ROCK CREEK MINE & BIG HURRAH PROJECT

2012 ANNUAL REPORT

Submitted To:

Alaska Department of Environmental Conservation

&

Alaska Department of Natural Resources

Submitted By:

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Contents

Tables

Figures

Appendices

Electronic Data

RockCreek_2012_InjectionWellData.xlsx
RockCreek_2012_WaterChemistryData.xlsx

Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AGC	Alaska Gold Company
AK	Alaska
amsl	above mean sea level
APDES	Alaska Pollutant Discharge Elimination System
AWQS	Alaska Water Quality Standards
BMP	Best Management Practice
BSNC	Bering Straits Native Corporation
CAA	Clean Air Act
CGP	Construction General Permit
CIL	Carbon-in-Leach
COC	Constituent of Concern
CWA	Clean Water Act
CY	Cubic Yards
DC-1	Diversion Channel #1
DC-2	Diversion Channel #2
DC-3	Diversion Channel #3
EPA	US Environmental Protection Agency
EPCRA	Community Right-to-Know Act
ft	Feet
GCL	Geosynthetic Clay Liner
gpd	gallons per day
gpm	gallons per minute
HDPE	High Density Polyethylene
hp	Horsepower
IWF	Injection Well Field
LAP	Land Application Permit
LCRS	Leak Collection and Recovery System
m^3	cubic meter
mg/L	milligrams per liter
MSGP	Multi-Sector General Permit
O&M	Operation and Maintenance
PAG	Potentially Acid Generating
psi	pounds per square inch
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RPA	Reclamation Plan Approval No. F20069578
RWP	Recycle Water Pond
SPCC	Spill Prevention Control and Countermeasure
SWPPP	Storm Water Pollution Prevention Plan
TCP	Temporary Closure Plan
TDS	Total Dissolved Solids
TSCA	Toxic Substances Control Act
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
TWUP	Temporary Water Use Permit
µg/L	micrograms per liter

UIC	Underground Injection Control
UTL	Upper Tolerance Limit
WAD	Weak Acid Dissociable
WET	Whole Effluent Toxicity
WMP	Waste Management Permit No. 2003-DB0051
WTP	Water Treatment Plant

1.0 Introduction

This annual report has been prepared by NOVAGOLD Resources Inc. (NOVAGOLD) in accordance with Section 1.9 of Alaska Department of Environmental Conservation (ADEC) Waste Management Permit (WMP) No. 2003-DB0051 and Alaska Department of Natural Resources (ADNR) Reclamation Plan Approval (RPA) No. F20069578. This report also satisfies annual reporting requirements in Part II E of U.S Environmental Protection Agency (EPA) Underground Injection Control (UIC) Permit No. AK-5X27-001-A, Section 1.7.2.2 of ADEC Land Application Permit (LAP) No. 2010DB0011, and Part 1.5 of ADEC Alaska Pollutant Discharge Elimination System (APDES) Permit No. AK0053627. For purposes of efficiency and avoiding duplication, NOVAGOLD has prepared one annual report to address the requirements of all permits. This report is based solely on information generated by NOVAGOLD. The Rock Creek Mine is operated by Alaska Gold Company (AGC), a wholly owned subsidiary of NOVAGOLD. On November 1, 2012 NOVAGOLD transferred ownership of the Rock Creek Mine and AGC to Bering Straits Native Corporation (BSNC). In agreement with ADEC and BSNC, NOVAGOLD has prepared the 2012 annual report for operations at the Rock Creek Mine.

Although the Rock Creek Mine and Big Hurrah site are permitted jointly, the two are located over 40 miles apart. In 2012, activities were focused on the closure of Rock Creek Mine with only minor activities involving surface water sampling conducted at the Big Hurrah site over the same period. Accordingly, this annual report primarily summarizes activities at the Rock Creek Mine.

The Rock Creek Mine was placed into Care and Maintenance status in November 2008 continuing through 2012. The following activities took place at the Rock Creek Mine in 2012:

- All development rock generated has been used for construction purposes; no development rock stockpiles were constructed.
- Maintained components of the Storm Water Management System
- Transferred storm water permit coverage form Construction General Permit (CGP) to Multi-Sector General Permit (MSGP) and updated the site SWPPP reflecting this change.
- Disposed of approved wastes in the Rock Creek inert solid waste landfill in accordance with WMP.
- Continued surface and groundwater monitoring programs, including analytical sampling and visual inspections.
- Finalized the final closure plan and completed Phase I closure activities including: decommissioning the Tailings Storage Facility (TSF) seepage collection system, filling the Recycle Water Pond (RWP), treatment and disposal of contained water in the carbon-in-leach (CIL) tanks, TSF, and RWP, and re-contouring and re-vegetation of decommissioned facilities.
- Continued operation of the Water Treatment Plant (WTP) for treatment of all remaining contained water while ensuring long-term compliance with effluent limits for injected water.

- Injected treated mine wastewater from the TSF, RWP, Main and South sumps, and CIL tanks.
- Conducted seasonal land application of South Sump water.
- Encapsulated and covered RWP and CIL tank solids in High Density Polyethylene (HDPE) lined repositories.
- Completed removal of all remaining bulk reagents and explosives not retained by BSNC.
- Shut down and winterized the WTP and Injection Well Field (IWF).
- Transferred ownership of Rock Creek Mine to BSNC.

Table 1 summarizes the various permit reporting requirements and the relevant sections of this report containing additional discussions of AGC's compliance with each.

Table 1: Reporting Requirements

Reference	Requirement	2012 Annual Report Section
Waste Management Permit (WMP) No. 2003-DB0051		
1.9.1	Submit an annual report summarizing the inspection and monitoring results set out in Section 1.8:	
1.8.1.1	Weekly visual monitoring: Signs of damage at facilities; above-grade portions of groundwater monitoring devices; visible portions of liners; containment structures and retaining walls; erosion control/diversion structures; waste escaping or leachate; unauthorized waste disposal; violations of permit conditions. As per Certificate of Reasonable Assurance (AK 0605-05AA), Item (8): Include monitoring of adequacy and effectiveness of Storm Water Management Best Management Practices (BMPs) in weekly visual monitoring required in the WMP.	Section 9.0
1.8.1.2	Surface water monitoring near the sites to ensure that water quality standards are not exceeded outside the waste management areas.	Section 8.2
1.8.1.3	Quarterly groundwater/seep sampling and analyses.	Section 8.3
1.8.1.4	Monitoring of treated pit dewatering wastewater prior to injection to ensure permit limits are met.	Section 8.4
1.8.1.5	Geochemical monitoring of development rock and tailings samples from Rock Creek Mine to ensure that there is low potential for production of leachate that is acidic and/or contains elevated levels of metals.	Section 8.7
1.8.1.6	Monitoring of paste tailings prior to placement in the TSF (and water recycled to the TSF or contained in the RWP) to ensure that limitations in Sections 1.2.3 and 1.2.4 are met.[1]	Section 8.5
1.8.1.7	Geochemical monitoring of development rock produced at Big Hurrah designed to detect and segregate PAG development rock as per Section 1.7.1.2.	Section 8.7
1.8.1.8	Monitoring of seepage, leachate, runoff and down-gradient groundwater of the PAG development rock storage area.	N/A[2]
1.8.1.9	Fluid management monitoring plan including a water accounting of the quantity of seepage through the TSF and treated pit dewatering wastewater discharged to the injection wells.	Section 9.1.2
1.8.1.10	Wildlife monitoring as required in Section 1.4.16.	Section 9.7
1.8.1.11	Water quality monitoring of the RWP.	Section 8.1.2
1.8.2.4	Inspections of TSF in conformance with Operations, Maintenance and Emergency Action Manual approved by ADNR.	Section 9.1
1.8.4	Samples from any groundwater well or surface water monitoring location that had a positive result for cyanide (previously reported to ADEC).	Section 8.0
1.8.5	Summary of log of wastes disposed in TSF, inert solid waste landfill facilities, development rock dump at Rock Creek, PAG and non-PAG development rock dump at Big Hurrah, and any backfill of satellite pit at Big Hurrah.	Section 3.2 Section 3.5
1.8.9	Any additional monitoring of influent, effluent, receiving water, air or solid waste in addition to those in the permit or more frequently than required.	Section 8.8

[1] The requirements outlined in WMP Section 1.8.1.6 have been modified in the above table to include water recycled to the TSF or contained in the RWP. Section 1.8.1.6 states to monitor paste tailings to ensure the limitations in Sections 1.2.3 and 1.2.4 are met. Section 1.2.4 refers to cyanide limitations on recycled water.

[2] Monitoring of seepage, leachate, runoff, and down-gradient groundwater of the PAG development rock storage area will be implemented when this development rock storage area is constructed.

Table 1: Reporting Requirements

Reference	Requirement	2012 Annual Report Section
1.9.4	Adequacy of financial responsibility, including, but not limited to, inflation, significant changes in reclamation activity costs, and concurrent reclamation, expansion or other changes to the operation of the facility.	Section 10.0
1.10.3	Notify ADEC of any exceedences of water quality standards or permit limits at a surface or groundwater monitoring station	Section 8.0
Land Application Permit No. 2010DB0011		
1.7.2	Submit an annual report summarizing the inspection and monitoring results set out in section 1.6.	
1.7.2.4	Quarterly and annual reports shall provide: • Total volume of water land applied • Map indicating areas of application • Hydraulic load per acre during each quarter • Cumulative hydraulic load per acre	Section 3.7
1.6.4; 1.6.5	Quarterly TSF pond, main sump, and TSF monitoring well sampling and analysis in accordance with Appendix D of the revised TCP.	Section 8.1.1 Section 8.1.3 Section 8.3.1
1.6.6	Daily visual monitoring of land applied wastewater to ensure runoff is not occurring and vegetation is not adversely affected.	Section 3.7
1.6.9	Report any positive results for cyanide concentration from any surface water or groundwater monitoring well location to ADEC as soon as possible.	Section 8.0
1.6.10	Maintain a log of all wastes applied to the land. The log shall include date of disposal, estimated volume, and description of the waste, and shall be summarized in the annual report.	Section 3.7
Alaska Pollutant Discharge Elimination Permit No. AK0053627		
1.5	Submit an annual report summarizing water quality monitoring results for all discharge and receiving waters.	Section 8.0
1.2.1	Monitor discharges from Outfall 001 to Rock Creek for parameters listed in Table 2.	Section 8.4
1.3.1	Conduct chronic toxicity tests on effluent samples from Outfall 001	Section 8.4
1.4.1	Monitor surface water in the vicinity of the mine at the stations and frequency listed in Table 3 and for all parameters listed in Table 2	Section 8.2
Reclamation Plan Approval (RPA) No. F20069578		
	Summary of results of all fourth quarter monitoring required by state/federal authorizations.	Section 8.0
	Reclamation activities and surface acreage disturbed.	Section 3.1
	Milling activities, quantities of topsoil salvaged and stockpiled, tons (and CY) of ore and development rock mined at the Rock Creek Mine site, tons (and CY) of ore and both PAG and non-PAG development rock mined at the Big Hurrah site during the previous year and planned for next year, and the available pit volume below the anticipated pit lake elevation at the end of the previous year and expected at the end of the next year.	Section 3.2 Section 3.3
	As built map submitted with annual report showing current development of all facilities within project area described in the Rock Creek Mine Plan of Operations Volume 4, including cleared and grubbed areas, topsoil or growth medium stockpiles, roads, PAG and non-PAG waste rock dumps, material sites, tailings facility, facility construction, and un-reclaimed exploration disturbance.	Section 2.1
	Adequacy of financial responsibility - inflation, changes in reclamation cost, concurrent reclamation, expansion or other changes to operation of facility.	Section 10.0
Underground Injection Control: Class V Permit No. AK-5X27-001-A		

