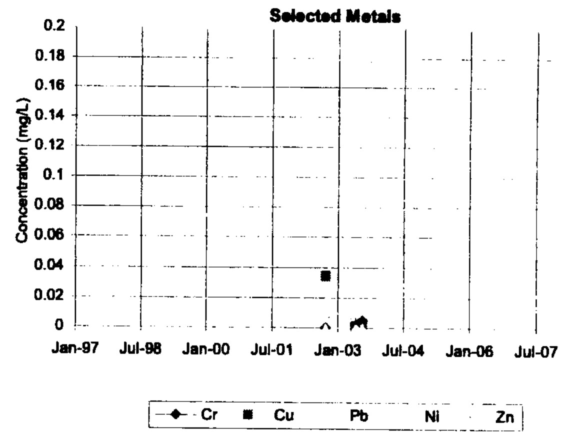

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

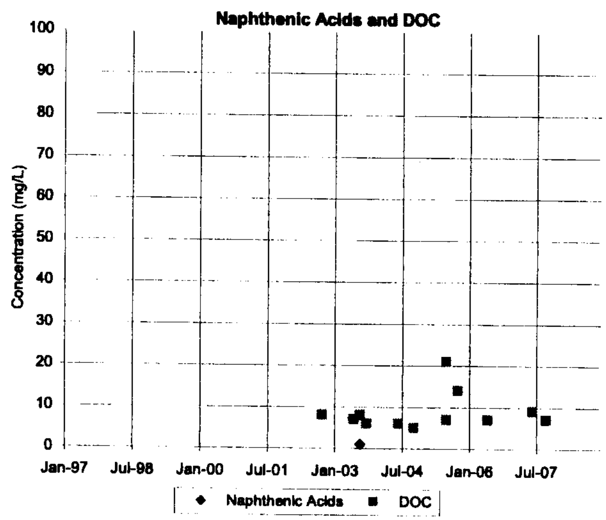

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

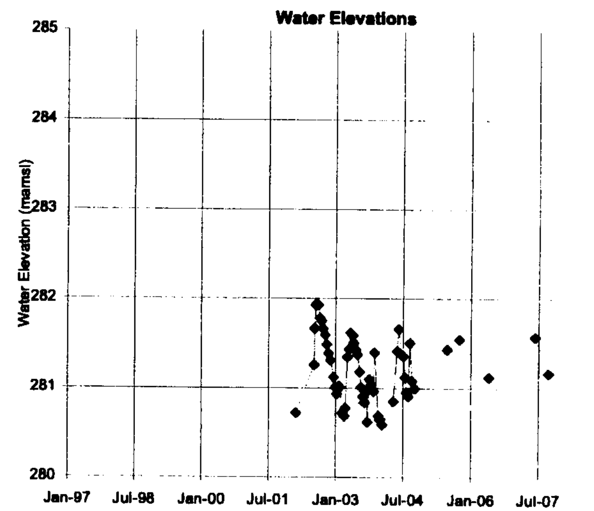

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-09

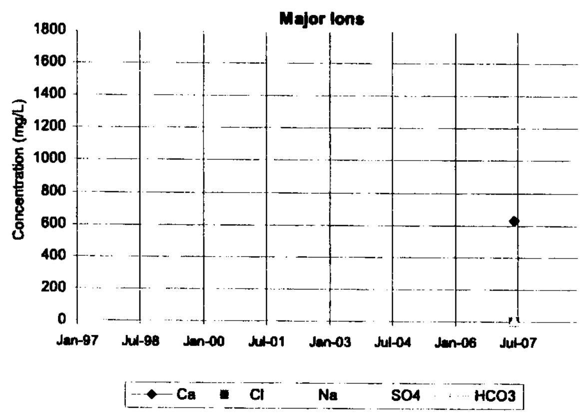

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

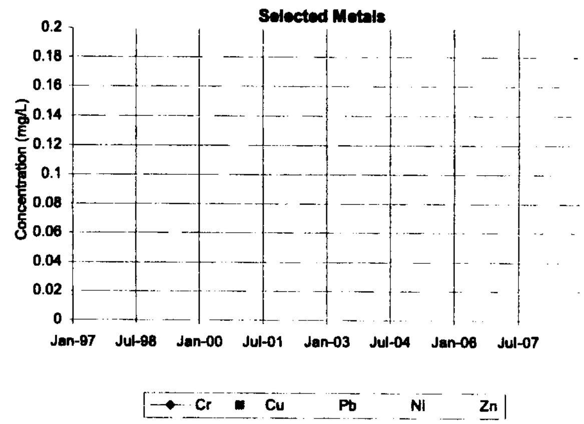

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

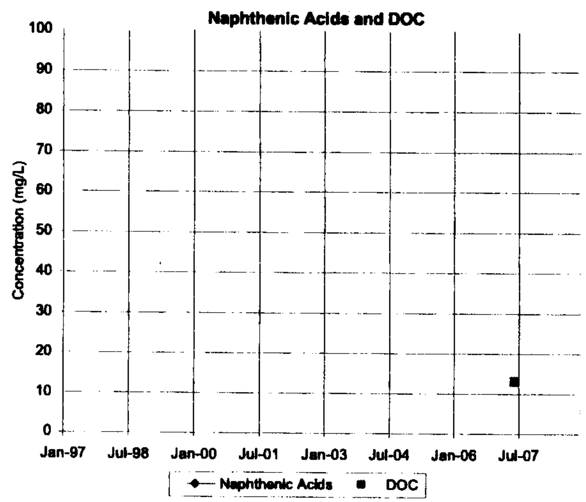

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

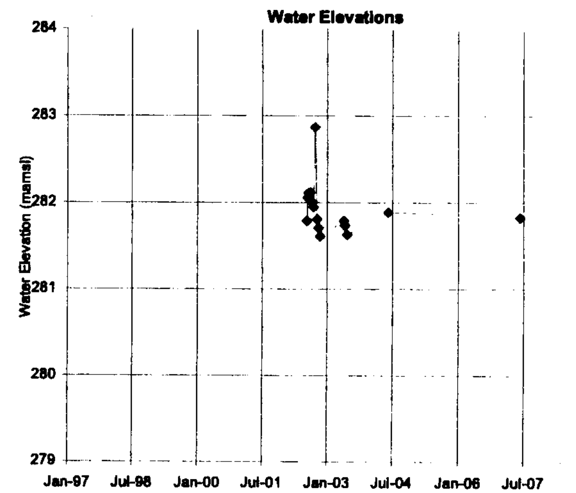

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-10

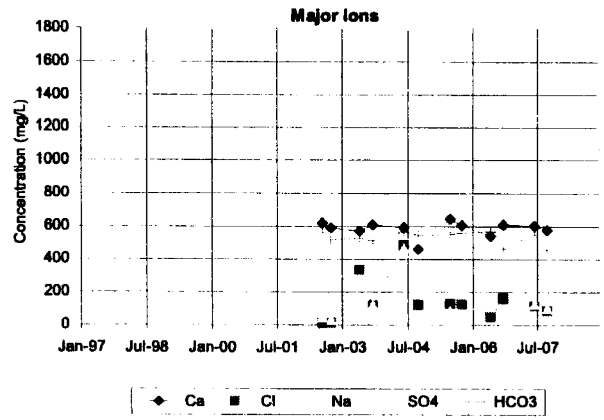

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

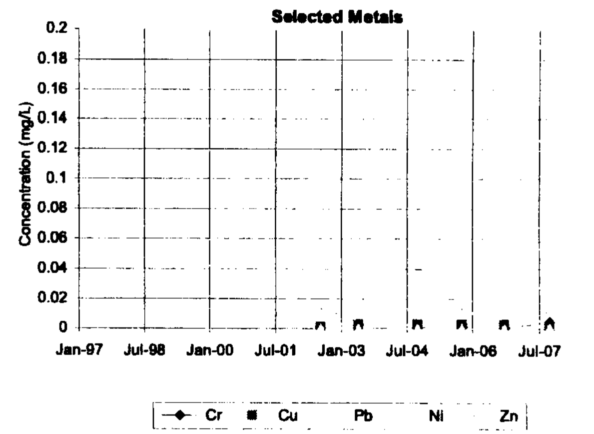

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

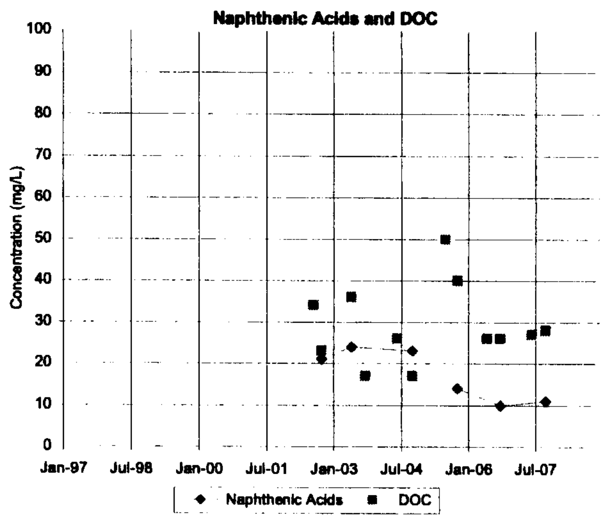

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

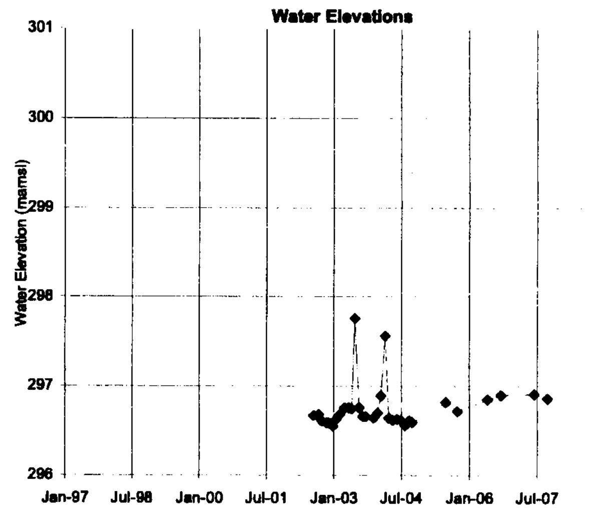

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-14

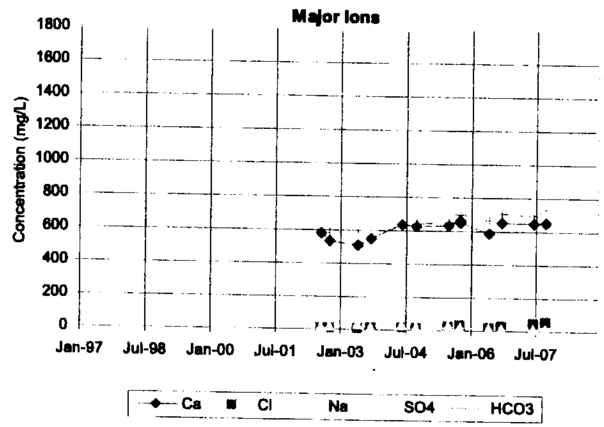

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

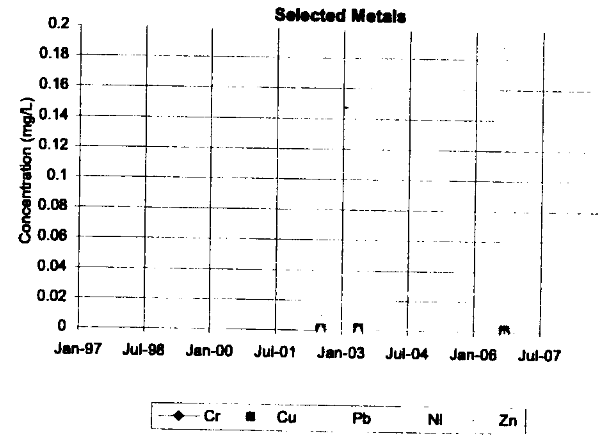

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

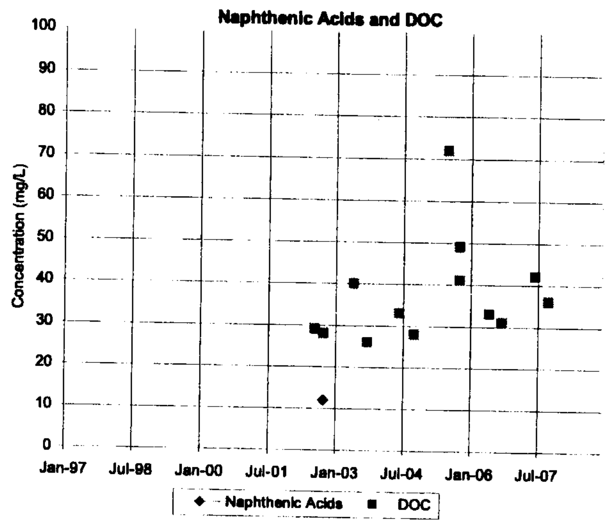

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

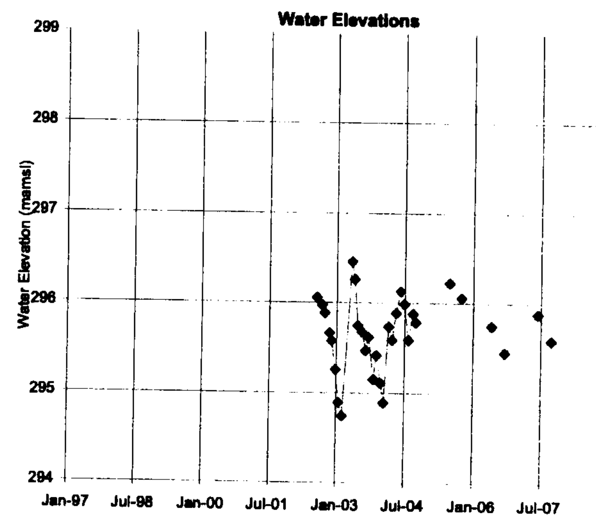

Water Elevations
Water Elevation (mamsl)
301
300
299
298
297
296
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0234-15

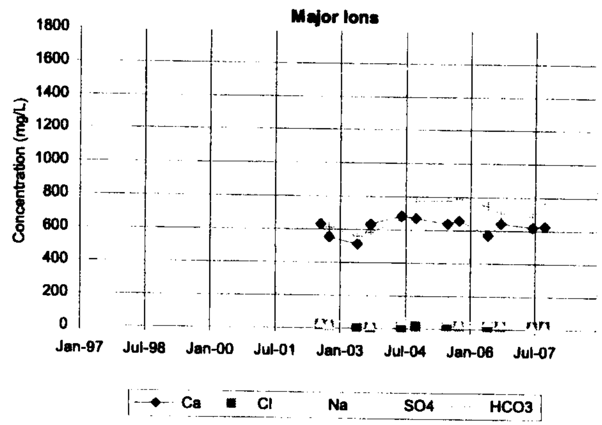

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

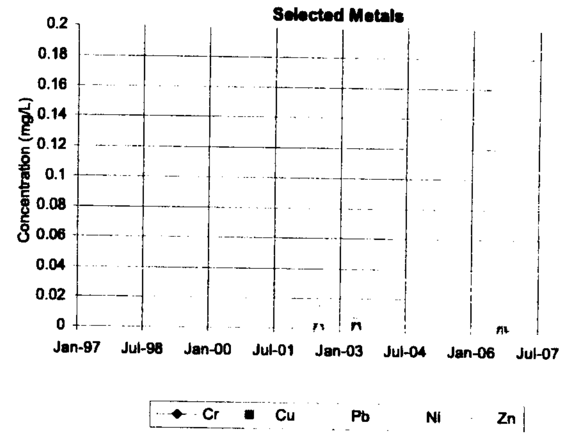

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

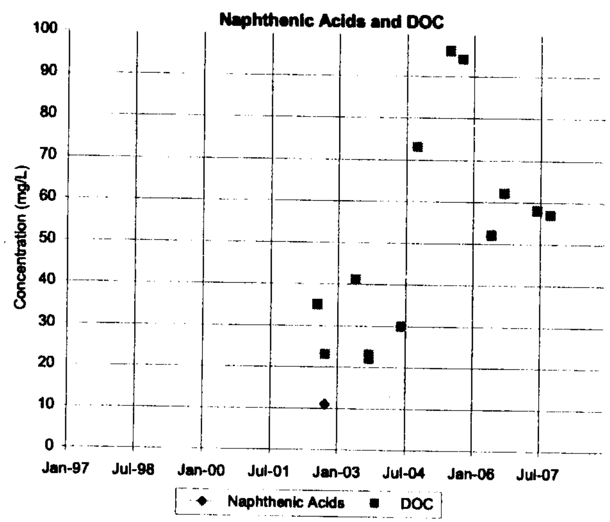

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

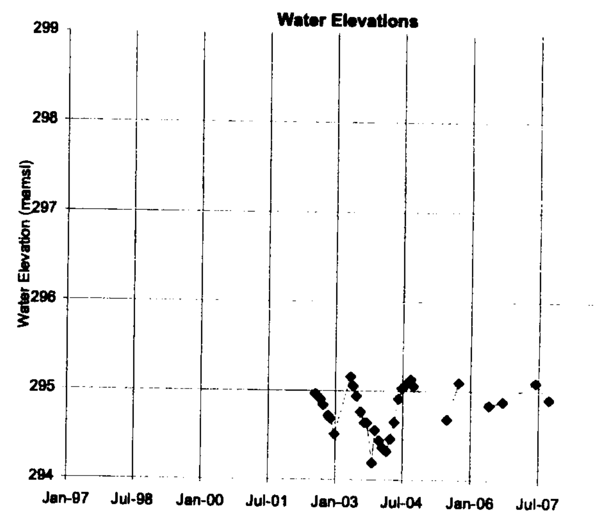

Water Elevations
Water Elevation (mamsl)
299
298
297
296
295
294
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0234-16

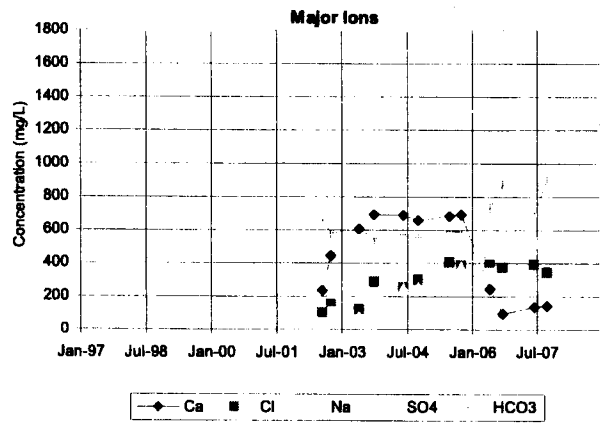

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

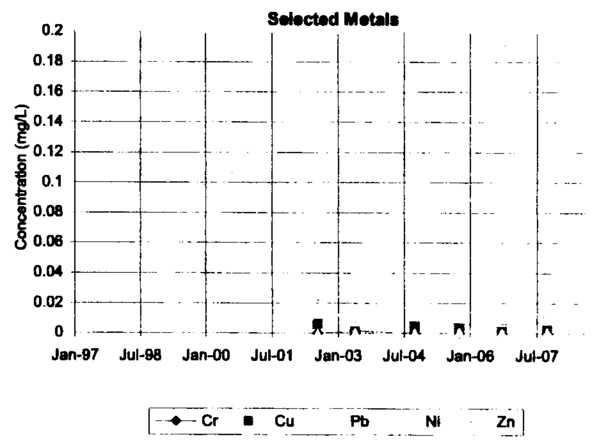

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

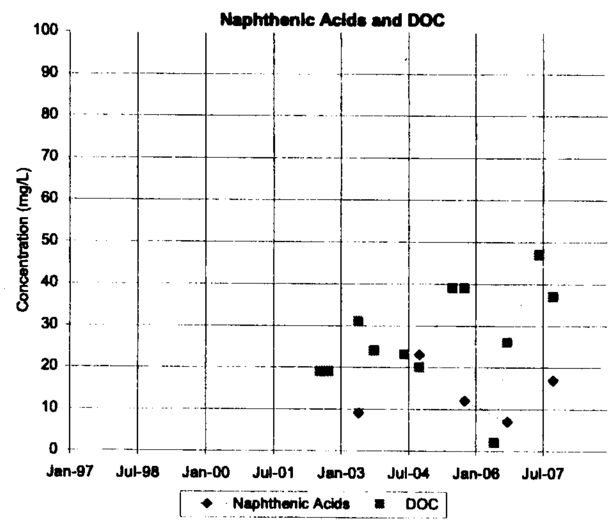

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

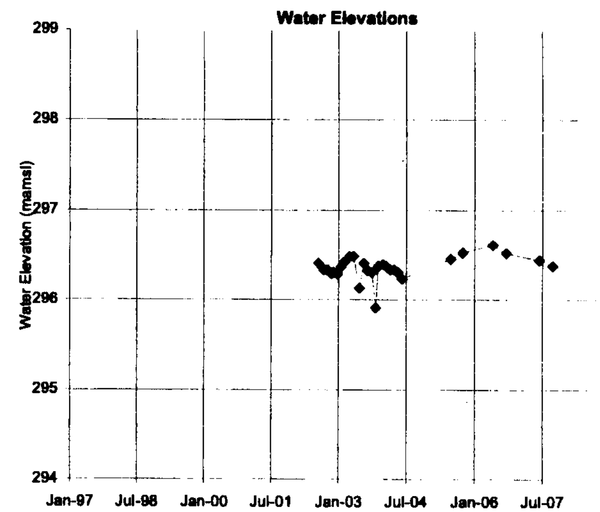

Water Elevations
Water Elevation (mamsl)
299
298
297
296
295
294
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0234-17

