MAXIM TECHNOLOGIES INC®
A TETRA TECH COMPANY

Consulting Engineers & Environmental Scientists
851 Bridger Drive, Suite F
Bozeman, MT 59715
PO Box 1413
Bozeman, MT 59771

Telephone: (406) 582-8780
Fax: (406) 582-8790

TECHNICAL MEMORANDUM

TO: Bob Kirkpatrick – Northern Region
Mary Beth Marks – On-Scene Coordinator

FROM: Allan Kirk – Senior Project Geologist
Cam Stringer – Project Hydrogeologist

DATE: January 6, 2003

RE: Summary of McLaren/Como Hydrogeologic Investigations
New World Mining District Response and Restoration Project

INTRODUCTION

Water sampling and analysis performed by Crown Butte Mines, Inc., various consultants, and state and federal agencies over the last 15 years has clearly documented groundwater and surface water contamination associated with mine wastes and other sources in the headwater areas of both Daisy Creek and Fisher Creek (Maxim, 2001a, 2002a). Mass load analyses by Amacher (1998) and Kimball and others (1999) in the Fisher Creek drainage, and Nimick and Cleasby (2001) in the Daisy Creek drainage, helped refine the conceptual model of contaminant transport. These studies documented the location of contaminant inflows from tributaries into the main stem of both Daisy and Fisher creeks, and, based on calculated increases in contaminant loads between adjacent surface water sampling stations, concluded that contaminated groundwater is also discharging to Daisy and Fisher Creeks at certain locations.

In 2001, Maxim Technologies, Inc. (Maxim), in cooperation with the New World Response and Restoration Project hydrogeology technical group, developed additional hydrogeologic investigations to help identify the nature and extent of contamination in the shallow unconsolidated and deeper bedrock groundwater systems in the McLaren Pit area, and the occurrence of groundwater in the Como Basin. Investigation activities included the following tasks, which were completed during 2001 and 2002:

- Installing 8 monitoring wells and 13 piezometers in the McLaren Pit area
- Installing 20 piezometers in the Como Basin
- Aquifer testing selected McLaren Pit area monitoring wells
- Measuring depth to groundwater and field parameters in monitoring wells and piezometers
- Collecting and analyzing surface water and groundwater samples from selected monitoring locations in the McLaren Pit area

Maxim's investigation methods and results are further described in the following sections. McLaren Pit activities are presented first, followed by presentation of activities conducted in the Como Basin.

MCLAREN PIT AREA

Monitoring well and piezometer installation, well development, sampling, and aquifer testing in the McLaren Pit area were conducted according to methods and procedures outlined in the project 2001

and 2002/2003 Work Plans (Maxim, 2001b, 2002b) and the Site-Wide Sampling and Analysis Plan (Maxim, 1999). Methods and results are described in this section for each of the tasks completed.

MONITORING WELL AND PIEZOMETER INSTALLATION

Monitoring wells and piezometers were installed in the McLaren Pit area in 2001 and 2001. Piezometers were initially planned to be installed in 2001 below the McLaren Pit in backhoe test pits. Due to winter shutdown, the test pits were delayed until 2002, and, in the interim, the hydrogeology technical group decided to expand the monitoring capabilities of the piezometers to include sampling water quality. With that change, it was decided to complete the piezometers in the same manner as the monitoring wells. The semantics of referring to piezometers and monitoring wells in this memorandum is only meant to distinguish between the paired bedrock and colluvial wells installed in 2001(monitoring wells) and the group of wells installed in colluvium in 2002 (piezometers).

Monitoring well pairs DCGW-101S and -101D, -102S and -102D, and -103S and -103D were installed in October 2001 with a truck-mounted air rotary drill rig at three locations in the vicinity of the McLaren Pit (**Figure 1**). Each well pair consists of a shallow well completed in alluvium/colluvium, and an adjacent deeper well completed in bedrock. In addition, wells DCGW-104 and DCGW-105 were installed in unconsolidated waste rock material in the McLaren Pit to replace two waste rock wells that had problematic completions (EPA-04 and EPA-03) (**Figure 1**). A deep well designed to sample groundwater within the Meagher Limestone upgradient of the McLaren Pit was planned, but has not yet been installed (green circle in upper center, **Figure 2)**.

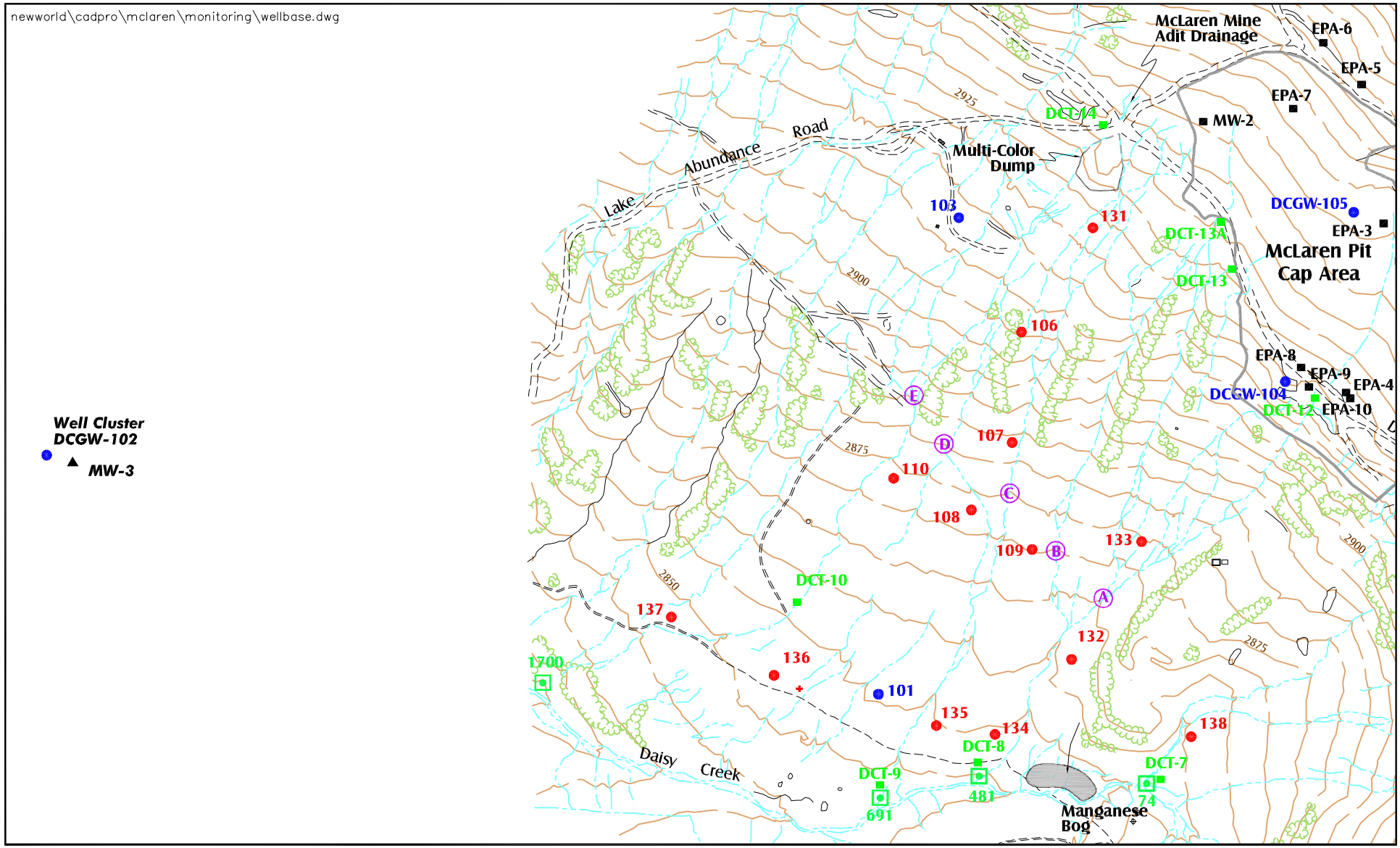
Between August 12, and August 23, 2002, 13 piezometers were installed in an area topographically below the McLaren Pit to help track seasonal changes in groundwater elevations in unconsolidated surficial material (colluvial and/or glacial till) and to help evaluate water quality through analyses of field parameters. Piezometers were installed with a high flotation, buggy-mounted auger drill rig.

Monitoring well and piezometer borings were logged from continuous drill cuttings and split spoon samples collected every 1.5 meters (5 feet). Wells and piezometers were completed with 5 centimeter (2 inch) PVC casing with a 1.5 meter (5 feet) or three meter (10-feet) screened interval, except for well DCGW-102S, which was cased with 10 centimeter (4 inch) casing. Screens were slotted PVC with 0.05 centimeter (0.020-inch) factory slots. Colorado silica sand (No. 10/20) was placed in the annular space across the screened interval and a minimum 0.6 meter (two feet) thick bentonite plug was placed on top of the sand pack. The remaining annular space to within 0.6 meters (two feet) of the surface was filled with cuttings and a 15 centimeter (6 inch) diameter steel casing well protector was cemented in place at the surface.

Figures 2 and 3 are photographs showing the well and piezometer locations from different perspectives in the McLaren Pit area. Lithologic and completion logs for wells and piezometers are contained in Attachment A.

GROUNDWATER AND SURFACE WATER MONITORING

Several groundwater monitoring events were conducted between October 2001 and October 2002. Groundwater monitoring was performed on McLaren Pit area monitoring wells/piezometers during October 2001, and July, August, September, and October 2002. During each monitoring event, depth to water, temperature, pH, and specific conductance (SC) were measured.


newworld\cadpro\mclaren\monitoring\wellbase.dwg
Well Cluster
DCGW-102
MW-3
McLaren Mine
Adit Drainage
EPA-6
EPA-5
EPA-7
MW-2
DCT-14
Multi-Color
Dump
Abundance
Road
Lake
2925
2900
2875
2850
103
131
DCGW-105
EPA-3
DCT-13A
McLaren Pit
Cap Area
DCT-13
106
EPA-8
EPA-9
EPA-4
DCGW-104
DCT-12
EPA-10
E
D
C
B
A
107
110
108
109
133
DCT-10
137
136
132
1700
101
135
134
138
DCT-8
DCT-7
DCT-9
481
74
691
Daisy
Creek
Manganese
Bog
N
0 10 Meters 50
1:4000
Contour Interval = 5 meters
MAXIM TECHNOLOGIES INC
9902245.432
EPA-7 Historic Monitoring Well
DCT-8 Historic Surface Water Station
A Surface Water Site (DCSW-0905 prefix not included)
1700 Nimick 2000 Surface Water Site
106 Piezometer (DCGW prefix not included)
101 Monitoring Well (DCGW prefix not included)
Creek/Drainage
Road/Trail
October 2002
Surface Water and Groundwater Monitoring Locations
Mclaren Pit Area
New World Mining District
Response and Restoration Project
FIGURE 1

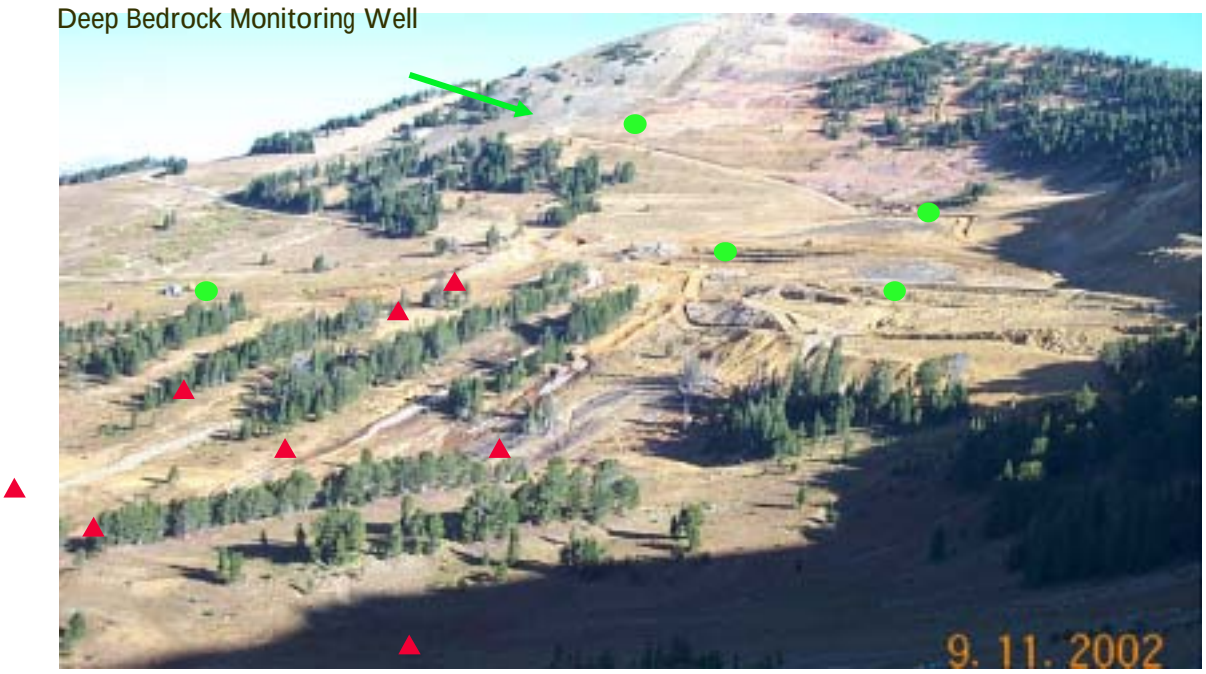


Figure 2. Photograph looking northeast towards Fisher Mountain showing location of McLaren Pit area piezometers (red triangles) and monitoring wells (green circles).

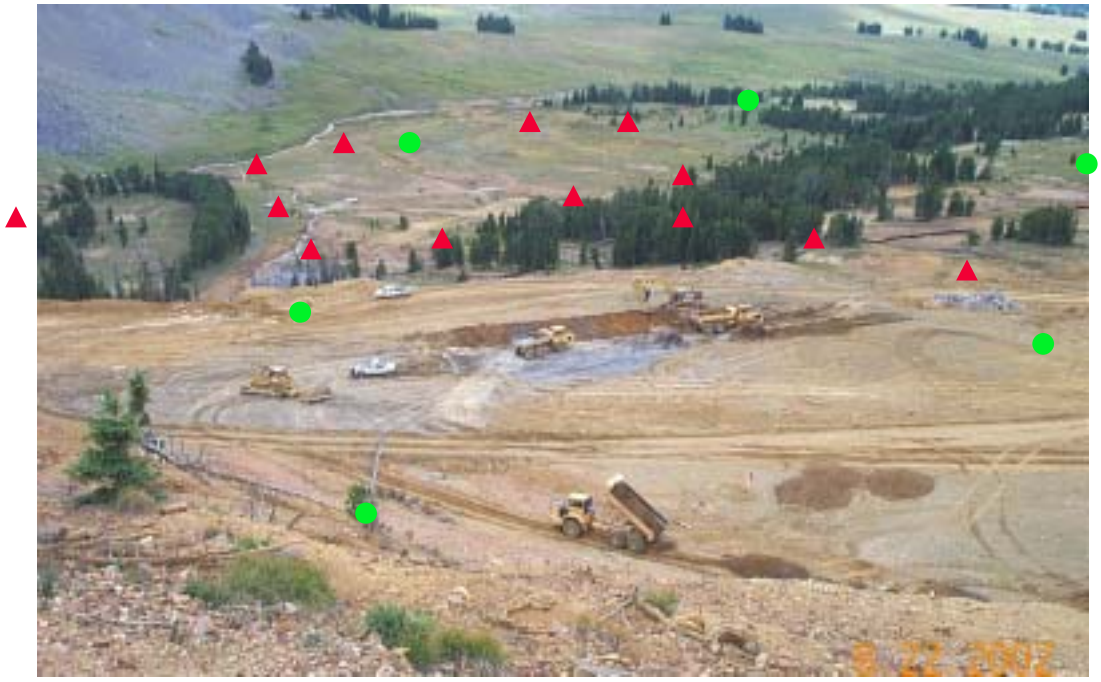


Figure 3. Photograph looking west towards Daisy Creek from the McLaren Pit high-wall showing location of McLaren Pit area piezometers (red triangles) and monitoring wells (green circles).

Groundwater samples were collected from monitoring wells during the October 2001, and July and August 2002 monitoring events. Piezometers were sampled in August 2002. Groundwater samples were shipped to Northern Analytical Laboratories, Inc., located in Billings, Montana, for laboratory analysis of dissolved metals, common ions, pH, and SC.

Select surface water samples were collected for this investigation in September 2002 to compare water quality in surface drainages below the McLaren Pit with groundwater quality data. Samples were collected from five drainages about midway between the McLaren Pit and Daisy Creek (**Figure 1**). Surface water samples were analyzed for dissolved metals and field parameters.

LITHOLOGY AND STRATIGRAPHY

Three general stratigraphic zones were encountered during drilling of McLaren Pit area piezometers: oxidized glacial till, reduced glacial till, and bedrock. Generalized stratigraphy is shown on **Figure 4**. On the steep upslope area just below the pit and county road, piezometers DCGW-106, -107, and -131 encountered relatively thick unconsolidated materials that were seven to 14 meters thick (23 to 47 feet). In the uppermost interval in these three borings, from 1.5 to 2.6 meters (5.0 to 8.5 feet) of grayish orange (oxidized) clayey silt (colluvium or till) with sub-angular to sub-rounded pebble- and cobble-sized rock fragments (yellow on **Figure 4**) was encountered. Thin layers (0.7 centimeters to 2.5 centimeters) of cemented iron oxide material occurred at the base of this surface unit, which in turn was underlain by a dense, sulfide-bearing greenish-gray clay and silty clay with sub-angular pebble and cobble sized Park Shale rock fragments (green reduced till on **Figure 4)**. Rock fragment content increased downward toward the bedrock contact (gray on **Figure 4)**.

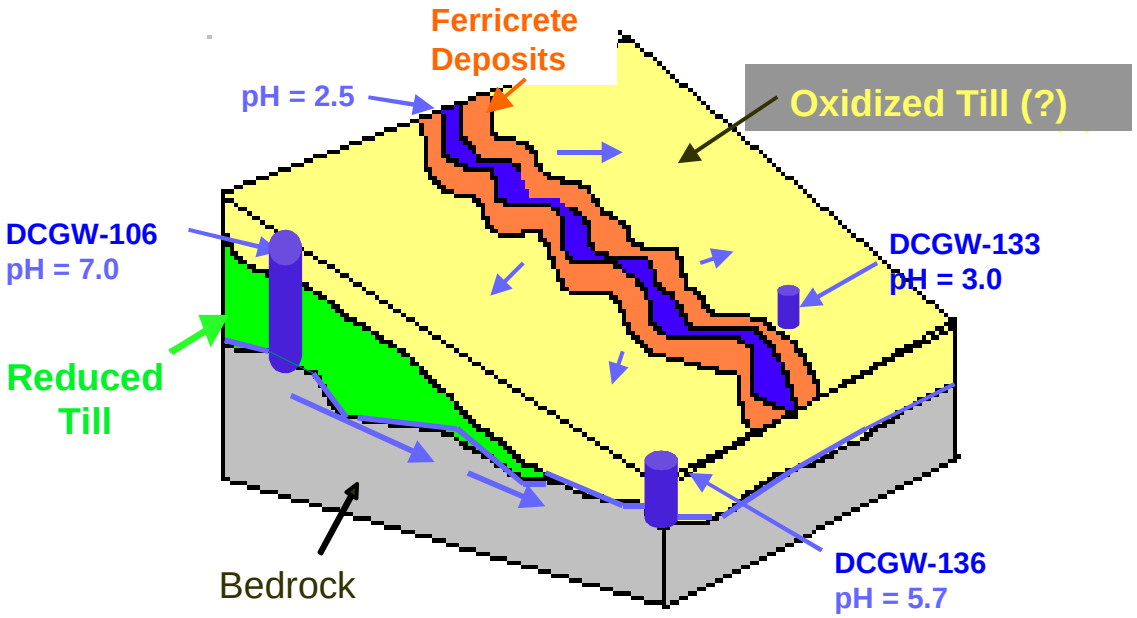


Figure 4. Schematic block diagram of the area below the McLaren Pit showing stratigraphy, and surface water and groundwater pH.