Table 1: Reporting Requirements

Reference	Requirement	2012 Annual Report Section
Part II E.1	Submit quarterly and annual reports summarizing monitoring results described in Part II D including information on data validity and any exceedences of limits contained in this permit or water quality standards.	Section 8.0
Part II D.2	Continuous monitoring of injection (injection rates, pressures, and volumes)	Section 6.0 Appendix C
Part II D.3	Monitoring treated wastewater injection includes: • Water quality analysis of treated wastewater just prior to injection for parameters listed in Part II C.7 • Water quality analysis of groundwater from IWF monitoring wells for parameters listed in Part II C.7	Section 8.4 Section 8.3.3
Part II D.4	Periodic visual inspection of IWF for leaks or signs of groundwater mounding to the surface.	Section 6.0

2.0 Project Overview

The Rock Creek Mine and Big Hurrah site are located on the Seward Peninsula along the west coast of Alaska (figure 1).

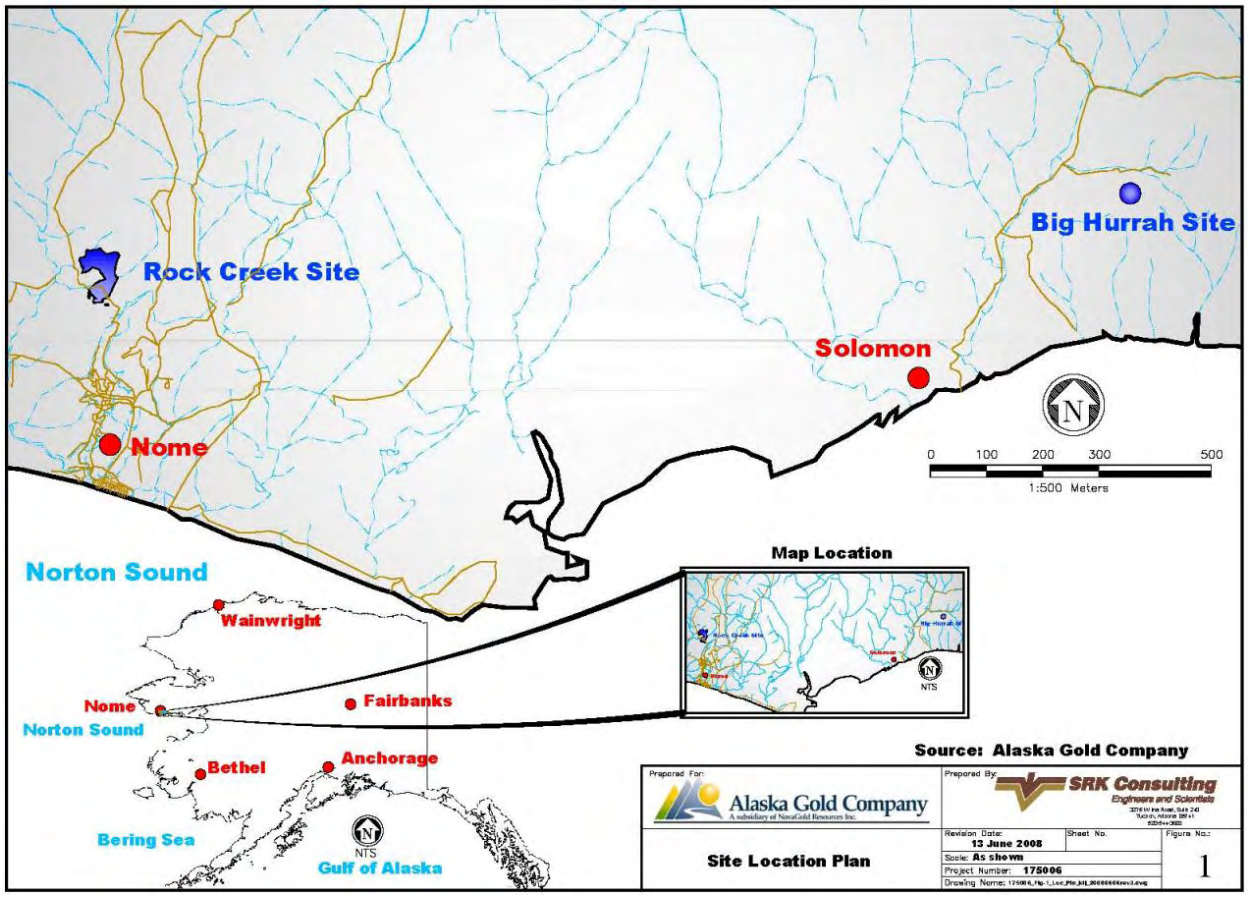

Figure 1: Rock Creek Mine and Big Hurrah Site Regional Location

2.1 Rock Creek Mine

The Rock Creek Mine is located approximately six miles north of Nome in the Snake River drainage on private lands owned by Sitnasuak Native Corporation (surface rights), BSNC (sub-surface rights), and AGC. Mine facilities currently include an open pit, TSF, explosive storage areas, IWF, organic stockpiles, storm water diversion channels, and mine roads (figure 2). Support facilities include the mill/gold recovery plant, maintenance shop, administration and mine dry buildings, warehouse, WTP, reagent storage locations, RWP, and fuel storage locations (figure 3). As part of Phase I closure activities the TSF and RWP were decommissioned in 2012.