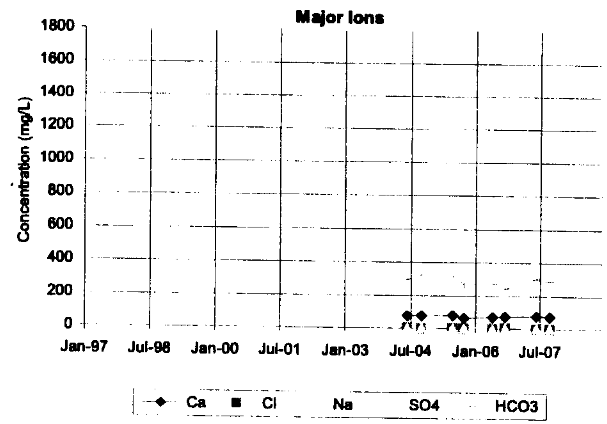

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

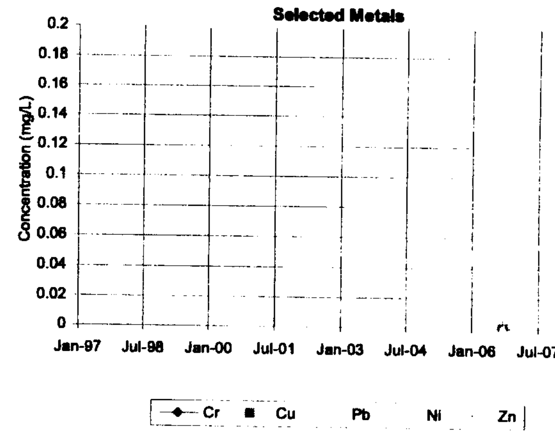

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

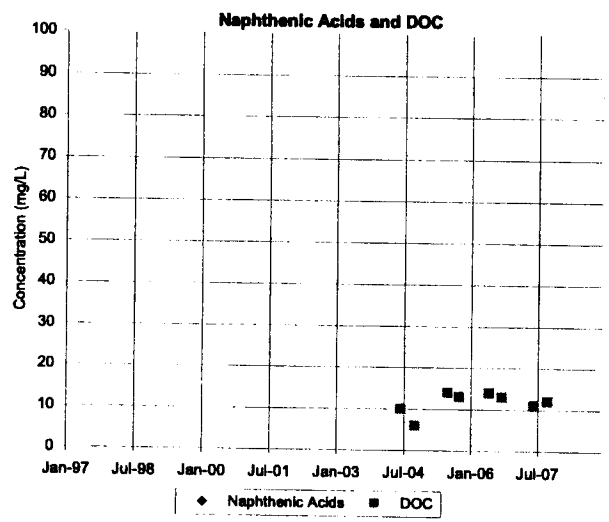

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

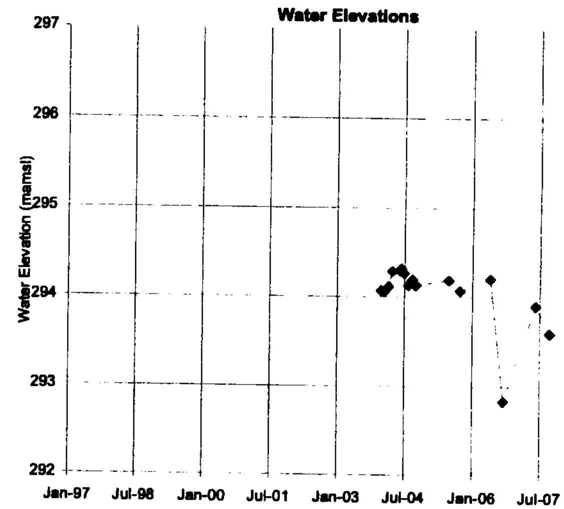

Water Elevations
Water Elevation (mamsl)
299
298
297
296
295
294
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0310-04

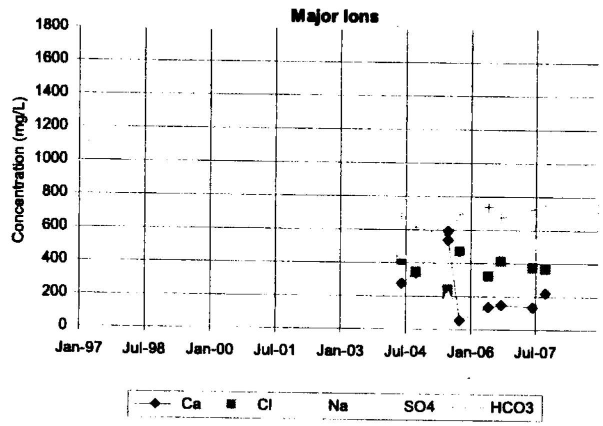

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

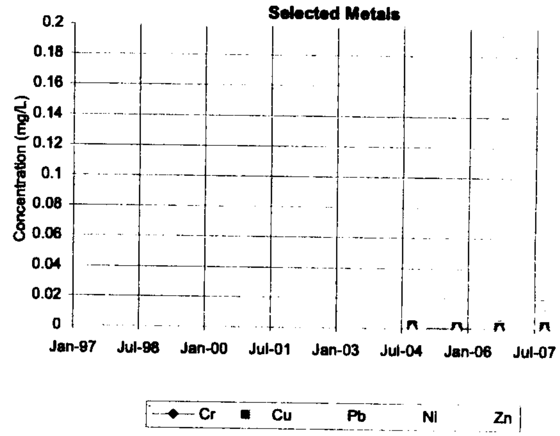

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

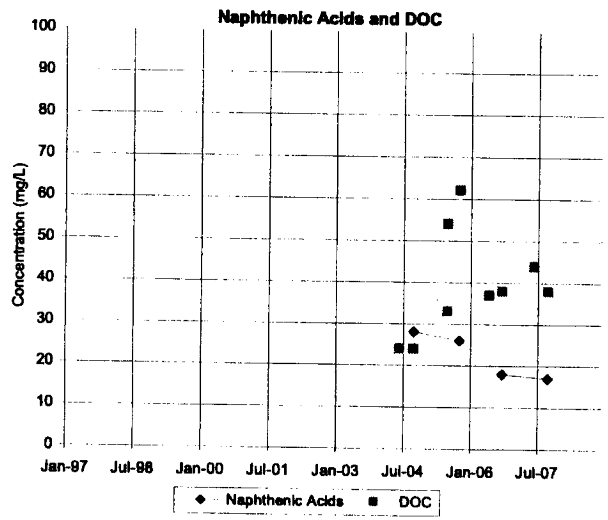

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

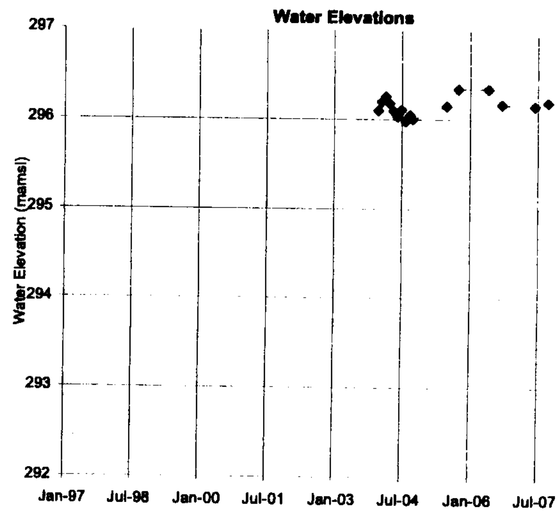

Water Elevations
Water Elevation (mamsl)
297
296
295
294
293
292
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0334-06

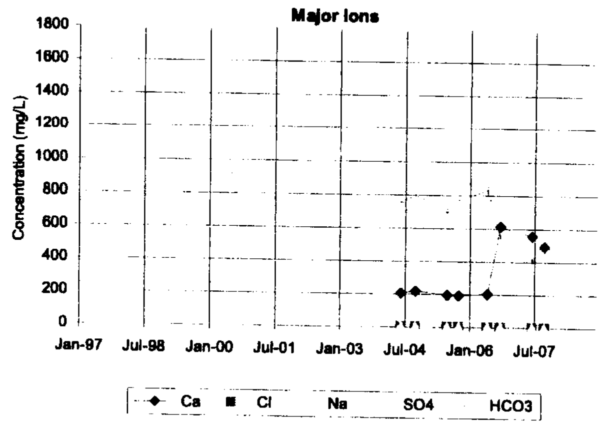

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

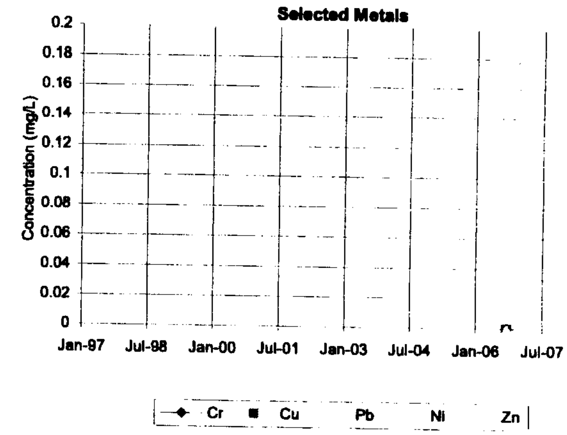

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

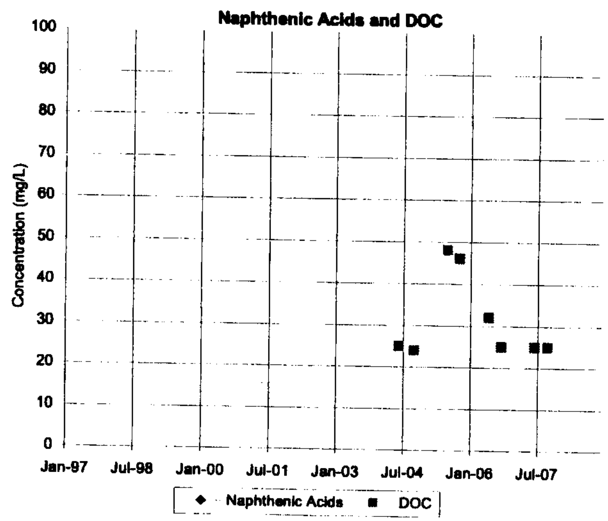

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

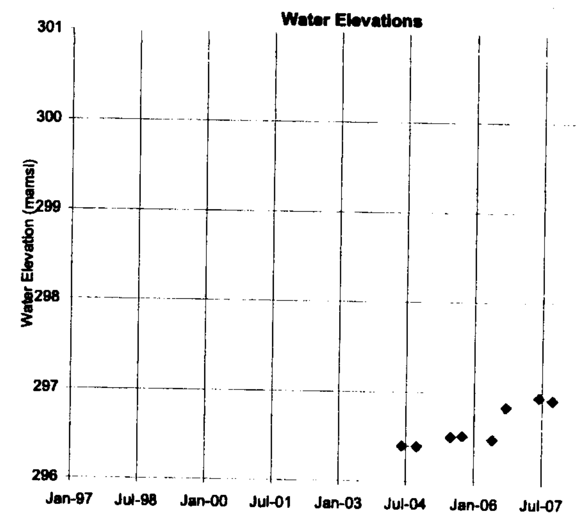

Water Elevations
Water Elevation (mamsl)
297
296
295
294
293
292
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0334-07

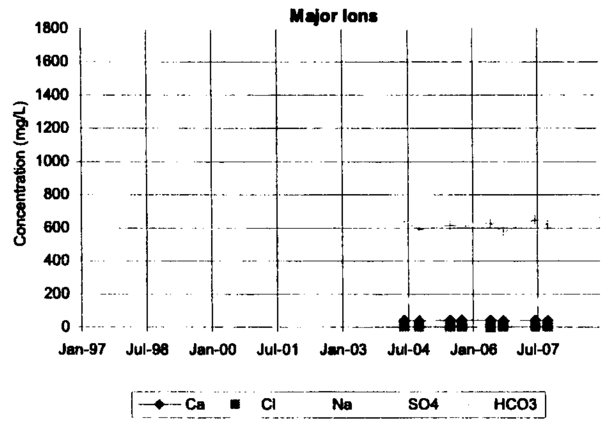

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

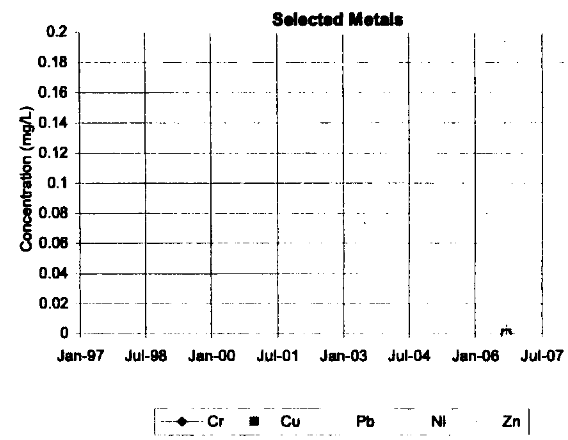

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

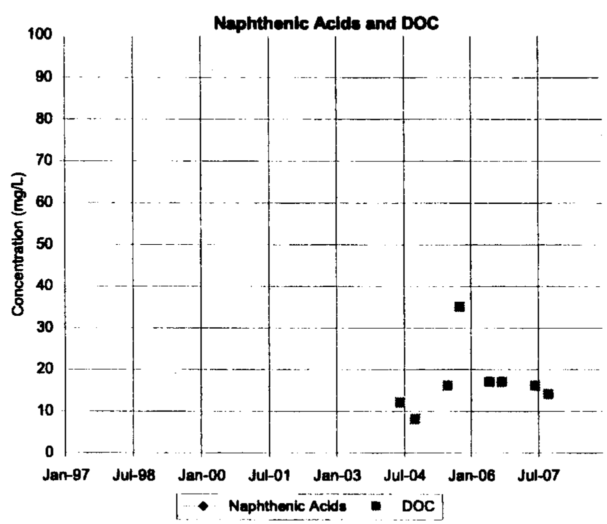

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

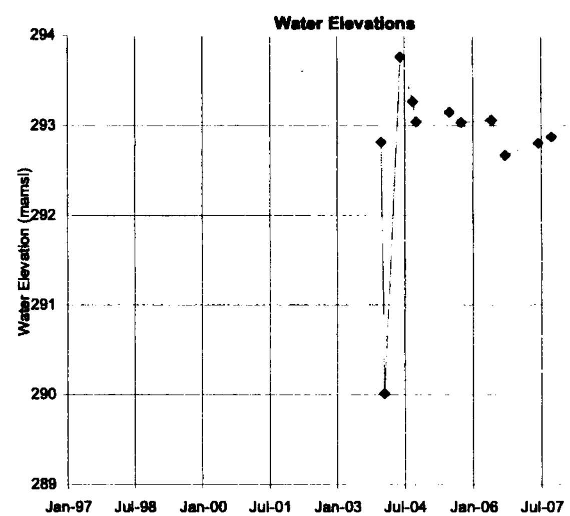

Water Elevations
Water Elevation (mamsl)
301
300
299
298
297
296
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0334-09