Piezometers drilled below the first break in slope below the McLaren Pit (DCGW-108, -109, -110) encountered between 3.0 and 4.6 meters (9.8 and 15.2 feet) of yellow-brown (oxidized) clayey silt material with sub-angular to sub rounded pebble- and cobble-sized rock fragments, with or without ferricrete layers at or near the bedrock contact.

Piezometers drilled on the lower colluvial slope adjacent to Daisy Creek (DCGW-134 through –137), encountered bedrock at 1.4 to 3.0 meters (4.5 to 10 feet). In addition bedrock was intercepted at 3.7 meters (12 feet) in DCGW-101D. The overlying material encountered in boreholes DCGW-134 through -136 was light yellow-brown and silty, and clayey silt in borehole DCGW-137. Rock clasts contained in this material consist of both sub-angular Park Shale pebbles and cobbles, and sub-rounded pebbles and gravel-sized clasts of the Lulu Pass Dacite Porphyry.

Piezometers DCGW-132 and –133, located near the upper break in slope, were collared in ferricrete and drilled into unconsolidated oxidized colluvial material beneath the ferricrete before encountering bedrock at very shallow depths. Field observations suggest that this material is less clay-rich and is siltier than the materials lying above this first break in slope. Depth to bedrock in these two boreholes is 1.3 meters (4.2 feet) and 2.1 meters (7.0 feet), respectively. Rock fragment content increased downward toward the bedrock contact. Piezometer DCGW-138 contained approximately 5.5 meters (18 feet) of colluvial materials consisting of silty clay and sandy silt material with scattered rock fragments.

SHALLOW GROUNDWATER FLOW

Depth to water information collected from McLaren Pit area monitoring wells and piezometers between October 2001 and October 2002 are summarized in **Tables 1 and 2**. **Figure 5** is a potentiometric surface map of the shallow groundwater system below the McLaren Pit. **Figure 5** indicates that groundwater in the shallow system generally flows southwest, turning more westerly as groundwater approaches Daisy Creek. Groundwater flow is generally perpendicular to the slope (down slope) with an overall gradient of 0.175. The gradient is steepest beneath the steepest topographic slope (between piezometers DCGW-106 and-107), becoming less steep as groundwater flows toward Daisy Creek.

Groundwater was encountered near the bottom of the three upslope boreholes (DCGW-106, -107, and -131) during drilling at depths ranging from 6.7 to 13.7 meters (21 to 44.5 feet) below ground surface. Water levels in the boreholes rose immediately, and became artesian in DCGW-106 and -107. Water levels in piezometer DCGW-106 and in monitoring well DCGW-103 remain artesian.

Generally, groundwater was first encountered during drilling of mid-slope piezometers (DCGW-108, -109, -110, 132, and 133) at or near the bedrock contact, with wet intervals in the sediments above the bedrock contact in holes DCGW-108, 110 and 133. Water levels measured in those piezometers have ranged from approximately 0.98 to 3.2 meters (3.2 to 10.5 feet) below measuring points.

Groundwater was first encountered in unconsolidated material just above the bedrock contact in down slope piezometers DCGW-134, 136 and 137. Water levels measured in piezometers DCGW-134 through -137 have ranged from about 1 to 2.0 meters (2.3 to 6.6 feet) below the measuring point. Several water-bearing intervals were encountered between 2.4 and 6.4 meters (8 and 21 feet) below ground surface during drilling of piezometer DCGW-138.

TABLE 1
Well Completion Data, Depth to Water, pH, and SC
McLaren Pit Area Monitoring Wells

WELL NO.	DATE	TOTAL DEPTH (meters)	CASING STICK-UP (meters)	DEPTH TO BEDROCK (meters)	DEPTH TO WATER (meters)	FIELD pH (su)	LAB pH (su)	FIELD SC (µS/cm)	LAB SC (µS/cm)
DCGW- 101 S	10/10/01				2.35	5.29	4.9	249	256
	7/10/02				NM	4.51	4.5	235	180
	9/5/02	4.49	0.79	3.66	2.11	4.48		223	
	9/17/02				1.95	4.56		187	
	10/7/02				1.95	4.58		235	
DCGW- 101 D	10/10/01				2.25	6.7	7.7	536	559
	7/10/02				NM	6.12	7.5	442	412
	9/5/02	8.35	0.73	3.66	2.24	NM		382	
	9/17/02				1.89	7.41		303	
	10/7/02				1.88	7.32		406	
DCGW- 102 S	7/8/02				NM	7.33	7.8	384	358
	9/5/02	9.58	0.73	8.84	NM	NM		NM	
	9/16/02				0.88	7.62		398	
	10/9/02				1.41	7.6		380	
DCGW- 102 D	7/8/02				NM	7.35	7.9	378	363
	9/5/02	17.50	0.73	11.58	NM	NM		NM	
	9/16/02				2.02	7.93		406	
	10/9/02				2.05	7.8		340	
MW-3	9/5/02				NM	NM		NM	
	9/16/02	14.90	0.90	6.70	1.73	7.62		394	
	10/9/02				1.76	7.7		350	
DCGW- 103 S	7/8/02				NM	6.15	6.8	700	738
	9/5/02	9.97	0.82	12.19	NM	NM		NM	
	9/17/02				Artesian	7.03		563	
	10/7/02				Artesian	6.91		718	
DCGW- 103 D	7/8/02				NM	6.41	7.3	534	521
	9/5/02	16.93	0.85	12.19	NM	NM		NM	
	9/17/02				Artesian	7.38		408	
	10/7/02				Artesian	7.38		499	
DCGW- 104	7/9/02				NM	2.89	2.6	2,890	2,540
	9/5/02	8.14	1.02	7.12	NM	NM		NM	
	9/17/02				7.15	3.19		2,060	
	10/7/02				7.52	3.18		2,480	
DCGW- 105	7/8/02				NM	2.83	2.6	1,832	1,480
	9/5/02	6.49	0.61	5.79	NM	NM		NM	
	9/17/02				5.34	3.09		1,084	
	10/7/02				5.60	3.05		1,253	

Notes:
NM : Not measured
µS/cm : microsiemens per centimeter
su : standard units

Total Depth (TD) measured from top of PVC casing
Casing Stick-up measured from ground surface
Depth to Bedrock measured from ground surface
Depth to water measured from top of PVC casing

TABLE 2
Well Completion Data, Depth to Water, pH, and Specific Conductance
McLaren Pit Area Piezometers

PIEZOMETER	DATE	TOTAL DEPTH (meters)	CASING STICK-UP (meters)	DEPTH TO BEDROCK (meters)	DEPTH TO WATER (su)	FIELD pH (su)	LAB pH (su)	FIELD SC (µS/cm)	LAB SC (µS/cm)
DCGW-106	8/19/02	4.41	0.23	NI	Artesian	7.16	7.2	792	838
	9/5/02				Artesian	NM		744	
	9/17/02				Artesian	7.21		690	
	10/7/02				Artesian	7.04		843	
DCGW-107	8/19/02	7.62	0.49	7.32	3.29	7.25	7.8	558	586
	9/5/02				4.65	NM		572	
	9/18/02				4.81	8.02		447	
	10/7/02				4.82	7.72		604	
DCGW-108	8/23/02	3.38	0.68	3.35	3.22	5.59	5.0	204	233
	9/5/02				2.34	NM		1,663	
	9/18/02				3.02	4.33		248	
	10/7/02				2.00	5.47		235	
DCGW-109	8/19/02	5.34	0.73	4.63	2.35	7.02	7.7	669	689
	9/5/02				2.10	NM		643	
	9/18/02				2.06	7.44		497	
	10/7/02				2.18	7.33		698	
DCGW-110	8/23/02	3.35	0.37	2.99	1.91	6.3	7.1	953	1,220
	9/5/02				1.90	NM		963	
	9/18/02				1.90	6.99		707	
	10/7/02				1.85	7.01		1,030	
DCGW-131	8/23/02	6.80	0.85	NI	6.31	6.36	6.8	1,694	2,340
	9/5/02				2.01	NM		1,685	
	9/17/02				1.94	6.79		1,651	
	10/7/02				1.47	6.67		2,020	
DCGW-132	8/22/02	3.14	0.37	2.13	1.75	4.22	3.9	1,174	1,470
	9/5/02				1.72	NM		1,233	
	9/18/02				1.69	3.8		965	
	10/7/02				1.69	4.02		1,250	
DCGW-133	8/22/02	2.96	0.46	1.28	1.13	3.75	3.0	1,110	1,470
	9/5/02				1.21	NM		1,289	
	9/18/02				0.98	2.98		901	
	10/7/02				1.17	3.14		1,177	
DCGW-134	8/22/02	2.83	0.52	1.68	1.27	6.62	4.3	258	681
	9/5/02				1.22	NM		386	
	9/18/02				1.17	6.83		289	
	10/7/02				1.18	7.03		395	
DCGW-135	8/23/02	2.26	0.40	1.37	Dry	NM		NM	
	9/5/02				1.94	NM		682	
	9/18/02				1.58	6.19		189	
	10/7/02				1.84	6.01		249	
DCGW-136	8/22/02	3.35	0.71	3.48	1.23	6.96	5.7	360	418
	9/5/02				1.34	NM		422	
	9/18/02				1.16	5.38		296	
	10/7/02				1.13	5.6		409	

TABLE 2 (continued)
Well Completion Data, Depth to Water, and Field Parameter Data for McLaren Pit Area Piezometers

PIEZOMETER	DATE	TOTAL DEPTH (meters)	CASING STICK-UP (meters)	DEPTH TO BEDROCK (meters)	DEPTH TO WATER (su)	FIELD pH (su)	LAB pH (su)	FIELD SC (µS/cm)	LAB SC (µS/cm)
DCGW-137	8/23/02	4.72	0.52	3.05	1.97	5.83	7.9	225	280
	9/5/02				1.36	NM		265	
	9/18/02				1.03	7.38		182	
	10/7/02				1.02	7.52		246	
DCGW-138	8/22/02	6.40	0.88	5.94	2.66	6.74	7.1	296	425
	9/5/02				3.12	NM		333	
	9/18/02				3.29	6.58		283	
	10/7/02				3.54	6.73		459	

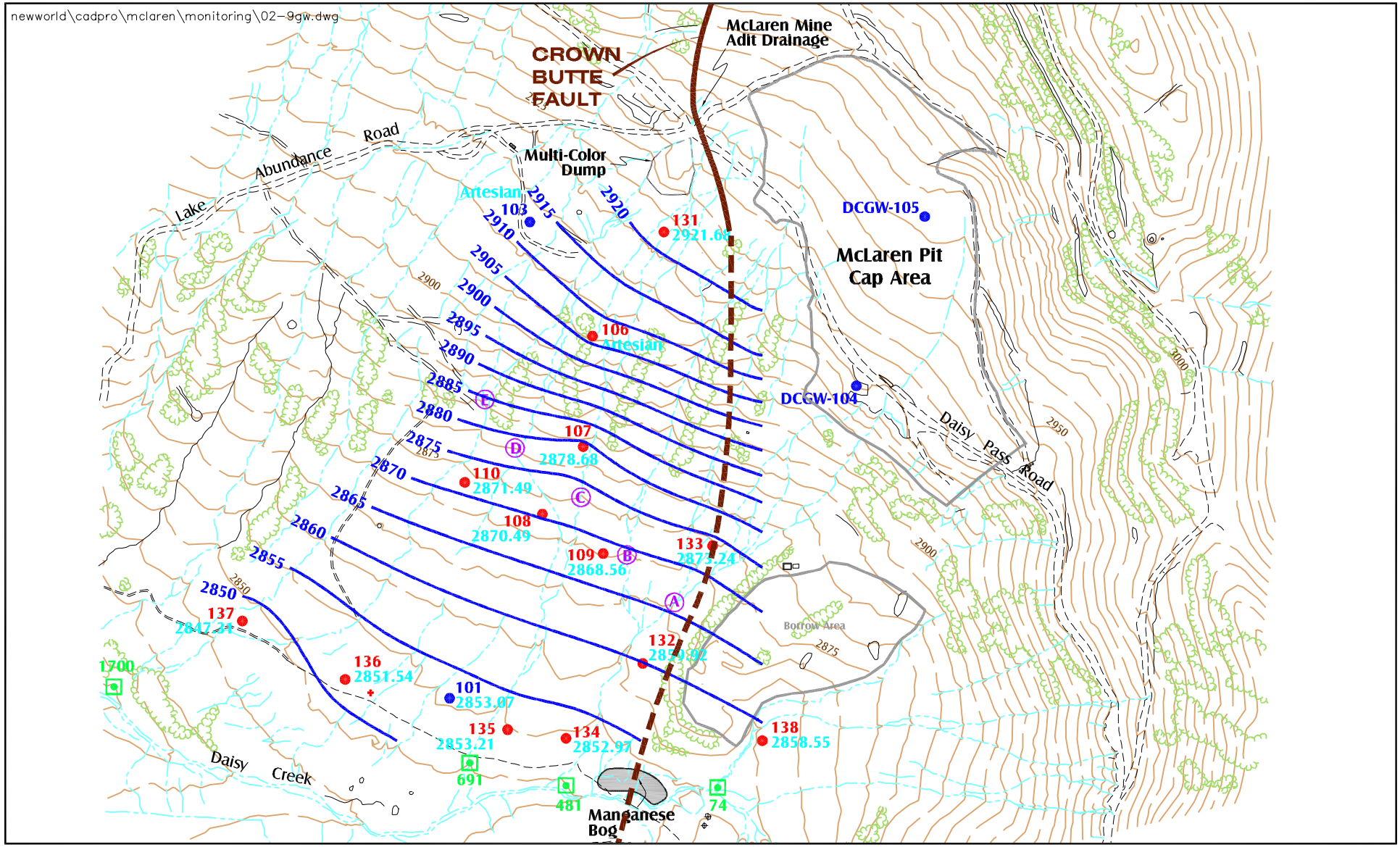
Notes:

NI :	Not intersected in the drilling	Total Depth (TD) measured from top of PVC casing	
NM :	Not measured	Casing Stick-up measured from ground surface	
µS/cm	microsiemens per centimeter	Depth to Bedrock measured from ground surface	
su :	standard units	Depth to water measured from top of PVC casing	

Based on observations during drilling and depth to water measured in wells and piezometers, groundwater occurs in shallow fractured bedrock and in unconsolidated material at the bedrock contact and in some intervals above the contact. The fact that during drilling the greatest degree of saturation was often observed at the contact between bedrock and overlying unconsolidated material suggests that this is the most permeable material and that the greatest volume of groundwater flow may occur within this zone.

The contact between oxidized and reduced unconsolidated material in DCGW-106, -107, and -131 was damp, but did not appear to produce water. Wet intervals were noted in fine-grained unconsolidated sediments during drilling of several other piezometers. Monitoring well DCGW-103S, which has the base of the screened interval 3 meters (10 feet) above the bedrock contact, was dry when constructed but is currently artesian. This suggests that upslope fine-grained unconsolidated sediments are low in permeability but will transmit water. Monitoring well DCGW-101S, which is screened above the bedrock contact across the water table, has about 2.4 meters (8 feet) of saturated thickness, suggesting that there is significant flow in unconsolidated material at that location. By contrast, water levels measured in piezometer DCGW-135 have all been below the colluvium/bedrock contact.

It appears that the shallow groundwater system in upslope and mid-slope areas is under confined conditions. Piezometer DCGW-106 and monitoring well DC-GW-103S are artesian, and water levels measured in most of the other piezometers are at elevations significantly above the level at which water was encountered during drilling. It is probable that groundwater flowing in unconsolidated material in the upslope and mid-slope areas is within relatively coarse-grained lenses or in broken rock at the bedrock interface, and is confined by the relatively impermeable nature of the unconsolidated fine-grained sediments.



Water Level Data 9/5/02

N

0 10 Meters 50
1:4000

Contour Interval = 5 meters

MAXIM TECHNOLOGIES INC® 9902245.432

Crown Butte Fault- (Dashed where inferred)
Surface Water Site (DCSW-0905 prefix not included)
1700 Nimick 2000 Surface Water Site
106 Piezometer (DCGW prefix not included)
101 Monitoring Well (DCGW prefix not included)
Creek/Drainage
Road/Trail
2860 Potentiometric Surface Contour
(Contour Interval = 5 meters)

Potentiometeric Surface of Shallow Alluvium
Mclaren Pit Area
New World Mining District
Response and Restoration Project
FIGURE 5

Unconsolidated material in the upslope and mid-slope area is primarily fine-grained and appears to be relatively low in permeability. Water levels in piezometers completed in these areas recovered relatively slowly after being bailed. Unconsolidated material in most downslope piezometers contained coarse-grained fractions and appears to be more transmissive. Water levels in piezometers completed in this area recovered relatively quickly after being bailed.

Surface water appears to have limited communication with groundwater in the upslope and mid-slope areas but probably recharges groundwater in the downslope area. All McLaren Pit area piezometers were drilled in the vicinity of incised, ferricrete-lined, surface water channels (orange band on **Figure 4**) with varying amounts of water flowing in the channels. All streams in the upper slope and mid-slope areas were flowing during groundwater monitoring, although many of these channels were dry in their downslope reaches. Apparently, surface water infiltrates the more permeable colluvial materials in the lower slope area. The lack of saturation observed in upslope and mid-slope unconsolidated materials in boreholes drilled adjacent to surface water channels suggests that the fine-grained, relatively impermeable nature of these sediments limits infiltration of surface water to groundwater in those areas. In downslope areas, surface water at least locally infiltrates through the coarser-grained colluvial materials, recharging the shallow groundwater flow system.

GROUNDWATER QUALITY

Field parameter data collected in 2001 and 2002 for McLaren Pit area monitoring wells and piezometers are summarized in **Tables 1 and 2**. Common ion and dissolved metal data for McLaren Pit area monitoring wells and piezometers are summarized in **Tables 3 and 4**. **Figures 6**, **7,** and **8** are isopleth maps for pH, SC, and sulfate, respectively, in shallow groundwater. **Figure 9** is a map with stiff diagrams for McLaren Pit area monitoring wells and piezometers. Laboratory analytical reports are contained in Attachment B.