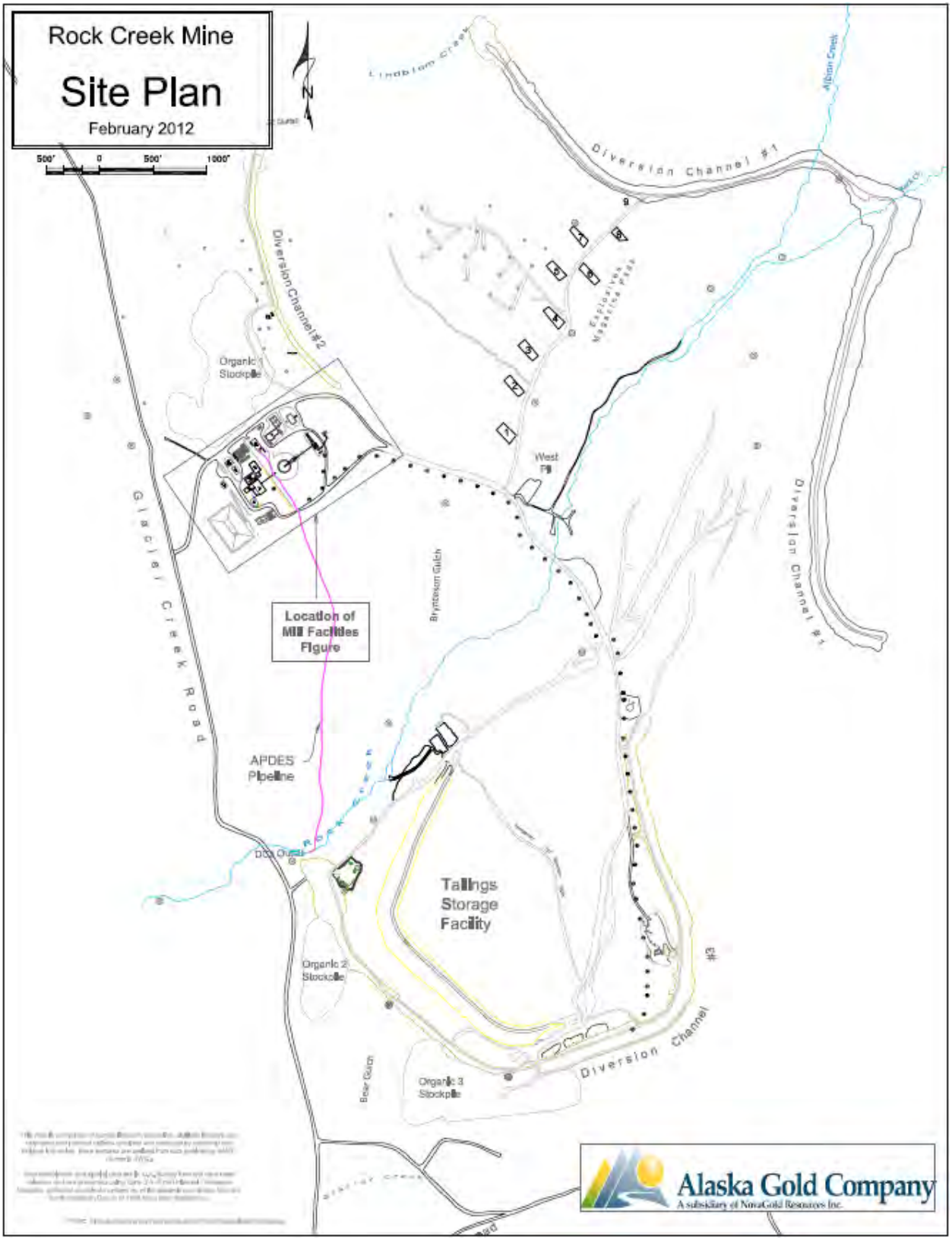

Figure 2: Rock Creek Site Map

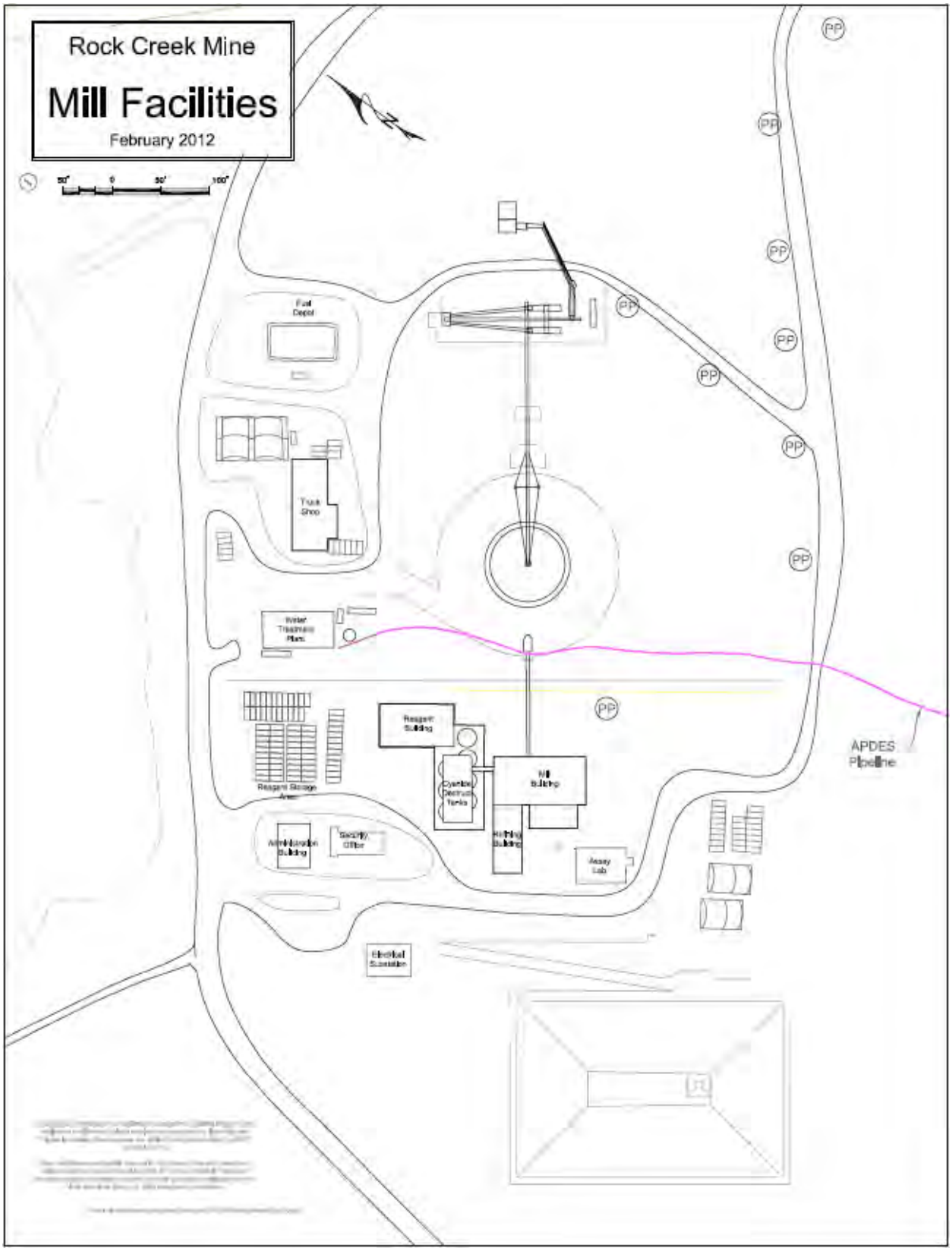

Figure 3: Rock Creek Mine Mill Facilities

2.2 Big Hurrah Site

The Big Hurrah site is located approximately 42 miles east of Nome in the Solomon River watershed on land owned by AGC. The Solomon Native Corporation owns the surface rights to the surrounding land.

2.3 Environmental Policy

Throughout NOVGOLD's ownership of the Rock Creek Mine, AGC followed the corporate governance of NOVAGOLD, which recognizes environmental management as a corporate priority. NOVAGOLD adopted the following Statement of Principles to establish corporate-wide standards of excellence that are applied during all stages of exploration, development, mining and closure:

- NOVAGOLD will communicate its commitment to excellence in environmental performance to its subsidiaries, employees, contractors, other agents and the communities in which it operates.
- All new activities and operations will be managed to ensure compliance with applicable laws and regulations. In the absence of regulation, best management practices will be applied to minimize environmental risk.
- Remediation and mitigation of historical mining impacts on properties acquired by NOVAGOLD will be managed through cooperative involvement of NOVAGOLD with previous owners, government agencies and the community.
- To achieve its commitment to environmental excellence, NOVAGOLD will use an environmental management system that ensures prioritization, planning, implementation, monitoring and accurate reporting.
- NOVAGOLD will strive to minimize releases to the air, land or water and will ensure appropriate treatment and disposal of waste.
- NOVAGOLD will allocate the necessary resources to meet its reclamation and environmental obligations.
- NOVAGOLD will continuously seek opportunities to improve its environmental performance through adherence to these principles.
- NOVAGOLD will regularly report progress to its employees, shareholders and the communities in which it operates.

2.4 Regulatory Requirements

The Rock Creek Mine and Big Hurrah sites are regulated primarily by the State of Alaska, with oversight by federal agencies. The various permits, approvals and authorizations in effect during 2012 are listed in table 2.

Table 2: Regulatory Instruments

Regulatory Instrument	Issued by	Regulated Activities

Table 2: Regulatory Instruments

Regulatory Instrument	Issued by	Regulated Activities
Waste Management Permit 2003-DB0051	ADEC	Disposal of wastes from the Rock Creek and Big Hurrah projects to the TSF, inert solid waste landfills, underground injection of treated wastewater, groundwater and surface water monitoring, and management of development rock. The Temporary Closure Plan (TCP) was developed under the authority of this permit and finalized on February 20, 2009. As of the completion of the Phase I closure activities, the requirements of this permit have expired and no longer apply to the site.
Department of the Army Permit POA-2006-742-M	Dept. of the Army	Placement of approximately 15,592,411 cubic yards of fill material into 346.5 acres of waters of the U.S. for development, operation and reclamation of the Rock Creek and Big Hurrah projects. This permit was extended through December 31, 2015 effective February 13, 2012.
Certificate of Reasonable Assurance	ADEC	Certificate of Reasonable Assurance for Department of the Army Permit POA-2006-742-M
Air Quality Control Minor Permit AQ0978MSS01	ADEC	Installation and operation of emission units in crushing and grinding circuit, shop/warehouse, emergency generators, and CIL process, mill, laboratory and administration buildings
Underground Injection Control Permit AK- 5X27-001-A	EPA Region 10	Injection of treated mine dewatering wastewater and a onetime disposal of treated wastewater contained in the TSF associated with closure of the Rock Creek Mine project utilizing Class V injection wells.
Alaska Pollutant Discharge Elimination System Permit No. AK0053267	ADEC	Surface discharge of treated wastewater from the TSF, main pit, and RWP to Rock Creek during periods of open water.
Land Application Permit No. 2010DB0011	ADEC	Seasonal land application of nondomestic wastewater using spray evaporators. Revised May 1, 2012 for land application of sump water to tundra.
APDES General Permit for Storm Water Discharges from Multi-Sector General Permit Activity No. AKR05DB98	ADEC	Discharge of storm water from mine related industrial activities at the Rock Creek Project. During 2012, per State permit requirements and direction from the State, AGC transitioned storm water discharge permit coverage from the CGP to the MSGP.
Reclamation Plan Approval F20069578	ADNR	Approval of Reclamation Plan for the Rock Creek and Big Hurrah projects
Rock Creek Mine Reclamation and Closure Plan F20129578	ADNR	Approval of final closure and reclamation of the Rock Creek Mine
Final Consistency Response AK 0605-05AA	ADNR	Final response regarding consistency of Rock Creek and Big Hurrah projects with the Alaska Coastal Management Program and affected coastal district's enforceable policies
Certificate of Approval to Construct a Dam AK00309	ADNR	Construction of the TSF at the Rock Creek Mine project. The applicability of this certificate of approval was terminated upon issuance of the letter from ADNR to AGC removing the TSF dam from State Dam Safety jurisdiction on September 13, 2012.
Temporary Certificate of Approval to Operate a Tailings Dam No. AK0039	ADNR	Reissued on December 31, 2009 as a temporary certificate to operate the TSF dam. The applicability of this certificate of approval was terminated upon issuance of the letter from ADNR to AGC removing the TSF dam from State Dam Safety jurisdiction on September 13, 2012.
Certificate of Approval to Abandon a Dam #AK00309	ADNR	Approval of the plan to abandon the TSF. After completion of the TSF breach, the applicability of this certificate of approval was terminated upon issuance of the letter from ADNR to AGC removing the TSF dam from State Dam Safety jurisdiction on September 13, 2012.

Table 2: Regulatory Instruments

Regulatory Instrument	Issued by	Regulated Activities
Fish Habitat Permit FH06-III-0233	ADNR	Rehabilitation of 2.5 miles of existing access road along Big Hurrah Creek and installation of culverted road crossings in Big Hurrah and Linda Vista creeks
Fish Habitat Permit FH12-III-0249	ADNR	Authorizes Phase II closure reclamation activities in Rock Creek including: breach of causeway and removal of causeway culverts, construction of drainage channel to reconnect Rock Creek through causeway breach, and remove in-stream settling ponds and restore Rock Creek channel to pre-mining condition.
Temporary Water Use Authorization TWUP F2011-108	ADNR	Withdrawal of groundwater from 11 interceptor wells surrounding Rock Creek Mine pit (pit dewatering). Replaces TWUP F2006-09
Temporary Water Use Authorization TWUP F2011-105	ADNR	Withdrawal of surface water from Rock Creek drainage within the Rock Creek Mine pit (pit dewatering). Replaces TWUP F2006-10
Temporary Water Use Authorization TWUP F2011-106	ADNR	Withdrawal of surface water from a tailings pond, TSF and process plant site drainage channels for mill process water for the Rock Creek Mine project. Replaces TWUP F2006-11
Temporary Water Use Authorization TWUP F2011-110	ADNR	Diversion of surface water from Rock Creek drainage diversion channels into Lindblom Creek to minimize drainage through the Rock Creek Mine site. Replaces TWUP F2006-12
Temporary Water Use Authorization TWUP F2011-109	ADNR	Withdrawal of groundwater from five interceptor wells surrounding the Big Hurrah Mine pit (pit dewatering). Replaces TWUP F2006-13
Temporary Water Use Authorization TWUP F2011-107	ADNR	Withdrawal of surface water from the Little Hurrah Creek drainage within the Big Hurrah Mine pit (pit dewatering). Replaces TWUP F2006-14

In addition to the permits, approvals and authorizations listed in table 2, AGC must comply with other state and federal laws including, but not limited to, state regulations regarding spill reporting, water quality standards, mining, reclamation and solid waste management, Resource Conservation and Recovery Act (RCRA), Emergency Planning and Community Right-to-Know Act (EPCRA), Toxic Substances Control Act (TSCA), Clean Air Act (CAA), and Clean Water Act (CWA).