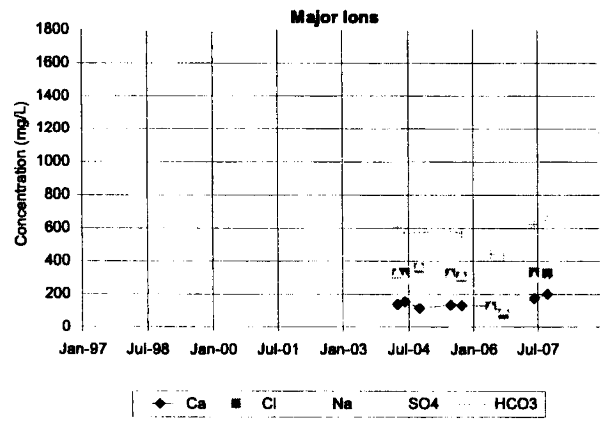

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca Cl Na SO4 HCO3

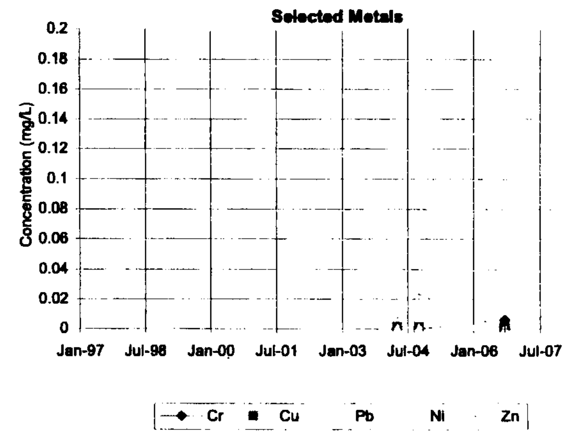

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr Cu Pb Ni Zn

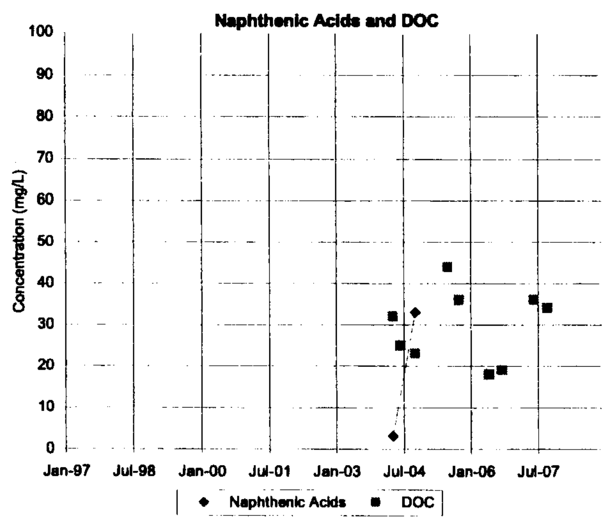

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids DOC

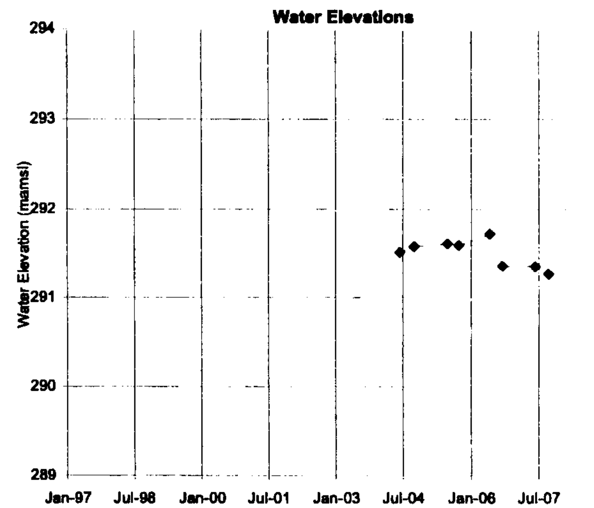

Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0410-01

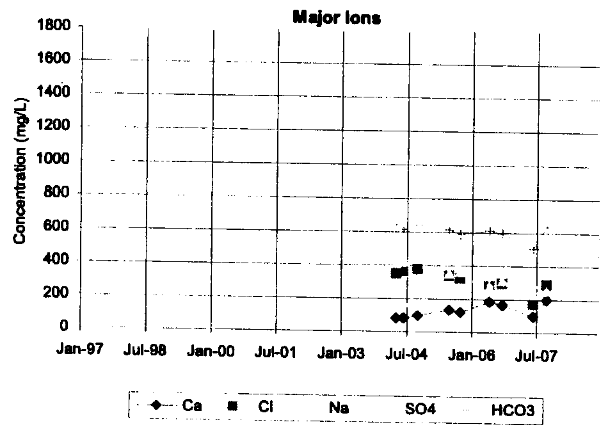

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca
Cl
Na
SO4
HCO3

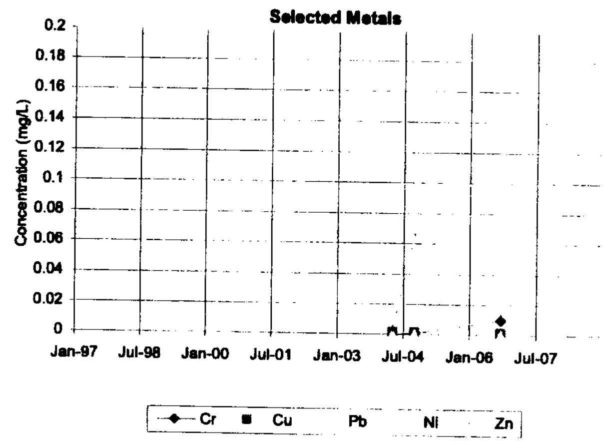

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr
Cu
Pb
Ni
Zn

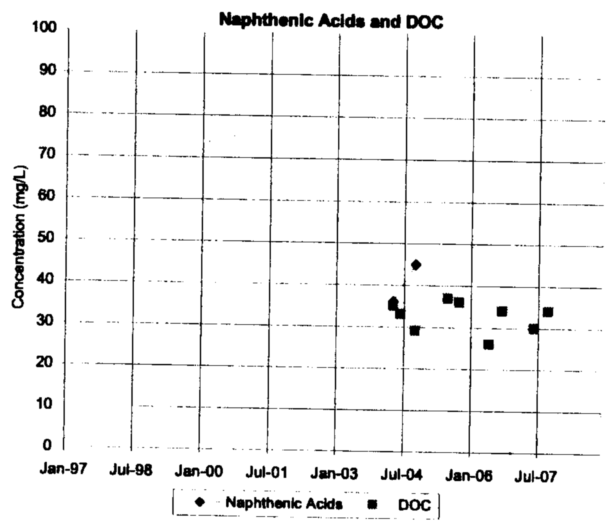

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids
DOC

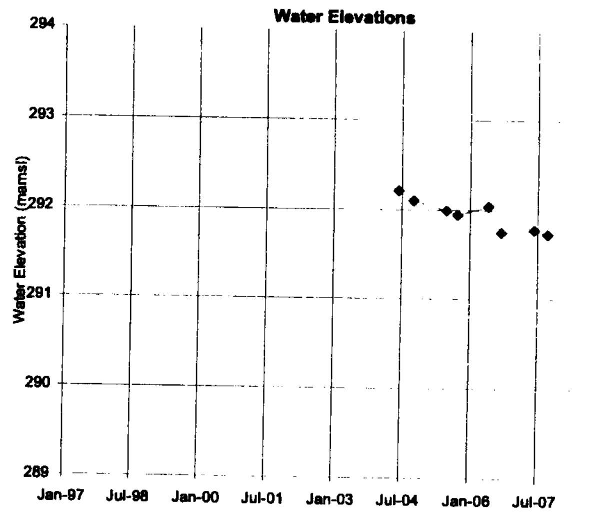

Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0410-02

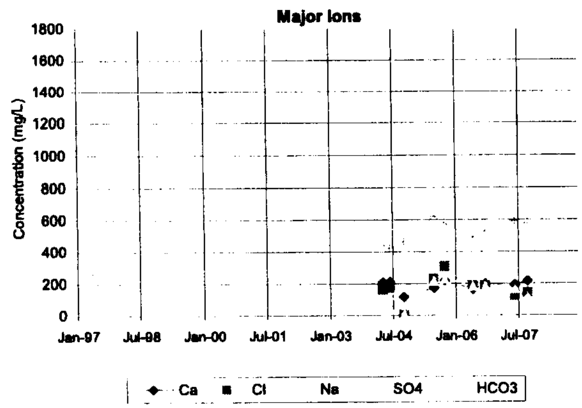

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca
Cl
Na
SO4
HCO3

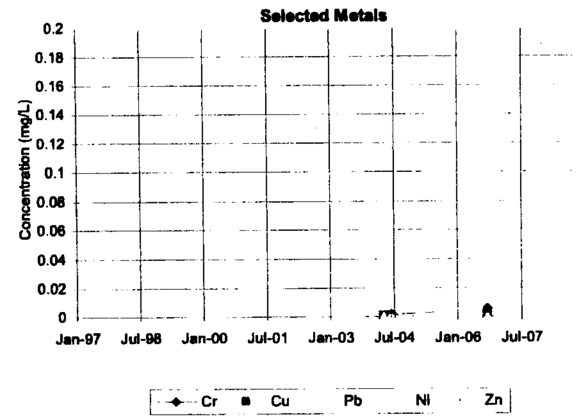

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr
Cu
Pb
Ni
Zn

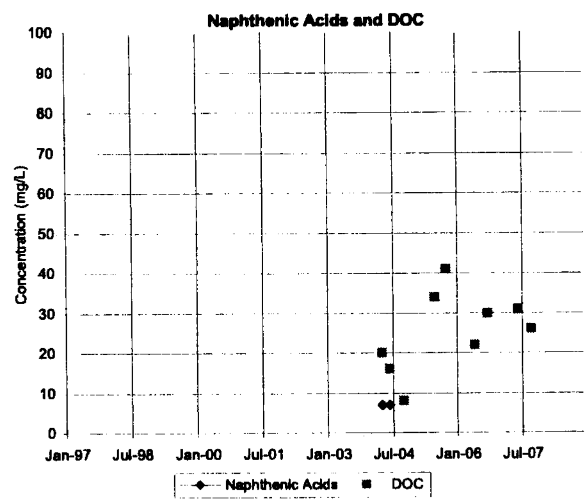

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids
DOC

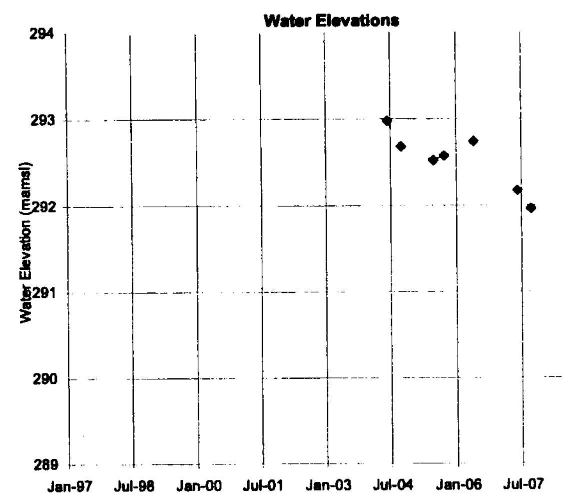

Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS041003A

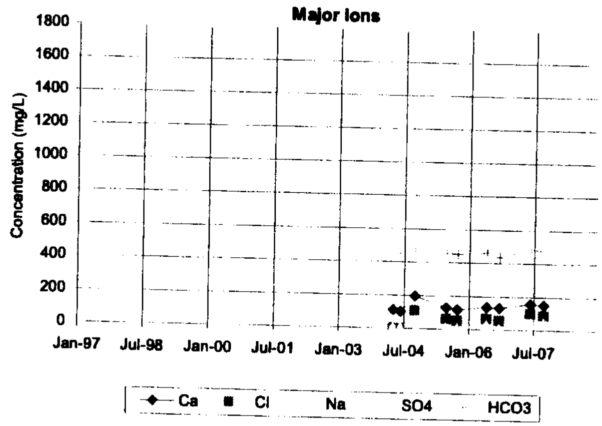

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

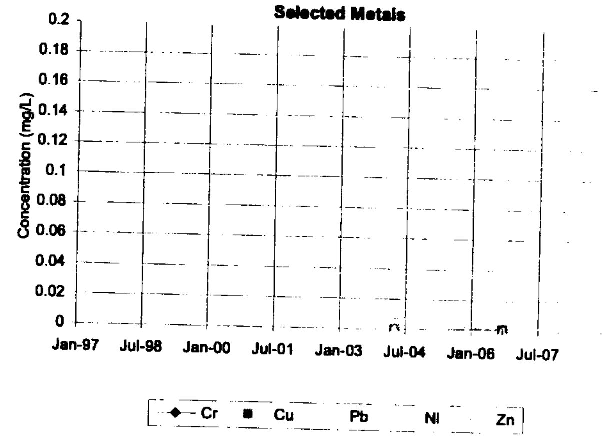

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

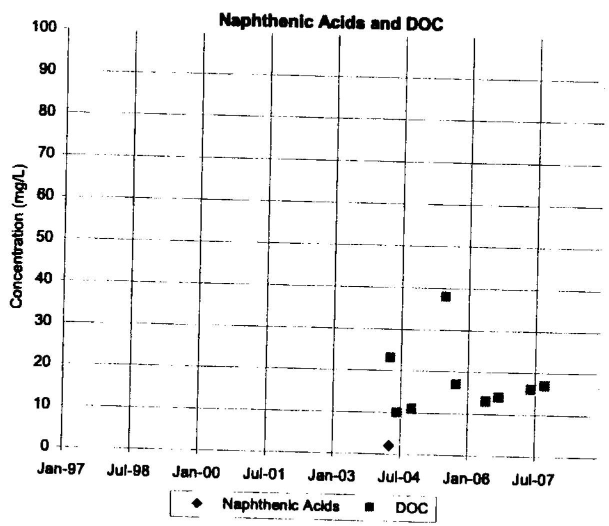

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

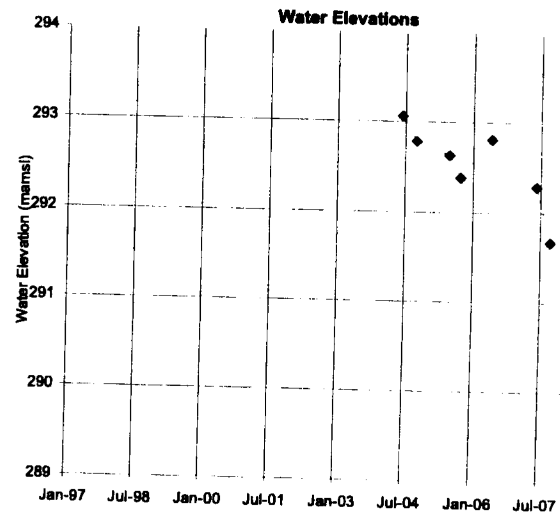

Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS041003B

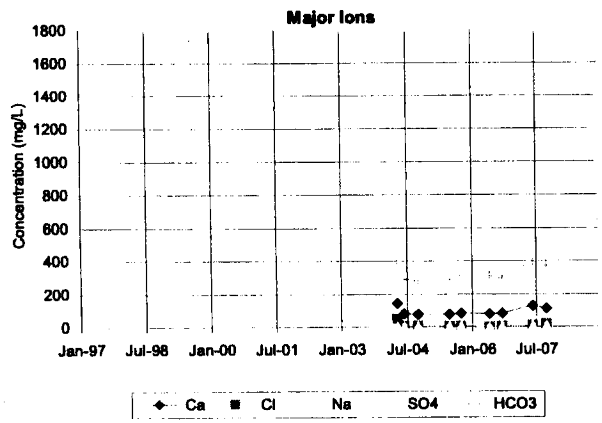

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

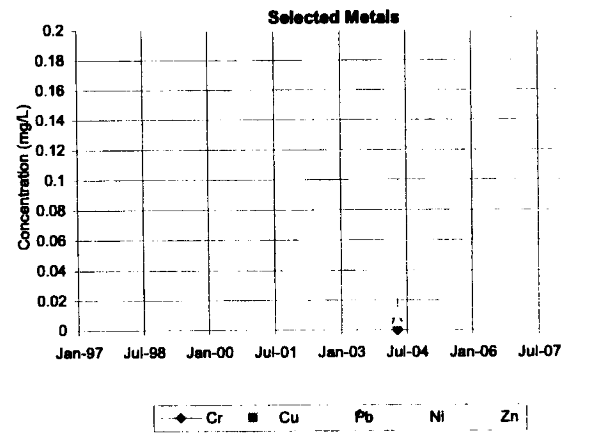

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

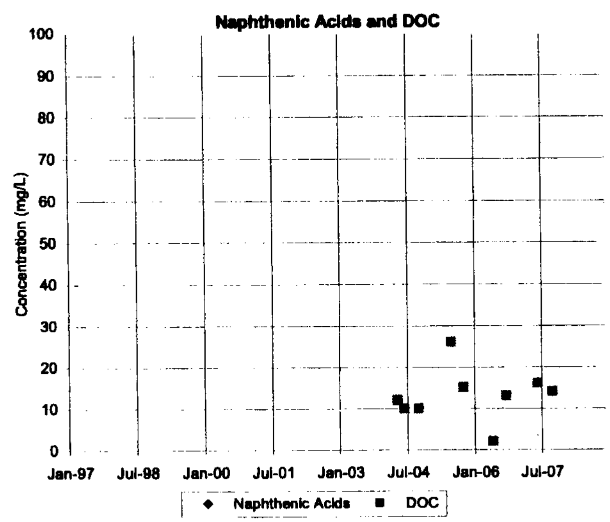

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

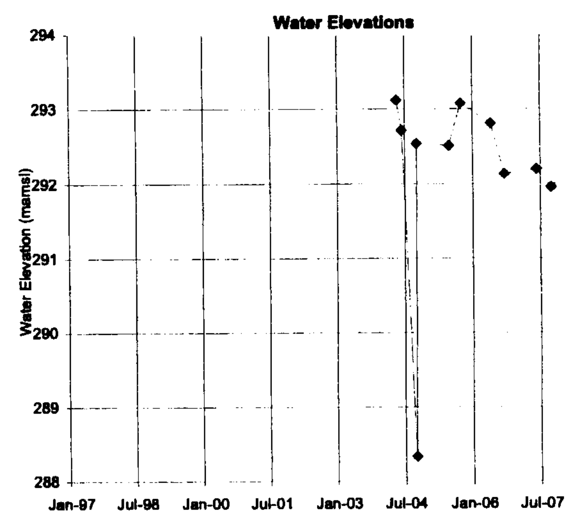

Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0410-04

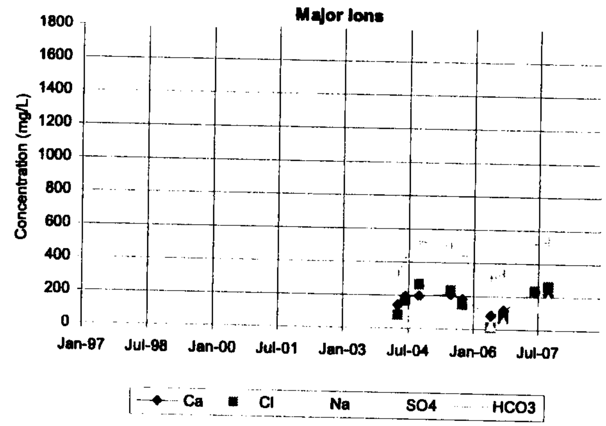

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr
Cu
Pb
Ni
Zn

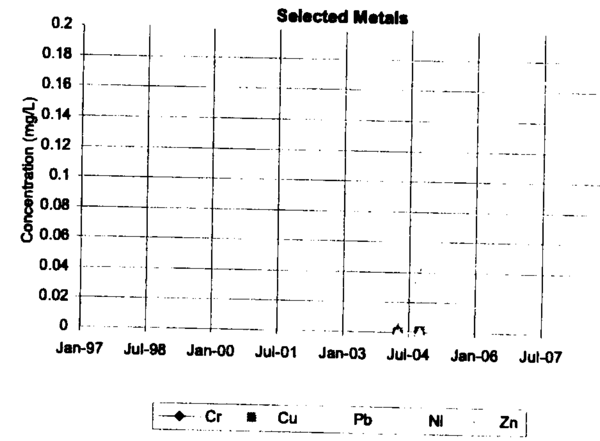

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
288
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

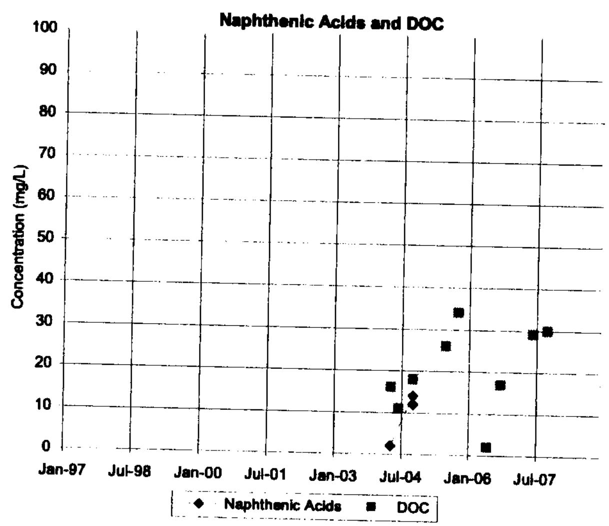
OWS0410-05



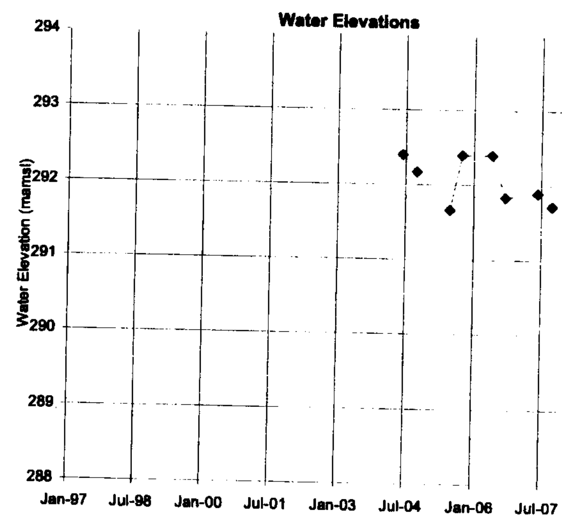
Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3



Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

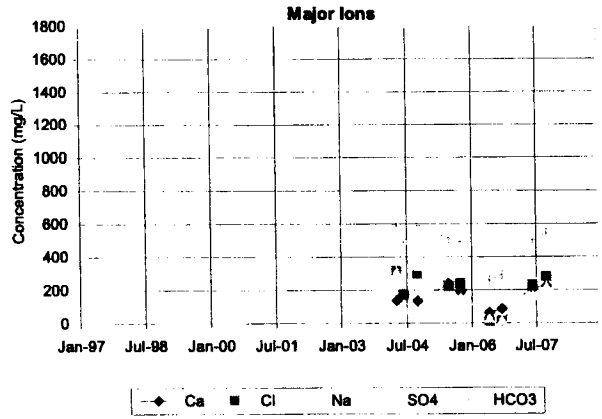


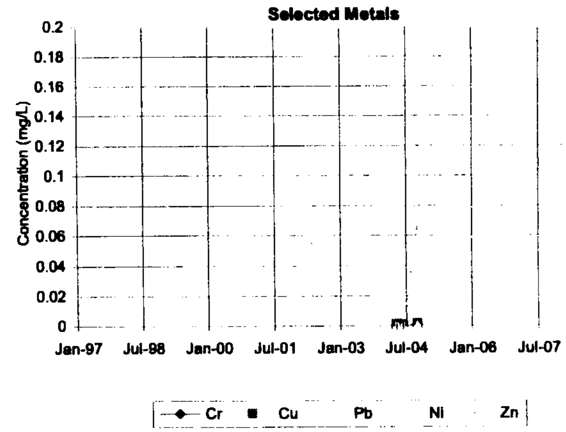
Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

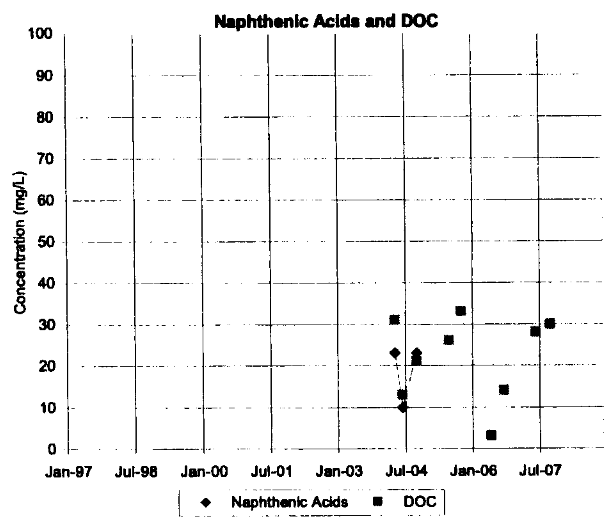


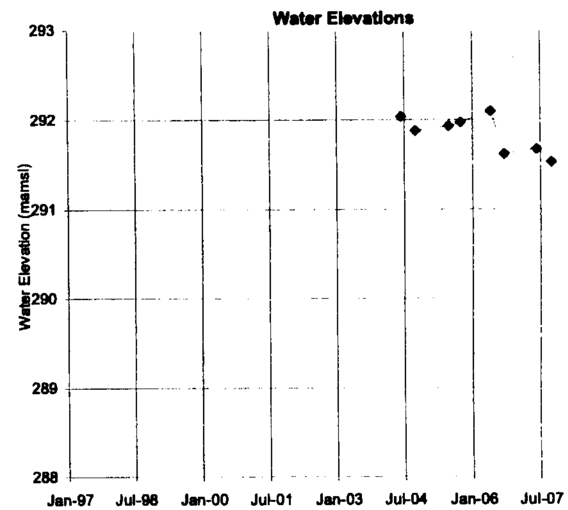
Water Elevations
Water Elevation (mamsl)
294
293
292
291
290
289
288
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0410-06

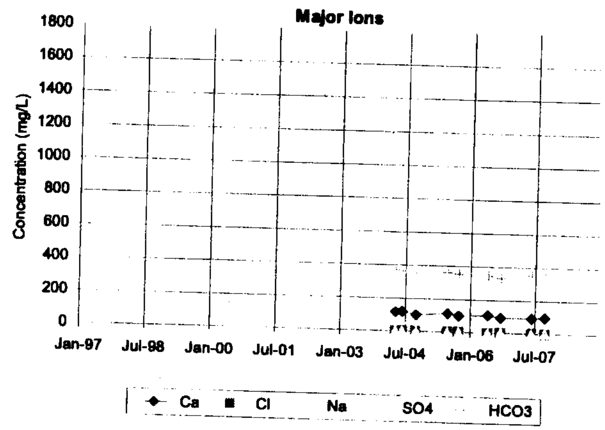

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

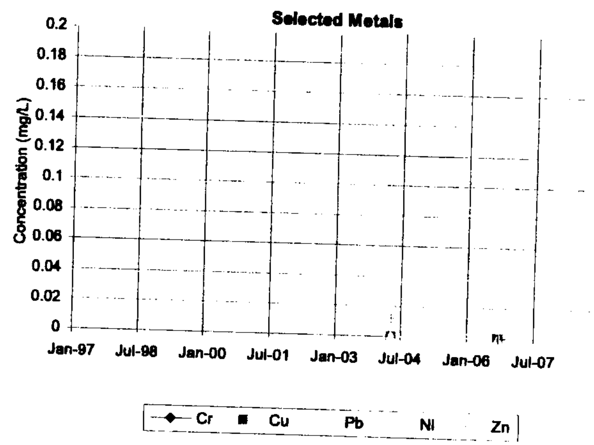

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

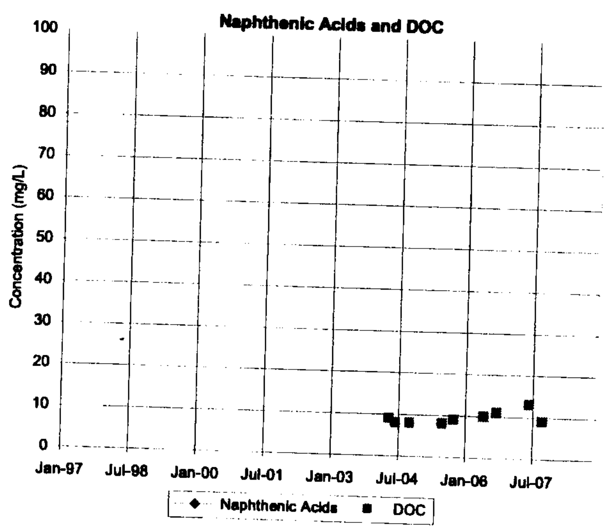

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

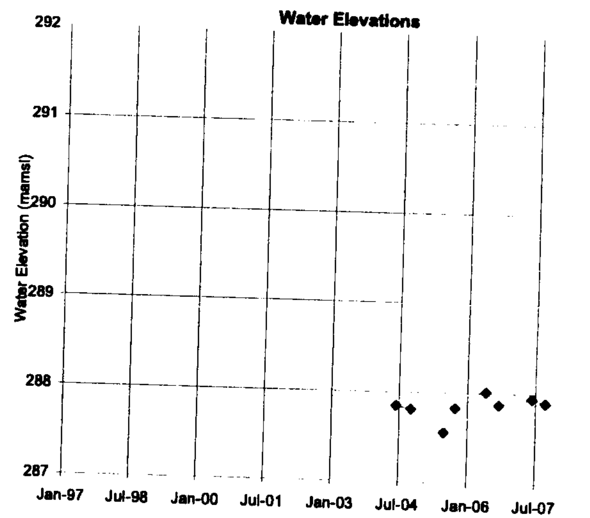

Water Elevations
Water Elevation (mamsl)
293
292
291
290
289
288
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0410-17