None of the samples collected from wells or piezometers in the McLaren Pit area between October 2001 and August 2002 exceeded groundwater standards for aluminum or lead (**Table 4**). Groundwater standards for cadmium and zinc were exceeded in the sample from well DCGW-104 and the standard for cadmium was also exceeded in wells DCGW-132 and 133. The copper standard was exceeded in samples from wells DCGW-104 and -105 and piezometers DCGW-132 and -133. The iron standard was exceeded in samples from DCGW-104, -105, -106, 107, -132, and -133. Samples from DCGW-104, -105, -106, -109, -110, and -131 through -134 exceeded the groundwater standard for sulfate. All samples exceeded the standard for manganese except those from piezometers DCGW-108, -109, -110, and -138. Yellow shading in **Table 4** indicates exceedances of groundwater standards.

Well DCGW-101S is completed in colluvium at (and immediately above) the bedrock contact, and DCGW-101D is a deep well completed in a Tertiary intrusive bedrock unit. During both the October 2001 and July 2002 sampling events, aluminum, cadmium, copper, and zinc concentrations were higher in water samples from well DCGW-101S than in -101D, and iron concentrations were higher in samples from DCGW-101D than in -101S (**Table 4**). Groundwater from well DCGW-101S exhibited considerably lower pH and higher SC than groundwater from the adjacent bedrock well (DCGW-101D) (**Table 1**).

TABLE 3
McLaren Pit Area Common Ion Results for 2002

Well/ Piezometer	Sample Date	Ca	Mg	Na	K	Hardness	Alkalinity			Acidity	SO_4	Cl
						$CaCO_3$	$CaCO_3$	CO_3	HCO_3	$CaCO_3$		
DCGW-101S	7/10/2002	30	7	2	1	104	<1	0	<1	24	103	<2
DCGW-101D	7/10/2002	73	15	5	2	244	94	0	115	<2	126	<2
DCGW-102S	7/8/2002	54	19	8	4	213	167	0	204	<2	38	<2
DCGW-102D	7/8/2002	43	19	17	3	186	171	0	209	<2	40	<2
DCGW-103S	7/8/2002	128	24	10	12	418	187	0	228	<2	225	<2
DCGW-103D	7/8/2002	90	21	8	2	311	169	0	206	<2	129	<2
DCGW-104	7/9/2002	186	83	10	3	806	<1	0	<1	987	1580	9
DCGW-105	7/8/2002	17	10	3	2	84	<1	0	<1	575	618	<2
DCGW-106	8/19/2002	146	26	8	4	472	212	0	259	<4	268J	<2
DCGW-107	8/19/2002	88	13	14	12	273	96	0	117	<4	195J	6
DCGW-108	8/23/2002	27	6	3	3	93	<4	0	<4	212	107J	<2
DCGW-109	8/19/2002	115	17	9	12	357	124	0	151	<4	266J	<2
DCGW-110	8/23/2002	218	28	9	10	660	124	0	151	<4	547J	<2
DCGW-131	8/23/2002	469	51	17	24	1380	174	0	212	<4	1270J	<2
DCGW-132	8/22/2002	141	50	9	23	558	<1	0	<1	523	810J	<2
DCGW-133	8/22/2002	103	25	4	6	360	<1	0	<1	404	639J	<2
DCGW-134	8/22/2002	41	8	6	5	135	<1	0	<1	121	320J	<2
DCGW-135	8/22/2002	*	*	*	*	*	*	*	*	*	*	*
DCGW-136	8/22/2002	62	14	4	2	212	<4	0	<4	43	183J	<2
DCGW-137	8/23/2002	39	9	5	3	134	97	0	118	<4	48J	2
DCGW-138	8/22/2002	62	8	3	3	188	40	0	49	<4	150J	<2

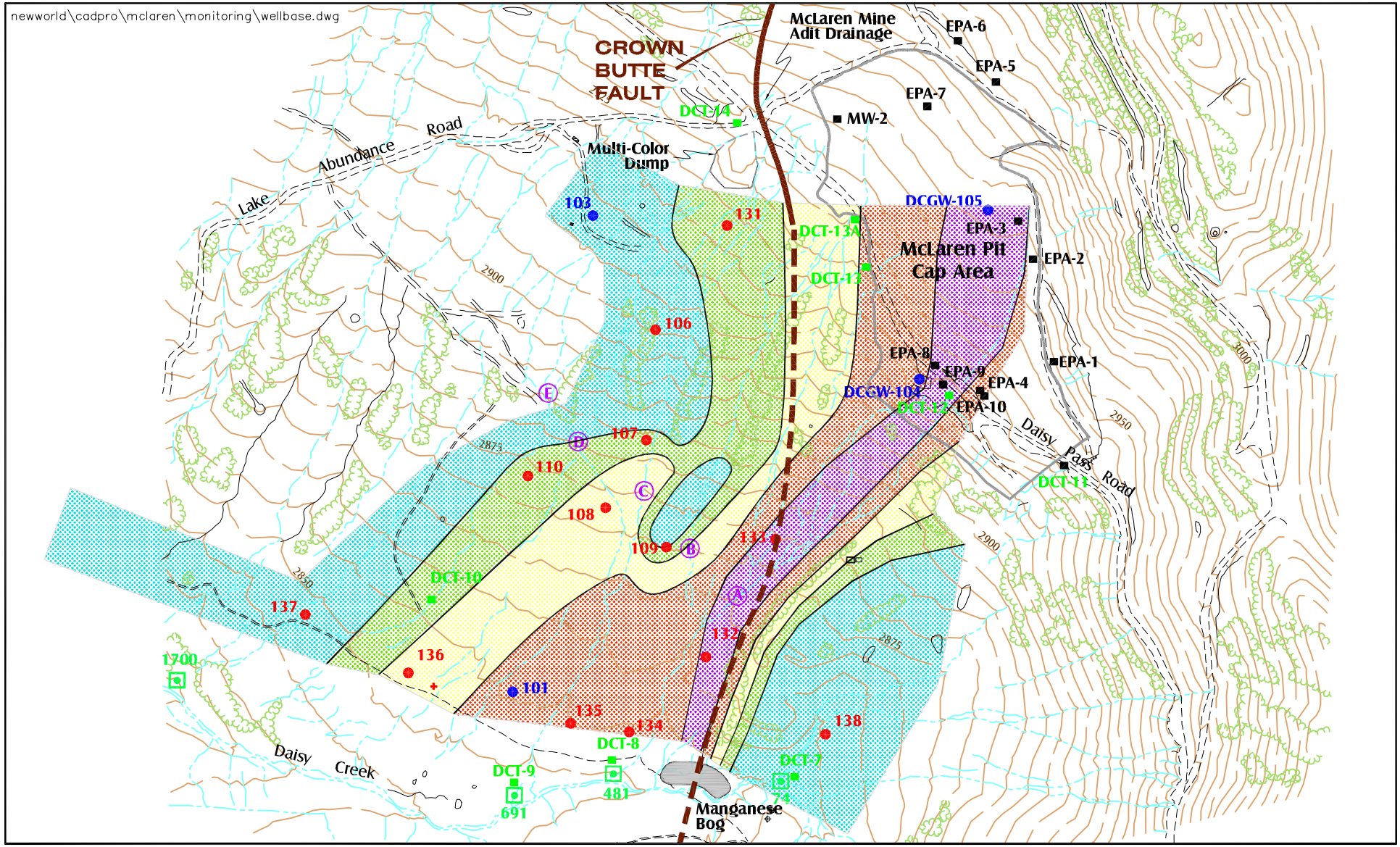
Notes:
All concentrations in milligrams per liter (mg/L)
* indicates well was dry
J indicates estimated concentration

Water quality data from these two wells indicates that groundwater quality in the colluvium is poorer than in the underlying bedrock at this location. Water quality data from the other two paired monitoring wells (DCGW-102S and -102D, and DCGW-103S and -103D) indicate that concentrations of most constituents in unconsolidated and bedrock water bearing units are similar (**Tables 3 and 4**) with two exceptions. Groundwater in the shallow colluvial wells (DCGW-102S and -103S) contained higher manganese values, while the bedrock wells (DC-GW-102D and -103D) contained higher iron concentrations (**Table 4**). Higher iron concentrations in bedrock wells may result from groundwater in these deeper wells being in a reducing state, or at least more reducing than the shallow wells.

TABLE 4
McLaren Pit Area Dissolved Metals and Sulfate Results for 2001/2002

Well/ Piezometer	Sample Date	Al	Cd	Cu	Fe	Pb	Mn	Zn	SO_4
DCGW-101S	10/10/2001	0.6	0.0006	0.088	0.09	<0.001	0.32	0.110	106
	7/10/2002	2.6	0.0003	0.13	0.01	0.001	0.26	0.100	103
	9/5/2002	2.2	0.0005	0.13	<0.01	0.003	0.21	<0.009	126
DCGW-101D	10/10/2001	<0.1	<0.0001	<0.001	0.21	<0.001	0.24	0.010	176
	7/10/2002	<0.1	<0.0001	<0.001	0.18	0.003	0.43	<0.010	126
	9/5/2002	<0.1	<0.0001	<0.001	<0.01	<0.001	0.23	<0.010	126
DCGW-102S	7/8/2002	<0.1	<0.0001	<0.001	<0.01	<0.001	0.54	<0.010	38
DCGW-102D	7/8/2002	0.1	0.0001	0.003	0.13	<0.001	0.19	0.010	40
DCGW-103S	7/8/2002	<0.1	<0.0001	0.002	0.08	<0.001	1.15	<0.001	225
DCGW-103D	10/10/2001	<0.1	0.0001	<0.001	0.22	<0.001	0.12	<0.010	111
	7/8/2002	<0.1	<0.0001	<0.001	0.26	<0.001	0.19	<0.010	129
DCGW-104	7/9/2002	114.0	0.0280	47.90	142.00	0.002	13.40	4.800	1580
DCGW-105	7/8/2002	28.9	0.0048	14.10	169.00	0.008	1.67	0.680	618
DCGW-106	8/23/02	<0.1	<0.0001	<0.001	2.5	<0.001	0.253	<0.01	268
DCGW-107	8/23/02	<0.1	0.0001	<0.001	0.85	<0.001	0.767	<0.01	195
DCGW-108	8/23/02	<0.1	0.0005	0.11	<0.01	<0.001	<0.005	<0.01	107
DCGW-109	8/23/02	<0.1	0.0001	0.003	<0.01	<0.001	<0.005	<0.01	266
DCGW-110	8/23/02	<0.1	0.0009	0.014	<0.01	<0.001	<0.005	<0.01	547
DCGW-131	8/23/02	<0.1	0.0005	0.003	<0.01	<0.001	<0.005	<0.01	1270
DCGW-132	8/23/02	22	0.014	3.36	138	0.006	9.77	1.72	810
DCGW-133	8/23/02	32	0.013	11.3	68	0.007	4.37	1.51	639
DCGW-134	8/23/02	<0.1	0.0002	0.004	0.02	<0.001	1.02	0.04	320
DCGW-135	8/23/02	*	*	*	*	*	*	*	*
DCGW-136	8/23/02	<0.1	0.0025	0.11	<0.01	<0.001	1.73	0.29	183
DCGW-137	8/23/02	<0.1	<0.0001	0.001	<0.01	<0.001	0.14	<0.01	48
DCGW-138	8/23/02	<0.1	0.0003	0.001	<0.01	<0.001	0.008	0.05	150
Groundwater Standard**		--	0.005	1.3	0.3	0.015	0.05	2.1	250

Notes:
All concentrations in milligrams per liter (mg/L)
Yellow Shading indicates concentration exceeding water quality standard
* indicates well was dry
** Human Health Standard Circular WQB-7 (MDEQ 2002)



N

0 10 Meters 50
1:4000

Contour Interval = 5 meters

MAXIM TECHNOLOGIES INC® 9902245.432

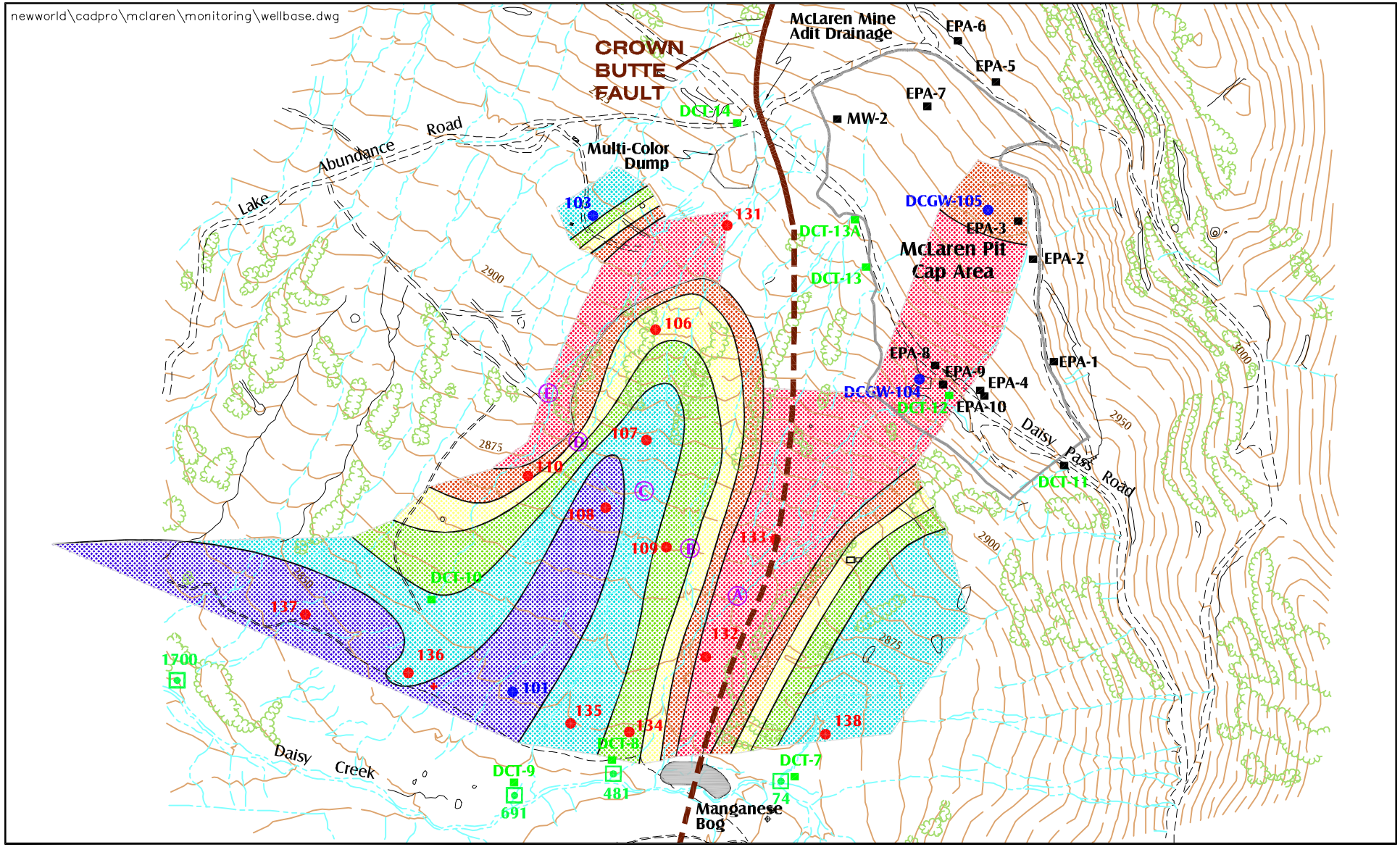
- A — Surface Water Site (DCSW-6905 prefix not included)
- 1700 — Nimick 2000 Surface Water Site
- 106 — Piezometer (DCGW prefix not included)
- 101 — Monitoring Well (DCGW prefix not included)
- Creek/Drainage
- Road/Trail
- Crown Butte Fault- (Dashed where inferred)

pH (Standard Units)

- <4
- 4-5
- 5-6
- 6-7
- >7

7/8-10/02 Mon. Well Data, 8/23/02 Piezometer Data

Isopleth Map of pH
Mclaren Pit Area
New World Mining District
Response and Restoration Project
FIGURE 6



N

0 10 Meters 50
1:4000

Contour Interval = 5 meters

MAXIM TECHNOLOGIES INC® 9902245.432

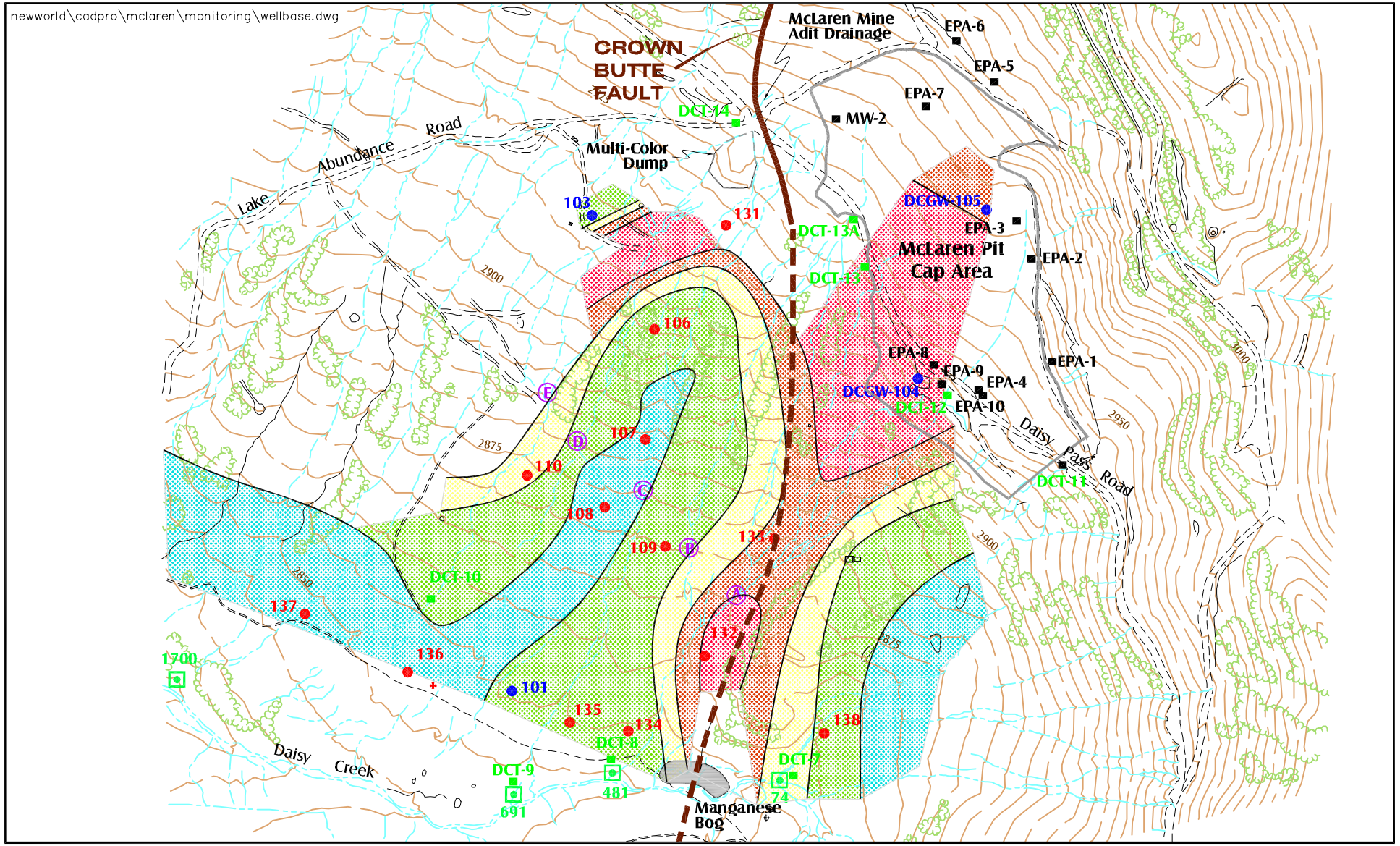
Surface Water Site (DCSW-6905 prefix not included)
1700 Nimick 2000 Surface Water Site
106 Piezometer (DCGW prefix not included)
101 Monitoring Well (DCGW prefix not included)
Creek/Drainage
Road/Trail
SC = Specific Conductance
Crown Butte Fault- (Dashed where inferred)