3.0 Rock Creek Mine Activities

Activities at the Rock Creek Mine in 2012 were directly related to the mine's Care and Maintenance status and final closure. Activities consisted of Phase I closure projects, contained water management, WTP operations, IWF maintenance and operation, treated water injection, south sump water land application, maintenance of the existing storm water diversion channels, and continued implementation of BMPs. These activities are discusses in the following sections.

3.1 Disturbance and Reclamation

Beginning in late 2011, AGC commenced Phase I closure activities at Rock Creek. The Phase I closure activities were focused on decommissioning and reclamation of portions of the TSF, seepage collection sumps, and RWP. As part of the closure projects, there was less than 2 acres of no new disturbance all of which was reclaimed in 2012. The cumulative disturbed area,

including disturbances prior to 2011, totals 383 acres with 122 acres reclaimed, including the Phase I closure activities completed in 2012 (table 3).

Table 3: Disturbed and Reclaimed Area

Year	Area (Acres)		
	Disturbed	Reclaimed	Cumulative
2007	338	0	338
2008	42	5	375
2009	2	0	377
2010	1	15	363
2011	0	0	363
2012	0	102	261
Total	**383**	**122**	**261**

3.2 Development Rock Stockpiles

Development rock from the Rock Creek Mine was used entirely for construction and reclamation activities; no stockpiles were constructed in 2012.

3.3 Organic Stockpiles

No material was placed in or removed from organic stockpiles #1 and #2 during 2012. Material was removed from organic stockpile #3 for use in re-vegetation of reclaimed areas (table 4). Material remaining in all stockpiles will be used in future reclamation activities.

Table 4: Rock Creek Organic Stockpile Volumes

Description	Units	Stockpile #1	Stockpile #2	Stockpile #3	Total
Total Volume End of 2008	m^3	487,482	40,962	625,973	1,294,237
Volume Placed - 2009	m^3	30,351	0	1,719	32,070
Total Volume End of 2009	m^3	517,833	180,962	627,512	1,326,307
Volume Placed – 2010	m^3	0	0	0	0
Total Volume End of 2010	m^3	517,883	180,962	627,512	1,326,307
Volume Placed - 2011	m^3	0	0	0	0
Total Volume End of 2011	m^3	517,883	180,962	627,512	1,326,307
Volume Placed/Removed - 2012	m^3	0	0	122,000	122,000
Total Volume End of 2012	m^3	517,883	180,962	505,512	1,204,307

3.4 Paste Tailings Storage Facility

ADNR issued a Certificate of Approval (No. AK00309) to AGC to operate the Rock Creek TSF dam on July 7, 2008. The State of Alaska suspended the Certificate in December 2008 when the Rock Creek Mine status was changed to Care and Maintenance. ADNR issued a Temporary Certificate of Approval (No. AK00309) to AGC to operate the TSF dam on December 31, 2009.

On February 10, 2012, ADNR issued a Certificate of Approval (No. AK00309) to abandon the dam as part of Phase I closure activities. On September 13, 2012, subsequent to the breaching of the dam, ADNR issued a letter removing the TSF dam from State Dam Safety jurisdiction.

There were no inspections or collection of geotechnical data of the TSF dam in 2012. In late 2011, AGC commenced Phase I closure activities of the TSF. The TSF dam was drained of all ponded water, the paste tailings were consolidated and covered with a HDPE liner, and the dam was breached. Breach activities were completed in February 2012.

3.5 Solid Waste Landfill

On September 7, 2009 AGC developed an inert materials landfill as permitted under the WMP. AGC continued to place material into the landfill throughout 2012. As of December 31, 2010 Cell 1 was closed. Cell 2 was opened in June 2010 and closed in September 2010. Cell 3 was opened in September 2010 and closed in June 2011. Cell 4 was opened in June 2011 and closed in May 2012. Cell 5 was opened June 2012 and closed in September 2012. The inert waste landfill was covered and re-contoured as part of final closure activities in September 2012.

Items discarded to Cell 4 during 2012 include:

- Wood debris
- HDPE liner
- Crushed culverts and pipe

Items discarded to Cell 5 during 2012 include:

- Scrap wood and pallets
- Scrap metal including crushed culverts, rebar, wire rope, scrap iron, steel valves, and scrap building material
- Scrap plastic material including HDPE liner, HDPE pipe, and PVC pipe
- Concrete blocks
- Smart ash residue
- Triple rinsed plastic totes and buckets
- Silt fence
- Miscellaneous construction debris
- Tires
- Insulation
- Rubber hose
- Cardboard

3.6 TSF Seepage Collection System

During 2009, AGC constructed a seepage collection system at the TSF dam's downstream toe consisting of flexible drain pipe backfilled with drain rock. The seepage collection sumps were lined with a geosynthetic clay liner (GCL), filled with drain rock and capped with GCL. In 2012 the seepage collection system was decommissioned as part of Phase I closure activities.

While in operation water collected in the sump was conveyed by gravity to one of two collection sumps (Main and South). South sump water was pumped to the Main Sump through a 3-inch insulated, heat-traced HDPE pipeline by a 7.5 horse-power (hp) submersible pump. Main Sump water was pumped by a 58 hp electric pump over the top of the TSF and back into the basin through a 6-inch heat-traced HDPE pipeline.

In order to complete the dewatering and breach of the TSF, in early 2012 TSF Main Sump water was re-routed directly to the WTP for treatment and disposal. Remaining TSF pond water was pumped directly to the Main Sump and batch transferred with sump water to the WTP. The Main Sump was decommissioned on May 18, 2012. During Main Sump decommissioning water from the South Sump was land applied directly to the tundra per revised LAP 2012DB0011. The South Sump was decommissioned on July 1, 2012.

Sump flow data was recorded up to decommissioning of both sumps and data is presented in appendix D.

3.7 Land Application

AGC received approval for land application of waste water at the Rock Creek mine site on August 6, 2010 as described in LAP 2010DB0011. This permit initially allowed land application of TSF pond water to the application area up gradient from the TSF using up to three evaporative sprayers not to exceed a combined application rate of 300 gpm. On May 1, 2012 the State formally approved a modification to the permit to allow land application of sump water to a tundra area between DC-3 and the Glacier Creek Road. The revised land application area is shown in figure 4.

There was no land application of waste water using the evaporative sprayers in 2012. Land application of sump water to the tundra began on May 1, 2012 and the system was decommissioned on July 1, 2012. Land application was achieved by pumping sump water into a weep hose system designed to maximize the spread of water over the entire land application area and prevent single point discharges. There was no requirement to record volumes pumped to the tundra under the revised permit. Twice daily visual monitoring was conducted to ensure that no ponding water or overland flow was resulting from disposal of sump water to the tundra. No adverse conditions were reported during these daily visual inspections.

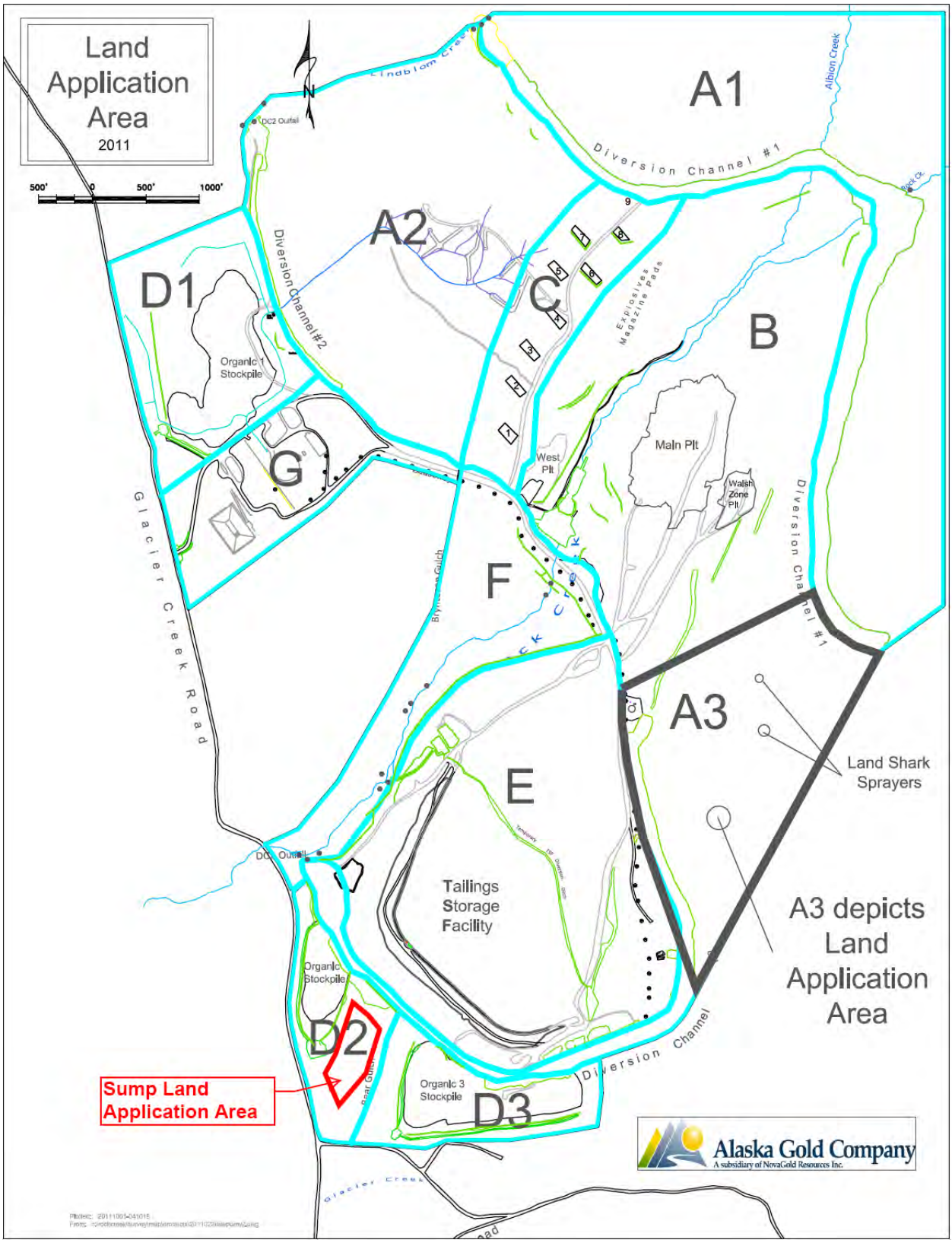

Figure 4: Land Application Area

3.8 Recycle Water Pond

The RWP was a synthetically lined retention pond designed to capture runoff from the plant site and TSF decant water. Over time, leaks were detected in the primary liner from small punctures. Rather than remove and reinstall the primary liner, AGC installed a secondary liner as an overlayment, with a leak collection and recovery system (LCRS) placed between the liners. An additional synthetic underliner is installed below the primary and secondary liners. The interstitial water volume (between the primary and secondary liners) from the LCRS is continuously pumped back to the RWP, with total flow volumes recorded each day (appendix B).