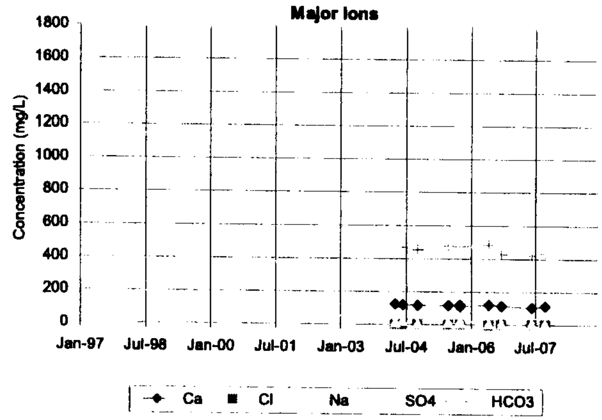

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Ca
Cl
Na
SO4
HCO3

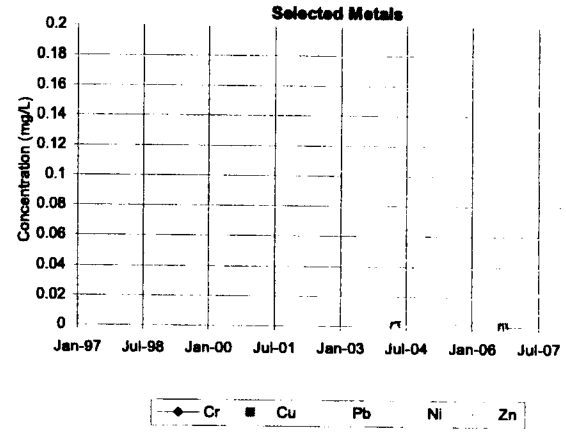

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Cr
Cu
Pb
Ni
Zn

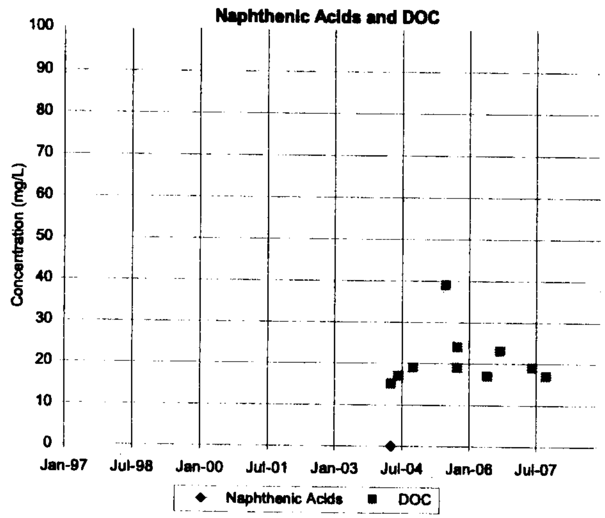

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07
Naphthenic Acids
DOC

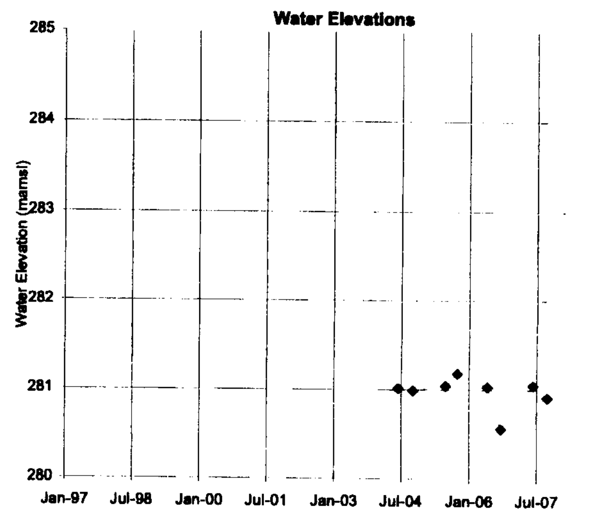

Water Elevations
Water Elevation (mamsl)
292
291
290
289
288
287
Jan-97 Jul-98 Jan-00 Jul-01 Jan-03 Jul-04 Jan-06 Jul-07

OWS0434-15

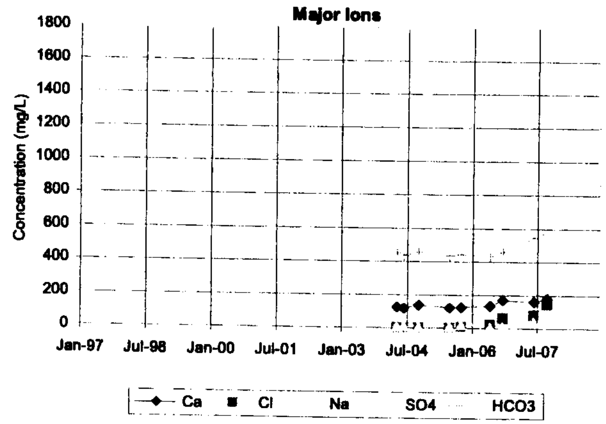

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

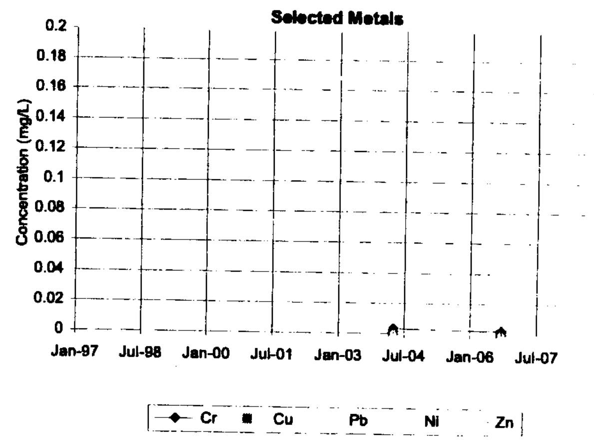

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

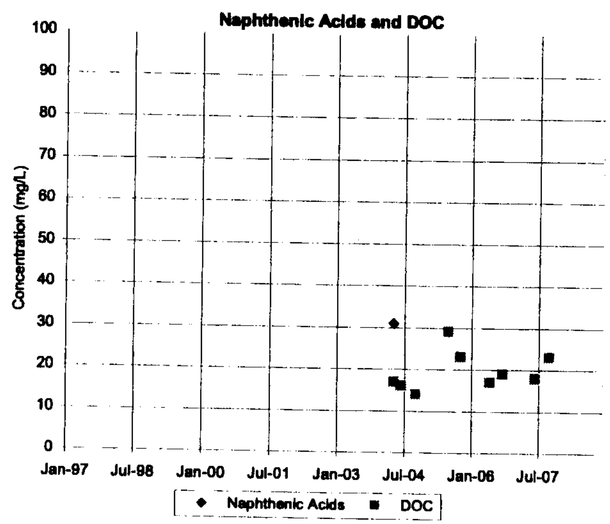

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

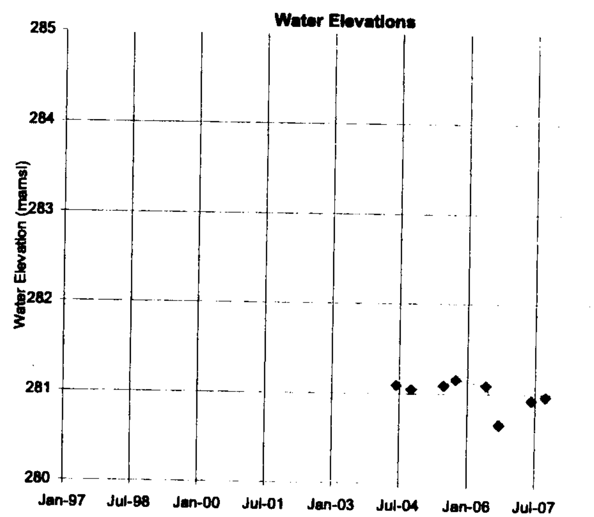

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0434-16

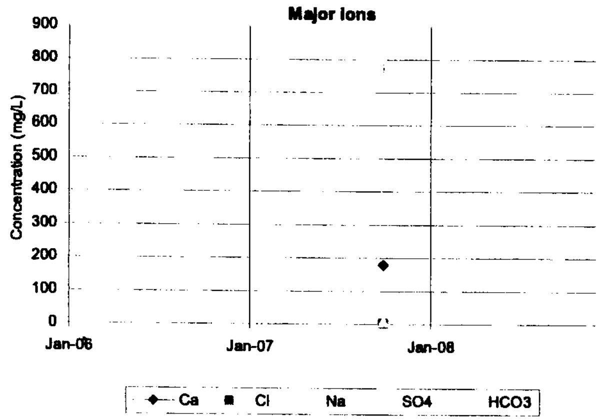

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Ca
Cl
Na
SO4
HCO3

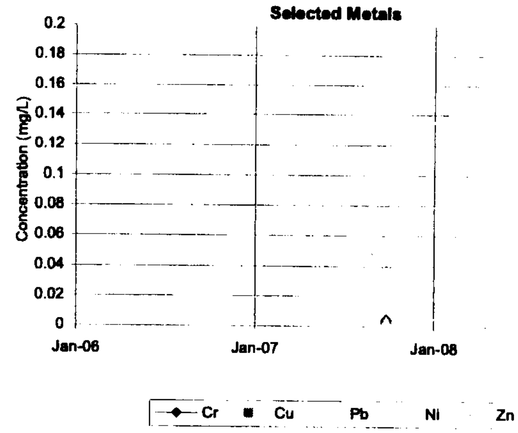

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Cr
Cu
Pb
Ni
Zn

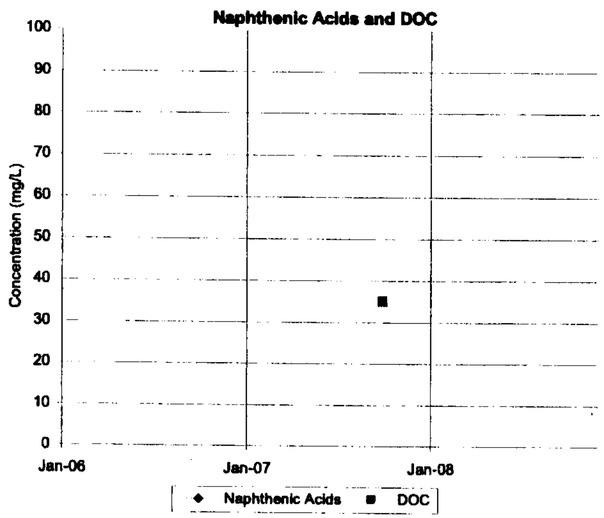

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07
Naphthenic Acids
DOC

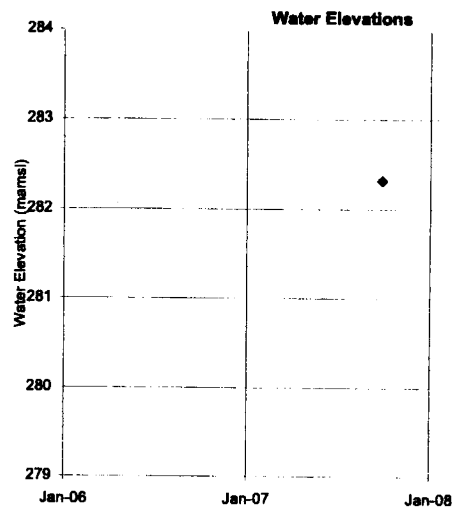

Water Elevations
Water Elevation (mamsl)
285
284
283
282
281
280
Jan-97
Jul-98
Jan-00
Jul-01
Jan-03
Jul-04
Jan-06
Jul-07

OWS0734400


Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
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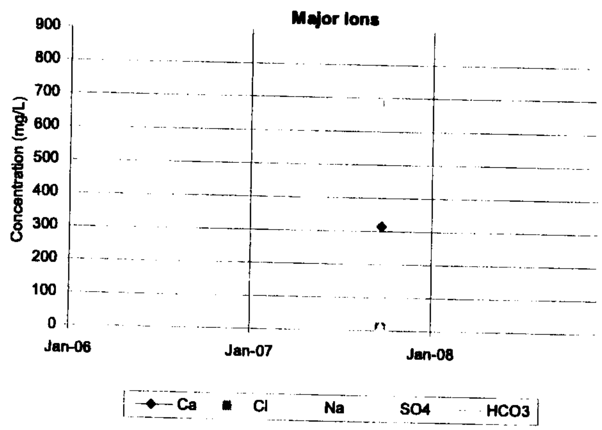
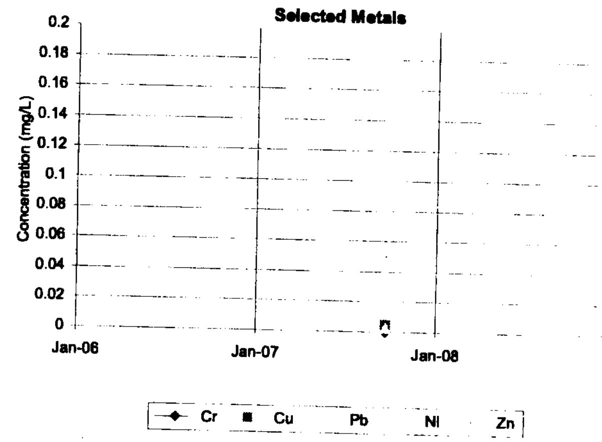
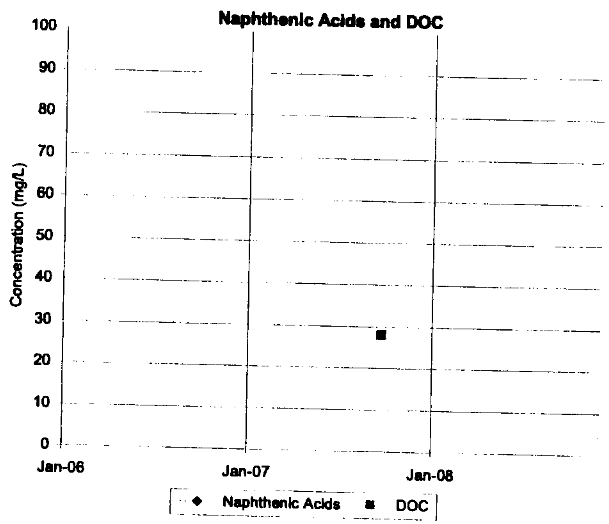
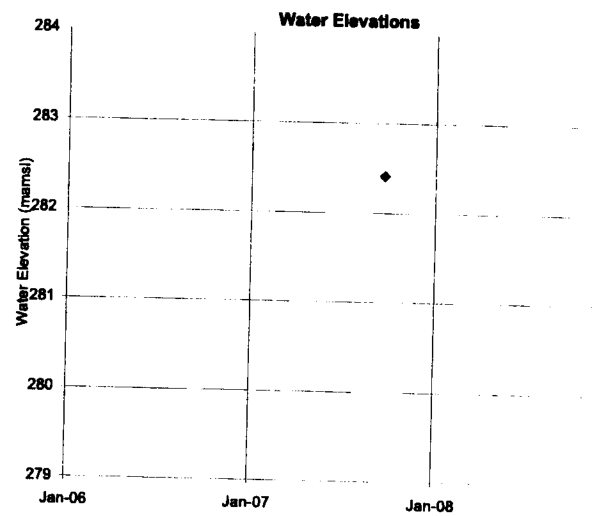
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734405