SC (micromhos per centimeter)

- <400
- 400-600
- 600-800
- 800-1000
- 1000-1200
- >1200

7/8-10/02 Mon. Well Data, 8/23/02 Piezometer Data

Isopleth Map of Specific Conductance
Mclaren Pit Area
New World Mining District
Response and Restoration Project
FIGURE 7



N

0 10 Meters 50

1:4000

Contour Interval = 5 meters

MAXIM TECHNOLOGIES INC 9902245.432

Ⓐ Surface Water Site (DCSW-6905 prefix not included)

1700 Nimick 2000 Surface Water Site

106 Piezometer (DCGW prefix not included)

101 Monitoring Well (DCGW prefix not included)

Creek/Drainage

Road/Trail

mg/l = milligrams per liter

Crown Butte Fault- (Dashed where inferred)

Sulfate (mg/l)

- <200
- 200-400
- 400-600
- 600-800
- >800

7/8-10/02 Mon. Well Data, 8/23/02 Piezometer Data

Isopleth Map of Sulfate Concentration

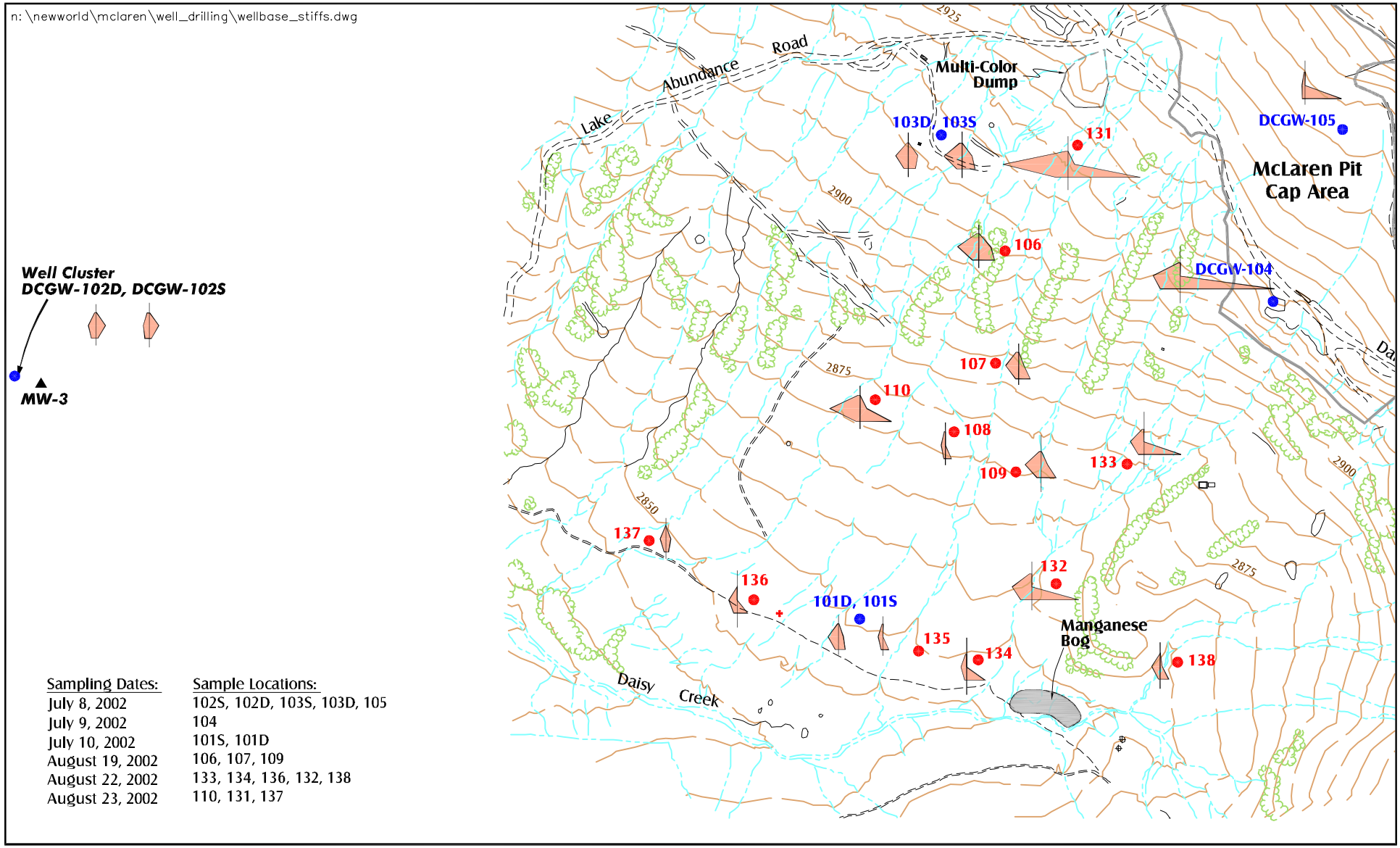
Mclaren Pit Area

New World Mining District

Response and Restoration Project

FIGURE 8

n: \newworld\mclaren\well_drilling\wellbase_stiffs.dwg



Well Cluster
DCGW-102D, DCGW-102S

MW-3

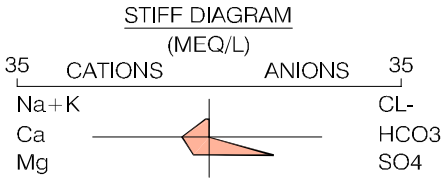
Sampling Dates:	Sample Locations:
July 8, 2002	102S, 102D, 103S, 103D, 105
July 9, 2002	104
July 10, 2002	101S, 101D
August 19, 2002	106, 107, 109
August 22, 2002	133, 134, 136, 132, 138
August 23, 2002	110, 131, 137

N

0 10 Meters 50
1:4000

MAXIM TECHNOLOGIES INC® 9902245.432

STIFF DIAGRAM
(MEQ/L)



106 Piezometer (DCGW prefix not included)
101 Monitoring Well (DCGW prefix not included)
Creek/Drainage
Road/Trail

Stiff Diagrams
Mclaren Pit Area
New World Mining District
Response and Restoration Project
FIGURE 9

Groundwater samples collected from wells DCGW-104 and -105, which are completed in mine waste in the McLaren Pit, contained very large concentrations of dissolved metals and sulfate (**Tables 3 and 4**). Water quality in these wells is similar to water quality observed in historic monitoring wells also completed in mine waste (EPA-03 and EPA-04, **Table 5**). Groundwater samples collected from wells screened in various types of bedrock in and near the McLaren Pit also exhibited low pH values and elevated metal concentrations (**Table 5**).

TABLE 5
Mean Groundwater Concentrations for Selected Parameters
McLaren Pit Area Historic Monitoring Wells

Well Name	Completion Formation	pH	Mean Dissolved Concentration (milligrams per liter)*					
			Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
EPA-01	Wolsey Sh.	4.5	0.0147	0.0164	0.0050	1.12	0.0977	2.38
EPA-02	Wolsey Sh.	2.9	0.0078	0.0105	0.0105	6.23	0.044	1.685
EPA-03	Waste	--	0.0061	0.0094	0.0140	11.7	0.089	1.13
EPA-04	Waste	2.4	0.0075	0.0245	0.0814	37.35	0.0207	3.83
EPA-05	Fisher Mt. Int.	--	0.0100	0.0040	0.0500	7.49	0.01	0.17
EPA-06	Fisher Mt. Int.	3.9	0.0075	0.0035	0.0142	3.02	0.0052	0.1855
EPA-07	Waste Rock	--	0.0100	0.0050	0.0100	1.17	0.0055	0.076
EPA-08	Meagher Ls.	4.2	0.0100	0.0200	0.0300	35.45	0.02	3.22
EPA-09	Wolsey Sh.	6.3	0.0089	0.0035	0.0070	0.086	0.005	0.159
EPA-10	Meagher Ls.	3.6	0.0088	0.023	0.0415	28.2	0.036	3.375
MW-2	Wolsey Sh	3.8	0.0109	0.005	0.0100	0.0342	0.0092	0.238
Groundwater Standard**	--	--	0.010	0.005	0.100	1.3	0.015	2.1

Notes: -- - indicates not applicable or not calculated
* - mean calculated from data collected between 1996 and 2001; n varies for each well and each parameter
** - Human Heath Standard, WQB-7 (MDEQ 2002).
Yellow shading indicates concentration exceeds groundwater standard

Groundwater from shallow wells and piezometers exhibited field measured pH ranging from 2.55 to 8.02 standard units (su). **Figure 6** is an isopleth map based on pH measured in groundwater samples collected from shallow wells between July 8 and July 10, 2002 and piezometers on August 23, 2002. The lowest pH (less that 4.0 su) was measured in samples from wells competed in waste rock in the McLaren Pit (DCGW-104 and -105) and piezometers in or in the vicinity of the downstream end of a large ferricrete apron that outcrops immediately below the south end of the McLaren Pit (DCGW-132 and -133). These piezometers also lie close to very acidic surface water flows from the south end of the McLaren Pit.

Figures 7 and 8 are isopleth maps based on laboratory SC and sulfate concentrations measured in groundwater samples collected from shallow wells between July 8 and July 10, 2002 and piezometers on August 23, 2002. Groundwater from mid- and upslope shallow monitoring wells and piezometers has relatively high SC and sulfate (generally greater than 500 microsiemens per centimeter [µS/cm]), while groundwater from the furthest downgradient piezometers (DCGW-101S, -134, -136, -138, and -108) has lower SC and sulfate (generally less than 450 µS/cm) (**Tables 1 and 2**). The highest SC

values (greater than 1,000 µS/cm) and sulfate concentrations (600 milligrams per liter [mg/L]) were measured in monitoring wells in McLaren Pit mine waste (DCGW-104 and -105), piezometers downgradient of McLaren Pit (DCGW-132 and -133), and a piezometer adjacent to the surface water channel between DCGW-110 and DCGW-131.

With the exception of wells competed in waste rock (DCGW-104 and -105), the highest dissolved aluminum, copper, cadmium, iron, lead and zinc concentrations measured in shallow groundwater were in samples from downgradient piezometers DCGW-132 and 133 (**Table 4**). The relatively high metals concentrations in piezometers DCGW-132 and -133 correlates with the high pH, SC, and sulfate concentrations measured in these piezometers.

Figure 9 indicates that most shallow groundwater downgradient of the McLaren Pit is a calcium-sulfate type. Groundwater from monitoring wells DCGW-101D and -103S are a calcium-sulfate-bicarbonate type, and groundwater from wells DCGW-102S, -102D, and -103D are a calcium-bicarbonate type. Comparison of stiff diagrams for shallow and deep wells from the three paired monitoring wells (DCGW-101, -102, and -103) indicates that the groundwater type in the deep well of each pair is very similar to that of the shallow well. This suggests that water flowing in the unconsolidated flow system is of a similar origin to that in the shallow bedrock system, and that the two systems are in direct hydraulic communication.

Although groundwater samples collected from many historic bedrock monitoring wells in the McLaren Pit exhibited relatively low pH and high metals concentrations (**Table 5**), the three new downgradient bedrock wells (DCGW-101D, -102D, and -103D) and older bedrock well MW-3 do not exhibit elevated metals concentrations (**Table 4)** or low pH (**Table 1**). This suggests that transport of contaminants in bedrock is fracture controlled.

The Crown Butte fault may be a preferential pathway for contaminant transport in bedrock below the McLaren Pit. Well DCGW-101D appears to be somewhat downgradient of the McLaren Pit but exhibits lower concentrations of metals and ions than upgradient piezometers completed in shallow colluvium. Groundwater flow in bedrock within the New World Mining District is known to be predominantly fracture controlled. While well DCGW-101D appears to be somewhat downgradient of the McLaren Pit, fractures along the Crown Butte fault may be transporting contaminated groundwater downgradient toward the manganese bog. Dye injected during tracer studies in the McLaren Pit area were detected in one monitoring well along the Crown Butte Fault in the upper Miller Creek drainage (approximately 1.6 kilometers (one mile) away) and another downstream in the Fisher Creek drainage (about 1.2 kilometers (0.75 miles) away) (G. J. Davies, Appendix F, in Start Report, 1998). Aquifer testing in the Miller Creek drainage indicates that the Crown Butte fault zone in upper Miller Creek is highly transmissive (Huntingdon, 1995). During one test, approximately 0.9 meters (3 feet) of drawdown was measured in the Miller Creek well (MW-5P) after it was pumped for 150 minutes at 400 liters per second (105 gallons per minute) and little if any drawdown was observed in the observation wells completed adjacent to the pumping well (MW-5P) but outside the fault zone. Aquifer transmissivity could not be quantified by the pumping test, but it did demonstrate that fractures associated with this fault are capable of transmitting very large volumes of groundwater in the plane of the fault but very little at right angles to the fault. It is possible that groundwater beneath the McLaren Pit flows in fractured bedrock downgradient to the southwest, and, upon encountering the fault, is directed laterally in a north-south direction along the fault plane.

SURFACE WATER QUALITY

Surface water samples were collected from five ferricrete-lined channels below the McLaren Pit (sites DCSW-0905-A through -E, **Figure 1)** along a line of piezometers immediately below the first break in slope. These samples were analyzed for field parameters and dissolved metals during the September 5, 2002 sampling event. **Table 6** summarizes water quality data for these surface water samples. Aluminum, copper, iron, and manganese concentrations were very high, exceeding surface water standards in almost all cases. The highest dissolved metals concentrations, lowest pH, and highest SC readings were measured in DCSW-0905A, directly in line with the low pH and high dissolved metals concentrations measured in shallow alluvium in DCGW-132 and -134. The pH at all surface water sites was very acidic, ranging from 2.55 su to 2.82 su. The SC ranged from 628 µS/cm to 2,390 µS/cm. Surface water pH measurements are more acidic than any of the water samples collected from any piezometer or monitoring well with the exception of piezometer DCGW-133.

TABLE 6
Water Quality Data for McLaren Pit Area Surface Water Samples

SURFACE WATER STATION	DATE	pH (su)	SC (µS/cm)	Dissolved Concentration (milligrams per liter)						
				Al	Cd	Cu	Fe	Pb	Mn	Zn
DCSW-0905A	9/5/2002	2.55	2,390	80.9	0.020	35.3	187	0.006	8.74	4.13
DCSW-0905B	9/5/2002	2.67	820	44.9	0.0023	5.15	5.30	0.007	0.54	0.23
DCSW-0905C	9/5/2002	2.82	628	15.3	0.0013	1.26	3.04	0.006	0.56	0.28
DCSW-0905D	9/5/2002	2.7	868	10.8	0.0012	1.45	4.65	0.005	0.50	0.12
DCSW-0905E	9/5/2002	2.56	1,827	25.6	0.0012	17.2	117	0.002	1.80	0.19
Chronic Aquatic Standard*				0.087	0.0014	0.005	1	0.003	--	0.067

Notes: µS/cm = microsiemens per centimeter
su = standard units
* - acute standard based on 50 mg/l hardness for cadmium, copper, and zinc, and 100 mg/l hardness for lead; yellow shading indicates exceedance of standard
-- indicates not applicable

SURFACE WATER-GROUNDWATER INTERACTION

Table 7 compares flow data, metal concentrations, and loading calculations between surface water sampling sites and adjacent monitoring wells and piezometers. Surface water sites are labeled with the prefix DCT (Daisy Creek tributary) and were selected because they are downgradient of the McLaren Pit (**Figure 1**). The data from these sites has been averaged for high and low flow periods of the year and the number of measurements averaged is also shown. As can be seen from **Table 7,** metal concentrations are significantly higher in periods of low flow than at high flow (higher by an average factor of about 3.9 for aluminum, 2.3 for copper, and 6.6 for zinc). Generally, samples collected by Nimick and Cleasby (2001) during a synoptic sampling run (green rows of data on **Table 7**) fall within the range of high and low values defined by the DCT sampling events. With the exception of DCGW-132, -133, and -104, metal concentrations are lower and pH is higher in shallow monitoring wells and piezometers than in adjacent surface water. Wells DCGW-104 and EPA-04 were drilled directly in mine waste within the McLaren Pit. A surface water tributary and seep that lies immediately downstream of these wells (DCT-12, **Figure 1)** has similar pH and metal concentrations (**Table 7**).

TABLE 7
Comparison of Flow Data, Water Quality and Loading from Adjacent Surface Water Sites, and Well Locations Below McLaren Pit

Site Code	# data points	Flow, (cfs)	Flow (gpm)	Flow (L/s)	Rel Flow	pH Lab	(mg/L) Al	(mg/L) Cu	(mg/L) Zn	Cu (mg/sec)	Cu (kg/day)	Cu (kg/yr)	% Annual
Nimick, 1999-74	1		22.5	1.420	low	6.97	0.18	0.175	0.185	0.25	0.021	6.78	316 days
DCT-7	6	0.360	161.6	10.226	low	7.00	2.60	0.450	0.370	4.60	0.398	125.64	79.41
DCT-7	3	0.874	392.3	24.826	high	6.10	0.30	0.310	0.432	7.70	0.665	32.58	20.59
	Factor increase in concentration between high and low flow						8.67	1.45	0.86		Total	158.22	
DCGW-134	08/23/02					4.30	0.10	0.004	0.040				
DCGW-132	08/23/02					3.90	22.00	3.960	1.720				
DCGW-133	08/23/02					3.75	32.00	11.300	1.510				
Nimick, 1999-481	1		17.9	1.130	low	2.85	38.60	14.500	1.460	16.39	1.416	447.35	316 days
DCT-8	7	0.038	17.1	1.079	low	2.70	65.60	23.210	2.190	25.05	2.165	684.00	35.14
DCT-8	3	1.369	614.4	38.887	high	2.90	23.00	7.670	0.640	298.26	25.770	1262.71	64.86
	Factor increase in concentration between high and low flow						2.85	3.03	3.42		Total	1946.71	
DCGW-101-S	7/10/2002					4.51	2.60	0.130	0.100				
Nimick, 1999-691	1		0.7	0.042	low	3.28	10.30	1.360	0.114	0.06	0.005	1.56	316 days
DCT-9	6	0.005	2.2	0.142	low	3.16	17.80	1.500	0.169	0.21	0.018	5.82	32.87
DCT-9		0.104	46.7	2.954	high	3.30	8.40	0.950	0.076	2.81	0.242	11.88	67.13
	Factor increase in concentration between high and low flow						2.12	1.58	2.22		Total	17.70	
DCGW-136	08/23/02					5.70	0.10	0.110	0.029				
Nimick, 1999-1700	1		1.3	0.083	low	3.98	6.46	1.111	0.183	0.09	0.008	2.52	316 days
DCT-10	3	0.004	1.8	0.114	low	2.70	40.75	8.135	0.247	0.92	0.080	25.24	14.80
DCT-10	4	0.495	222.2	14.061	high	3.05	6.60	2.440	0.064	34.31	2.964	145.24	85.20
	Factor increase in concentration between high and low flow						6.17	3.33	3.86		Total	170.48	
DCT-11	2	0.004	1.8	0.114	low	2.95	22.90	12.335	1.330	1.40	0.121		
DCGW-104	7/10/2002					2.89	114.00	47.900	4.800				
MW-EPA-4	many					2.40		37.350	3.830				
DCT-12	6	0.020	9.0	0.568	low	2.52	71.80	33.900	3.700	19.26	1.664	525.81	64.91
DCT-12	1	0.112	50.3	3.181	high	2.60	47.50	21.1	2.480	67.13	5.800	284.19	35.09
	Factor increase in concentration between high and low flow						1.51	1.61	1.49		Total	810.00	
DCT-13	1	0.003	1.3	0.085	low	2.90	21.60	5.790	1.000	0.49	0.043	13.47	29.45
DCT-13	1	0.220	98.7	6.249	high	3.20	3.80	1.220	0.030	7.62	0.659	32.28	70.55
	Factor increase in concentration between high and low flow						5.68	4.75	33.33		Total	45.75	
DCGW-131	08/23/02					6.80	0.10	0.003	0.010				
DCT-14	6	0.007	3.1	0.199	low	6.67	0.38	0.028	0.023	0.01	0.0005	0.15	6.63
DCT-14	1	0.130	58.3	3.693	high	5.90	2.00	0.137	0.030	0.51	0.044	2.14	93.37
	Factor increase in concentration between high and low flow						0.19	0.20	0.77		Total	2.29	
	Overall average factor increase						3.89	2.28	6.56				
										Avg annual low flow load contribution (%)			33.05
	Yellow = well data, reported concentrations are for dissolved metals									Avg annual high flow load contribution (%)			66.95
	Green = surface water data from Nimick and Cleasby (2001), reported concentrations are for total recoverable metals												
	White= surface water data from Crown Butte Mines, Inc. reported concentrations are for total recoverable metals												
	* assumes 316 days per year of low flow and 49 days per year (7 weeks) of high flow.												