Prior to decommissioning the RWP in 2012, AGC conducted daily visual inspections of the RWP and liner systems, and routinely sampled contained water for cyanide (total and WAD). Data showed that water from the RWP, as discussed in Section 8.1.2, was not adversely impacting groundwater quality in the immediate vicinity of the RWP.

As part of Phase I closure activities the RWP was decommissioned in 2012. RWP closure activities were initiated in July 2012. Final closure including; dewater of the RWP, removal and containment of RWP solids, backfilling of the RWP, encapsulation of RWP solids in a lined repository within RWP footprint, and re-contouring and re-vegetation of filled RWP was completed in September 2012.

4.0 Storm Water Management

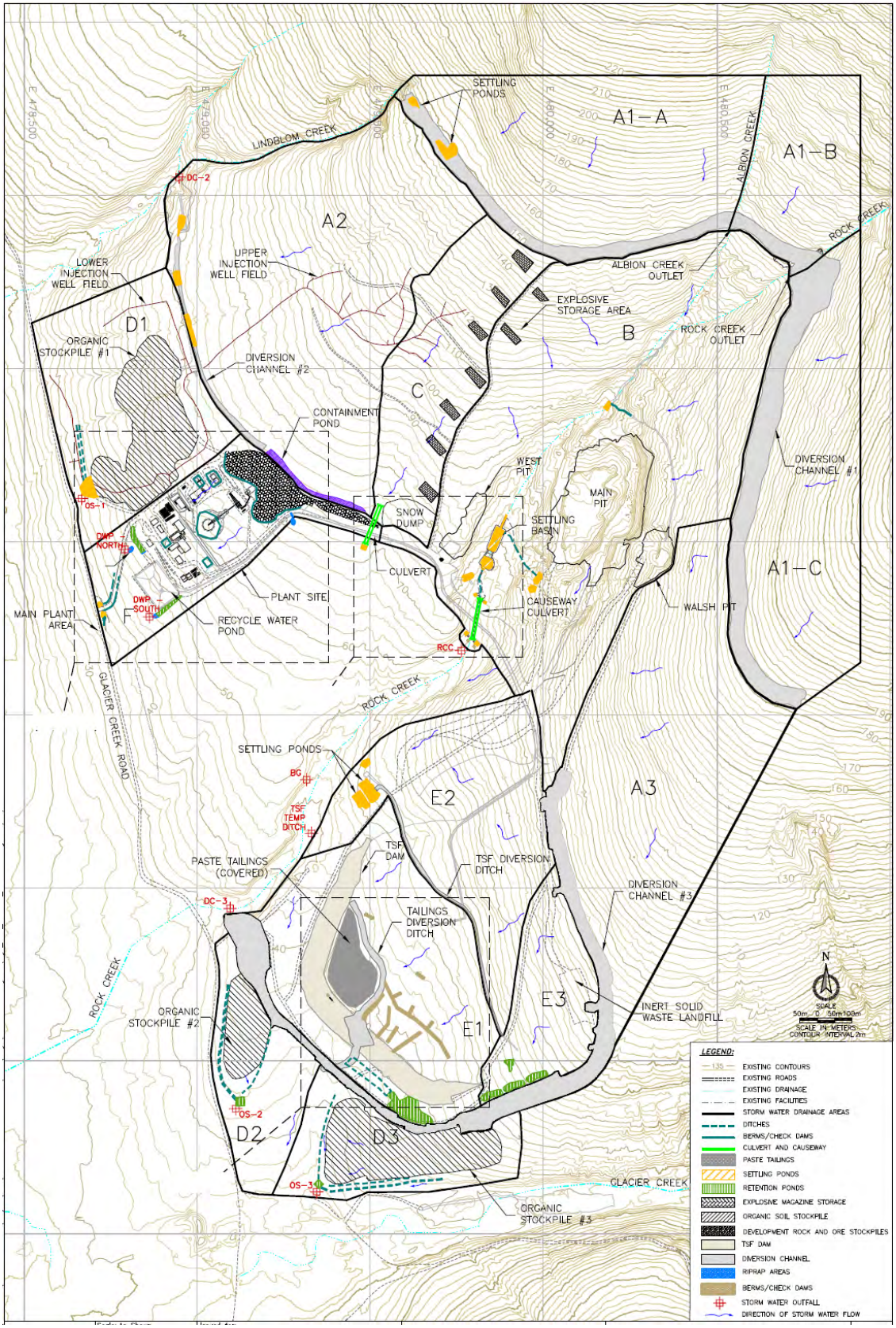

Figure 5: Rock Creek Mine SWPPP Structures

In 2012, AGC began coverage under the State's MSGP for discharges from industrial activities. Visual inspections of all diversion structures, outfalls, and BMPs were conducted daily, weekly, or monthly as described in the updated Rock Creek Storm Water Pollution Prevention Plan (SWPPP). Any problems noted during inspections were corrected as soon as practicable. All diversion structures and BMPs continued to perform well throughout 2012. Visual observations of stormwater samples collected at required outfalls indicated that all upstream BMPs were effective.

AGC conducted BMP maintenance, erosion control, and re-seeding projects during 2012 including:

- Re-routed stormwater runoff from the mill site away from the RWP to facilitate RWP closure.
- Constructed additional diversion structures and settling ponds on the north and south sides of the RWP to handle redirected stormwater runoff.
- Redirected stormwater runoff from the TSF basin through the TSF breach channel (finished February 2012) into DC-3 approximately 1500 feet upstream of the DC-3 outfall.
- Removed ice buildup from settling ponds and completed snow/ice removal from major diversion ditches prior to spring breakup to ensure effectiveness of BMPs.
- Improved several major BMPs and the DC-3 outfall to prevent erosion during high water flows.
- Installed new BMPs including straw wattles, wire reinforced silt fence, and erosion control mat throughout site as part of spring break-up maintenance activities.
- Constructed multiple, intermittent BMPs around all Phase I closure activity disturbance areas.
- Completed site wide re-contouring and re-seeding projects including all areas disturbed by Phase I closure activities.

5.0 Water Treatment Plant

AGC continued to operate the WTP through the end of September 2012. During 2012 the WTP was utilized to treat various contained water sources as part of Phase I closure activities. The plant was closely monitored and chemical treatment parameters were adjusted to ensure compliance with Alaska Water Quality Standards (AWQS) and permit limits as source water chemistry changed. Although no new modifications were made within the WTP, AGC made several modifications to influent piping and re-routed some source waters through the mill facility 800 area tanks and pumps for pre-treatment purposes. These modifications include:

- Reversed Main Sump flow to receive TSF pond water and batch transferred pond and sump water directly to WTP
- Combined dewatering water from RPW-02 with the underliner pump water and transferred combined waters directly to WTP

- Pumped RWP water to the thickener for pre-settling of suspended solids before pumping to WTP for final treatment and disposal
- Pumped CIL tank water through the 800 mill area for pre-treatment to reduce metals levels, reduce remaining cyanide levels, and adjust pH for final treatment and disposal

WTP Flow data for 2012 are presented in appendix E.

6.0 Injection Well Field

The Rock Creek Mine IWF is operated as authorized by UIC Permit No. AK-5X27-001-A. The IWF is also regulated by ADEC WMP No. 2003-DB0051, which incorporates many of the same conditions as the UIC permit. The IWF receives treated waste water directly from the WTP which treated water from the TSF pond, Main Sump, RWP, and CIL tanks as part of Phase I closure activities. ADEC authorized AGC to commence underground injection on May 15, 2009.

There are 29 wells that make up the IWF (figure 6). Seven injection wells were not used in 2012. Table 5 summarizes the unavailable injection wells. Of the 22 active wells, water was not injected into every well in 2012 because a smaller number of wells could be used to manage the maximum flow of treated water.

Table 5: Unavailable Injection Wells

Well ID	Comments
1	Well header broken, last used 12/1/2011
3	Never operated or connected to the IWF
22	No feed line, last used 10/6/2011
23	Never operated or connected to the IWF
24	Injection rate < 1 gpm, not used in 2012
25	Plugged and abandoned September 2012
32	No feed line, not used in 2012
45	Annular seal failed, not used in 2012

Monthly average injection rates ranged from a low of 44 gpm in March to a high of 224 gpm in January. Injection rates varied greatly throughout 2012 as various contained water sources were emptied as part of Phase I closure activities. Eleven wells were injecting treated water as of August 19, 2012. The IWF was shut down on August 20, 2012 in preparation for final treatment of remaining contained water in the CIL tanks and remaining WTP waste water. From August 20 to September 17, 2012 the injection wells were operated on a very limited basis as final treated waters were treated and injected in small batches.

There were no leaks or groundwater upwelling from injection wells during 2012.

A spreadsheet of daily recorded injection well data including packer inflation pressure, injection pressure, instantaneous injection rate, and totalizer readings is provided as an attachment to this report. Monthly injection rate tables are provided in appendix C.