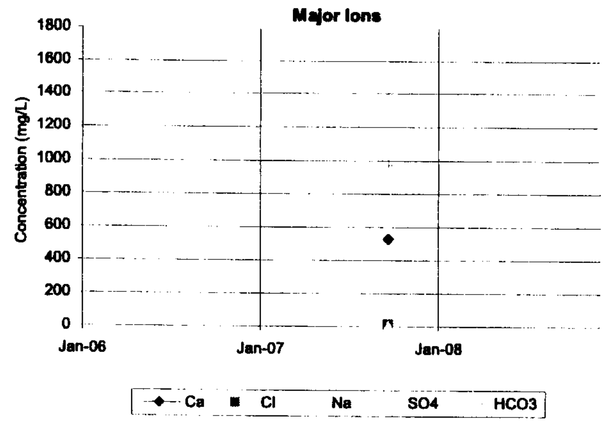

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

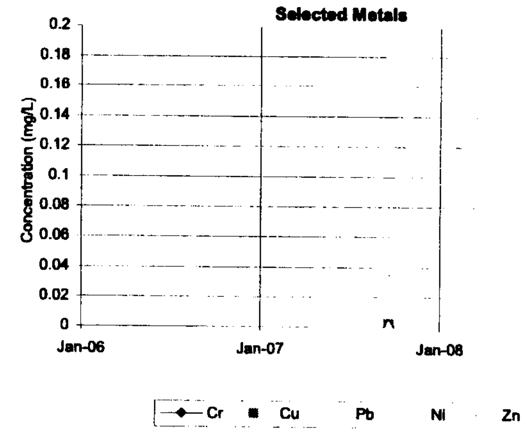

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

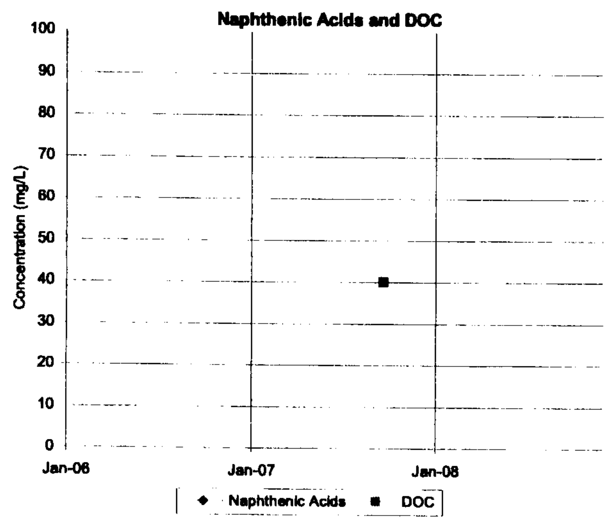

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

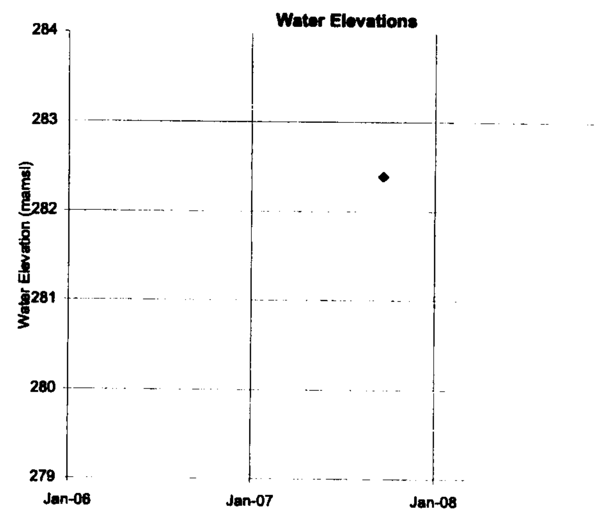

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734406

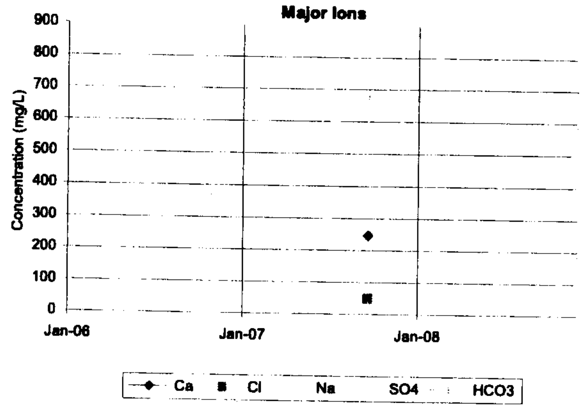

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

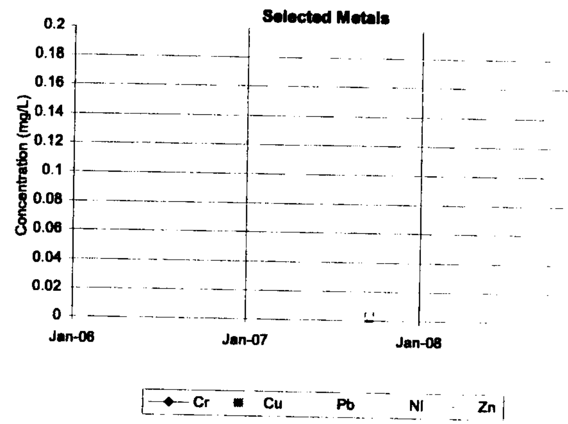

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

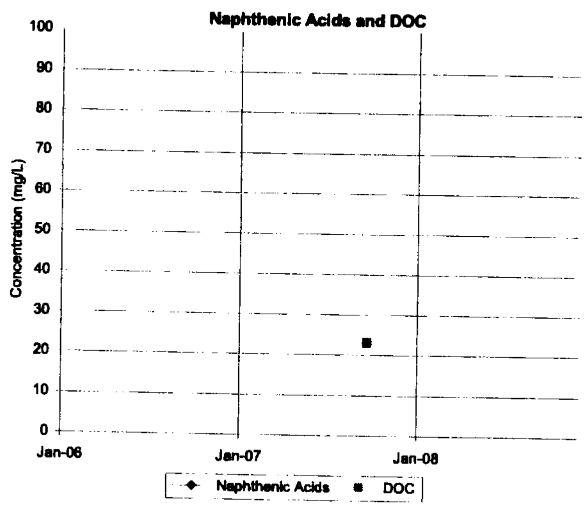

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

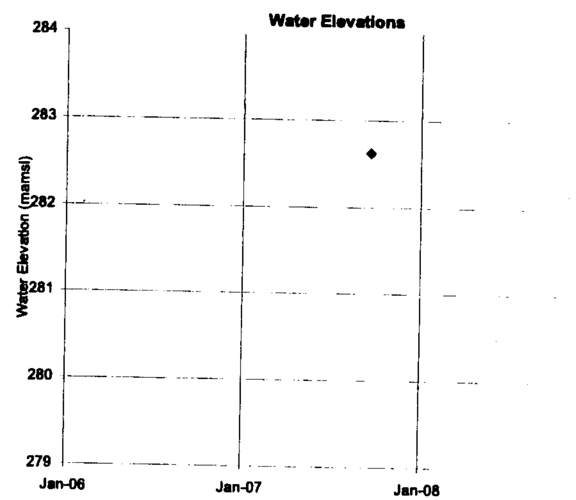

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734407

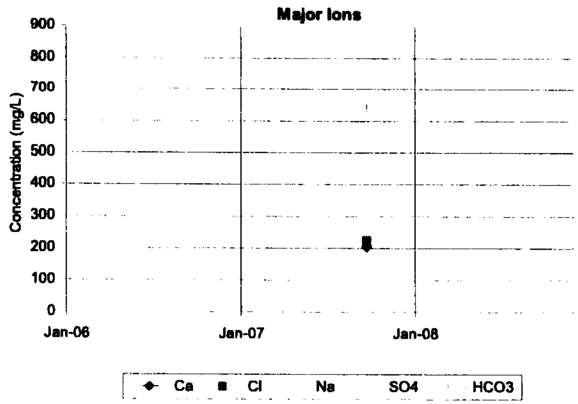

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

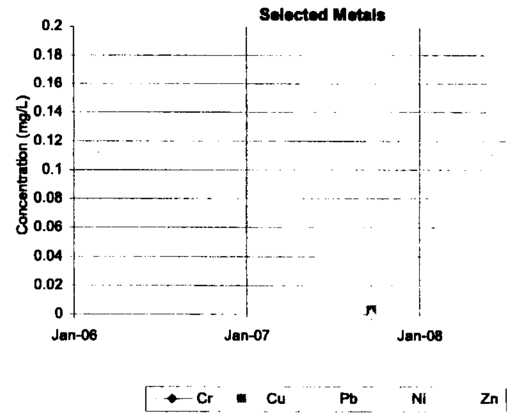

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

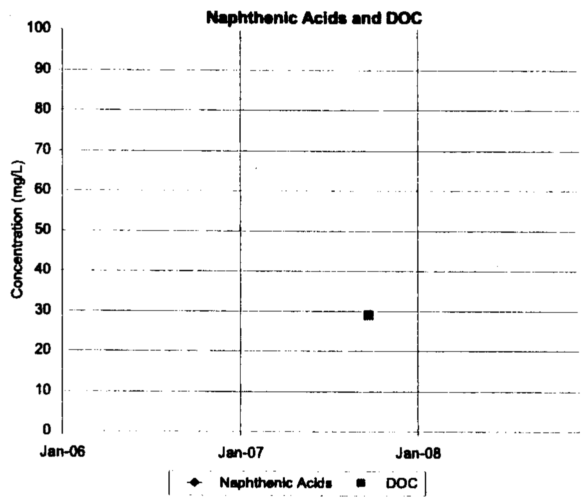

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

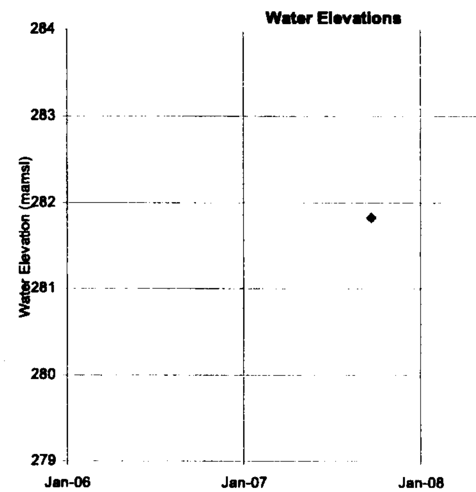

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734408

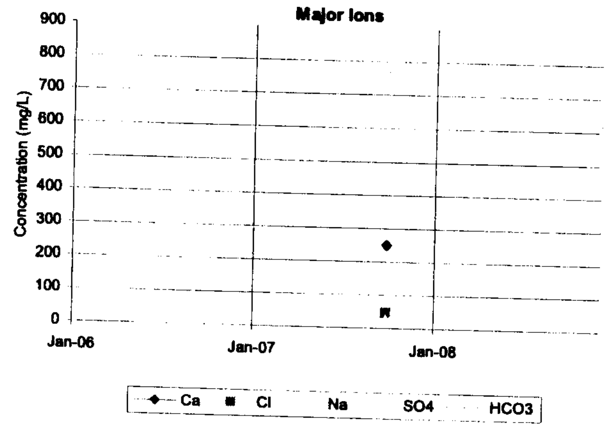

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

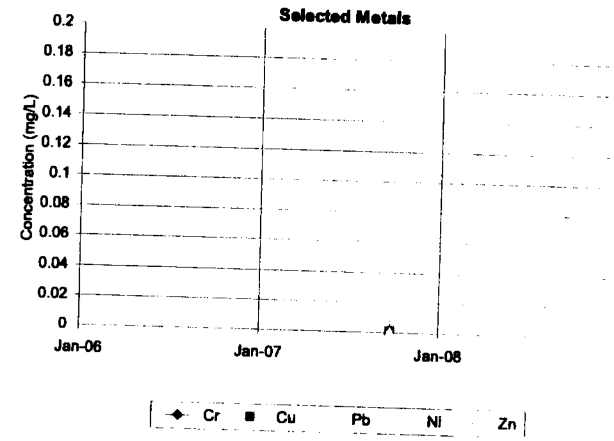

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

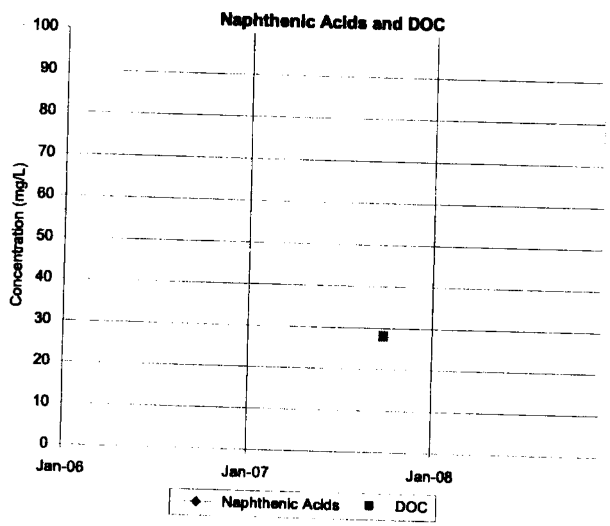

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

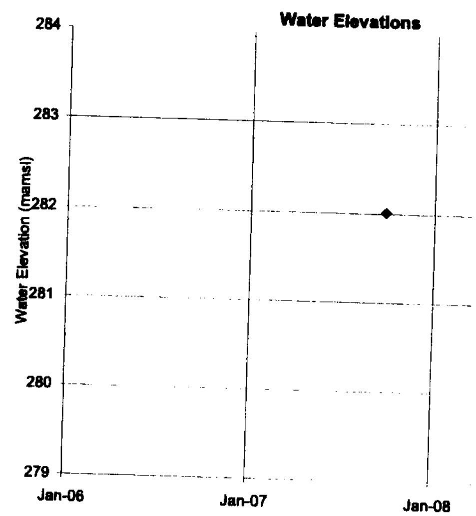

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734409

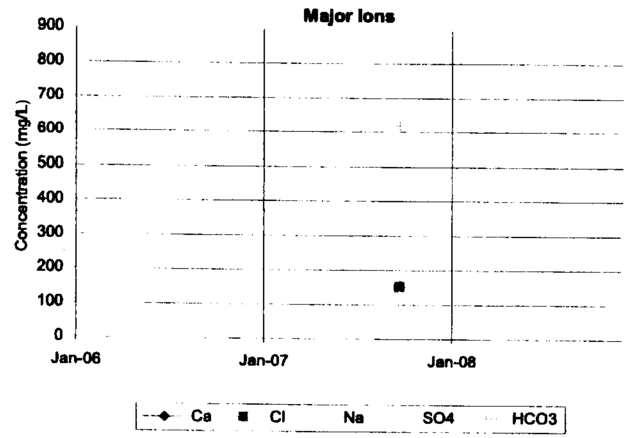

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

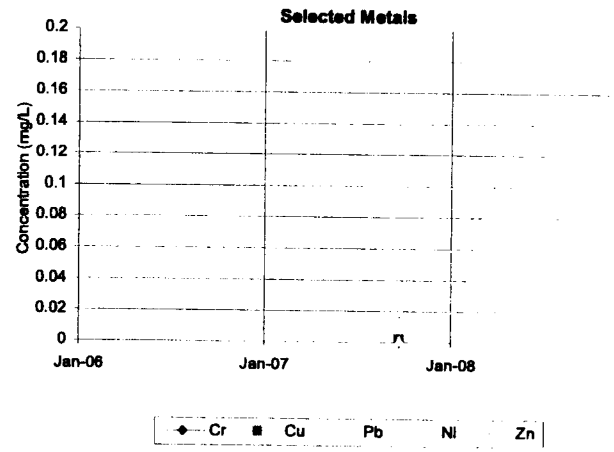

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

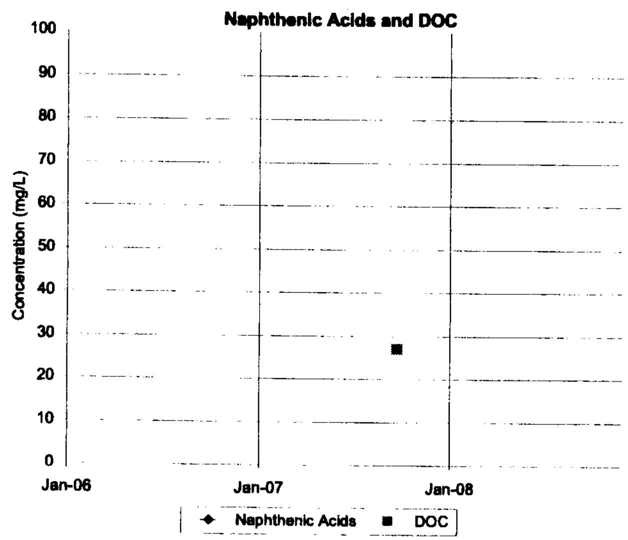

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

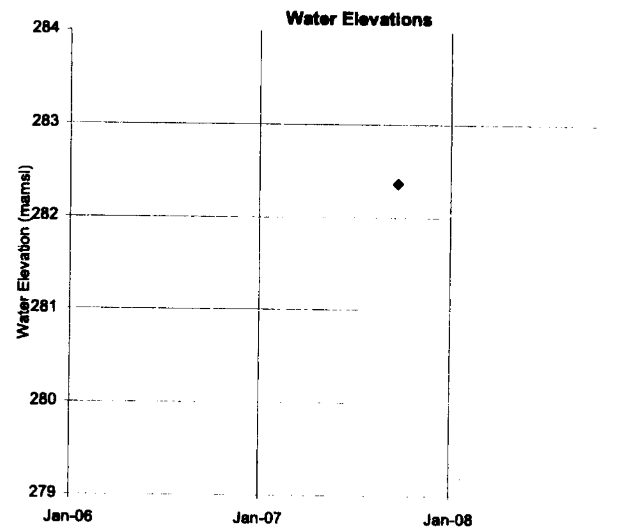

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734410

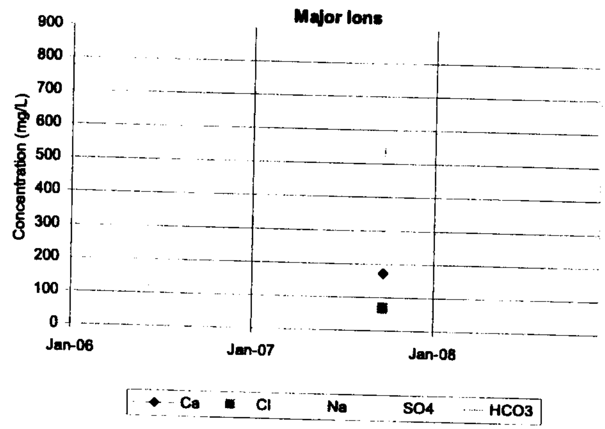

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

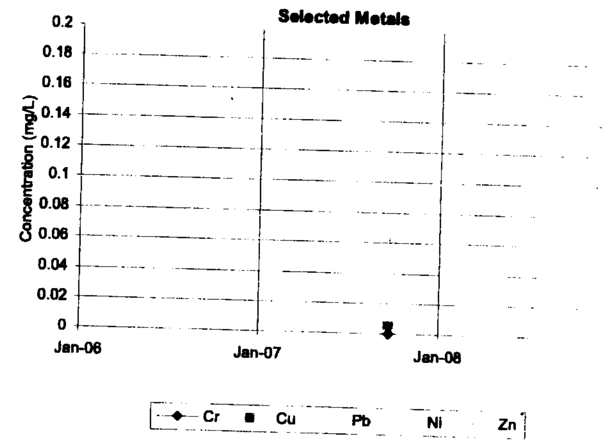

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

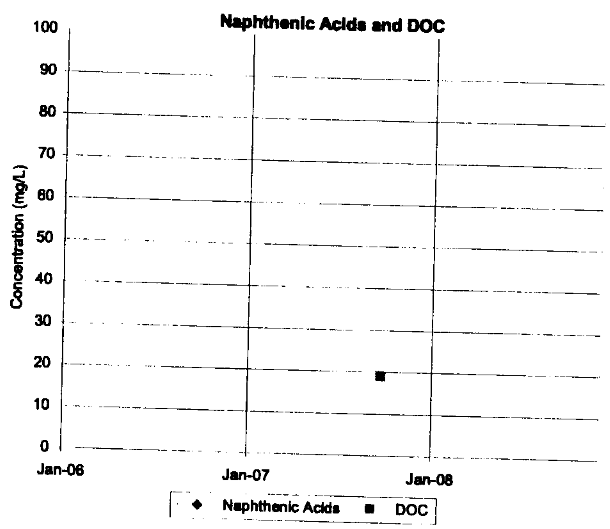

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

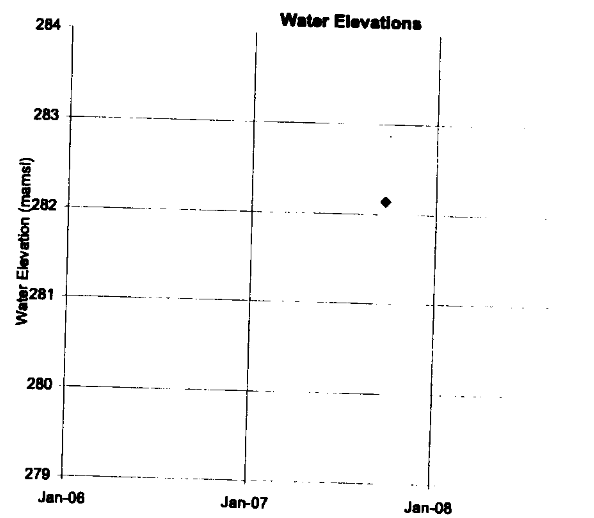

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734411

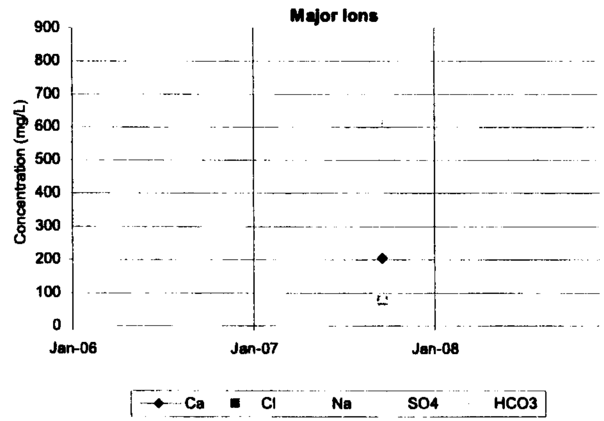

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

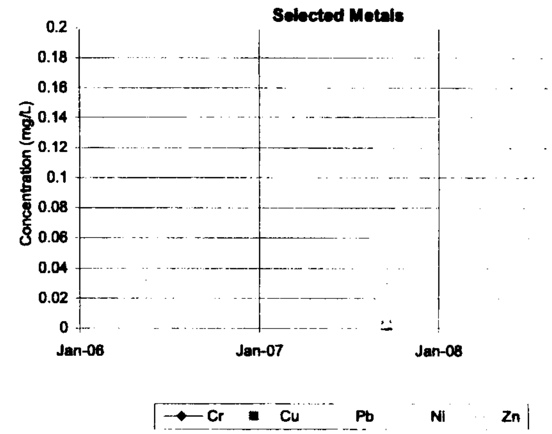

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

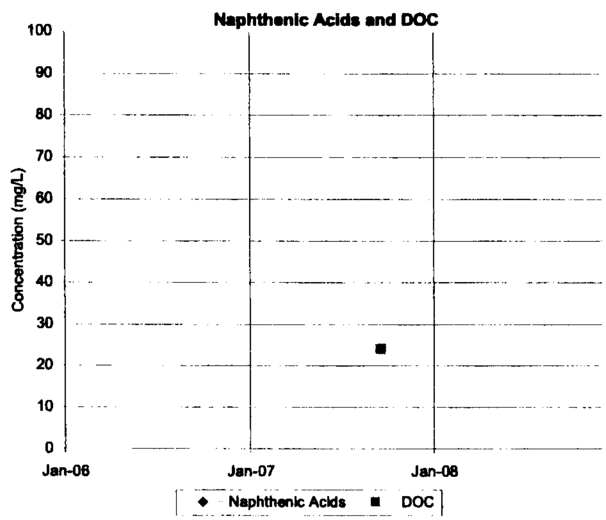

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

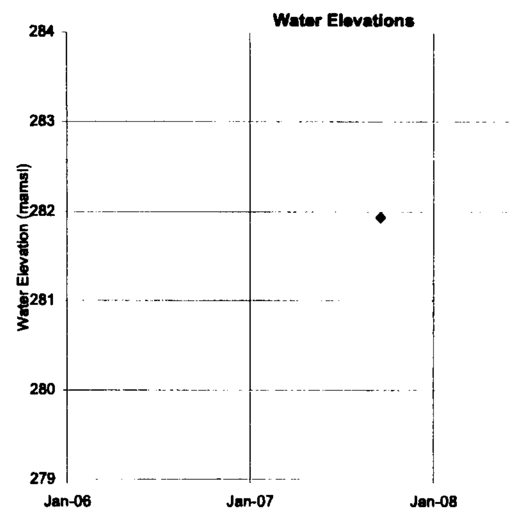

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734412

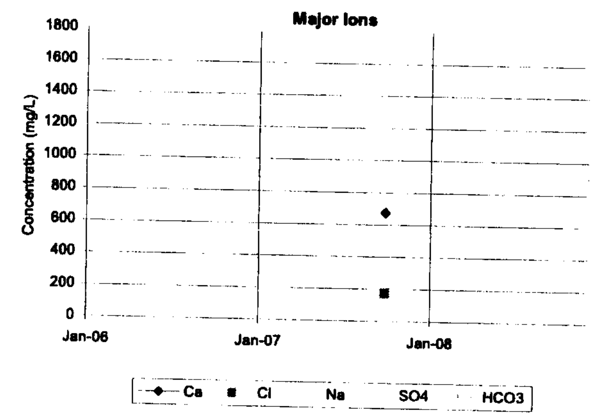

Major Ions
Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

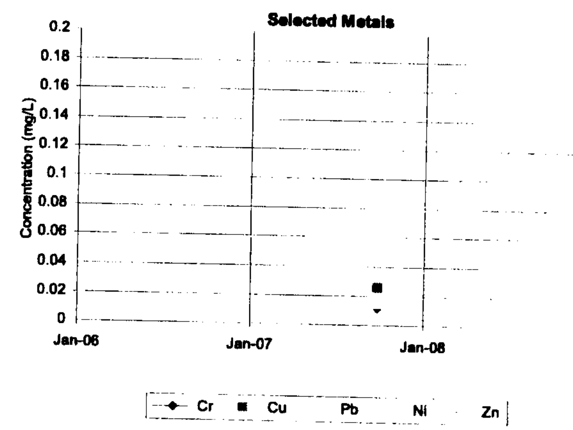

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

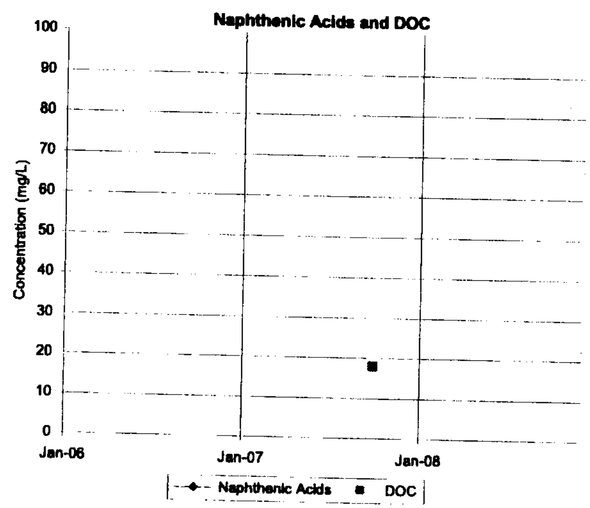

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

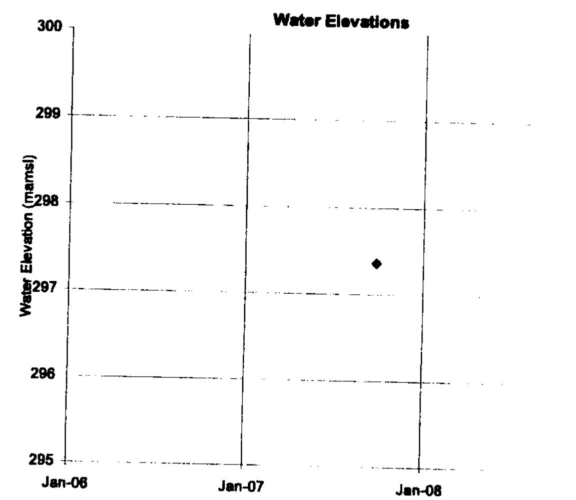

Water Elevations
Water Elevation (mamsl)
284
283
282
281
280
279
Jan-06
Jan-07
Jan-08

OWS0734413

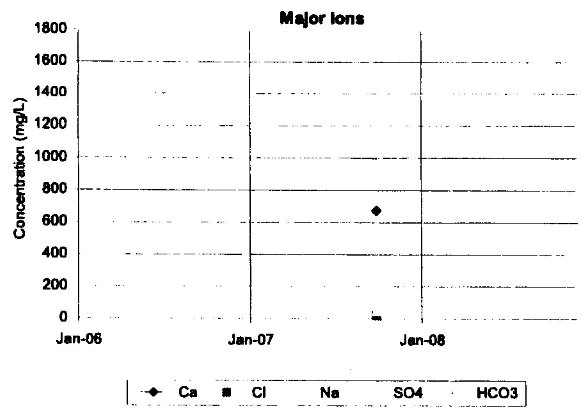

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

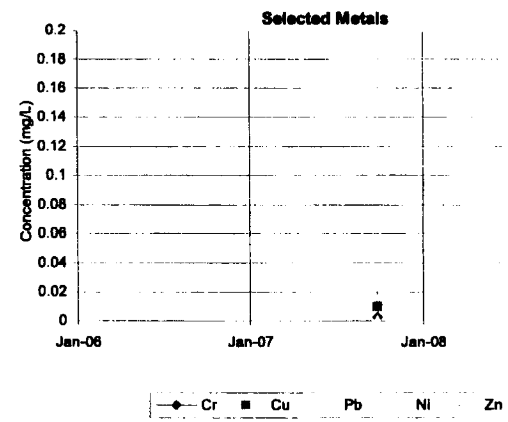

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
300
299
298
297
296
295
Jan-06
Jan-07
Jan-08