Tributary DCT-12 and several other streams flow down from the McLaren Pit across a broad ferricrete covered surface. These tributaries merge just below piezometer DCGW-133 and the combined stream flows past piezometer DCGW-132 to tributary DCT-8. The depth to bedrock in these piezometers is shallow, and they are completed at the surface in ferricrete adjacent to highly acidic metal-laden surface water. Water levels in both piezometers are only about a meter (a few feet) below ground surface and produce groundwater with low pH and high concentrations of metals. Piezometer DCGW-134 also lies adjacent to tributary DCT-8 but has a significantly higher pH (4.3 su) and considerably lower concentrations of metals. This suggests that shallow colluvial plumes of contaminated water may be quite restricted in aerial extent and may be flowing in discrete localized zones of preferential flow. In this particular area (DCGW-134), the zone of preferential flow may be in close proximity to surface water and can be traced from wells DCGW-104 through 133 and 132 (but not 134), and may be the source for contaminated water surfacing in the area of the manganese bog adjacent to Daisy Creek (**Figure 1**).

With respect to loading analysis Nimick and Cleasby's report (2001) summarizes as follows:

> *"Significant copper loading to Daisy Creek occurred only in the upper half of the stream. Sources included subsurface inflow and right-bank (mined side) surface inflows. Copper loads in left-bank (unmined side) surface inflows were negligible. Most (71 percent) of the total copper loading in the study reach occurred along a 341-foot reach near the stream's headwaters. About 53 percent of the total copper load was contributed by five surface inflows that drain a manganese bog and the southern part of the McLaren Mine. Copper loading from subsurface inflow was substantial, contributing 46 percent of the total dissolved copper load to Daisy Creek. More than half of this subsurface copper loading occurred downstream from the reaches that received significant surface loading. Flow through the shallow subsurface appears to be the main copper-transport pathway from the McLaren Mine and surrounding altered and mineralized bedrock to Daisy Creek during base-flow conditions." (Nimick and Cleasby, 2001, p. 1)*

Table 7 includes load calculations for copper in the tributaries to Daisy Creek (DCT samples). Even though metal concentrations were much higher in DCT surface water samples during low flow periods, the overall rate of metal loading to Daisy Creek is greatest during high flow. Annual load calculations were estimated assuming that high flow conditions occur over a period of 49 days per year (seven weeks) and low flow condition occur over the remaining 316 days (45 weeks) of the year. Using these assumptions, approximately 67 per cent of the load to Fisher Creek occurs during the seven weeks of high flow, whereas 33 percent of the load is distributed over the remaining 45 weeks per year of low flow. Using DCT-8 (in the vicinity of DCGW-134) and Nimick and Cleasby site 481 as an example, approximately 1,947 kilograms (kg) of copper are added annually to the main stream of Daisy Creek from this tributary. Approximately 1,263 kg are added annually during high flow (end of June to mid-August) and 684 kg area added throughout the remainder of the year.

Table 8 presents averaged surface water quality data from long established sampling sites on Daisy Creek. Comparison of **Table 4** to **Table 8** indicates that, generally, metals concentrations in shallow groundwater from monitoring wells and piezometers completed just upgradient of Daisy Creek (DCGW-101S, and -134 through -138) are appreciably lower than concentrations measured in water from the main stem of Daisy Creek. The fact that water quality is better in shallow groundwater than surface water in tributaries flowing from the pit area and the main stem of Daisy Creek suggests that shallow groundwater may not be a major source of metal loading along most of this reach of Daisy

Creek, at least in the vicinity of these wells and piezometers. **Figure 6**, **7**, and **8** suggest that there is probably a zone along the Crown Butte Fault where groundwater of poor quality is discharging to Daisy Creek near the manganese bog between tributaries DCT-7 and DCT-8 (**Figure 1)**.

TABLE 8
Mean Concentrations of Selected Parameters in Surface Water

Location	Mean Total Recoverable Concentration (milligrams/liter)								pH(1) (su)
	Al	Cd	Cr	Cu	Fe	Pb	Mn	Zn	
McLaren Mine Adit (D-18) (2)	0.233	0.0008	<0.02	0.013	14.975	0.004	0.892	0.046	3.7
Daisy Creek @ DC-1(3)	17.3	0.0048	0.014	5.646	27.782	0.019	2.37	0.732	3.2
Daisy Creek @ DC-2(3)	12.93	0.0037	0.006	3.61	14.22	0.006	1.81	0.503	3.6
Daisy Creek @ DC-5 (3) (Temp. Stds. Compliance Pt.)	3.83	0.001	0.002	1.375	3.6	<0.002	0.60	0.207	6.6
Temporary Standard @ DC-5	9.51	0.004	--	3.530	6.830	--	1.71	0.540	4.6
WQB-7Standard (hardness=100)	0.087	0.0025	0.21	0.009	0.30	0.0032	0.05	0.120	

Notes:
(1) pH in standard units
(2) Data from Hydrometrics (1992); average for samples collected during 1989-1991 time period
(3) Mean concentrations calculated from available data in project database - 1989 - 2000
-- Not applicable

In summary, based on dissolved metals data for shallow wells and piezometers and in surface waters of the various tributaries and Daisy Creek, and the relationships observed for the contoured pH, SC, and sulfate data, it appears that most of the significant contaminant loading to Daisy Creek comes from contaminated surface water tributaries originating in the McLaren Pit area, and discrete zones of preferential flow of contaminated groundwater along the Crown Butte fault through shallow colluvial material and bedrock. Bedrock groundwater quality is relatively uncontaminated, and most shallow colluvial wells are only modestly contaminated compared to surface water in the tributaries, Daisy Creek, and select zones of preferential flow in shallow colluvium.

AQUIFER TESTING

Aquifer testing was conducted during September 2002 on wells in the Daisy Creek area north and west of the McLaren Pit as a part of the McLaren Pit groundwater investigation. An aquifer test was performed on one alluvial/bedrock well cluster (DCGW-102S and -102D, and MW-3), and the remaining paired wells were slug-tested. Prior to aquifer testing, wells DCGW-101S, -101D, -102S, and -102D were developed to remove fine-grained sediment and improve hydraulic communication between the wells and the formation. The wells were developed by alternately surging the well casing using a surge block and then removing turbid water from the well casing using a hand-lift pump. Wells DCGW-103S and -103D were not further developed due to artesian flow in these wells.

The pump test was conducted on well MW-3, as it was more appropriately constructed for a pumping test. Adjacent monitoring wells DCGW-102S and -102D were used as observation wells. The pumping test in well MW-3 was inconclusive because the lowest pumping rate available with equipment on hand was 2.3 liters per minute, and well MW-3 could not sustain this rate.

Slug tests were performed on wells DCGW-101S, -101D, and -102D between September 17 and September 19, 2002. Well DC-GW-102S was not slug-tested because the water level in that well did not recover sufficiently within 72 hours of development. Wells DCGW-103S and -103D were not slug-tested due to artesian flow in these wells. Depth to water was measured in the wells prior to each test using a decontaminated electric water level probe. Water was displaced by rapidly inserting a slug into the well casing and then measuring water levels on a regular basis until they recovered to near pre-test levels ("slug-in" test). The slug was then removed rapidly from the well and water levels were again recorded until water levels recovered ("slug-out" test). Field data collected during the slug tests are contained in Attachment C.

Time-displacement data resulting from the slug tests were analyzed by the Bouwer and Rice method (Bouwer and Rice 1976) for unconfined aquifers. This method is applicable because well DCGW-101S is screened in unconfined alluvium and wells DCGW-101D and -102D are screened in fractured bedrock with no overlying aquitard unit. Results of slug test analyses (**Table 9**) indicate that hydraulic conductivity estimates range from 0.26 meters (0.86 feet) per day (3.04E-04 cm/sec) for well DCGW-101D (Lulu Pass Rhyodacite) to 0.85 meters (2.78 feet) per day (9.81E-04 cm/sec) for well DCGW-101S (sandy alluvium).

TABLE 9
Summary Of Slug Test Results*

Well Tested	Unit Tested	Test Type	Hydraulic Conductivity (meters/day / feet/day)	Hydraulic Conductivity (cm/sec)
DCGW-101S	Sandy Alluvium	Slug-in	0.847 / (2.78)	9.81E-04
DCGW-101S	Sandy Alluvium	Slug-out	0.747 / (2.45)	8.64E-04
DCGW-101D	Lulu Pass Rhyodacite	Slug-in	0.263 / (0.862)	3.04E-04
DCGW-101D	Lulu Pass Rhyodacite	Slug-out	0.297 / (0.975)	3.44E-04
DCGW-102D	Park Shale	Slug-in	0.573 / (1.88)	6.63E-04
DCGW-102D	Park Shale	Slug-out	0.442 / (1.45)	5.12E-04

* Method of Analysis, Bower and Rice (1976)

COMO BASIN AREA

The objective of the Como Basin groundwater investigation was to determine water level and water quality within disturbed unconsolidated surficial materials overlying the bedrock-hosted Como massive sulfide deposit. As part of this investigation, soil samples were collected from the near-surface to

determine physical and chemical properties. Hydrogeologic and soils investigation activities completed in the Como Basin area are discussed below.

PIEZOMETER INSTALLATION AND LITHOLOGY

As with the McLaren Pit piezometers, the Como Basin piezometers were initially planned to be installed in backhoe test pits. Because the auger drill rig was available from the McLaren program, the piezometers were installed by drilling and completed in the same manner as monitoring wells. The semantics of referring to piezometers in this memorandum is only meant to distinguish between the wells installed for this investigation and wells previously installed in the Como Basin area by others.

Twenty piezometers were completed in unconsolidated material in the Como Basin during the summer of 2002 (**Figures 10, 11,** and **12**). Sixteen of the piezometers were installed on a 30.5 meter (100 foot) grid covering the basin. Two piezometers were drilled in an upper diversion ditch and two other holes were drilled on the bedrock ridge that forms Lulu Pass and the southwest rim of the basin (near a perennial snowfield). Lithologic and completion logs for the piezometers are included in Attachment D. **Table 10** summarizes piezometer completion information and field parameter data for piezometers that had water at the time of sampling.

Boreholes drilled within the basin intercepted a variable thickness of colluvial material ranging in thickness from 1.1 to 4.3 meters (3.7 to 14 feet). This material consisted of yellow to brown silt, with varying quantities of clay and sand, and scattered rock fragments. This material probably represents a weathered in place soil material derived from the underlying bedrock (including massive sulfide-bearing rock hosted in the Meagher Limestone). Colluvial material was moist during drilling in August 2002. Wet intervals within the colluvium were noted during drilling of several of the boreholes, mostly at the colluvium/ bedrock contact.

SHALLOW GROUNDWATER FLOW

Six of the holes drilled in the Como Basin encountered water with the remaining borings being dry (**Figure 10**). Holes containing water are located either near the Como Raise (FCGW-114) or are near a surface water channel that extends down the face of Fisher Mountain and cross-cuts the diversion ditch near holes FCGW-119 and -116 (**Figures 10 and 12**). Water-bearing piezometers extend across the basin in a line from this channel that includes holes FCGW-126, -129, -122, -116, and -119. It is not known if the linear arrangement of water-bearing piezometers is the result of water infiltrating through the diversion channel and then flowing downhill through unconsolidated material, or if water may be flowing from bedrock, perhaps along a liner fault trace, into the overlying unconsolidated disturbed soil material.

GROUNDWATER QUALITY

Field sampling forms for data collected in the Como Basin are presented in Attachment E. **Table 10** indicates that ground water in the six water-bearing piezometers is mildly to strongly acidic (pH=3.5 to 5.0) and SC ranges from 151 to 1,486 μS/cm. Samples collected from Como Basin piezometers were not analyzed for dissolved metals. However, in 2001 during excavation of the collar of the Como Raise (**Figure 12**), a water quality sample was collected from a 38 liters per minute (10 gallons per minute) flow of water along the bedrock-surficial material contact (near holes FCGW-113 and 114) for

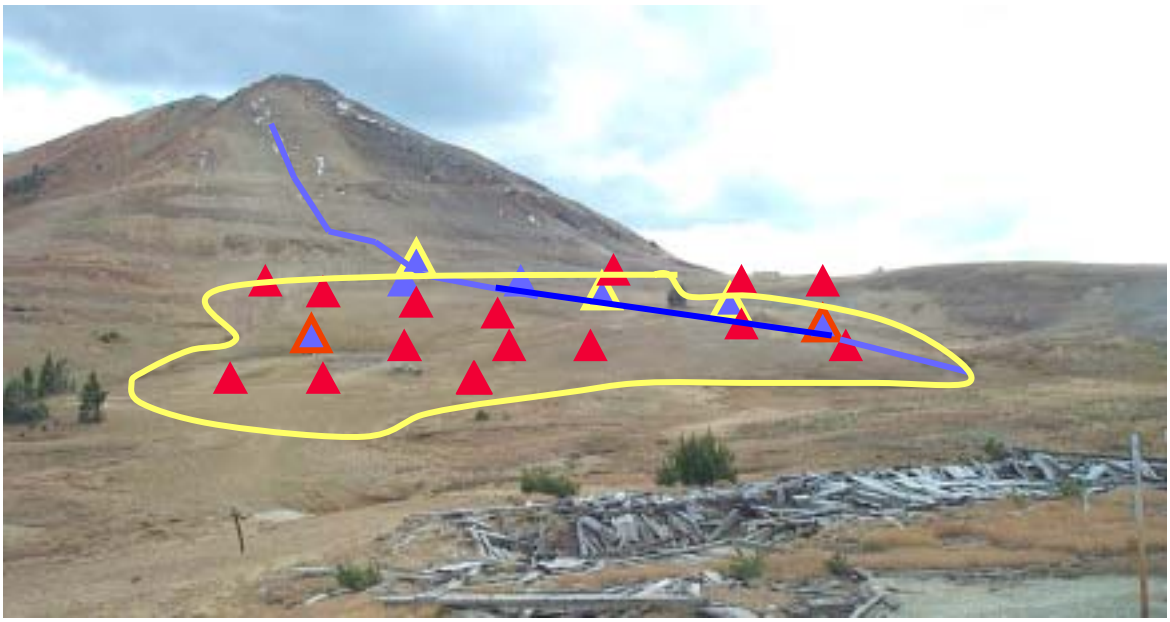
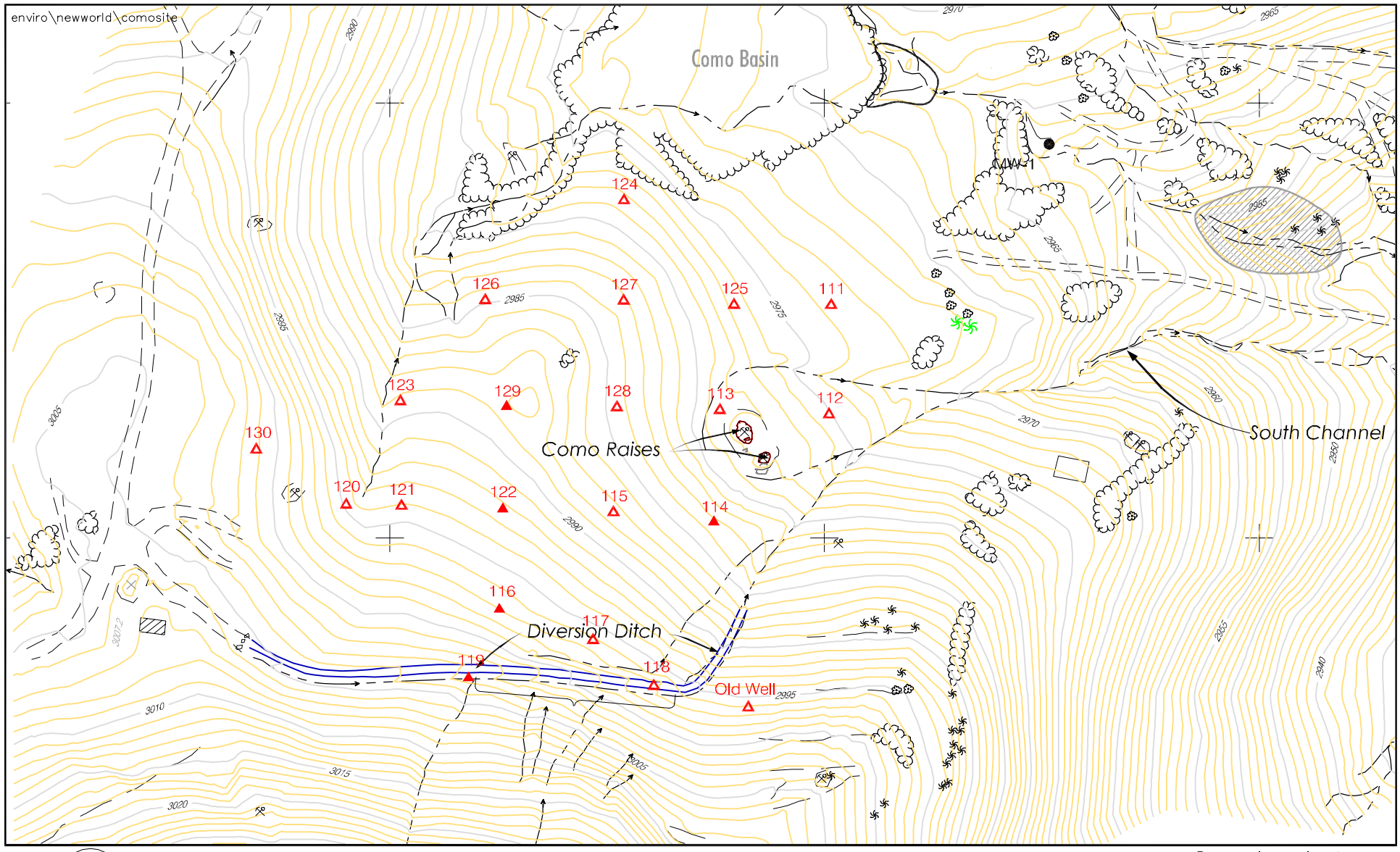


Figure 10. Photograph showing approximate location of Como Basin Piezometers. Yellow line delineates area of disturbance; blue line shows drainage channel and alignment of water bearing borings; triangles are piezometers; blue triangles are water-bearing piezometers; blue triangles with red rims have pH of less than 3.0 su; blue triangles with yellow rims have pH of 5.5 to 6.1 su (8/23/02).