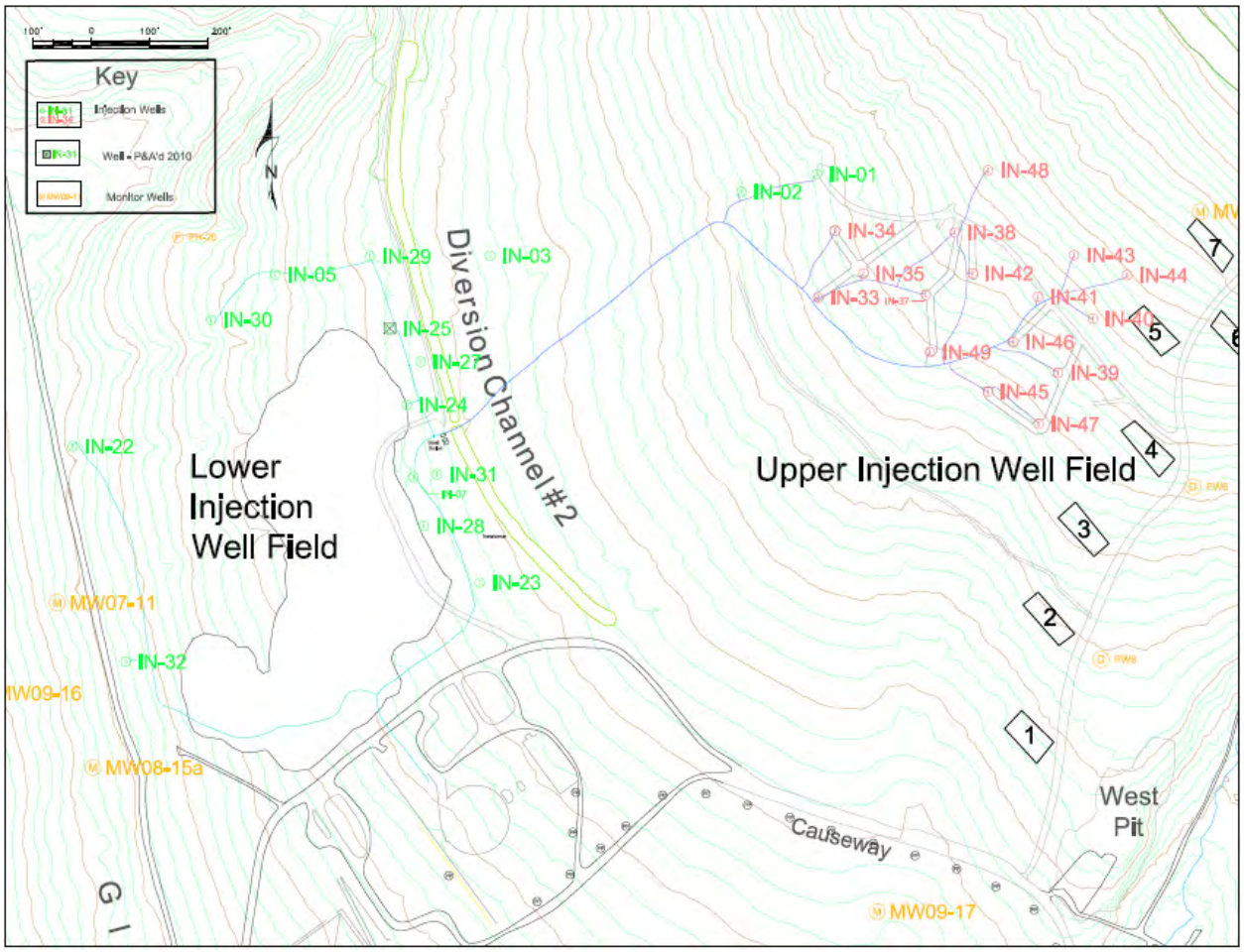

Figure 6: Rock Creek Mine IWF Map

7.0 Reportable Spills

There were 5 reportable spills at the Rock Creek Mine in 2012 (table 6). Spilled substances were related to construction, maintenance, and hauling activities and included antifreeze, diesel fuel, used oil, and hydraulic oil. All spills were reported to DEC following spill reporting requirements. All spills were cleaned up immediately.

Table 6: Reportable Spills

Item Spilled	Date	Potential Responsible Party	Location	Quantity	Cause
Antifreeze	2/9/2012	Alaska Aggregate Products	Rock Creek	1 gallon	Failed hose on 16G grader
Antifreeze	2/21/2012	Alaska Gold Company	Rock Creek	1 gallon	Unknown source/cause
Diesel Fuel	4/27/2012	Alaska Gold Company	Rock Creek	5 gallons	Spill found beneath generator, cause unknown
Used Oil	5/1/2012	Alaska Gold Company	Satellite Field	1 gallon	Used oil drain pan spilled onto shop floor with some oil spilling onto soil outside main door
Hydraulic Oil	6/18/2012	Stamped Ventures	Rock Creek	5 gallons	Filter canister "O" ring failed on pressure line of side dump trailer

8.0 Monitoring (Analytical)

Environmental monitoring of water sources, development rock, and paste tailings has been conducted by AGC as specified by permit requirements and following the Monitoring Plan(November 2008) and Final TCP (Revised Version – April 26, 2010) that were applicable up to the transfer of AGC from NOVAGOLD to BSNC on November 1, 2012. During the Care and Maintenance period, analytical monitoring has been primarily focused on water sources. There are no development rock stockpiles at the Rock Creek facility and no paste tailings are generated during Care and Maintenance that require monitoring.

Water quality monitoring requirements and effluent limitations have been specified in WMP 2003-DB0051, UIC Permit AK-5X27-001-A, LAP 2010DB0011, and APDES Permit AK0053627. The analytical monitoring program for water is divided into four separate categories: contained, ground, surface, and treated water. Each category is discussed in more detail below. In addition to required sampling events, AGC collected additional water samples not subject to specific compliance requirements. These additional samples included: multiple water samples from various points in the WTP to optimize performance; pit lake water to characterize water chemistry for potential future treatment and disposal; CIL tank process water to determine appropriate treatment methods; and additional contained water samples to predict and account for changing WTP influent water chemistry. The additional data is available for review upon request.

With the exception of some conventional parameters analyzed in the field by AGC staff (e.g., pH, temperature, turbidity, and chlorine), all water chemistry samples are analyzed by a contract laboratory (SGS North America Inc.) in Anchorage for the pollutants listed in table 7.

Analytical data for samples collected from Rock Creek and Big Hurrah monitoring locations are reported in appendices A1–A20. Complete analytical data and lab reports are available from NOVAGOLD. Water chemistry data spreadsheets for complete results from Rock Creek 2012 compliance sampling are provided as an attachment to this report.

Table 7: Water Chemistry Sampling Parameters

Parameter	Ground Water WMP/TCP	Surface Water WMP/TCP	Surface Water APDES Permit	Contained Water WMP/TCP	Treated Water UIC Permit	Treated Water APDES Permit
Aluminum*	X	X	X	X	X	X
Antimony*	X	X	X	X	X	X
Arsenic*	X	X	X	X	X	X
Barium*	X	X	X	X	X	X
Beryllium*	X	X	X	X	X	X
Cadmium*	X	X	X	X	X	X
Calcium*	X	X	X	X	X	X
Chromium*	X	X	X	X	X	X
Cobalt*	X	X	X	X	X	X
Copper*	X	X	X	X	X	X
Iron*	X	X	X	X	X	X
Lead*	X	X	X	X	X	X
Magnesium*	X	X	X	X	X	X
Manganese*	X	X	X	X	X	X
Molybdenum*	X	X	X	X	X	X
Nickel*	X	X	X	X	X	X
Phosphorus*	X	X	X	X	X	X
Potassium*	X	X	X	X	X	X
Selenium*	X	X	X	X	X	X
Silicon*	X	X	X	X	X	X
Silver*	X	X	X	X	X	X
Sodium*	X	X	X	X	X	X
Strontium*	X	X	X	X	X	X
Thallium*	X	X	X	X	X	X
Tin*	X	X	X	X	X	X
Titanium*	X	X	X	X	X	X
Vanadium*	X	X	X	X	X	X
Zinc*	X	X	X	X	X	X
pH**	X	X	X	X	X	X
Conductivity	X	X	X	X	X	X
Total Dissolved Solids	X	X	X	X	X	X
Alkalinity	X	X	X	X	X	X
Ammonia-N	X	X		X		
Chloride	X	X	X	X	X	X
Fluoride	X	X	X	X	X	X
Sulfate	X	X	X	X	X	X
Sulfide	X					
Cyanide (total)	X	X		X	X	
Cyanide (WAD)	X	X	X	X	X	X
Mercury	X	X	X	X		X
Total Suspended Solids	X	X	X	X		X
Nitrate/Nitrite-	X	X		X	X	

Table 7: Water Chemistry Sampling Parameters

Parameter	Ground Water WMP/TCP	Surface Water WMP/TCP	Surface Water APDES Permit	Contained Water WMP/TCP	Treated Water UIC Permit	Treated Water APDES Permit
N						
Chlorine**			X			X
Chronic Whole Effluent Toxicity (WET)						X

*Metals analyzed for total and dissolved concentrations,**Chlorine and pH are measured on-site due to short analytical holding times for these parameters

8.1 Contained Water

Prior to Phase I Closure activities contained water sampling was conducted on a quarterly basis and included sampling of the TSF Pond, RWP, South Sump, Main Sump, Main Pit Lake, and RWP Underliner (table 8). The TSF Pond, South Sump, and Main Sump samples were used to monitor water quality in the TSF water management system while the RWP and RWP Underliner samples were used to evaluate the integrity of the RWP system. As noted above, AGC has not been required to monitor the Main Pit Lake. Main Pit Lake samples have only been collected when the water surface is ice free.

As part of Phase I Closure activities during 2012 the TSF, Main Sump, South Sump, and RWP were decommissioned. As a result, contained water sampling was no longer required as these decommissioning activities progressed. Table 8 summarizes the contained water sample sites and when sampling stopped as a result of these activities.

There are no contained water systems at the Big Hurrah site.

Table 8: Contained Water Sampling Locations

Sample ID	Collection Location	Final Sampling/Decommissioning
TSF Pond	Directly from TSF pond when unfrozen; From port on WTP influent line prior to untreated water tank when TSF pond is frozen	Last sample collected during the first quarter 2012; TSF breach completed February 2012
RWP	Port on recirculation loop above pond culverts	Last sample collected during the second quarter 2012; Final dewatering initiated July 1, 2012
RWP Underliner	Port on recirculation loop above pond culverts	Last sample collected during the second quarter 2012; Pump decommissioned in spring 2012
South Sump	Directly from sump culvert using bailer	Last sample collected during the first quarter 2012; South Sump decommissioning initiated in April 2012
Main Sump	Directly from sump culvert using bailer; If snow covered then from port on TSF return line in TSF pump conex	Last sample collected during the first quarter 2012; Main Sump decommissioning initiated in March 2012
Main Pit Lake	Directly from main pit lake when ice free; Not sampled during frozen conditions	Last sample collected during the second quarter 2012; No dewatering or sampling required as part of Phase I Closure activities

8.1.1 Tailings Storage Facility

The TSF Pond was sampled during the first quarter of 2012. Due to frozen pond conditions at the time of sampling the sample was collected from a port on the WTP influent line just prior to the untreated water tank. Samples collected from the TSF were not subject to limitations in the WMP. The data were used primarily to evaluate trends in the influent concentration to the WTP in order to plan for any necessary operational changes to the WTP processes.

The TSF was breached beginning in late 2011 and the breach was completed in February 2012 including removal of all water contained in the TSF pond. As a result, no further water sampling was performed in the TSF area after the first quarter 2012 and no future sampling will be performed.

Analytical data for the TSF pond monitoring samples is reported in appendix A1.