OWS0734414


Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
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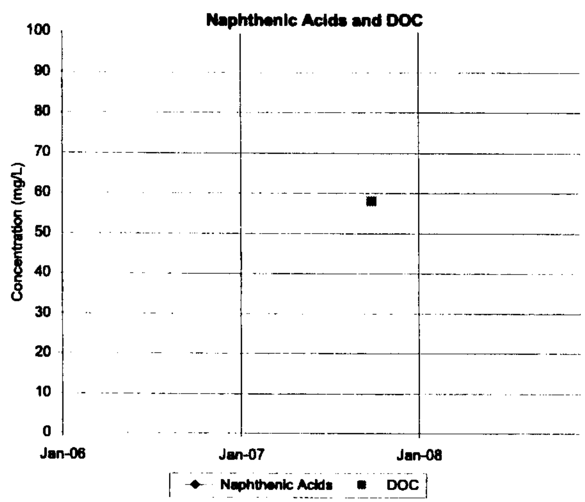
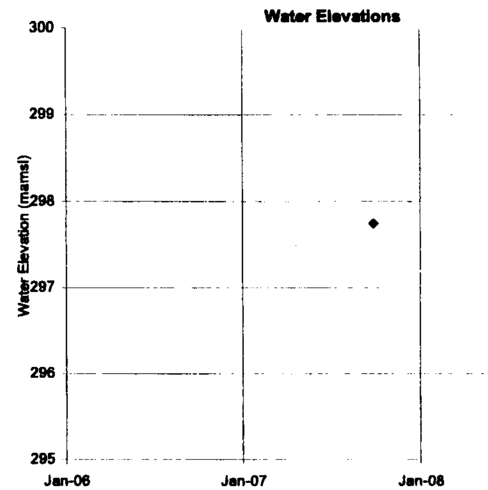
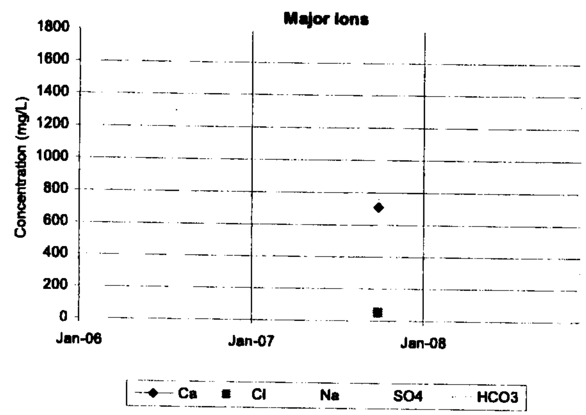
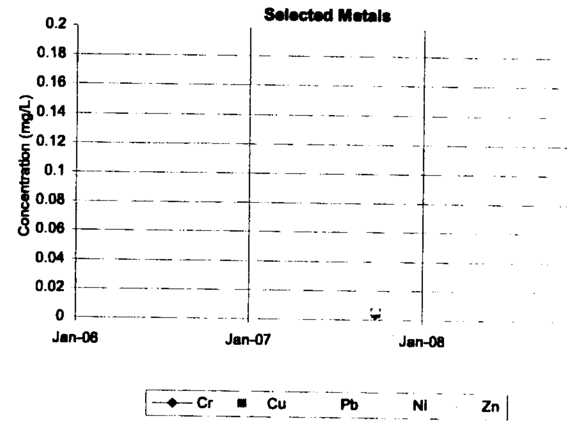
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn

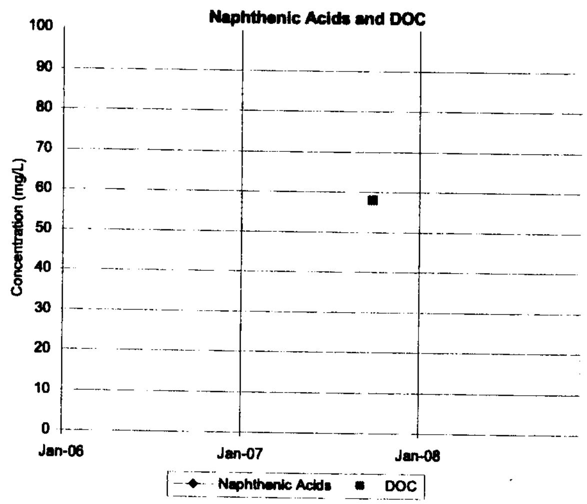

Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC

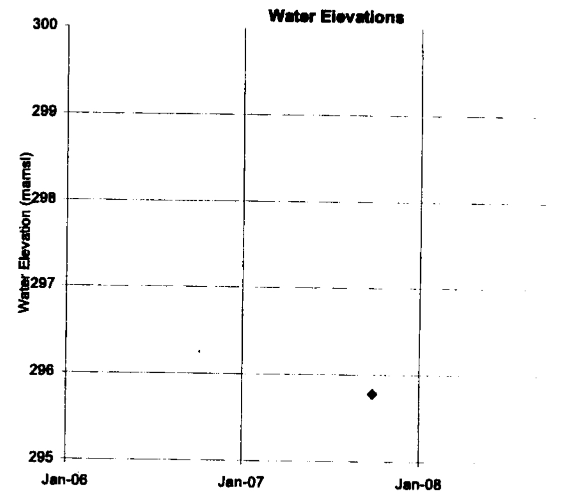

Water Elevations
Water Elevation (mamsl)
300
299
298
297
296
295
Jan-06
Jan-07
Jan-08

OWS0734416

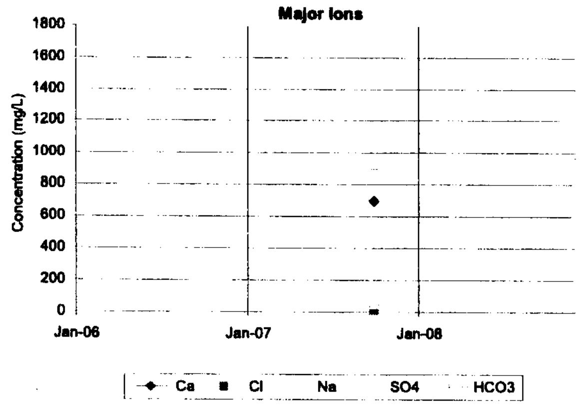

Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3

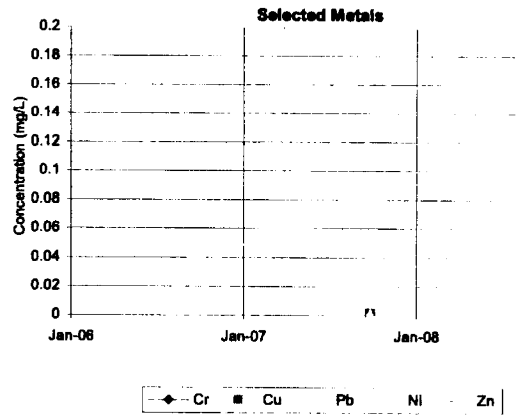

Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
300
299
298
297
296
295
Jan-06
Jan-07
Jan-08

OWS0734417


Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
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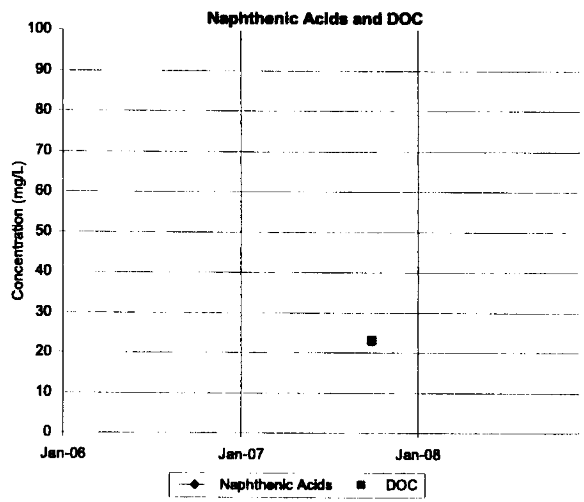
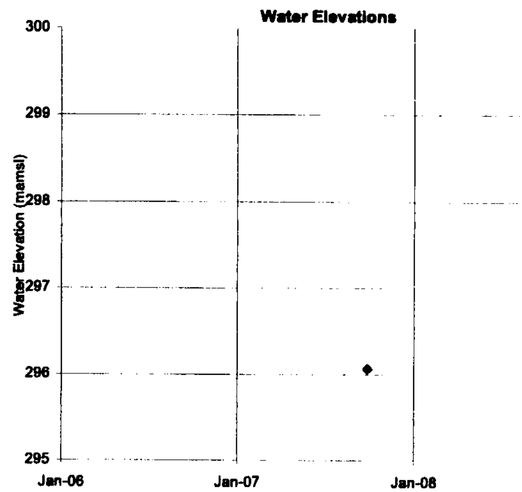
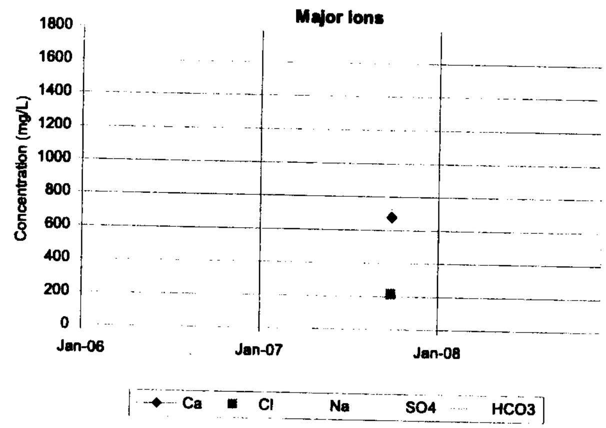
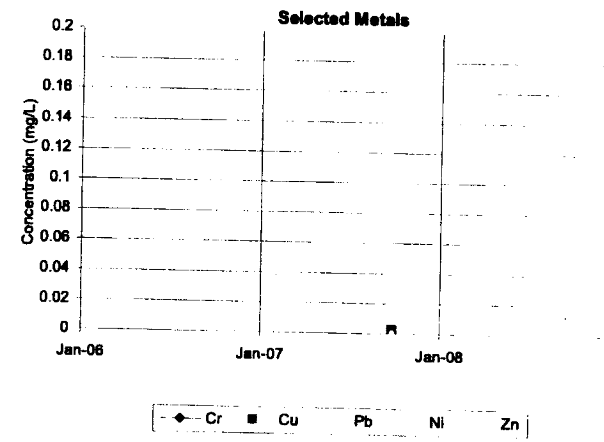
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
300
299
298
297
296
295
Jan-06
Jan-07
Jan-08

OWS0734418


Major Ions
Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Ca
Cl
Na
SO4
HCO3


Selected Metals
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
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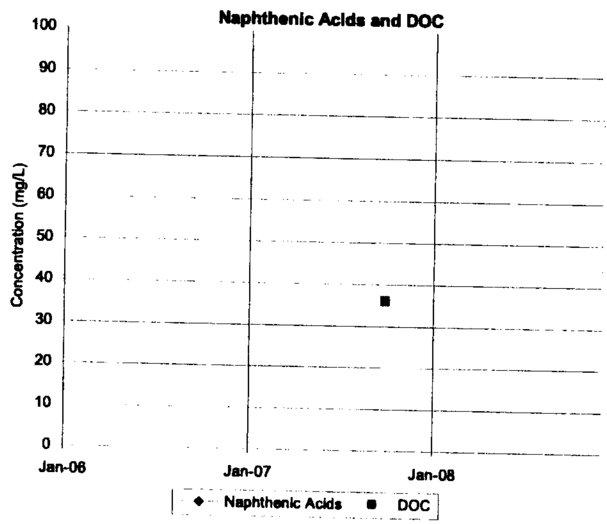
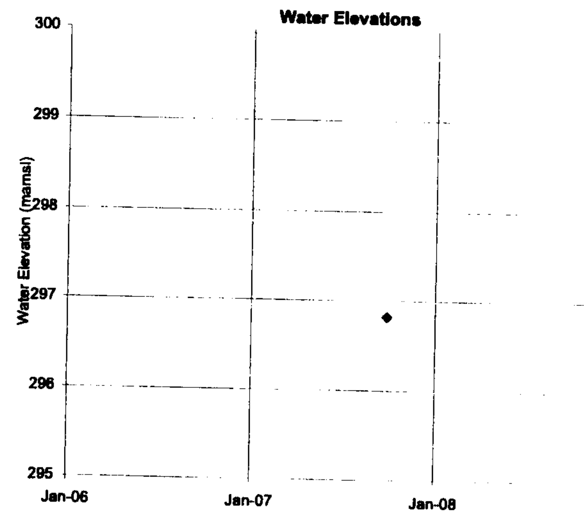
0
Jan-06
Jan-07
Jan-08
Cr
Cu
Pb
Ni
Zn


Naphthenic Acids and DOC
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Naphthenic Acids
DOC


Water Elevations
Water Elevation (mamsl)
300
299
298
297
296
295
Jan-06
Jan-07
Jan-08

APPENDIX C

ADDITIONAL ANALYTICAL DATA FOR LOCATION ATP BY SYNCRUDE RESEARCH

Table : Properties of Surface and MFT Pore Waters from Syncrude's Aurora Settling Pond: July 27, 2007
Station 1. Surface Elevation 320.3m (AMSL)

	Water Zone	FINE TAILS ZONE				
Depth	**2m**	**10m**	**11m**	**13m**	**15m**	**20m**
General						
Elevation (AMSL) (m)	318	310	309	307	305	300
pH (units)	8.35	8.17	7.86	7.9	7.79	7.78
Conductivity (uS/cm)	2980	3050	3010	2880	2760	2750
Temperature (C)	23.6	12.8	12.2	12.5	12.7	13
Dissolved Solids (% by wt)**	0.175	0.178	0.178	0.164	0.166	0.164
Solids Content (g/100g)	0.04	17.6	26.62	33.46	37.33	35.11
Methylene Blue (mls 6mN/100g)						
Alkalinity ($mg.L^{-1}$)**	566	589	601	679	723	725
Chem. Oxygen Demand ($mg.L^{-1}$)**	194	174		140	138	188
Biol. Oxygen Demand ($mg.L^{-1}$)	2.2					
Dissolved Oxygen ($mg.L^{-1}$)						
Redox Potential (mV)	140	134		128	92	62
Phenols ($mg.L^{-1}$)**	0.01	0.012		0.012	0.011	0.026
Cyanide ($mg.L^{-1}$)**	0.003	0.002		0.002	0.002	0.003
Sulphides ($mg.L^{-1}$)	<0.01	<0.01		<0.01	<0.01	<0.01
Total Pet. Hydrocarbon ($mg.L^{-1}$)	11.6					
Bitumen Content (% by wt)		0.29	0.42	4.94	1.54	4.54
Naphtha Content (% by wt)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dis. Organic Carbon ($mgC.L^{-1}$)**	45	44		35	34	57
Naphthenic Acids ($mg.L^{-1}$)	79.6	79.9		58.8	49.3	63.3
Tannin&Lignin ($mg.L^{-1}$)**	1	1.4		1.3	1.4	3.5
Surfactants (MBAS) ($mg.L^{-1}$)**	1	1		1	1	1
Hardness (as $CaCO_3$)**	107	118	142	119	184	191
Acute Toxicity						
IC_{50} (% by vol)						
IC_{20} (% by vol)						
Nutrients						
o-Phosphate ($mgP.L^{-1}$)	0.016	0.012		0.011	0.011	0.063
Total Phosphorous ($mgP.L^{-1}$)	0.06	0.06		0.06	0.06	0.08
Ammonia ($mgN.L^{-1}$)	4.21	3.92	3.38	2.71	3.15	3.21
Nitrate + Nitrite ($mgN.L^{-1}$)	0.072	0.01		0.003	0.003	
Total Nitrogen ($mgN.L^{-1}$)	4.15	4.84		3.5	3.28	3.81
Major Ions ($mg. L^{-1}$)						
I) Cations						
Na^+	613	611	590	543	522	529
K^+	18	23	31	15	16	17
Mg^{++}	13	15	19	16	22	20
Ca^{++}	21	22	25	21	37	43
II) Anions						
F^-	BDL	BDL	BDL	BDL	BDL	BDL
Cl^-	380	380	370	390	400	410
$SO_4^=$	337	324	292	101	27.1	13.3
$CO_3^=$	0	17.7	16.8	7.8	0	0
HCO_3^-	691	683	699	812	882	884

* Samples from Station1 in Aurora TP, July 27, 2007: 6352700N, 474400E (UTM). Surface elevation: 320.5m (AMSL). ** Fine Tails Pore Water (centrifuged at 30 000g and 0.45u filter-passing)

Table : Properties of Surface Zone Waters from Syncrude's Aurora Settling Basin: 2002-2007

VARIABLES	Surface Zone Waters of ATP					
	2007	**2006**	**2005**	**2004**	**2003**	**2002**
General						
Surface Elevation (AMSL) (m)	318	315	310	305	301	
pH (units)	8.35	8.14	8.26	7.97	8.15	8.18
Conductivity (uS/cm)	2980	2750	2500	2330	2330	2290
Temperature ©	23.6					
Dissolved Solids (% wt)**	0.175	0.172	0.162	0.15	0.153	0.153
Solids Content (g/100g)	0.04	<0.01	<0.01	0.03	0.155	0.163
Alkalinity ($mg.L^{-1}$)**	566	529	492	525		
COD ($mg.L^{-1}$)**	194	186	152	146		
BOD ($mg.L^{-1}$)	2.2	0.5	0.5	1.4		
DO ($mg.L^{-1}$)				-		
Eh (mV)	140	71		249		
Phenols ($mg.L^{-1}$)**	0.01	0.007	0.002	<0.01		
Cyanide ($mg.L^{-1}$)**	0.003	0.002	0.002	0.003		
Sulphides ($mg.L^{-1}$)	<0.01			<0.01		
TPH ($mg.L^{-1}$)	11.6	2	14	2		
Bitumen Content (% by wt.)						
Naphtha Content (% by wt)	<0.01					
DOC ($mgC.L^{-1}$)**	45	36	34.9	36.2		
Naphthenic Acids (mg/L)	79.6	62.5	54	46.5	34	35
Tannin&Lignin ($mg.L^{-1}$)**	1	1	<0.5	0.5		
Surfactants (MBAS) ($mg.L^{-1}$)**	1	1	1	<0.7		
Hardness (as $CaCO_3$)**	107	147	165	219	237	205
IC_{50} (% by vol)			-	>100	100	100
IC_{20} (% by vol)			-	82	51	25
o-Phosphate ($mgP.L^{-1}$)	0.016	0.012	0.008	0.019	BDL	BDL
Tot. Phosphorous ($mgP.L^{-1}$)	0.06	0.02	0	0.09	BDL	BDL
Ammonia ($mgN.L^{-1}$)	4.21	2.45	1.24	1.5	1.64	0.01
Nitrate + Nitrite ($mgN.L^{-1}$)	0.072	1.3	0.19	0.284		
Tot. Nitrogen ($mgN.L^{-1}$)	4.15	1.3	1.8	2.68		
Major Ions (mg/L)						
i) Cations						
Sodium (Na^+)	613	576	542	495	483	459
Potassium (K^+)	18	22.8	19.3	17.5	15.8	14.4
Magnesium (Mg^{++})	13	18.6	18.6	21.6	21.9	19.7
Calcium (Ca^{++})	21	27.9	34.8	51.6	58.4	49
ii) Anions						
Fluoride (F^-)	BDL	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (Cl^-)	380	380	365	370	350	385
Sulphate ($SO_4^=$)	337	273	243	201	174	145
Carbonate ($CO_3^=$)	0	16.5	0	0	0	0
Bicarbonate (HCO_3^-)	691	612	600	640	594	633

Table : Trace and Major Elements in Aurora Settling Pond Waters: 2007

		Surface Zone ("Free" Water) **	Fine Tails Zone (Pore Water)**				
Depth	units	**2m**	**10m**	**11m**	**13m**	**15m**	**20m**
Trace							
Aluminum (Al)	mg/L	0.2	0		0.6	0	0
Antimony (Sb)	mg/L	0.008	0.003		0.002	0.001	0
Arsenic (As)	mg/L	<0.001	<0.001		0.006	0.006	<0.001
Barium (Ba)	mg/L	0.25	0.22		0.17	0.79	0.83
Beryllium (Be)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001
Boron (B)	mg/L	1.4	2.3		2.7	2.7	2.1
Cadmium (Cd)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001
Calcium (Ca)	mg/L	21	22	25	21	37	43
Chromium (Cr)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001
Cobalt (Co)	mg/L	0.008	0.007		<0.001	<0.001	<0.001
Copper (Cu)	mg/L	0.006	0.008		<0.001	0.002	<0.001
Iron (Fe)	mg/L	<0.001	<0.001		0.003	0.004	0.003
Lead (Pb)	mg/L	<0.001	<0.001		<0.001	0.6	0.7
Lithium (Li)	mg/L	0.2	0.2		<0.001	<0.001	<0.001
Magnesium (Mg)	mg/L	13	15	19	0.2	0.2	0.2
Manganese (Mn)	mg/L	0.07	0.12		16	22	20
Mercury (Hg)	mg/L	<0.05	<0.05		0.02	0.09	0.25
Molybdenum (Mo)	mg/L	0.11	0.105		<0.05	<0.05	<0.05
Nickel (Ni)	mg/L	0.013	0.016		0.052	0.018	0.006
Potassium (K)	mg/L	18	23	31	0.009	0.008	0.008
Selenium (Se)	mg/L	<0.005	<0.005		15	16	17
Silicon (Si)	mg/L	2.1	2.8		<0.005	<0.005	<0.005
Silver (Ag)	mg/L	<0.0005	<0.0005		4	4.7	5.6
Sodium (Na)	mg/L	613	611	590	<0.0005	<0.0005	<0.0005
Strontium (Sr)	mg/L	0.7	0.8		543	522	529
Sulphur (S)	mg/L	80	87	81	0.8	1.1	0.9
Thallium (Tl)	mg/L	<0.001	<0.001	<0.001	22	12	6
Tin (Sn)	mg/L	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001
Titanium (Ti)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg/L	0.009	0.008	0.008	<0.005	<0.005	0.006
Vanadium (V)	mg/L	<0.005	<0.005	<0.005	0.009	0.003	0.002
Zinc (Zn)	mg/L	0.15	0.15	0.13	<0.005	<0.005	<0.005
Zirconium (Zr)	mg/L	<0.01	<0.01	<0.01	0.11	0.09	0.07
					<0.01	<0.01	<0.01

*Dissolved: 0.45u filter-passing. Analyzed using ICP/MS (except As, Se, Sb by Hydride AA and Hg by Cold Vapour AA) by Maxxam Analytical. All values expressed in mg/L.