Figure 11. Photograph showing area of historic disturbance in the Como Basin.



Contour Interval = 1 meter

N

0 10 Meters 40

Scale 1:1500

MAXIM TECHNOLOGIES INC® 9902245.432

- Index Contour
- Intermediate Contour
- Old Roads & Trails
- Top / Toe Slope
- Terraces
- Spot Elevation
- Test Hole
- Old Building Site
- Tree & Vegetation Outline
- Diversion Ditch
- Ditchs / Drains
- Shrub
- Tree
- Piezometer Containing Water
- Dry Piezometer
- Monitoring Well

Como Basin Piezometer Locations
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 12

TABLE 10
Well Completion Data, Depth to Water, and Field Parameter Data for Como Basin Area Piezometers

WELL NO.	DATE	TOTAL DEPTH (meters)	CASING STICK-UP (meters)	DEPTH TO BEDROCK (meters)	DEPTH TO WATER (meters)	TEMP (deg. C)	pH (su)	SC (uS/cm)
FCGW-111	8/22/2002	4.46	0.43	3.55	Dry			
FCGW-112	8/22/2002	4.49	0.71	3.35	Dry			
FCGW-113	8/22/2002	2.93	0.34	2.53	Dry			
FCGW-114	8/23/2002	3.41	0.52	1.62	2.92	4.0	2.49	659
	9/16/2002				Dry			
	10/8/2002				Dry			
FCGW-115	8/22/2002	2.96	0.40	1.52	Dry			
FCGW-116	8/23/2002	3.78	0.70	3.18	3.33	3.5	6.15	151
	9/16/2002				2.87	3.2	6.85	184
	10/8/2002				Dry			
FCGW-117	8/22/2002	2.93	0.55	1.37	Dry			
FCGW-118	8/22/2002	3.55	0.55	2.53	Dry			
FCGW-119	8/23/2002	5.15	0.65	2.29	4.43	5.0	5.7	174
	9/16/2002				4.26	2.0	7.05	228
	10/8/2002				4.65	1.0	7.52	268
FCGW-120	8/22/2002	2.68	0.79	1.55	Dry			
FCGW-121	8/22/2002	2.47	0.65	1.43	Dry			
FCGW-122	8/23/2002	2.96	0.58	1.37	1.89	4.0	6.1	180
	9/16/2002				2.42	3.5	6.84	208
	10/8/2002				2.76	2.0	7.32	234
FCGW-123	8/22/2002	2.73	0.98	1.13	Dry			
FCGW-124	8/22/2002	3.47	0.71	2.84	Dry			
FCGW-125	8/22/2002	3.66	0.79	3.17	Dry			
FCGW-126	8/23/2002	5.92	0.94	4.27	4.44	3.5	2.36	1,242
	9/16/2002				4.33	3.2	2.85	1,486
	10/8/2002				5.81	4.0	2.93	1,405
FCGW-127	8/22/2002	2.93	0.76	2.29	Dry			
FCGW-128	8/22/2002	1.77	0.55	1.37	Dry			
FCGW-129	8/23/2002	1.89	0.71	1.58	1.80	4.0	5.55	441
	9/16/2002				1.63	5.5	5.65	482
	10/8/2002				Dry			
FCGW-130	8/22/2002	3.29	NM	1.32	Dry			

Notes:

NM : Not measured — Total Depth (TD) measured from top of PVC casing
µS/cm microsiemens per centimeter — Casing stick-up measured from ground surface
su : standard units — Depth to bedrock measured from ground surface
Depth to water measured from top of PVC casing

Table 11
Water Quality Results From Water Flowing at the Colluvium-Bedrock Contact in the Como Basin.

Site	Date	pH (su)	SC (µS/cm)	Concentration (milligrams per liter)							
				Al	As	Cd	Cu	Fe	Mn	Pb	Zn
F-8R-0	7/27/01	2.3	2100	25.5	0.005	0.0074	16.8	107	13.7	0.005	1.33

Notes: µS/cm = microsiemens per centimeter
su = standard units

laboratory analysis. Analytical results for this sample indicate it is acidic with relatively high metal concentrations (**Table 11**).

SOIL SAMPLING RESULTS

Split spoon samples were collected every 1.5 meters (5 feet) during drilling of the borings for the piezometers and analyzed for total metals and acid-base account. Bulk material samples were collected from the upper 1.2 meters (4 feet) of each boring within the disturbed area (yellow boundary on Figure 10) for geotechnical testing. In addition, soil from three of the holes was collected from both the upper 0.3 meters (one foot) and the interval from 0.6 to 0.9 meters (2 to 3 feet) to determine if there is a difference in metal concentrations or acidic characteristics between these two intervals. Laboratory analytical data are presented in Attachment F.

Soil sampling results are summarized in **Tables 12 and 13**. Total metal results for the two different depth intervals sampled in three boreholes (**Table 12**) shows that, while metals concentrations are generally low compared to human health cleanup guidelines, the surface interval (0 to 0.1 meters) contains two to three times higher copper, lead, and zinc concentrations than the subsurface (0.61 to 0.91 meter) interval. The pH in the surface interval (**Table 12**) was higher than the subsurface interval in each of the three boreholes sampled, and the lime requirement to bring the pH to near-neutral was lower for the surface interval than the subsurface interval (**Table 13**).

The higher metal concentrations observed in the upper most layer (0.1 meter) of surficial material may be the result of weathering of sulfides in the near surface environment and wicking of metals dissolved in water to the surface by capillary action driven by evaporation. At the surface, the metal laden water evaporates and the metals are precipitated. The higher pH in the near surface material is likely the result of lime amendment applied by Crown Butte Mines in 1993.

Acid-base accounting characteristics of the Como Basin soils are summarized in **Table 13**. The lowest pH encountered was 3.2 su in borehole FCSI-128. This borehole is located in about the center of the basin, just west of the Como Raise. Of the 25 samples analyzed for acid-base characteristics, only 10 exhibited a pH less than 6.0 su, and, of these 10, only two samples were ultra-acidic (pH less than 4.0 su). Average lime requirement for the upper 1.2 meter interval of soil in the basin is 13.6 tons of lime per 1,000 tons of soil. The highest lime requirement measured was 57 tons/1,000 tons.

TABLE 12
Summary of Total Metals Results for Como Basin Soil Samples

Site ID	Sample Depth (meters)	pH (su)	Total Concentration (milligrams per kilogram)				
			Arsenic	Cadmium	Copper	Lead	Zinc
FCSI-122	0-0.1	7.5	<2	<2	698	75	179
	0.61-0.91	6.6	<2	<2	246	<20	60
FCSI-123	0-0.1	6.4	<2	<2	289	133	147
	0.61-0.91	4.3	<2	<2	117	36	128
FCSI-125	0-0.1	7.3	<2	<2	438	23	68
	0.61-0.91	4.3	<2	<2	265	<20	29
Human Health Cleanup Guideline			700	19,500	27,100	1,100	220,000
Phytotoxicity Cleanup Guideline			15-50	3-8	60-125	100-400	70-400

Notes: pH in standard units; Cleanup Guideline (Maxim, 2002b)

TABLE 13
Summary of Acid-Base Accounting Results for Como Basin Soil Samples

Site ID	Sample Depth (meters)	pH (su)[1]	Electrical Conductivity (mmhos/cm)[2]	Total Sulfur (%)	(tons CaCO3/1,000 tons soil)		
					Neutralization Potential	SMP Lime Requirement[(3)]	Total Lime Requirement
FCSI-111	0-1.2	6.5	2.67	0.28	16	1.0	9.0
FCSI-112	0-1.2	4.7	2.36	0.85	<1	8.1	40
FCSI-113	0-1.2	5.6	2.58	1.10	13	3.9	44
FCSI-114	0-1.2	3.6	1.38	0.39	<1	15	31
FCSI-115	0-1.2	4.5	2.26	0.64	2	6	31
FCSI-116	0-1.2	6.9	0.5	0.25	6	0	11
FCSI-117	0-1.2	6.8	0.44	0.40	6	0	12
FCSI-118	0-1.2	6.2	0.69	0.32	4	0	11
FCSI-119	0-1.2	7.5	0.46	0.41	70	0	0
FCSI-120	0-1.2	5.9	0.25	<0.05	4	0.3	0
FCSI-121	0-1.2	6.4	0.45	<0.05	6	0	0
FCSI-122	0-0.1	7.5	0.37	<0.05	30	0	0
	0.61-0.91	6.6	0.17	<0.05	3	0	0
	0-1.2	7.2	0.71	<0.05	13	0	0
FCSI-123	0-0.1	6.4	0.67	<0.05	3	0	0
	0.61-0.91	4.3	0.09	<0.05	<1	8.9	11
	0-1.2	4.6	0.19	0.06	<1	5.9	7
FCSI-124	0-1.2	6.3	3.30	0.20	7	1	5
FCSI-125	0-0.1	7.3	0.70	0.33	28	0	11
	0.61-0.91	4.3	3.14	0.58	2	6.1	23
	0-1.2	6.5	3.24	0.71	10	0.3	16
FCSI-126	0-1.2	6.8	0.66	<0.05	8	0	0
FCSI-127	0-1.2	5.1	1.70	0.45	2	5.3	22
FCSI-128	0-1.2	3.2	2.72	1.17	<1	15	57
FCSI-129	0-1.2	7.0	0.85	0.10	13	0	0
Average				**0.44**	**10.04**	**3.07**	**13.64**

Notes:
(1) pH in standard units
(2) mmhos/cm = millimhos per centimeter
(3) SMP = Shoemaker, McLean, and Pratt single buffer method

REFERENCES

Amacher, M.C., 1998. Metal Loadings and Metals in Sediments and Wetland Soils in the Fisher and Daisy Creek Catchments in the New World Mining District, Montana. A Draft Assessment Report Prepared for USDA-FS Region 1 and the USEPA. Forestry Sciences Laboratory, USDA-FS-RMRS, Logan, Utah. January.

Bouwer, H. and R.C. Rice, 1976. A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. Water Resources Research, v. 12, p. 423-428.

Davies, G. J., Appendix F, Results of the Ground-Water Tracing Experiments at the New World Mine Site, Montana; in URS Operating Systems, Inc., 1998, Site Assessment Summary and Sampling Activities Report, New World Mine, Cooke City, Montana. Prepared for U.S. EPA, Contract 68-W5-0031. Superfund Technical Assessment and Response Team (START) – Region VIII, September 11. 1998.

Huntingdon, 1995. Results of Aquifer Testing in the Miller Creek Drainage, New World Project, Cooke City, Montana. Prepared for Crown Butte Mines, Inc. February.

Kimball, B.A., D.A. Nimick, L.J. Gerner, and R.L Runkel, 1997. Quantification of Metal Loading in Fisher Creek Using Tracer-Injection and Synoptic Sampling Studies, Park County, Montana, August 1997. Water Resources Investigations Report 99-4119. U.S. Geological Survey. Prepared in cooperation with the USEPA.

Maxim Technologies, 1999. Site-Wide Sampling and Analysis Plan. New World Mining District Response and Restoration Project. Appendix B of the Overall Project Work Plan. Final. Prepared for the USDA Forest Service, Northern Region, November 10.

Maxim Technologies, Inc., 2001a, McLaren Pit Response Action Engineering Evaluation/Cost Analysis, New World Mining District Response and Restoration Project. Prepared for the USDA Forest Service, Northern Region, June 2002, 116p. and appendices

Maxim Technologies, Inc., 2001b, 2001 Work Plan, New World Mining District, Response and Restoration Project, Prepared for the USDA Forest Service, Northern Region, p. 16. June 25, 2001.

Maxim Technologies, Inc., 2002a, Como Basin/Glengarry Adit/Fisher Creek Response Action Engineering Evaluation/Cost Analysis, Prepared for the USDA Forest Service, Northern Region, report submitted to the US DA Forest Service in June of 2002, 211p. and appendices.

Maxim Technologies, Inc., 2002b, 2002/2003 Work Plan, New World Mining District, Response and Restoration Project, Prepared for the USDA Forest Service Northern Region, pp. 8-14 and 24. July 2002.

Montana Department of Environmental Quality (MDEQ). 2002. Circular WQB-7 Montana Numeric Water Quality Standards, Planning, Prevention and Assistance Division, Standards and Economic Analysis Section, January.

Nimick, David and T. E. Cleasby, 2001, Quantification of Metal Loads by Tracer Injection and Synoptic Sampling in Daisy Creek and the Stillwater River, Park County, Montana, August 1999. U.S. Geological Survey, Water-Resources Investigations Report 00-4261.

ATTACHMENT A

MCLAREN PIT AREA MONITORING WELL AND PIEZOMETER LITHOLOGIC AND COMPLETION LOGS

McLaren Pit Area and Como Basin Hydrogeologic Investigations

New World Mining District Response and Restoration Project

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

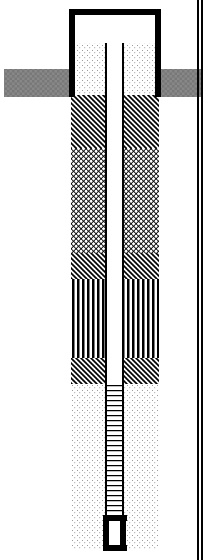
JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **DCGW 106**
LOCATION AT SITE:	McLaren Pit		LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/13/02 to 8/13/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 42.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: artesian	HEIGHT ABOVE GROUND SURFACE (feet): 2.5'		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9534.48	(meters): 2906.11	WELL PROTECTOR: 6" stick-up steel

Remarks: artesian flow

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0	0-2	grab	colluvium, orange/brown silt and gravel cobbles, moist
5.0	4-6	spoon	clayey-silt w/gravel, org/brn color; moist
			contact 8.5
10.0	9-11	spoon	green clay: stiff, moist w/ gravel
			silty clay: stiff green/brown w/gravel, harder drive,
15.0	14-16	spoon	moist (no water) Meagher LS rock frags at bottom of
			spoon; increased drilling difficulty
20.0	19-21	spoon	silty clay: grn/brn, moist, stiff to ~19.5'
			incr rock w/interst. Clay: crystals, lt gray; back to
25.0	24-26	spoon	silty clay as before 19.5
			glacial till; contact around 22-23'; lt olive grn silty
30.0	29-31	spoon	clay w/ clasts/gravel, moist, stiff; park shale clasts
			sulfides, fine gr and dispersed in clay
35.0	34-36	spoon	as above
			as above
40.0	39-41	spoon	as above
			augered to 42.5; from 39' had become v difficult to
45.0	42.5-44.5	spoon	turn the drill rods, likely due to clay material
			in spoon, dec clay, rock clasts/gravel, brn/grn color
			water on spoon at 42.5'
			44.5 : Bottom of hole

WELL COMPLETION LOG

Stick up well protector :	2.5
Concrete/drill cuttings	0-2
Bentonite Chips	2-3
Drill Cuttings	3-20
Bentonite Chips	20-21
Caved-in material/ Bentonite Chips	21-29
Bentonite Chips	29-31
Screen	31.5
Silica Sand	31-42.5
Cap	42.5
Bottom	44.5



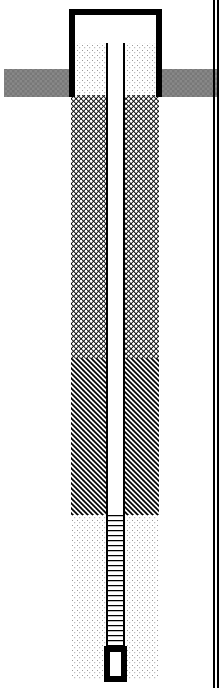
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 107**
LOCATION AT SITE:	McLaren Pit	LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/13/02 to 8/14/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 23.0	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 10.79'	HEIGHT ABOVE GROUND SURFACE (feet): 1.6'		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9459.77 (meters): 2883.34	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Stick up well protector : 1.6
0.0	0.5-2	grab	Yellow/brown silty loam, moist	
			scattered rock frags	Concrete 0-1
2.0				
4.0				Drill Cuttings 1-12
	5-7	spoon	water at 5.5'; oxidation to 5.5' changing to a lt green	
6.0			color; clayey silt w/rock frags, very firm, moist (not	
			wet) below 5.5'; water from 5-5.5' zone	
8.0			color change from yel/brn to lt green; clayey	
			material w/minor rock frags	
10.0	10-12	spoon		
			lt green clayey silt w/rock frag, firm, moist,	
12.0			pyrite in clayey matrix	Bentonite Chips 12-17
14.0				
	15-17	spoon	gray green, clayey silt or silty clay w/rock frags;	
16.0			moist, pyrite, firm or dense as above.	
18.0				Top of screen 18
20.0	20-22	spoon	as above	Silica Sand 17-23
			gravelly: harder drilling	
22.0				
	23-25	spoon	dense, clayey material; slow drillings	Cap 23
24.0			tan brn; weathered zone above park shale bedrock;	
			wet clay matrix w/abnt rock frags; bedrock (Park	Bottom 25
			shale) green/gray and gray, siliceous, hard fracturing	
			along bedding; 25.0 : Bottom of hole	



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

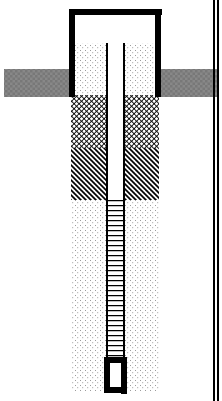
JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **DCGW 108**
LOCATION AT SITE: McLaren Pit			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/14/02 to 8/14/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 11.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 10.55	HEIGHT ABOVE GROUND SURFACE (feet): 2.2'		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9427.02	(meters): 2873.36	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0	0-2	grab	brown silty loam, moist, scattered small rock frags
2.0			
4.0	4-6	spoon	yellow brown; minor green colored clayey silt w/rock frags; moist
6.0			
8.0			water bearing zone in clayey or silty sand
	9-11.1	spoon	yel/brn clayey silt/sand w/ rock, wet, firm-loose
10.0			becomes very firm, silt texture w/ rock frags;
			moist, auger refusal at 11.0'

WELL COMPLETION LOG

Stick up well protector :	2.2
Concrete	0-1
Drill Cuttings	1-3
Bentonite Chips	3-4.5
Top of screen	6
Silica Sand	4.5-11
Cap	11
Bottom: 11.1	