8.1.2 Recycle Water Pond

Water from the RWP was sampled during the first and second quarter of 2012. The RWP Underliner was not sampled during the first quarter 2012 because the pump was frozen. RWP and RWP Underliner samples were collected from ports on the recirculation loop immediately above the pond culverts. Samples were collected from the RWP Underliner pump to determine if any RWP water was reaching groundwater through breaches in the primary and secondary liners. The LCRS installed between the primary and secondary liners is designed to collect small leakage volumes from between the liners and pump it back to the RWP before reaching the RWP Underliner.

The RWP Underliner pump was decommissioned in the spring of 2012 prior to second quarter sampling and RWP dewatering and decommissioning began on July 1, 2012 prior to third quarter sampling. As a result, no further water sampling of the RWP and RWP Underliner was performed after these dates and no future sampling will be performed.

Water contained in the RWP may not exceed WAD cyanide levels of 25 mg/L for any one sample, nor may the 90th percentile of all samples exceed 10 mg/L (WMP Section 1.2.4). All RWP samples showed WAD cyanide levels below permit requirements. Samples collected from the RWP Underliner were also well below the permit limits. A comparison of RWP and RWP Underliner analytical data demonstrates that RWP water was not breaching the liner system or adversely impacting groundwater quality.

Analytical data for RWP monitoring samples are reported in appendix A2.

8.1.3 TSF Seepage Collection System

The TSF seepage collection system included the South and Main sumps below the toe of the TSF dam. Historically, water from the Main Sump was recycled directly to the TSF pond where it was then pumped to the WTP for treatment and injection. In order to dewater the TSF pond and breach the TSF dam, water from the TSF pond was pumped into the Main Sump and the combined sump and pond water was directed to the WTP for final treatment and disposal. Water from the South Sump was pumped directly to the Main Sump prior to Main Sump

decommissioning. After the TSF breach was completed in February 2012 and Main Sump decommissioning was initiated in March of 2012, South Sump water was disposed of through land application.

The South and Main sumps were sampled during the first quarter of 2012. Samples were collected directly from the sump culverts using bailers. As a result of decommissioning activities, no further sampling was conducted after the first quarter 2012, and no future sampling will be performed.

Water recycled to the TSF may not exceed a WAD cyanide level of 25 mg/L for any one sample, nor may the 90th percentile of all samples exceed 10 mg/L (WMP Section 1.2.4). Water samples collected from the seepage collection system sumps had non-detectable results or were below lab reporting limits for WAD cyanide. There are no other permit limits that apply to the sump water.

Analytical data for Main and South sump monitoring samples are reported in appendices A3 and A4. This data was primarily used to monitor WTP influent water chemistry and project potential changes in influent water chemistry that could have affected WTP treatment performance.

8.1.4 Pit Lake

There have been no mining activities in the main pit during the temporary closure period, and the pit is not actively dewatered while in Care and Maintenance. The Main Pit has been allowed to fill with storm water runoff creating the pit lake. Main Pit samples were collected during the second quarter of 2012. The pit lake was frozen during the first quarter and no sample was collected. There are no requirements to monitor pit lake water chemistry as part of Phase I closure activities and no further sampling was collected during the second half of 2012.

Sample data is available for review upon request from NOVAGOLD.

8.2 Surface Water

Surface water at the Rock Creek Mine site is sampled monthly when flow is present. As part of modified monitoring requirements for post closure activities, Rock Creek site monthly surface water samples were no longer required after the third quarter of 2012. In addition, 3 regional surface water samples are collected in the vicinity of the Rock Creek Mine each quarter during periods of open flow. Quarterly regional samples are still required under post closure monitoring requirements. Under AGC's APDES permit additional monthly samples (as noted in table 9) may be collected from Rock Creek and the Snake River when actively discharging to Rock Creek in order to monitor impacts to water quality, if any, from surface discharge of treated waste water at APDES outfall 001. There was no surface discharge of treated wastewater during 2012 and no additional samples were collected. All surface water sample locations are listed in table 9.

There is no requirement in the final TCP (revised April 26, 2010) to collect surface water samples at the Big Hurrah site. AGC has elected to collect annual surface water samples at the Big Hurrah site in order to document background water chemistry trends.

Table 9: Surface Water Sampling Locations at Rock Creek

Sample ID	Location	Description
SABC	Snake River above Balto Creek	Snake River above mine site (APDES monitoring site)
SRTB	Snake River	Snake River at Teller Bridge (APDES monitoring site)
GLAC	Glacier Creek	Glacier Creek at Glacier Creek Bridge
DC3-Upstream (DC3-A)	Rock Creek	Upstream of the DC-3 outlet (APDES monitoring site)
DC3-Discharge (DC3-B)	Rock Creek	At the discharge of DC-3 to Rock Creek
DC3-Downstream (DC3-C)	Rock Creek	Downstream of the DC-3 outlet (APDES monitoring site)

8.2.1 Rock Creek Regional

The regional, quarterly surface water samples in the vicinity of the Rock Creek Mine are collected on Glacier Creek and the Snake River in order to monitor water quality below the mine site (table 9). During the first quarter of 2012, no regional sample was collected on Glacier Creek (GLAC) as there was no open water.

All analytical data collected from the regional sample locations (SABC, SRTB, and GLAC) in 2012 showed pollutants below AWQS. Regional surface water chemistry results are graphed and presented in appendix A5-A7. An excel spreadsheet of the regional water chemistry data is available as an electronic appendix to this report.

8.2.2 Rock Creek Site

Surface water samples at the Rock Creek Mine site are collected at the outfall of diversion channel 3 (DC-3). Three samples are taken; above the outfall, from the discharge, and below the discharge (within 20 feet) (table 9).

During winter months, Rock Creek is covered in snow and overflow ice. AGC environmental staff checks for water flow at the sample locations by digging holes through the snow and ice until the gravel stream bottom is reached. No surface water samples were collected from January through March 2012 as no flow was present on the stream bed.

During 2012, analytical samples collected from locations within Rock Creek consistently exceeded AWQS for total arsenic. Sampling results also showed isolated exceedences for total aluminum, total antimony, total iron, total manganese, sulfate, and TDS at some sample points. A summary of observed exceedences is presented in table 10. AGC notes that elevated levels for total arsenic observed in upstream locations demonstrate naturally high background levels present in Rock Creek. Exceedences observed at the discharge point for antimony, iron, sulfate, and TDS did not impact downstream water quality. Exceedences of aluminum in the discharge and downstream samples in April sampling are believed to be the result of increased turbidity during elevated flows during the spring break-up period. Exceedences for manganese appear to be isolated events. Downstream exceedences for aluminum and manganese were not repeated in later sampling.

Sampling on Rock Creek is intended to monitor impacts to water quality from both mining activities and surface discharge of treated waste water. There was no surface discharge during 2012. The TSF dam was breached prior to 2012 spring break-up allowing DC-3 to receive water through the TSF breach channel. Additional grading and reclamation activities took place upstream of the DC-3 discharge through September 2012 including placement of fill from mine waste rock, re-contouring of grades to promote positive drainage, and application of top soil and hydroseed in re-contoured areas. The paste tailings stored within the TSF are fully covered and there are no mining related sources of pollutants to DC-3.

Table 10: Rock Creek Surface Water Monitoring Summary

Parameter	DC3-Upstream	DC3-Discharge	DC3-Downstream
	# AWQS Exceedences	# AWQS Exceedences	# AWQS Exceedences
Aluminum (total)	-	2	1
Antimony (total)	-	2	-
Arsenic (total)	6	6	6
Iron (total)	-	1	-
Manganese (total)	-	2	1
Sulfate	-	1	-
TDS	-	2	-

Arsenic

Arsenic is naturally present at elevated levels throughout the Rock Creek drainage, as demonstrated by the fact that all Rock Creek samples collected during 2012 showed concentrations above AWQS (10µg/L). The total arsenic values in the upstream samples ranged from 41.4µg/L to 73.1µg/L and the downstream samples ranged from 40.1µg/L to 80.4µg/L. SRK Consulting conducted a natural condition analysis verifying the ubiquitous nature of arsenic in the Rock Creek vicinity (SRK 2008). AGC notes that there are no trends showing that the mine is causing any elevation of arsenic levels beyond naturally occurring conditions in the area.

AGC reported arsenic exceedences to ADEC by memoranda dated May 25, July 5, August 30, October 7, and November 30, 2011 in which background arsenic levels were discussed.

Aluminum

Exceedences of AWQS for total aluminum in the April 28, 2012 samples occurred in the discharge sample (862µg/L) and the downstream sample (362µg/L). A single exceedence of total aluminum in the discharge sample was also observed in the May 30, 2012 sample (129µg/L).

Review of the data shows total aluminum values are much greater than dissolved metal values indicating that total suspended solids (TSS) contributed to the exceedence (table 11). Increases in TSS are probably related to elevated stream turbidity during elevated flows during spring runoff.

Table 11: Comparison of total/dissolved Aluminum and TSS Values

Date	Sample ID	Total Aluminum (µg/L)	Dissolved Aluminum (µg/L)	TSS (mg/L)
4/28/2012	DC3-Upstream	*63.2	18.6(J)	3.3
4/28/2012	DC3-Discharge	862	16.8(J)	21
4/28/2012	DC3-Downstream	362	13.5(J)	11.3
5/30/2012	DC3-Discharge	129	14.4(J)	5.73

ND = indicates the analyte is not detected; (J) = the quantitation is an estimation
TSS values range from not-detected to 3.74mg/L when no aluminum exceedences are observed
*Value does not exceed AWQS for total aluminum; value shown for reference

AGC reported aluminum exceedences to ADEC by memoranda dated May 25 and July 5, 2012 in which seasonal fluctuations and elevated TSS were discussed.

Manganese

Exceedences of AWQS for total manganese were observed in the discharge (152µg/L) and downstream sample (75.4µg/L) in April 28, 2012 sampling. A single exceedence for total manganese was observed in the discharge sample (91.9µg/L) collected on September 13, 2012. Manganese exceedences appear to be isolated and do not appear in successive sample events.

AGC reported manganese exceedences to ADEC by memoranda dated May 25 and October 7, 2012.

Antimony and Iron

Total antimony exceeded AWQS in two discharge samples collected on June 23, 2012 (7.75µg/L) and July 24, 2012 (7.68µg/L) and total iron exceeded AWQS one time in the discharge sample collected on April 28, 2012 (1840µg/L). Total antimony was not significantly above AWQS and did not adversely impact downstream water quality. The total iron exceedence was an isolated event and did not result in a downstream water quality exceedence for iron. No further exceedences for total iron were observed in any Rock Creek surface water samples collected in 2012.

AGC reported antimony and iron exceedences to ADEC by memoranda dated May 25, August 30, and November 30, 2012.