** Samples from Station1 in Aurora TP, July 27, 2007: 6352700N, 474400E (UTM). Surface elevation: 320.5m (AMSL). Fine Tails Pore Water (centrifuged at 30 000g and 0.45u filter-passing)

Table : PAH Concentrations in Surface and Fine Tails Zones of Aurora TP: 2007

		PAH Concentrations (mg/kg)				
	Mol wt	Surface	Fine Tails Zone			
Depth		**2m**	**10m**	**13m**	**15m**	**20m**
Solids Content (wt%)**		<0.02		23.6	36.4	39.4
Hydrocarbon (wt%)**		<0.01		0.86	2.49	5.43
Naphtha (wt%)**		<0.01		<0.01	0.07	
Naphthalene*	128	<0.0001	0.36	0.07	<0.5	<0.5
Methyl naphthalene	142	<0.0001	0.59	0.11	<0.5	<0.5
C2-Subst'd Naphthalene	156	<0.0001	0.65	0.14	<0.5	<0.5
C3-Subst'd Naphthalene	170	<0.0001	0.42	0.19	4.0	4.3
C4-Subst'd Naphthalene	184	<0.0001	0.28	0.70	9.8	8.4
Benzo(b)thiophene	134	<0.002	<0.2	<0.2	<0.2	<0.2
Methyl Benzo(b)thiophene	148	<0.002	<0.2	<0.2	<0.2	<0.2
C2 sub'd Benzo(b)thiophene	162	<0.004	<0.4	<0.4	<0.4	<0.4
C3 sub'd Benzo(b)thiophene	176	<0.004	<0.4	<0.4	<0.4	<0.4
C4 sub'd Benzo(b)thiophene	190	<0.004	<0.4	<0.4	<0.4	<0.4
Acenaphthylene*	152	<0.0001	<0.05	<0.05	<0.5	<0.5
Acenaphthene*	154	<0.0001	<0.05	<0.05	<0.5	<0.5
Methyl Acenaphthene	168	<0.0001	<0.05	<0.05	0.6	0.5
Fluorene*	166	<0.0001	<0.05	<0.05	<0.5	<0.5
Methyl Fluorene	180	<0.0001	0.09	0.30	3.1	3.3
C2-Subst'd Fluorene	194	<0.0001	0.21	0.92	9.5	9.8
C3-Subst'd Fluorene	208	<0.0001	0.36	1.4	13	13
Biphenyl	154	<0.0001	0.09	<0.05	<0.5	<0.5
Methyl Biphenyl	168	<0.0001	<0.05	<0.05	<0.5	<0.5
C2-Subst'd Biphenyl	182	<0.0001	<0.05	<0.05	<0.5	<0.5
Phenanthrene*	178	<0.0001	0.09	<0.05	1.8	1.9
Anthracene*	178	<0.0001	<0.05	<0.05	<0.5	<0.5
Methyl Phenan/Anthracene	192	<0.0001	0.26	0.66	17	17
C2-Subst'd Phenan/Anthracene	206	<0.0001	0.76	3.0	30	30
C3-Subst'd Phenan/Anthracene	220	<0.0001	0.88	3.0	27	26
C4-Subst'd Phenan/Anthracene	234	<0.0001	1.5	4.0	38	33
Retene (1-Methyl-7-Isopropyl-Phenanthrene)	219	<0.0001	<0.05	0.16	0.8	0.7
Dibenzothiophene*	184	<0.0001	<0.05	0.07	<0.5	<0.5
Methyl Dibenzothiophene	198	<0.0001	0.15	0.63	5.8	5.8
C2-Subst'd Dibenzothiophene	212	<0.0001	0.51	2.3	22	23
C3-Subst'd Dibenzothiophene	226	0.0002	0.86	3.3	27	26
C4-Subst'd Dibenzothiophene	240	<0.0001	0.80	2.4	21	20
Fluoranthene*	202	<0.0001	<0.05	<0.05	<0.5	<0.5
Benzo(j)fluoranthene	252	<0.0001	<0.05	<0.05	<0.5	<0.5
Pyrene*	202	<0.0001	0.07	0.13	1.0	1.0
Methyl Pyrene/Fluoranthene	216	<0.0001	0.22	0.46	3.6	3.9
C2 sub'd fluoranthene/pyrene	230	0.0001	0.29	0.73	5.6	5.9
C3 sub'd fluoranthene/pyrene	244	<0.0001	0.30	0.89	7.3	7.9
Benzo(a)Anthracene/ Chrysene *	228	<0.0001	0.12	0.35	3.2	3.4
Chrysene	228	<0.0001				
Methyl Chrysene/Benz(a)Anthrac.	242	<0.0001	0.20	0.56	4.7	5.0
C2-Subst'd Chrysene/Benz(a)Anthrac.	256	<0.0001	0.25	0.66	5.2	5.8
Benzo[b&k]Fluoranthene*	252	<0.0001	<0.05	<0.05	<0.5	<0.5
Benzo[a]Pyrene*	252	<0.0001	<0.05	<0.05	<0.5	<0.5
Methyl Benzo[a] Pyrene /Benzo[b&k]Fluoranthene	266	<0.0001	0.11	0.23	2.7	2.9
C2-Subst'd Benzo[a] Pyrene /Benzo[b&k]Fluoranthene	280	<0.0001	<0.05	0.28	2.0	1.9
Indeno[c,d-1,2,3]Pyrene*	276	<0.0001	<0.05	<0.05	<0.5	<0.5
Dibenzo[a,h]Anthracene*	278	<0.0001	<0.05	<0.05	<0.5	<0.5
Benzo[g,h,i]Perylene*	276	0.0004	<0.05	<0.05	<0.5	<0.5

Priority PAH's as defined in the US EPA Protocol (Method 625) plus alkyl derivatives.

GC/MS analyses performed by Enviro-Test Laboratories, Edmonton, Alberta.

* Samples from Station 1 in Aurora TP, July 27, 2007: 6352700N, 474400E (UTM). Surface elevation: 320.5m (AMSL)

APPENDIX C

Table : Fractionation of extractable organics in Aurora TP: 2007

A) Extractable Organics: Gravimetric Analysis

SAMPLE	FRACTIONS OF EXTRACTABLE ORGANIC MATERIAL				
	ACID EXTRACT*	BASE/NEUTRAL EXTRACT**			
		Total	Alumina Column Fractions		
			Fraction 1	Fraction 2	Fraction 3
a. "Free Water" Zone (ug/L) [a]					
1. Total Sample (2m)	55000	<8000	<8000	<8000	<8000
2. Dissolved Fraction (2m)					
b. Fine Tails Zone **(mg/kg of dry weight)** [b]					
2. Fine Tails (includes SPM and Bitumen) (mg/kg of dry weight)					
Depth: 10m	6200	2600	<1000	<1000	<1000
Depth: 13m	2500	11000	4900	1300	<500
Depth: 15m	9700	100000	41000	20000	1500
Depth: 20m	5400	110000	43000	17000	1100
Depth: 20m(duplicate)	4100	94000	36000	18000	2000

* acid (pH=2) partition of the dichloromethane soxhlet extraction of sample (see following Table for Elution Profile).

** base/neutral partition of dichloromethane extract of sample. B/N extract separated into three fractions on an alumina column based on polarity. NB. Volatile components less than C7 not included. Quantitation by gravimetric analysis of each fraction.

a) Detection Limit: 8000ug/L b) Detection Limit: 500 or 1000mg/kg

Samples from Station 1 in Aurora TP, July 27, 2007: 6352700N, 474400E (UTM). Surface elevation: 320.5m (AMSL)

**** Elution Profile of Alumina Adsorbent for Base/Neutral Extract**

FRACTION	ELUTION SOLVENT	CHEMICAL CLASS REPRESENTED (based on polar character)
1	Pentane	Saturates/Olefins and MonoAromatics
2	Benzene	PAH's and Polycyclic Aromatic Sulphur Hydrocarbons
3	Chloroform	PAHN's Heterocyclics

B.) Extractable Organics: GC/FID Analysis

SAMPLE	FRACTIONS OF EXTRACTABLE ORGANIC MATERIAL				
	ACID EXTRACT*	BASE/NEUTRAL EXTRACT**			
		Total	Alumina Column Fractions		
			Fraction 1	Fraction 2	Fraction 3
a. "Free Water" Zone (ug/L) [a]					
1. Total Sample (2m)	38000	5200	1700	720	650
2. Dissolved Fraction (2m)					
b. Fine Tails Zone **(mg/kg of dry weight)** [b]					
2. Fine Tails (includes SPM and Bitumen) (mg/kg of dry weight)					
Depth: 10m	170	2500	1500	380	20
Depth: 13m	760	8000	5500	1200	120
Depth: 15m	4700	61000	40000	11000	900
Depth: 20m	3900	59000	39000	9000	780
Depth: 20m(duplicate)	2500	56000	35000	9600	780

* acid (pH=2) partition of the dichloromethane soxhlet extraction of sample (see following Table for Elution Profile).

** base/neutral partition of dichloromethane extract of sample. B/N extract separated into three fractions on an alumina column based on polarity. NB. Volatile components less than C7 not included. Quantitation by GC/FID of each fraction.

a) Detection Limit: 50ug/L b) Detection Limit: 20mg/kg

Samples from Station 1 in Aurora TP, July 27, 2007: 6352700N, 474400E (UTM). Surface elevation: 320.5m (AMSL)

**** Elution Profile of Alumina Adsorbent for Base/Neutral Extract**

FRACTION	ELUTION SOLVENT	CHEMICAL CLASS REPRESENTED (based on polar character)
1	Pentane	Saturates/Olefins and MonoAromatics
2	Benzene	PAH's and Polycyclic Aromatic Sulphur Hydrocarbons
3	Chloroform	PAHN's Heterocyclics

Table : Concentrations of BTEX VOCs in Aurora TP: 2007

COMPOUND	SOURCE OF SAMPLE				
	SURFACE ZONE WATERS	*FINE TAILS (ug/g)*			
	2m	*10m*	*13m*	*15m*	*20m*
VOLATILE ORGANIC					
Benzene*		<0.03	<0.01	<0.01	<0.01
Toluene*		<0.05	<0.02	<0.02	<0.02
Ethylbenzene*		<0.05	<0.02	<0.02	<0.02
Xylenes*		<0.1	<0.04	<0.04	0.04
Solids and Hydrocarbon Content (g/100g)**					
Solids (g/100g)	<0.04	17.6	33.5	37.3	35.1
Bitumen (g/100g)	<0.01	0.29	4.94	1.54	4.54
Naphtha (g/100g)	<0.01	<0.01	<0.01	<0.01	<0.01

*BTEX analysis (EPA SW-846). BTEX analysis by Enviro-Test Laboratories, Edmonton, AB

** OWS and Naphtha analysis performed at Syncrude Research, Edmonton.

Samples from Station 1 in Aurora TP, July 27, 2007: 6352700N, 474400E (UTM). Surface elevation: 320.5m (AMSL)

APPENDIX D: Well Completion Data

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	OWS9710011	OWS9710026	OWS9710027	OWS9710028	OWS9734001	OWS9734002	OWS9734003	OWS9734004	OWS9734005	OWS9734006	OWS9734007
Northing	6354223.21	6353480.57	6354324.91	6354489.36	6351223.43	6352628.24	6352436.69	6352826.55	6352597.16	6352597.16	6352040.53
Easting	472142.1	475929.05	474928.72	473836.87	469143.99	469543.66	469947.07	470743.13	470965.69	470965.69	471328.03
Ground Elevation	297.64	286.68	293.13	296.16	301.58	299.2	299.72	299.16	299.58	299.58	297.63
Depth of Hole	8.23	2.54	6.86	6.3	8.07	6.22	7.62	8.23	3.79	7.32	5.49
Well Stickup	0.9	0.86	0.91	0.91	0.77	1.19	1.27	0.99	1	1.65	0.76
Well Elevation	298.54	287.54	294.04	297.07	302.35	300.39	300.99	300.15	300.58	301.23	298.39
Top of Bentonite	1.83	0.61	0	0	2.4	1.16	1.52	3.05	0.61	3.05	1.83
Top of Sand	3.47	1.22	1.83	1.98	3.93	2.38	3.05	4.57	1.04	3.96	2.74
Top of Screen	5.18	1.78	4.32	3.91	5.15	3.3	4.57	5.18	1.65	4.27	3.35
Bottom of Screen	6.71	2.69	5.79	5.38	6.61	4.76	6.1	6.71	3.18	5.79	4.88
Bottom of Well	8.23	2.69	6.86	6.3	8.07	6.22	7.62	8.23	3.78	7.32	5.49
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	1/29/1997	3/19/1997	3/22/1997	3/22/1997	1/21/1997	1/21/1997	1/21/1997	1/20/1997	4/2/1997	1/18/1997	1/25/1997

	OWS9734008	OWS9734009	OWS9734010	OWS9734012	OWS9734014	OWS9734015	OWS9734017	OWS9734018	OWS9734020	OWS9734021	OWS9734022
Northing	6351716.3	6351222.97	6350827.58	6353382.27	6351807.89	6350950.45	6350825.99	6350156.73	6350566.25	6350981.76	6350981.76
Easting	471151.21	470340.43	469541.41	472506.46	471943.62	471435.79	471143.52	471586.11	475095.2	475582.08	475582.08
Ground Elevation	297.41	298.05	299.49	299.01	295.57	293.9	293.77	293.22	282.22	282.33	282.33
Depth of Hole	5.18	3.96	4.13	8.23	4.42	4.27	5.49	4.57	2.59	3.96	3.05
Well Stickup	0.77	0.76	0.55	0.75	1.02	0.53	1.12	0.86	0.91	0.79	0.46
Well Elevation	298.18	298.81	300.04	299.76	296.59	294.43	294.89	294.08	283.13	283.12	282.79
Top of Bentonite	1.22	0.91	1.45	0.91	0.91	0.91	1.52	0.3	0.61	1.52	1.07
Top of Sand	2.74	1.83	2.06	2.59	2	1.83	3.05	2.13	1.07	3.05	1.22
Top of Screen	3.05	1.96	2.36	3.5	2.96	2.43	3.66	2.43	1.6	3.35	2.74
Bottom of Screen	4.57	3.48	3.82	6.4	4.42	3.96	5.18	3.96	2.59	3.96	3.05
Bottom of Well	5.18	3.96	4.13	7.92	4.42	4.26	5.49	4.57	2.59	3.96	3.05
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	1/25/1997	1/24/1997	1/24/1997	1/30/1997	3/7/1997	1/27/1997	1/27/1997	1/27/1997	3/22/1997	1/28/1997	1/28/1997

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	OWS9734023	OWS9734024	OWS9734025	OWS973416A	OWS973416B	OWS9834755	OWS9934761	OWS9934762	OWS0010765	OWS0010766	OWS0110-01
Northing	6351425.91	6352926.73	6352609.53	6352442.7	6352442.7	6350230.06	6351952.1	6350908.8	6353802.9	6353941.3	6354227.59
Easting	475847.49	473388	473745.14	475947.81	475947.81	468889.75	475838.1	475501.2	475431.5	475054.5	474207.82
Ground Elevation	282.52	294.68	292.51	283.49	283.49	299.08	282.56	282.03	290.99	293.5	293.802
Depth of Hole	2.44	4.57	4.88	5.59	8.23	6.1	5.79	4.57	6.1	6.1	7
Well Stickup	0.69	0.36	0.97	0.86	0.91	1	0.91	0.91	0.91	0.76	1.1
Well Elevation	283.21	295.04	293.48	284.35	284.4	300.08	283.47	282.94	291.9	294.26	294.902
Top of Bentonite	0.3	0.91	1.22	1.22	0.91	0	0	0	0	0	0
Top of Sand	1.07	2.44	2.74	2.44	1.98	0.9	3.35	3.13	3.96	3.66	2.74
Top of Screen	1.22	2.74	3.35	4.06	7.01	1.6	4.1	3.2	4.57	4.57	3.96
Bottom of Screen	2.13	4.27	4.57	5.59	8.23	2.5	5.64	4.42	6.1	6.1	5.49
Bottom of Well	2.44	4.57	4.87	5.59	8.23	2.5	5.64	4.42	6.1	6.1	5.49
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	1/28/1997	1/29/1997	1/29/1997	3/20/1997	3/19/1997	12/10/1998	3/11/1999	3/11/1999	8/16/2000	8/16/2000	2/27/2001

	OWS0110-02	OWS0110-03	OWS0110-04	OWS0134-05	OWS0134-06	OWS0134-07	OWS0134-08	OWS0134-09	OWS0134-10	OWS0134-11	OWS0134-12
Northing	6354225.86	6354057.59	6353358.55	6353123.52	6352987.08	6352965.05	6352610.75	6352605.14	6351425.55	6350429.28	6350317.45
Easting	474671.81	474673.51	475542.82	475850.38	476096.24	476367.93	475754.99	475950.87	475733.69	474871.54	474765.17
Ground Elevation	292.985	292.95	287.514	285.383	284.652	284.012	283.749	283.387	282.177	281.661	281.777
Depth of Hole	7	7.6	4.3	3.7	8.8	5.2	5.8	7	3.2	4	2.7
Well Stickup	1	1	0.75	0.65	1	0.9	0.95	1	0.85	0.9	0.9
Well Elevation	293.985	293.95	288.264	286.033	285.652	284.912	284.699	284.387	283.027	282.561	282.677
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	2.74	3.66	3.35	1.83	7.01	4.27	3.81	5.79	1.22	3.05	1.83
Top of Screen	3.05	3.96	3.66	2.13	7.32	4.57	4.27	6.35	1.68	3.35	2.13
Bottom of Screen	3.81	5.49	4.27	3.66	8.84	5.18	5.79	6.96	3.2	3.96	2.74
Bottom of Well	3.81	5.49	4.27	3.66	8.84	5.18	5.79	6.96	3.2	3.96	2.74
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	2/27/2001	2/24/2001	2/22/2001	2/22/2001	2/22/2001	2/23/2001	2/28/2001	2/28/2001	3/2/2001	3/2/2001	3/2/2001

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	OWS0134-13	OWS0134-14	OWS0134-15	OWS0134-16	OWS0134-17	OWS0210-11	OWS021012A	OWS021012B	OWS0210-13	OWS0234-01	OWS023402A
Northing	6350232.12	6350154.22	6350150.59	6350152.03	6350237.36	6355128.28	6354969.34	6354970.28	6354791.53	6352450.51	6352448.62
Easting	474849.77	473975.58	473573.08	473221.81	470015.2	475045.35	474665.56	474667.48	474294.07	475811.82	475947.5
Ground Elevation	281.491	284.012	284.694	289.505	294.742	293.03	293.56	293.55	294.17	283.21	282.92
Depth of Hole	2.7	4	4.3	1.2	2.1	15.24	13.72	13.72	13.72	9.14	9.14
Well Stickup	0.9	0.9	1	1	0.9	0.91	0.94	0.99	0.91	0.89	1.12
Well Elevation	282.391	284.912	285.694	290.505	295.642	293.94	294.5	294.54	295.08	284.1	284.04
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	1.52	3.2	2.59	0.3	1.22	3.05	2.74	3.96	3.05	4.19	3.51
Top of Screen	1.83	3.35	2.74	0.46	1.52	6.83	3.06	7.19	4.47	4.5	3.87
Bottom of Screen	2.74	3.96	4.27	1.22	2.13	8.36	4.58	8.71	5.99	6.02	5.4
Bottom of Well	2.74	3.96	4.27	1.22	2.13	8.36	4.58	8.71	5.99	6.02	5.4
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	4/18/2001	3/1/2001	3/1/2001	3/1/2001	3/3/2001	4/8/2002	4/9/2002	4/9/2002	4/9/2002	2/26/2002	2/27/2002

	OWS023402B	OWS0234-03	OWS0234-04	OWS0234-05	OWS0234-06	OWS0234-07	OWS0234-08	OWS0234-09	OWS0234-10	OWS0234-14	OWS0234-15
Northing	6352448.59	6352200.05	6352119.4	6352279.79	6352372.2	6351983.79	6351797.41	6351747.01	6351846.87	6350540.73	6350260
Easting	475951.06	475841.98	476009.7	476010.58	476099.23	476008.84	476010.64	475833.21	475835.69	469363.18	469669.72
Ground Elevation	282.92	282.54	282.05	282.36	282.28	282.48	282.09	283.6	285.98	299.03	297.33
Depth of Hole	9.14	9.14	6.1	6.1	7.62	4.57	3.05	4.57	6.1	6.096	4.572
Well Stickup	1.04	0.94	0.94	1.02	0.99	0.97	0.93	0.86	1.14	0.89	0.84
Well Elevation	283.96	283.48	282.99	283.38	283.27	283.45	283.02	284.46	287.12	299.92	298.17
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	6.4	3.81	3.2	4.12	3.96	1.78	1.52	1.83	2.59	1.22	1.32
Top of Screen	6.63	4.09	3.56	4.42	4.28	2.07	1.7	2.13	2.92	1.38	1.47
Bottom of Screen	7.39	5.61	5.08	5.94	5.8	2.98	2.31	3.05	4.45	2.91	3
Bottom of Well	7.39	5.61	5.08	5.94	5.8	2.98	2.31	3.05	4.45	2.91	3
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	2/26/2002	2/27/2002	2/27/2002	2/27/2002	2/28/2002	2/28/2002	3/1/2002	2/28/2002	3/1/2002	6/11/2002	6/12/2002

	OWS0234-16	OWS0234-17	OWS0310-01	OWS0310-02	OWS0310-03	OWS0310-04	OWS0334-06	OWS0334-07	OWS0334-09	OWS0410-01	OWS0410-02
Northing	6350259.38	6350859.3	6354061.28	6354129.09	6354209.9	6354412.33	6350958.77	6350235.45	6350154.85	6354088.28	6354072.88
Easting	469863.29	469504.59	472896.23	472966.5	472987.68	473598.4	469514.47	468998.91	470006.66	474530.79	474327.01
Ground Elevation	296.57	300.12	299.482	296.845	296.306	295.48	300.11	298.62	294.1	293.03	293.7
Depth of Hole	4.572	7.62	13.72	12.19	13.72	13.72	7.62	6.1	3.05	12.192	12.192
Well Stickup	0.89	0.91	0.91	0.79	0.53	0.89	0.91	0.89	0.89	1.09	0.94
Well Elevation	297.46	301.03	300.392	297.635	296.836	296.37	301.02	299.51	294.99	294.12	294.64
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	0.91	2.44	5.59	6.4	4.95	6.1	3.56	1.7	2.54	2	3.6
Top of Screen	1.02	3.05	6.02	7.06	5.61	6.6	3.68	1.32	2.54	4.57	5.03
Bottom of Screen	2.54	4.57	7.54	8.59	6.83	8.13	5.21	2.84	3.02	7.62	8.08
Bottom of Well	2.54	4.57	7.54	8.59	6.83	8.13	5.21	2.84	3.02	9.14	9.6
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	6/12/2002	7/30/2002	9/29/2003	9/29/2003	9/29/2003	11/24/2003	11/25/2003	11/21/2003	11/25/2003	3/27/2004	3/29/2004