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

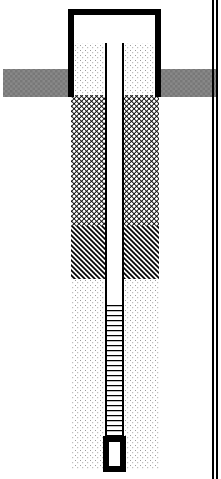
JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 109**
LOCATION AT SITE:	McLaren Pit	LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/14/02 to 8/14/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 15.0	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 7.72'	HEIGHT ABOVE GROUND SURFACE (feet): 2.4'		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9418.19 (meters): 2870.67	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0	0-2	grab	brown and yellow brown silty loam
2.0			gravelly material
4.0			
	5-7	spoon	yel/brn clayey silt to clay matrix w/rock frags;
6.0			moist, wet at end of spoon
8.0			
10.0	10-12	spoon	brn to green brn; silty matrix w/abnt rock
			moist and dense: 10.7-12.0' difficult drilling
12.0			
14.0			yel/brn silty clay matrix w/abnt rock
	15-17	spoon	
16.0			bedrock, fractured, moist
18.0			

WELL COMPLETION LOG

Stick up well protector :	2.4
Concrete	0-1
Drill Cuttings	1-6.5
Bentonite Chips	6.5-8
Top of screen	10
Silica Sand	8-15
Cap	15
Bottom: 17.0	



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

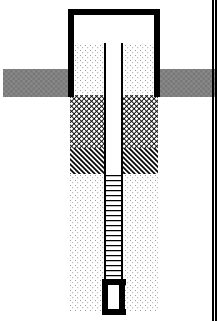
JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 110**
LOCATION AT SITE: McLaren Pit		LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/14/02 to 8/14/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 9.0	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 6.26'	HEIGHT ABOVE GROUND SURFACE (feet): 1.2		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9427.13 (meters): 2873.39	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0	0-2	grab	brown silty loam; moist, loose
2.0			
4.0	4-6	spoon	yel/brwn silt matrix w/rock to 5'
			brown to brn/black; silt matrix w/rock
6.0			wet to very moist, firm
8.0			rocky material
			brown silty matrix w/abnt rock frags moist, loose
10.0	10-12	spoon	bedrock tdlp at 9.8' fractured by spoon
			altered to green brown color at 10.5'
12.0			

WELL COMPLETION LOG

Stick up well protector:	1.2
Concrete	0-1
Drill Cuttings	1-3
Bentonite Chips	3-4
Top of screen	4
Silica Sand and Cave-in material	4-9
Cap	9
Bottom: 11.0'	



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

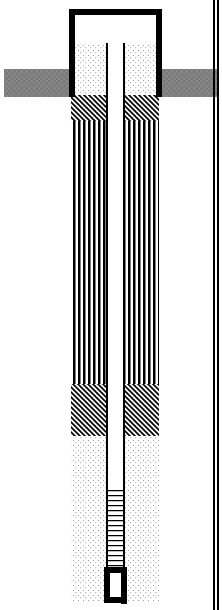
MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **DCGW 131**
LOCATION AT SITE: McLaren Pit			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/20/02 to 8/21/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 20.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 20.69'	HEIGHT ABOVE GROUND SURFACE (feet): 2.8		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9592.15	(meters): 2923.69	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0			yel/brn silty clay w/ rock/gravel, moist, plastic
2.0			
4.0	4-6	spoon	at 4.8', color change to gray/green, firm moist
			clasts/rock frags can contain pyrite
6.0			
8.0			
	9-11	spoon	gray/green lcayey silt w/clasts/rock frags
10.0			firm, moist, trace or ~1% pyrite (or less)
12.0			
14.0	14-16	spoon	
			as above but w/trace (~0.25%) pyrite
16.0			
18.0			
	19-20	spoon	as above, water at end of spoon
20.0			auger refusal @ 20'

WELL COMPLETION LOG



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

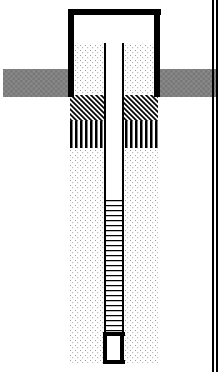
JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 132**
LOCATION AT SITE: McLaren Pit		LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/21/02 to 8/21/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 10.0	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 5.74'	HEIGHT ABOVE GROUND SURFACE (feet): 1.2		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9388.57 (meters): 2861.64	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0			
2.0			
	3.5-5	spoon	brown and dark brown silt w/abnt rock frags
4.0			moist, wet from 4.5-5.0'; looks like ferricrete @4.0'
6.0			
			contact w/ bedrock
8.0	8.5-9.4	spoon	rocky
			bedrock? Rock frags/abnt fracturing, wet, firm but
10.0			fracturing readily in spoon; brwn and yel-brn but
			rock is gray/blk; appears to be sediment.
			augered to 10' to complete well; water measured
			at 5.75' and coming up

WELL COMPLETION LOG

Stick up well protector:	1.2
Concrete	0-1
Bentonite Chips	1-2
Cave-in material	2-3
Silica Sand	3-10
Top of screen	5
Cap	10
Bottom : 10'	



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

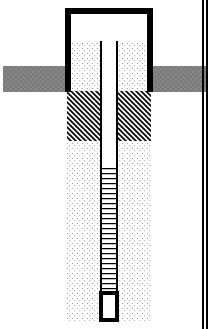
JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 133**
LOCATION AT SITE: McLaren Pit		LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/21/02 to 8/21/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 9.0	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 3.71'	HEIGHT ABOVE GROUND SURFACE (feet): 1.5'		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9430.61 (meters): 2874.45	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0			
			brwn sand silt, gravel colluvium,
2.0			moist, no soil development
4.0	4-5.5	spoon	colluvium to 4.2'
			bedrock? Similar to bedrock in DCSI 132
6.0			water at3.9'; drilled through hard material @ ~6.5'
8.0			
	9-9.3	spoon	as above
10.0			

WELL COMPLETION LOG

Stick up well protector :	1.5
Concrete	0-1
Bentonite Chips	1-3
Silica Sand	3-9
Top of screen	4
Cap	9
Bottom : 9.3	



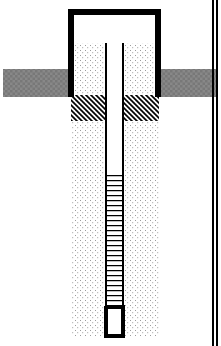
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.:	9902245	PROJECT:	New World Response and Restoration	WELL NO.:	**DCGW 134**
LOCATION AT SITE:		McLaren Pit		LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:				DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.):		8	DATE STARTED - DATE COMPLETED: 8/21/02 to 8/21/02	WELL CASING:	2" PVC
				WELL SCREEN:	0.020" PVC
			DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet):		9.5	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER:		4.18'	HEIGHT ABOVE GROUND SURFACE (feet): 1.7		Quicrete Concrete
MEASUREMENT DATE:		8/23/2002	MEAS. PT. ELEVATION (feet): 9364.15 (meters): 2854.19	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
0.0				Stick up well protector:	1.7
			vegetative cover	Concrete	0-1
2.0				Bentonite Chips	1-3.5
			brwn soil, silty w/scattered small (<1 cm) clasts		
4.0	4.5-6.5	spoon	wet at 4.5'	Silica Sand	3.5-9.5
			bedrock, igneous rock texture	Top of screen	4.5
6.0			altered/oxidized, wet, soft		
8.0					
	9.5-10.3	spoon		Cap	9.5
10.0					
				Bottom : 10.3	



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

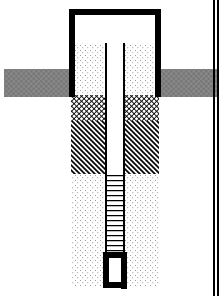
MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 135**
LOCATION AT SITE:	McLaren Pit	LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/21/02 to 8/21/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 7.5	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.3		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9367.26 (meters): 2855.14	WELL PROTECTOR:	6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0			
			brwn silt w/scattered gravel, moist
2.0			
			brwn clayey silt w/rock frags, v moist to wet
4.0	4-6	spoon	
			bedrock, altered; firm, gray/white, moist
6.0			augered to 7.5' : cuttings are dry
	7.5-8	spoon	
8.0			increasing hardness @7.5

WELL COMPLETION LOG

Stick up well protector:	1.3
Concrete	0-1
Drill cuttings	1-2
Bentonite Chips	2-4
Top of screen	4
Cap	7.5
Bottom : 7.5	



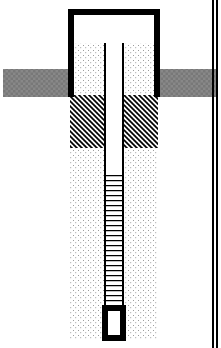
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 136**
LOCATION AT SITE: McLaren Pit		LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/21/02 to 8/21/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 9.5	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 4.03'	HEIGHT ABOVE GROUND SURFACE (feet): 2.3		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9359.84 (meters): 2852.88	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Stick up well protector: 2.3
0.0				
			brwn clayey silt w/scattered gravel	Concrete 0-1.5
2.0			very moist to wet	Bentonite Chips 1-3.5
4.0	4.5-6.5	spoon		Silica Sand 3.5-9.5
			incr in hardness; change in texture/altered/weathered	Top of screen 4.5
6.0			colluvium (silt + gravel) yel/brwn to dk brwn, wet,	
			firm, but crumbles	
8.0				
	9.5-10.3	spoon	incr in drilling difficulty; auger refusal @9.5'	Cap 9.5
10.0			brwn silt w/gravel, becoming moist (not wet)	
			bedrock, igneous rock; dry, tan/white; fractured	Bottom : 10.3



MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

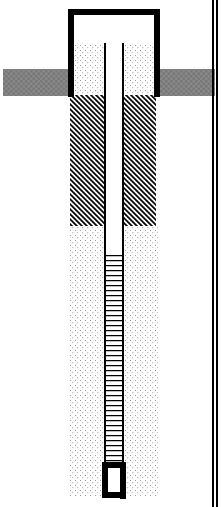
JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 137**
LOCATION AT SITE:	McLaren Pit	LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/22/02 to 8/22/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 15.5	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 6.46'	HEIGHT ABOVE GROUND SURFACE (feet): 1.7'		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9346.03 (meters): 2848.67	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0	0-2	grab	brown clayey silt w/ rock/gravel, moist
2.0			
			brown to yel/brwn silty clay w/scattered gravel;
4.0			moist, plastic, firm
	4-6	spoon	
6.0			at 6.5' rocky material, harder drilling
8.0			
			brown silt w/rock/gravel, firm, moist
10.0	9-10.4	spoon	0.2' wet zone at contact w/bedrock
			igneous bedrock, dry tan-green; fractured
12.0			
14.0			wet zone in softer bedrock: 14-14.5', otherwise
	14-15.5	spoon	firm, moist, chloritic altered bedrock w/o fracturing
16.0			augered to 15.5' to complete well

WELL COMPLETION LOG

Stick up well protector :	1.7
Concrete	0-1.5
Bentonite Chips	1.5-6
top of screen	7.5
Silica Sand	6-15.5
cap	15.5
bottom: 15.5	



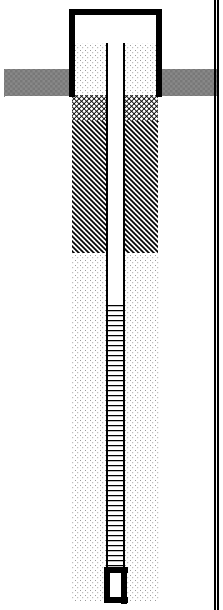
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.:	**DCGW 138**
LOCATION AT SITE:	McLaren Pit	LOGGED BY:	M F Pearson
LEGAL DESCRIPTION:		DRILLING CONTRACTOR:	SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/22/02 to 8/22/02	WELL CASING:	2" PVC
		WELL SCREEN:	0.020" PVC
	DRILLING METHOD: hollowstem auger	SAND PACK:	#12 Silica Sand
TOTAL WELL DEPTH (feet): 21.0	MEASURING POINT: North side PVC	SEALANTS:	Bentonite Chips
DEPTH TO WATER: 8.73'	HEIGHT ABOVE GROUND SURFACE (feet): 2.9		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9388.67 (meters): 2861.67	WELL PROTECTOR:	6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Stick up well protector:	2.9
0.0			brown clayey silt and fine gr snd		
			w/ rock/gravel, scattered, moist	Concrete	0-1
2.0				Drill Cuttings	1-2
				Bentonite Chips	2-7
4.0	4-6	spoon	as above		
6.0					
8.0			wet at 8'		
	9-11	spoon	sandy w/ small gravel to silty w/scattered rock		
10.0			gravel, wet, brown, minor clay	Top of screen	9.5
12.0					
14.0	14-16	spoon	same as above sandy/silty clay	Silica Sand	7-19.5
			w/ scattered rock/gravel, wet		
16.0					
			at 18' harder drilling; zone of weathered fractured		
18.0			bedrock w/ gravel, wet, loose, brown, black		
	19-21	spoon	sedimentary bedrock,		
20.0			blk to brwn sedimentary bedrock, fissile, wet	Cap	19.5
			some clayey zones; augered to 19.5' to complete well		
				Bottom : 21.0'	



ATTACHMENT B

FIELD SAMPLING FORMS AND LABORATORY ANALYTICAL RESULTS
MCLAREN PIT AREA

McLaren Pit Area and Como Basin Hydrogeologic Investigations

New World Mining District Response and Restoration Project

ATTACHMENT C

SLUG AND AQUIFER TEST DATA

McLaren Pit Area and Como Basin Hydrogeologic Investigations

New World Mining District Response and Restoration Project

ATTACHMENT D

COMO BASIN PIEZOMETER LITHOLOGIC AND COMPLETION LOGS

McLaren Pit Area and Como Basin Hydrogeologic Investigations

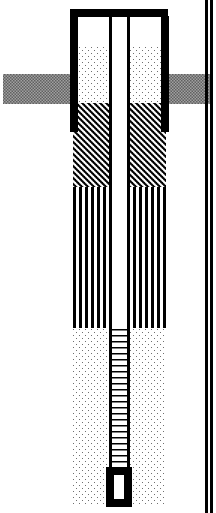
New World Mining District Response and Restoration Project

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-111**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/15/02 to 8/15/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 14.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.4		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9757.56	(meters): 2974.10	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
0.0				Top of PVC casing +1.4
	0.0-4.0	bulk	Yellow-brown silt with small rock frags., moist	Concrete 0.0-1.0
2.0		sample		
				Bentonite Chips &
4.0				Drill Cuttings 1.0-4.0
	4.0-6.0	spoon	As above	
6.0				
8.0				Borehole walls collapsed,
				Caved-in material 4.0-9.0
10.0	9.0-11.0	spoon	Yellow-brown silt with trace green color, scattered rock	Top of screen 9.0
			frags., green rock at bottom, moist, firm	
12.0				#12 Silica Sand 9.0-14.0
14.0				Bottom of screen 14.0
	14.0-16.0	spoon	Tan and light green rock, broken and weathered bedrock,	Cap
16.0			moist, fractured, no water	
			16.0 : Bottom of hole	



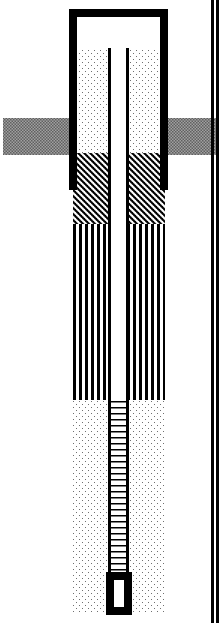
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-112**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/15/02 to 8/15/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 13.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): 2.3		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9762.28	(meters): 2975.54	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing +2.3	
0.0					
1.0	0.0-4.0	bulk	Brown, yellow-brown silt w/scattered gravel/rock,	Concrete	0.0-1.0
		sample	moist, loose		
3.0				Bentonite Chips	1.0-3.0
	4.5-6.5	spoon	As above		
5.0				Caved-in material	3.0-7.7
7.0					
9.0	9.5-11.5	spoon	Brown clayey silt to 11.0': very moist, scattered rock	Top of screen	8.5
			frag, wet zone (0.2' interval) at 10.5'		
11.0			From 11-11.5' possible bedrock, brown & green w/	#12 Silica Sand	7.7-13
			pyrite, fractured, moist		
13.0			Altered (green), fractured bedrock w/pyrite 13.0-13.5'	Bottom of screen	13.0
	13.0-13.5	spoon	13.5 : Bottom of hole	Cap	



** NOTE **

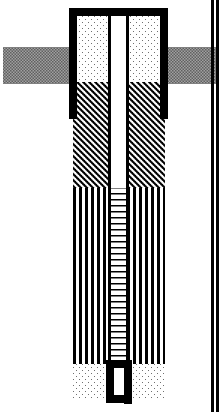
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-113**
LOCATION AT SITE:	Como Basin Area		LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/15/02 to 8/15/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 9.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.1		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9773.95	(meters): 2979.10	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
0.0				Top of PVC casing +1.1
1.0	0.0-4.0	bulk	Yellow-brown clayey silt w/scattered rock frags	Concrete 0.0-1.0
		sample		Cuttings 1.0-2.0
3.0				Bentonite Chips 2.0-4.0
	4.0-6.0	spoon	Tan to yellow-brown silt matrix w/scattered rock	
5.0			frags, very moist to wet, 5.8-6.0'	Top of screen 4.5
			wet at end of spoon	
7.0				#12 Silica Sand w/
				Caved-in material 4.0-9.5
9.0	9.0-10.0	spoon	9.25-11.0 bedrock w/abnt sulfides, soft, dry	
			augered to 9.5'	Bottom of screen 9.5
11.0				Cap
			11.0 : Bottom of hole	



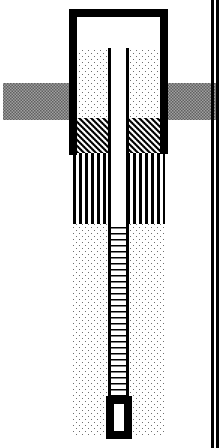
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-114**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/15/02 to 8/15/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 9.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 9.58	HEIGHT ABOVE GROUND SURFACE (feet): 1.7		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9789.03	(meters): 2983.70	WELL PROTECTOR: 6" stick-up steel
Remarks: water in bore hole			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +1.7
0.0				
1.0	0.0-4.0	bulk	Yellow-brown to brown clayey silt w/scattered rock	Concrete 0.0-1.0
		sample	frags.	Bentonite Chips 1.0-2.0
3.0				Caved-in material 2.0-4.0
				Top of screen 4.5
5.0	5.0-7.0	spoon	Bedrock altered green & brown, soft, skarn, moist	
			wet at end of spoon	
7.0			augered to 9.5 (possibly a boulder)	#12 Silica Sand 4.0-9.5
9.0	9.5-11.5	spoon	soft bedrock; altered green and brown to 10.25' :	
			reduced w/abnt sulfide from 10.25'-11.5', wet from	Bottom of screen 9.5
11.0			10.5-11.5', water in bore hole	Cap
			11.5 : Bottom of hole	