	OWS041003A	OWS041003B	OWS0410-04	OWS0410-05	OWS0410-06	OWS0410-07	OWS0410-08	OWS0410-09	OWS0410-10	OWS0410-11	OWS0410-12
Northing	6354343.12	6354345.58	6354477.26	6354337.67	6354238.7	6354999.91	6355033.47	6354669.07	6355415.37	6355750.87	6355724.81
Easting	474061.18	474059.73	474234.41	474317.52	474439.13	473200.02	473930.04	475497.24	472991.79	473721.76	475018.43
Ground Elevation	294.31	294.33	294.25	293.79	293.67	296.34	294.68	297.09	296.99	297.89	293.64
Depth of Hole	15.24	15.24	15.24	15.24	13.716	13.716	15.24	21.336	18.288	18.288	16.764
Well Stickup	0.95	1.01	0.94	0.86	1.02	0.89	0.86	0.3	0.97	0.94	0.81
Well Elevation	295.26	295.34	295.19	294.65	294.69	297.23	295.54	297.39	297.96	298.83	294.45
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	1.22	4.57	3.05	4.33	3.96	6.22	2.13	11.89	5.18	4.06	3.1
Top of Screen	3.05	8.53	7.47	5.03	4.57	6.4	3.45	12.67	7.54	7.16	3.68
Bottom of Screen	4.57	11.58	8.99	8.08	7.62	7.92	4.98	15.7	10.64	10.26	6.78
Bottom of Well	6.1	14.63	8.99	9.6	9.14	7.92	4.98	15.7	10.67	10.29	6.81
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	3/30/2004	3/30/2004	3/27/2004	3/29/2004	3/30/2004	3/27/2004	3/27/2004	3/31/2004	3/30/2004	3/30/2004	3/29/2004

	OWS0410-13	OWS0410-14	OWS0410-17	OWS0410-19	OWS0410-20	OWS0410-21	OWS0410-22	OWS0410-23	OWS0410-24	OWS0410-25	OWS0410-26
Northing	6355486.24	6356212.74	6353692.45	6354320.43	6354147.04	6354087.97	6354036.41	6354090.07	6354135.16	6354113.36	6354143.12
Easting	476391.64	476063.18	475316.83	472891.86	472844.25	472715.3	472549.36	472961.56	471855.54	472139.38	472353.5
Ground Elevation	292.73	290.69	291.53	297.19	296.97	296.4	296.4	298.59	297.12	296.62	297.04
Depth of Hole	15.24	16.764	9.144	13.716	12.192	11.887	12.192	15.24	12.19	12.19	12.19
Well Stickup	0.84	0.76	0.84	1	0.72	0.72	0.84	1.07	0.86	0.86	0.89
Well Elevation	293.57	291.45	292.37	298.19	297.69	297.12	297.24	299.66	297.98	297.48	297.93
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	3.05	2.44	2.18	6.71	4.27	4.27	3.35		6.1	6.55	5.18
Top of Screen	9.91	6.27	4.57	7.01	6.1	4.88	3.66	6.86	6.1	6.73	5.18
Bottom of Screen	11.43	7.8	7.62	8.53	9.14	7.92	6.71	9.91	7.62	8.26	6.68
Bottom of Well	11.45	7.8	9.14	11.58	7.62	9.45	9.75	12.95	7.67	8.31	6.73
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	3/26/2004	3/26/2004	3/27/2004	3/23/2004	3/20/2004	3/26/2004	3/24/2004	3/22/2004	5/18/2004	5/18/2004	5/18/2004

	OWS0410-27	OWS0410-28	OWS0410-29	OWS0410-30	OWS041031A	OWS041031B	OWS0410-32	OWS0410-33	OWS0410-34	OWS0410-35	OWS0410-36
Northing	6353921.25	6353825.05	6353827.32	6353716.72	6353714.11	6353717.16	6353412.3	6353964.7	6353879.13	6353423.55	6354410.62
Easting	472069.38	471856.6	472465.57	472245.75	472460.45	472462.15	472461.58	472831.53	472764.04	475475.41	473463.92
Ground Elevation	296.61	297.04	299.77	299.28	301.53	300.55	298.75	300.12	300.44	288.45	296.12
Depth of Hole	12.19	12.19	13.72	13.72	13.72	13.72	12.19	15.24	15.24	7.62	13.72
Well Stickup	0.84	0.84	0.84	0.84	0.81	0.81	0.84	0.84	0.84	0.91	0.91
Well Elevation	297.45	297.88	300.61	300.12	302.34	301.36	299.59	300.96	301.28	289.36	297.03
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	7.01	4.27	7.16	5.64	3.28	8.84	4.52	8.53	5.79	4.39	8.13
Top of Screen	7.62	6.68	7.42	5.87	4.5	8.89	4.47	8.86	6.2	4.57	8.66
Bottom of Screen	9.14	8.2	8.94	7.39	6.02	10.41	5.99	10.39	7.72	6.1	10.19
Bottom of Well	9.19	8.28	8.99	7.44	6.07	10.41	6.05	10.44	7.77	6.1	10.19
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	5/17/2004	5/17/2004	5/27/2004	5/27/2004	5/20/2004	5/20/2004	5/27/2004	5/19/2004	5/19/2004	11/4/2004	11/5/2004

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	OWS0434-15	OWS0434-16	OWS0510-01	OWS0510-02	OWS0510-03	OWS0510-04	OWS0510-05	OWS0510-06	OWS0534-07	OWS0534-08	OWS0534-09
Northing	6350376.15	6350168.86	6355026.8	6354925.24	6354725.58	6355323.27	6355449.03	6355624.8	6352435.23	6352115.61	6352108.85
Easting	474907.27	474631.53	471646.93	471651.21	471649.87	471653.27	471638.41	471647.46	475777.28	475888.33	475865.22
Ground Elevation	281.46	281.42	298.35	298.13	298.03	300.64	306.9	311.9	284.51	282.91	282.62
Depth of Hole	4.572	3.048	15.24	10.06	5.33	18.29	23.77	28.96	13.72	7.62	6.1
Well Stickup	0.86	0.91	0.79	0.71	0.92	0.86	0.77	0.79	0.92	0.9	0.97
Well Elevation	282.32	282.33	299.14	298.84	298.95	301.5	307.67	312.69	285.43	283.81	283.59
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	0.76	0.91	2.45	6	1.5	6.04	7.13	20.5	5.79	3.81	3.2
Top of Screen	1.22	0.85	2.75	6.12	2.03	6.35	8.13	21.25	6.1	3.96	3.29
Bottom of Screen	1.52	2.68	8.85	9.18	3.55	9.4	18.8	24.3	7.62	5.49	4.78
Bottom of Well	1.52	2.68	11.8	10	5.3	12.58	23.7	26.2	7.62	5.49	4.78
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	4/2/2004	4/2/2004	4/6/2005	4/5/2005	4/5/2005	4/7/2005	4/9/2005	4/12/2005	6/9/2005	6/10/2005	6/9/2005

	OWS0534-10	OWS0534-11	OWS0734400	OWS0734405	OWS0734406	OWS0734407	OWS0734408	OWS0734409	OWS0734410	OWS0734411	OWS0734412
Northing	6351784.27	6351785.71	6350204.991	6350628.861	6350727.659	6350827.54	6351165.726	6351263.802	6351351.513	6351526.268	6351611.35
Easting	475747.08	475738.9	474426.222	475025.251	475139.647	475272.818	475676.025	475687.867	475696.04	475714.15	475721.293
Ground Elevation	283.79	283.75	282.86	282.65	284.49	284.74	282.83	282.7	282.57	283.04	301.29
Depth of Hole	13.72	9.14	5.41	4.21	5.63	7.36	5.33	5.56	5.49	5.33	5.06
Well Stickup	0.9	0.91	1.2	1.08	1.06	1.09	1.09	0.75	1.23	1.06	1.1
Well Elevation	284.69	284.66	284.06	283.72	285.55	285.83	283.92	283.45	283.8	284.1	284.17
Top of Bentonite	0	0	0	0	0	0	0	0	0	0	0
Top of Sand	2.95	4.11	1.83	1.22	2.44	3.66	1.83	1.83	1.22	1.22	1.52
Top of Screen	3.2	4.81	2.59	1.52	2.9	4.57	2.67	2.74	2.44	2.13	2.29
Bottom of Screen	4.72	6.3	4.12	3.05	4.42	6.1	4.19	4.27	3.96	3.66	3.81
Bottom of Well	4.72	6.3	5.41	4.21	5.63	7.36	5.33	5.56	5.49	5.33	5.06
Well Diameter	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Drill Date	6/7/2005	6/9/2005	10/12/2007	10/11/2007	10/11/2007	10/10/2007	10/2/2007	10/2/2007	10/3/2007	10/3/2007	10/3/2007

	OWS0734413	OWS0734414	OWS0734416	OWS0734417	OWS0734418
Northing	6350992.594	6350341.652	6350380.209	6350599.709	6350910.743
Easting	469148.972	469316.066	470128.208	470035.359	469766.247
Ground Elevation	297.42	298.76	295.62	296.72	297.93
Depth of Hole	7.16	4.05	5.58	4.22	4.36
Well Stickup	0.95	0.84	0.94	1.02	0.87
Well Elevation	302.24	300.51	298.81	298.65	299.72
Top of Bentonite	0	0	0	0	0
Top of Sand	3.87	0.91	2.26	0.91	0.91
Top of Screen	4.11	1.22	2.74	1.37	1.52
Bottom of Screen	5.64	2.74	4.27	2.9	3.05
Bottom of Well	7.16	4.05	5.58	4.22	4.36
Well Diameter	0.05	0.05	0.05	0.05	0.05
Drill Date	9/29/2007	9/29/2007	10/1/2007	10/1/2007	9/29/2007

APPENDIX E: Groundwater Sampling Procedures

PROCEDURES FOR GROUNDWATER SAMPLING AND SURFACE WATER AT THE SYNCRUDE AURORA

This technical procedure was prepared specifically for the groundwater and surface water sampling programs at the Syncrude Aurora Mine.

A) GROUNDWATER SAMPLING PROCEDURES

1. Plan and Prepare for Groundwater Sampling

If wells need to be developed, Develop the well before proceeding

2. Measure Water Level

3. Purge the Well

4. Collect the Groundwater Samples

5. Record Water Quality Parameters

6. Decontaminate the Equipment

Repeat Steps 2 to 6 for the Next Well

7. Complete Sample Chain-of-Custody Form, Store and Submit Sample to Lab

1) Plan and Prepare for Groundwater Sampling

Off-site Preparation

- Calibrate water quality meter daily, either the night before or that morning. Record calibration information in meter calibration log book.
- Prepare sampling bottles for wells to be purged and sampled. Label with the well number and type of analysis required.
- Ensure that the number of wells is achievable in a day so that samples can be shipped the same day as sampled. Sampling conducted Sunday through Thursday in most cases. Occasionally, sampling can be done on Friday, but the laboratory must be notified to expect Saturday morning samples.
- To maximize efficient use of time, wells within close proximity to each other should be selected each day.
- Organize groundwater sampling equipment (i.e., water level tape, water quality meter, spare Waterra tubing and foot valves) and datasheets.

On-site Preparation

- Put on appropriate personal protective equipment (hard hat, safety glasses, steel toed boots, Nomex coveralls where applicable (e.g., sulphur block area).
- Put on disposable Nitrile gloves at each individual well prior to sample collection and change between wells.
- Unlock monitoring well and note the well condition (i.e., missing lock, damage). Confirm the well number written on the well.

2) Measure Water Level

- Total well depths are provided by Syncrude.
- Measure water level with a water level tape.
- Move Waterra tubing (if folded) to allow water level tape to enter the well with little restriction.
- Read static water level at the top of casing (TOC). In most cases the casing has been previously marked with permanent marker on one side (always the high side if casing was cut uneven). Read and record water level at this mark.
- Subtract the static water level from the total well depth. Then multiply the well water level by 2.032 L/m for a 2 inch casing, 1.13 L/m for 1.5 inch casing or 4.51 L/m for 3 inch casing to determine one well volume. Then multiply by 3 to determine 3 well volumes. Round well volume to the nearest whole number (i.e., 16.7 L would be rounded to 18 L).

3) Purge the Well

- Pull Waterra tubing up off the bottom (1 to 3 m) before purging.
- Purge water by hand into a graduated pail until 3 well volumes are achieved.
- For a few shallow wells that typically have poor recovery, an attempt should be made to purge the well with a peristaltic pump.
- If 3 well volumes are achieved, proceed to collect the required samples.
- If 3 well volumes are not achieved (i.e., well bails dry), then allow well to recover prior to collecting samples.

4) Collect the Groundwater Samples

- Label bottles with the date of collection.
- If water remains turbid after 3 wells volumes have been purged, allow well to sit for an hour or two to allow the suspended solids to settle out prior to sampling. This method is very common at the Aurora site on the newer 03 and 04 wells.
- Put on disposable Nitrile gloves and discard after use.
- Wells that recover well and do not bail dry should be sampled immediately after purging. For wells that do not recover well, sampling should be done as soon as possible and not more than 24 hours after purging.
- Keep Waterra tubing 1 to 3 m off the bottom of the well to minimize total suspended solids in water sample.
- For wells with high suspended solids, minimize agitation by slower pumping action.
- Allow water to pass onto the ground until sample is clear in colour or visually clear of suspended solids before sampling.
- Ensure correct number and type of bottles to be filled from the table provided by Syncrude.
- Fill bottles by hand directly from end of Waterra tubing.
- For a few shallow wells that typically have poor recovery or for wells with high suspended solids, use a peristaltic pump to collect the sample.
- If a dissolved metals sample is required, filter the samples using a 45 micron (single use filter supplied by Syncrude) directly attached to the Waterra tubing. Also filter the dissolved organic carbon (DOC) sample. Allow water to pass through the filter for a few seconds prior to collection of the sample.
- As per Syncrude request, if a dissolved metals sample is not required, do not field filter the DOC sample. This will be done at the laboratory.

- Add preservatives to filled bottles as appropriate and shake to ensure thorough mixing of preservative and water sample.
- For samples where no headspace is required (i.e., volatiles), fill bottles so that the water mounds at the rim to ensure no air bubbles are trapped.
- If a well is dry or frozen, record time it was visited and comments (i.e., frozen, dry, etc.). Revisit it later in the field program and attempt to sample it again.
- Record time of sample collection on datasheet when last bottle is filled.

5) Record Water Quality Parameters

- Collect field water quality parameters after groundwater samples have been collected.
- Field water quality was measured using a Y.S.I. 556 Multiprobe meter.
- Collect water into a plastic 500 mL container that has been rinsed with de-ionized water and ambient water.
- Allow temperature, pH and EC to stabilize prior to recording parameters. Stir the water sample lightly during readings to ensure water is uniform in all parameters.
- Record temperature, pH, EC and specific conductance (conductivity corrected to 25°C).
- Record colour and odour if any as well as other visual observations (i.e., hydrocarbon sheen).

6) Decontaminate the Equipment

- Decontaminate water level tape after use at each well by spraying with a phosphate-free decontamination soap (Liqui-Nox™) and rinse with tap water. Use a clean paper towel to wipe the probe. Spray the probe with methanol to remove any solvent-soluble residues that may remain and allow to evaporate. Rinse probe with de-ionized water (from Syncrude laboratory).
- Rinse container used for field water quality parameters and water quality meter probe with de-ionized water after use.

7) Complete Sample Chain-of-Custody Form, Store and Submit Sample to Lab

- Keep samples in coolers with ice packs during the day.
- Ensure samples are shipped to the laboratory on the same day, as they are collected.
- Complete chain of custody forms and send with samples.
- Pack samples with newspaper to minimize bottle movement and breakage.

8) Quality Assurance/Quality Control Procedures

- Collect one trip blank and one field blank during the field program and analyze for trace parameters.
- Collect one duplicate sample for approximately every 10 samples collected for metals, naphthenic acids and phenols and one duplicate sample for approximately every 20 samples collected for routine parameters.
- Fill both the initial sample bottle and the duplicate sample bottle at the same time (i.e., 1/4 into first bottle, 1/4 into second bottle, etc.), so that they are as similar as possible.
- Use a random approach for determining which sites should be sampled in duplicate. Choose wells that produce enough water to fill two complete sets of sample bottles.
- Give duplicate sample bottles a unique sample number and fictitious sampling time on chain of custody forms in order to submit it to the laboratory as a "blind" duplicate. Write the duplicate sample identification on the datasheet indicating, which sample it, is a duplicate of.

B) SURFACE WATER SAMPLING PROCEDURES

1) Plan and Prepare for Surface Water Sampling

Off-site Preparation

- Calibrate water quality meter daily, either the night before or that morning. Record calibration information in meter calibration log book.
- Prepare sampling bottles for surface water sites to be sampled. Label with the surface site number and type of analysis required.
- Ensure that the number of surface water sites is achievable in a day so that samples can be shipped the same day as sampled. Sampling conducted Sunday through Thursday in most cases. Occasionally, sampling can be done on Friday, but the laboratory must be notified to expect Saturday morning samples.
- To maximize efficient use of time, sites within close proximity to each other should be selected each day.
- Organize surface water sampling equipment (i.e., sampling pole, 1L plastic collection bottle, water quality meter) and datasheets.

On-site Preparation

- Put on appropriate personal protective equipment (hard hat, safety glasses, steel toed boots, Nomex coveralls where applicable (e.g., sulphur block area).
- Put on disposable Nitrile gloves at each individual surface water site prior to sample collection and change between sites.

2) Collect the Surface Water Sample

- Put on disposable Nitrile gloves and discard after use
- Rinse the decontaminated collection bottle with ambient water three times prior to sample collection.
- Where possible, such as finger drainpipes, fill bottles directly from end of pipe.
- In ponds and non-flowing water, fill bottles at 25 cm below the surface, reaching out from shore with the sample pole at stations marked "sample point".
- In shallow surface water sites, care should be taken to not disturb bottom sediment while filling bottles.
- In flowing water, collect the water sample with the mouth of the sample bottle pointing upstream 25 cm below the surface.
- Label bottles with the date of collection.

- Ensure correct number and type of bottles to be filled from the table provided by Syncrude.
- Add preservatives to filled bottles as appropriate and shake to ensure thorough mixing of preservative and water sample.
- No field filtering is required unless suspended solids are high.
- For samples where no headspace is required (i.e., volatiles), fill bottles so that the water mounds at the rim to ensure no air bubbles are trapped.
- If a surface site is dry, record time it was visited and comments (i.e., dry, etc.). Revisit it later in the field program (especially after rainfall events) and attempt to sample it again.
- Record time of sample collection on datasheet when last bottle is filled.

3) Record Water Quality Parameters

- Collect field water quality parameters after surface water samples have been collected.
- Field water quality was measured using a Y.S.I. 556 Multiprobe meter.
- Collect water into a plastic 500 mL container that has been rinsed with de-ionized water and ambient water.
- Allow temperature, pH and EC to stabilize prior to recording parameters. Stir the water sample lightly during readings to ensure water is uniform in all parameters.
- Record temperature, pH, EC and specific conductance (conductivity corrected to 25°C).
- Record colour and odour if any as well as other visual observations (i.e., hydrocarbon sheen).

4) Decontaminate the Equipment

- Decontaminate collection bottle after use at each site. Spray with a phosphate-free decontamination soap (Liqui-Nox™). Then, rinse with tap water. Spray bottle with methanol to remove any solvent-soluble residues that may remain and allow to evaporate. Then, rinse bottle with de-ionized water (from Syncrude laboratory).
- Use a new collection bottle whenever necessary, especially if the previous surface water site left an oily residue on the collection bottle or if a hydrocarbon sheen was observed at the site.
- Rinse container used for field water quality parameters and water quality meter probe with de-ionized water after use.

5) Complete Sample Chain-of-Custody Form, Store and Submit Sample to Lab

- Keep samples in coolers with ice packs during the day.
- Ensure samples are shipped to the laboratory on the same day, as they are collected.

- Complete chain of custody forms and send with samples.
- Pack samples with newspaper to minimize bottle movement and breakage.

6) Quality Assurance/Quality Control Procedures

- Collect one trip blank and one field blank during the field program and analyze for trace parameters.
- Collect one duplicate sample for approximately every 10 samples collected for metals, naphthenic acids and phenols and one duplicate sample for approximately every 20 samples collected for routine parameters.
- Fill both the initial sample bottle and the duplicate sample bottle at the same time (i.e., 1/4 into first bottle, 1/4 into second bottle, etc.), so that they are as similar as possible.
- Use a random approach for determining which sites should be sampled in duplicate. Choose sites that have enough water to fill two complete sets of sample bottles.

C) GROUNDWATER WELL DEVELOPMENT PROCEDURES

1) Selection of Wells to be Developed

- Syncrude identifies the wells that need to be developed each season. These include monitoring wells with a history of high sediment loads as well as newly installed wells.

2) Well Development

- If necessary, install Waterra tubing and foot valve.
- Develop wells using a power Waterra pump (if the well is deep) or by hand (if the well is shallow).
- Keep Waterra tubing just off the bottom of the well.
- If using the power pump, move the tubing up as necessary to reduce wear on the casing/foot valve interface if well development goes on for hours.
- Record start and finish times for well development.
- Collect water purged from each well in a graduated bucket and determine total volume purged as well as visual water clarity throughout the development process.
- Continue purging water from the well until the water is visually clear or until 4 hours have passed. As per Syncrude request, no more than 4 hours should be spent developing a well.
- Record water level, purge volume and recovery rate. Also record visual water turbidity (e.g., turbid, clearing up, cloudy, very clear) as it changes during well development.
- Release purged water well away from the well casing to reduce the risk of purge water entering the water table near the well.
- If a well bails dry before well development is complete, allow it to recover and revisit the well for further development to a maximum of 4 hours.

3) Collect Groundwater Sample

- Collect groundwater samples from developed wells immediately after development.
- If water is still not clear after 4 hours of development, allow water to settle for a couple hours prior to collecting the groundwater sample.

Follow groundwater sampling procedures in Section A.