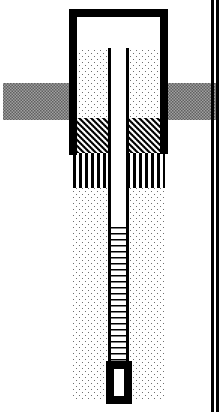
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-115**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/15/02 to 8/15/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 9.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.3		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9801.98	(meters): 2987.64	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +1.3
0.0				
1.0	1.0-4.0	bulk	brown clayey silt w/scattered rock frag; moist	Concrete 0.0-1.0
		sample		Bentonite Chips 1.0-2.0
3.0				Caved-in material 2.0-3.0
	4.0-6.0	spoon	As above, very moist to wet	Top of screen 4.0
5.0			Green altered bedrock, soft, very moist, altered to	
			silty clay wet texture	
7.0				#12 Silica Sand 3.0-9.0
9.0	9.0-11.0	spoon	bedrock; green to gray white, altered, soft,	Bottom of screen 9.0
			moist, incr. Induration at 10.7'	Cap
11.0				
			11.0 : Bottom of hole	



** NOTE **

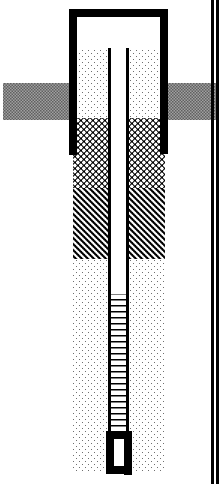
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-116**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/15/02 to 8/15/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 11.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 10.91	HEIGHT ABOVE GROUND SURFACE (feet): 2.0		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9834.07	(meters): 2997.42	WELL PROTECTOR: 6" stick-up steel

Remarks: 10' north of original staked location

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+2.0
0.0					
1.0	0.0-4.0	bulk	brown clayey silt w/scattered rock frags	Concrete	0.0-1.0
		sample		Drill cuttings	1.0-3.0
3.0					
	4.0-6.0	spoon	Brown and green-brown silt texture w/scattered	Bentonite Chips	3.0-4.8
5.0			rock frags, moist firm		
				#12 Silica Sand	4.8-11.0
7.0					
			harder drilling at 8'	Top of screen	6.0
9.0	9.0-11.0	spoon	brown clayey silt w/ abnt rock frag to 9.9'		
			wet from 9.2 - 9.9; bedrock, altered, fractured, moist		
11.0			not wet; augered to 11.0'	Bottom of screen	11.0
				Cap	



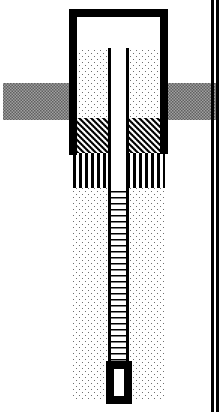
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-117**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/16/02 to 8/16/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 10.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.8		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9831.24	(meters): 2996.56	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +1.8
0.0				
1.0	0.0-3.5	bulk	brown clayey silt w/scattered rock frags	Concrete 0.0-1.0
		sample		Bentonite Chips 1.0-2.0
3.0				Caved-in material 2.0-3.5
	3.5-5.5	spoon	bedrock at 4.5' : soft, brown, yellow-brown altered	Top of screen 3.5
5.0			moist, loose	
				#12 Silica Sand 3.5-8.5
7.0			harder drilling	
	8.5-10.5	spoon	bedrock : brown and yellow-brown, altered, firm	Bottom of screen 8.5
9.0			slightly moist; brown oxid on fractures;	Cap
			augered to 8.5 to set well	
11.0			10.5 : Bottom of hole	



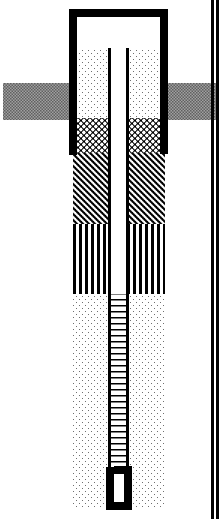
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-118**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/16/02 to 8/16/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 11.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.8		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9835.45	(meters): 2997.84	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+1.8
0.0					
1.0	0.0-4.0	bulk	brown silt w/scattered gravel	Concrete	0.0-1.0
		sample		Cuttings	1.0-2.0
3.0				Bentonite Chips	2.0-4.0
	4.0-6.0	spoon	Clayey silt-brown to light brown, firm, moist		
5.0			w/rock frags	Caved-in material	4.0-6.0
7.0				Top of screen	6.5
			harder drilling at 8'		
9.0	9.0-11.0	spoon	brown clayey silt w/rock frags	#12 Silica Sand	6.0-11.5
			bedrock contact at 9.25', very moist, firm, altered	Bottom of screen	11.5
11.0			gray-white to yellow-brown clayey		
			very moist 9.5-11.0'	Cap	
			auger to 11.5' to set well		



** NOTE **

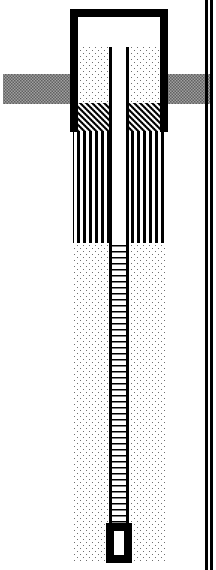
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-119**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/16/02 to 8/16/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 16.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 14.54	HEIGHT ABOVE GROUND SURFACE (feet): 2.1		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9854.39	(meters): 3003.62	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+2.1
0.0					
			Armored (rock) water channel	Concrete	0.0-1.0
2.0	1.0-4.0	bulk	rown silt w/rock frags	Bentonite Chips	1.0-2.5
		sample			
4.0				Caved-in material	2.5-6.0
	4.0-6.0	spoon	brown and tan sandy silt w/smaller rock frags		
6.0			moist, firm to loose		
				Top of screen	6.0
8.0					
			brown silt (texture) w/small rock frags		
10.0	9.0-11.0	spoon	loose, moist, rock frags <1 cm size		
			unsure if this is bedrock or colluvium		
12.0			inferred ferricrete	#12 Silica Sand	6.0-16.0
			becoming more firm; cont'd brown mat. As above	and cave-in material	
14.0					
	14.0-16.0	spoon	as above w/ larger rock frags (2 cm) and	Cap	
16.0			carbonaceous material	Bottom of screen	16.0
			wet zone from 14 to 14.2'; 14.2-16.0' is moist		
			augered to 16.0' to complete well		



** NOTE **

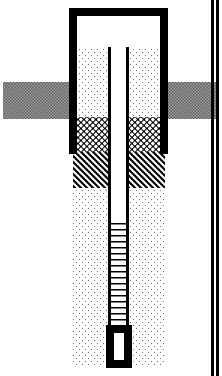
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-120**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/16/02 to 8/16/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 7.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 2.6		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9827.47	(meters): 2995.41	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +2.6
0.0				
1.0	0.0-4.0	bulk	brown clayey silt w/scattered rock frags	Concrete 0.0-1.0
		sample		Drill cuttings 1.0-2.5
3.0				Bentonite Chips 2.5-3.5
				Top of screen 4.0
5.0	5.0-7.0	spoon	bedrock at 5.1' : brown oxidation: 5.1-6.0	
			Green color w/fine gr pyrite -- 0.5%: 6.0-7.0	#12 Silica Sand 3.5-7.0
7.0				Bottom of screen 7.0
			Bottom of hole: 7.0'	Cap



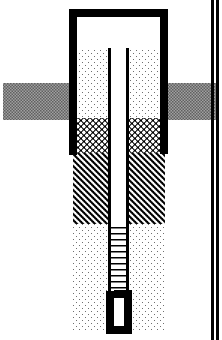
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-121**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/16/02 to 8/19/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 6.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 2.1		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9825.83	(meters): 2994.91	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +2.1
0.0				
1.0	0.0-4.0	bulk	gray-black silt and abnt rock	Concrete 0.0-1.0
		sample		Drill cuttings 1.0-2.0
3.0			gravel w/silt matrix - brown, moist	Bentonite Chips 2.0-4.0
	4.0-8.0	spoon	bedrock w/abnt fracturing, black coating on	Top of screen 4.0
5.0			fractures and gray-white alteration	#12 Silica Sand 4.0-6.0
			rocky drilling	Bottom of screen 6.0
7.0			cont'd abnt fracturing, water in fractures	
			alteration and fracture coatings as above	
			bottom of hole: 8.0	



** NOTE **

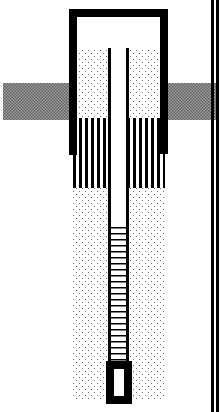
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-122**
LOCATION AT SITE:	Como Basin Area		LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/19/02 to 8/19/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 8.8	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 6.21	HEIGHT ABOVE GROUND SURFACE (feet): 1.9		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9819.20	(meters): 2992.89	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+1.9
0.0					
1.0	0.0-3.0	bulk	yellow-brown silt w/scattered rock frags; moist	Concrete	0.0-1.0
		sample		Caved-in material	1.0-3.0
3.0					
	4.0-6.0	spoon	light green to orange brown silt; very moist	Top of screen	3.8
5.0			few rock frag; bedrock at 4.5' soft		
7.0				#12 Silica Sand	3.0-8.8
9.0	9.0-11.0	spoon	bedrock - soft, oxidation brown, moist	Bottom of screen	8.8
			reduced after w/scattered oxid + minor pyrite	Cap	
11.0					
			11.0 : Bottom of hole		



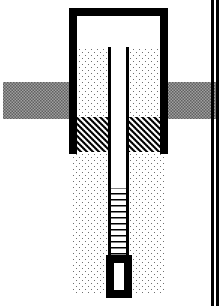
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-123**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/19/02 to 8/19/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 5.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 3.2		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9810.72	(meters): 2990.31	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +3.2
0.0				
1.0	0.0-3.5	bulk	yellow-brown and light brown clayey silt	Concrete 0.0-1.0
		sample	w/scattered rock frags	Bentonite Chips 1.0-3.0
3.0				top of screen 3.0
	3.5-5.5	spoon	bedrock - altered to brown and green, soft, moist	#12 Silica Sand 3-5.0
5.0				Bottom of screen 5.0
			bottom of hole : 5.5	Cap



** NOTE **

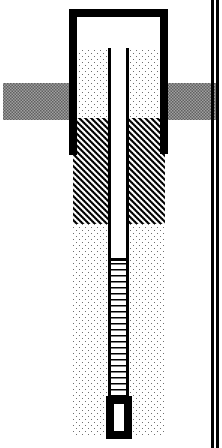
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-124**
LOCATION AT SITE:	Como Basin Area		LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/19/02 to 8/19/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 10.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 2.3		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9774.04	(meters): 2979.13	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Top of PVC casing +2.3
0.0				
1.0	0.0-4.0	bulk	yellow-brown silt w/abnt rock frags/gravel;	Concrete 0.0-1.5
		sample	moist loose	Bentonite Chips 1.5-4.0
3.0				
	4.0-6.0	spoon	as above; possible bedrock at 5.9'; moist	
5.0			rock >2" size	Top of screen 5.0
				#12 Silica Sand 4.0-10.0
7.0				
			loose, tan colluvium to 9.2' - moist to dry	Bottom of screen 10.0
9.0	9.0-11.0	spoon	abnt rock frags/gravelly	Cap
			tan and brown bedrock; sl moist, loose	
11.0			abnt fracturing w/oxid on fractures	
			augered to 10.0' to complete well	
			11.0 : Bottom of hole	



** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

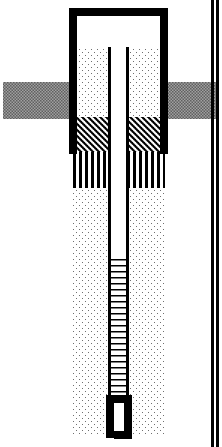
JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-125**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/19/02 to 8/19/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 10.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): 2.6		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9767.67	(meters): 2977.19	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0			
1.0	0.0-4.0	bulk	brown silt w/rock frags, moist
		sample	
3.0			
			brown silt w/rock frag; moist to 5.7'
5.0	5.0-7.0	spoon	at 5.7' color change to yellow-brown and gray-white
			sandy silt w/abnt rock frags
7.0			
9.0			tan-brown silt w/abnt rock frags
	10.0-12.0	spoon	bedrock - coherent-looking, gray-white, sl moist
11.0			abnt fracturing; augered to 10.5' to complete well
			12.0 : Bottom of hole

WELL COMPLETION LOG

Top of PVC casing	+2.6
Concrete	0.0-1.0
Bentonite Chips	1.0-2.0
Caved-in material	2.0-3.0
Top of screen	5.5
#12 Silica Sand	3.0-10.5
Bottom of screen	10.5
Cap	



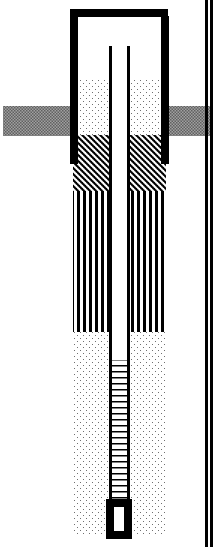
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-126**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.) 8	DATE STARTED - DATE COMPLETED: 8/20/02 to 8/20/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 14.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 14.58	HEIGHT ABOVE GROUND SURFACE (feet): 3.1		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9796.64	(meters): 2986.02	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+3.1
0.0					
	0.0-3.5	bulk	brown clayey silt w/rock frags; moist	Concrete	0.0-1.0
2.0		sample			
	3.5-5.5	spoon		Bentonite Chips	1.0-3.0
4.0			As above, with decr. Clay		
6.0			rocky, tough drilling	Caved-in material	3.0-8.0
8.0	8.5-10.5	spoon	brown silt and sandy silt w/ small (<2 cm) rock frags		
			moist		
10.0			(could be altered bedrock w/coherent rock frags)	Top of screen	9.5
			continue drilling		
12.0			as above w/increased moisture to 14'	#12 Silica Sand	8.0-14.5
	13.5-15.5	spoon	bedrock - oxidized - brown, very moist to wet, soft		
14.0				Bottom of screen	14.5
			as above but altered gray-white	Cap	
16.0			augered to 14.5 to complete well		
			abnt sulfides below 15.3'		
			15.5 : Bottom of hole		



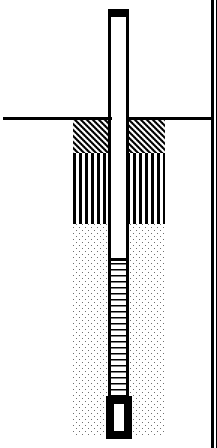
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-127**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/20/02 to 8/20/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 8.5	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): 2.5		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9789.79	(meters): 2983.93	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+2.5
0.0					
1.0	0.0-3.5	bulk	clayey silt w/rock frags; brown to yellow	Bentonite Chips	0.0-1.5
		sample	brown moist	Caved-in material	1.5-3.0
3.0					
	3.5-5.5	spoon	as above w/increased moisture at 4.5-5.5'	Top of screen	3.5
5.0			brown to yellow-brown		
				#12 Silica Sand w/	3.0-8.5
7.0					
	8.5-10.5	spoon	green to gray-white bedrock (?)	Bottom of screen	8.5
9.0			rock frags or more coherent rock observed in	cap	
			silty matrix; moist, firm		
11.0			10.5 : Bottom of hole		



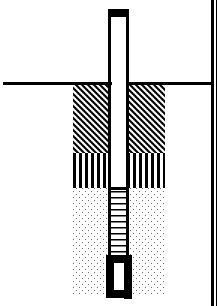
** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-128**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/20/02 to 8/20/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 5.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: dry	HEIGHT ABOVE GROUND SURFACE (feet): 1.8		Quicrete Concrete
MEASUREMENT DATE: 8/22/2002	MEAS. PT. ELEVATION (feet): 9792.30	(meters): 2984.69	WELL PROTECTOR: 6" stick-up steel
Remarks:			

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	+1.8
0.0					
1.0	0.0-4.0	bulk	tan-brown silt w/abnt rock/gravel; moist	Bentonite Chips	0.0-2.0
		sample			
3.0			as above	Caved-in material	2.0-3.0
	4.0-6.0	spoon	gray and gray-white bedrock (altered)	Top of screen	3.0
5.0			w/ sulfides, moist, firm	#12 Silica Sand	3.0-5.0
			augered to 5' to set well	Bottom of screen	5.0
7.0			bottom of hole : 6.0'		



** NOTE **

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

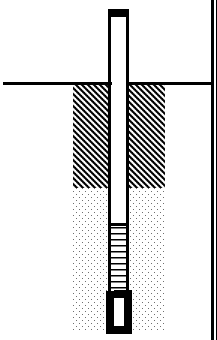
JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-129**
LOCATION AT SITE: Como Basin Area			LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/20/02 to 8/20/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 6.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: 5.61	HEIGHT ABOVE GROUND SURFACE (feet): 2.3		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9807.91	(meters): 2989.45	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION
0.0			
1.0	0.0-5.0	bulk	brown and dark gran/brown silty clay
		sample	w/ rock/gravel; moist
3.0			
			as above to 5.2'
5.0	5.0-7.0	spoon	bedrock (?) alteration - gray/white w/oxidation
			on small fractures, soft, moist; augered to 6'
7.0			bottom of hole : 7.0'

WELL COMPLETION LOG

Top of PVC casing	2.3
Bentonite Chips	0.0-3.0
Top of screen	4.0
#12 Silica Sand	3.0-6.0
Bottom of screen	6.0



** NOTE **

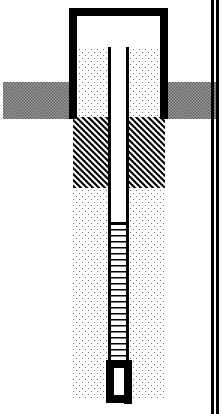
MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration		WELL NO.: **FCGW-130**
LOCATION AT SITE:	Como Basin Area		LOGGED BY: M F Pearson
LEGAL DESCRIPTION:			DRILLING CONTRACTOR: SK Geotechnical
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/21/02 to 8/21/02		WELL CASING: 2" PVC
			WELL SCREEN: 0.020" PVC
	DRILLING METHOD: hollowstem auger		SAND PACK: #12 Silica Sand
TOTAL WELL DEPTH (feet): 9.0	MEASURING POINT: North side PVC		SEALANTS: Bentonite Chips
DEPTH TO WATER: Dry	HEIGHT ABOVE GROUND SURFACE (feet): Not Measured		Quicrete Concrete
MEASUREMENT DATE: 8/23/2002	MEAS. PT. ELEVATION (feet): 9848.81	(meters): 3001.92	WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG	
				Top of PVC casing	NM
0.0					
1.0			weathered bedrock - gravelly w/interstitial silt	Concrete	0.0-0.5
			tan, moist, tdlp bedrock	Bentonite Chips	.05-3.0
3.0					
	4.0-6.0	spoon	bedrock contact at 4.25'	#12 Silica Sand	3.0-9.0
5.0			bedrock (tdlp) gray white w/oxidation	Top of screen	4.0
			sl moist, abnt. Fracturing		
7.0			chloritic alteration near 6'		
9.0			augered to 9' to complete well	Bottom of screen	9.0



** NOTE **

ATTACHMENT E

FIELD SAMPLING FORMS – COMO BASIN AREA

McLaren Pit Area and Como Basin Hydrogeologic Investigations

New World Mining District Response and Restoration Project

ATTACHMENT F

COMO BASIN SOIL ANALYTICAL RESULTS

McLaren Pit Area and Como Basin Hydrogeologic Investigations

New World Mining District Response and Restoration Project