Sulfate and TDS

The results for sulfate in the DC-3 outfall discharge show exceedences of AWQS for samples collected on June 23, 2011 (254mg/L) and exceedences for TDS in the DC-3 outfall discharge samples collected on June 25 (518mg/L) and July 24, 2012 (553mg/L). The exceedences at the discharge location are not significantly above AWQS and are not contributing to downstream exceedences.

AGC reported sulfate and TDS exceedences to ADEC by memoranda dated August 30 and November 30, 2012.

Analytical data for samples collected from Rock Creek surface water locations are reported in appendices A8-A10.

8.2.3 Big Hurrah

Surface water is monitored yearly at 6 locations on and around the Big Hurrah site (table 12). Complete analytical data and lab reports of all samples collected from Big Hurrah surface water locations are available from NOVAGOLD upon request.

Table 12: Surface Water Sampling Locations at Big Hurrah

Sample ID	Location	Description
BHBL	Lower Big Hurrah Creek	Big Hurrah Creek below mine site
BHRU	Upper Big Hurrah Creek	Big Hurrah Creek above mine site
HUFF	Huff Creek	Huff Creek tributary to Big Hurrah Creek above mine site
LHRL	Lower Little Hurrah Creek	Mouth of Little Hurrah Creek below proposed pit
LHRU	Upper Little Hurrah Creek	Little Hurrah Creek above proposed pit
LIDA	Linda Vista Creek	Linda Vista Creek tributary to Big Hurrah below mine site

8.3 Groundwater

AGC's groundwater monitoring program was developed to determine whether TSF seepage or injection to the IWF contribute to exceedences of AWQS. Additional wells are monitored down-gradient of the RWP to identify leaks and below the Rock Creek Mine to identify broad changes to groundwater chemistry from the entire site (table 13). Monitoring wells designated as "A" or "B" refer to deep and shallow collection points for the same well.

Groundwater samples were collected quarterly during the first 3 quarters of 2012 from each well listed in table 13. As part of post closure monitoring beginning in the fourth quarter of 2012 the number of groundwater samples collected was reduced to 5 wells (MW03-05, MW07-11, MW08-15, MW08-14A, and MW08-14B). Some wells are dry or contain too little water for purging at certain times of the year as groundwater levels seasonally fluctuate and, as a result, samples are not collected during these times.

No groundwater monitoring is required at the Big Hurrah site.

Table 13: Rock Creek Groundwater Sample Locations

Well Sample ID	Location	Description
MW03-05	Above Rock Creek Culvert	Background Monitoring Well
MW06-08A,B	South TSF dam/South of South Sump	TSF Monitoring Well
MW06-09A,B	West TSF dam/West of Main Sump	TSF Monitoring Well
MW06-10A,B	Between North TSF and Rock Creek	TSF Monitoring Well
MW07-11	West of IWF	Down-gradient of IWF
MW08-14A,B	South of RWP	Down-gradient of RWP
MW08-15	West of IWF	Down-gradient of IWF
MW09-17	Southwest of IWF	Down-gradient of IWF

8.3.1 TSF Monitoring Wells

There are 3 pairs (one shallow and one deep) of groundwater monitoring wells down-gradient of the TSF. MW06-8A and 8B are down-gradient of the south end of the TSF south of the South Sump, MW06-9A and 9B are down-gradient of the central portion of the TSF west of the Main Sump, and MW06-10A and 10B are down-gradient of the north end of the TSF. Samples are collected from each monitoring well quarterly as specified in the TCP (revised TCP Table D.1). Throughout 2012, wells MW06-08B and MW06-10B were dry and no samples were collected at these points. Monitoring well MW06-9B was dry during the first quarter of 2012 and monitoring well MW06-10A was dry during the second and third quarters of 2012. Groundwater sampling of TSF monitoring wells is not required as part of post closure monitoring beginning in the fourth quarter of 2012.

In addition to AWQS, the TCP incorporates specific upper tolerance limits (UTLs) for key parameters in the groundwater which are based on initial assessment of background constituent of concern (COC) concentrations, and are intended to assess whether TSF seepage is reaching the monitoring wells (TCP Table D.3). When either the UTL or AWQS is exceeded, AGC must initiate corrective actions and follow-up monitoring to address any water quality issues (WMP 1.2.10 and 1.10.3). A summary of the number of exceedences of TCP UTLs and AWQS for TSF monitoring wells are summarized in table 14.

Table 14: TSF Monitoring Well Summary

Parameter	MW06-08A		MW06-09A		MW06-09B		MW06-10A	
	# Times Exceeding:		*# Times Exceeding:*		*# Times Exceeding:*		*# Times Exceeding:*	
	AWQS	TCP Action Level (UTL)	AWQS	TCP Action Level (UTL)	AWQS	TCP Action Level (UTL)	AWQS	TCP Action Level (UTL)
Arsenic	3	-	3	-	2	-	1	-
Copper*	-	-	-	-	-	1	-	-
Iron	1	-	1	-	1	-	-	-
Manganese	2	-	2	-	2	-	-	-
Nickel*	-	-	-	-	-	1	-	-
Potassium	-	-	-	-	-	1	-	-
Sodium	-	-	-	3	-	1	-	-
Sulfate	-	1	-	2	3	1	-	1
TDS	-	-	-	1	1	1	-	-
Total Nitrate/Nitrite-N	-	1	-	-	-	-	-	-

*Copper and Nickel UTLs are for total metals, AWQS is for dissolved metals and is hardness dependent

In addition to AWQS and UTLs, AGC also identified well-specific background levels based on a detailed statistical analysis of baseline condition for each well. AGC contracted Tetra Tech, Inc. to conduct this study in 2009 (Tetra Tech, January 2010). The resulting analysis demonstrated the strong influence of background groundwater concentrations on the observed exceedences in each well. In fact, most of the sample results from the TSF wells, when compared to the well-specific background levels, are within the range of natural conditions for the Rock Creek drainage.

AGC submitted the detailed results of the Tetra Tech study to ADEC on April 27, 2010. This submittal proposed specific trigger levels for each well based on the higher of AWQS or the well-specific background level. AGC continues to report exceedences of AWQS or UTLs as required under WMP section 1.2.10; however, AGC only performs further corrective action beyond monitoring when these well-specific background levels have been exceeded.

The TCP UTLs for various key parameters were exceeded in all TSF monitoring wells that were sampled. It is important to note that although the UTLs were exceeded, there were no exceedences of AWQS for these same parameters, and AGC did not take any further corrective actions as a result. Exceedences of AWQS in 2012 and associated corrective actions are discussed below.

Arsenic

Exceedences of AWQS for total arsenic were consistently observed in TSF monitoring wells, but were below natural background limits established for each well. A summary of the range of arsenic values compared to well-specific background values is shown in table 15.

Table 15: Comparison of Total Arsenic in TSF Monitoring Wells versus Established Background Values

Well ID	Total Arsenic range (µg/L)	Background Value (µg/L)
MW06-8A	253-271	362
MW06-9A	76.1-82.9	93
MW06-9B	204-237	340
MW06-10A	98.4	133.3

AGC reported these exceedences to ADEC by memoranda dated May 14, August 30, October 7, and November 30, 2012 in which natural background values for arsenic were discussed.

Iron

Total iron levels in TSF monitoring wells vary widely in individual wells and historically have shown evidence of fluctuations in any given well. Each TSF monitoring well except MW06-10A experienced occasional exceedences of AWQS for total iron in 2012. There are no established background values for total iron for TSF monitoring wells. Total iron values fluctuate widely around the mine site and were observed to range from 246µg/L to 20,000µg/L site wide in 2012 and from non-detectable to 30,200µg/L since sampling began in 2008. Higher values are noted to occur in shallow monitoring wells that monitor sub-surface groundwater in gravel/overburden above bedrock. Total iron values ranged from 804µg/L to 1160µg/L in MW06-8A, from 246µg/L to 1460µg/L in MW06-9A, and from 18,200µg/L to 20,000µg/L in MW06-9B.

AGC reported specific well iron exceedences to ADEC by memoranda dated August 30 and October 7, 2012 in which site wide iron levels were discussed.

Manganese

Total manganese values occasionally exceeded AWQS in all TSF monitoring wells except MW06-10A. The AWQS for total manganese was exceeded in MW06-8A two times (54µg/L and 50.9µg/L) and in MW06-9A two times (140µg/L and 92.5µg/L). Results were not significantly above the AWQS for total manganese (50µg/L) in MW06-8A. Although manganese values were above AWQS and the background limit (86.3µg/L) for well MW06-9A, the observed manganese level is generally consistent with the range of background data for the mine site.

Total manganese values in MW06-9B ranged from 1280µg/L to 1320µg/L in 2012. These values are above AWQS (50µg/L) and the established background level (314µg/L) for this well. In 2010, AGC observed elevated total manganese levels in MW06-9B above background values and previously observed historic values. As a result, AGC contracted HydroGeo, Inc. (HydroGeo) to conduct a geochemical and hydrologic investigation of MW06-9B, MW06-9A, and the Main Sump, which had elevated manganese levels, and was considered up-gradient of these wells. HydroGeo did not find any relationship between elevated manganese in the Main Sump and monitoring wells MW06-9A/B. Specifically, water level data show that groundwater appears to move from the wells towards the Main Sump rather than in the other direction (HydroGeo Inc., January 2011). AGC submitted the HydroGeo technical memorandum to ADEC on February 16, 2011.

Total manganese values continued to rise through 2011 and 2012. Note that TSS was also increasing in this well over the same time period ranging from 3.9 to 27mg/L from 2011 to late 2012. Increased TSS may be an indication of poor well purging or a problem with the well installation/condition as it continues to age over time. Measured analytical values in the shallow overburden well were not reflected in the deeper bedrock groundwater well MW06-9A that is paired with this well.

Total manganese exceedences for TSF monitoring wells observed during 2012 were reported to ADEC by memoranda dated May 15, August 30, and October 7, 2012.

Sulfate and TDS

There were two exceedences of AWQS for sulfate (379mg/L and 489mg/L) and one exceedence of AWQS for TDS (902mg/L) in monitoring well MW06-9B. Similar to total manganese values, sulfate and TDS have also been higher than previously observed levels in this well, but levels are not always in exceedence of AWQS. With TSS values increasing as discussed with the manganese exceedence, the sulfate and TDS exceedences are likely the result of poor purging or a problem with the well installation/condition.

Sulfate and TDS exceedences for TSF monitoring wells observed during 2012 were reported to ADEC by memoranda dated August 30 and October 7, 2012.

Analytical data for TSF monitoring well samples are reported in appendices A12-A15.

8.3.2 RWP Monitoring Wells

There is one deep and one shallow groundwater monitoring well (MW08-14A and 14B) down-gradient of the RWP. These wells are sampled quarterly under temporary closure and post closure monitoring requirements. These locations were monitored to identify possible leaks from the RWP and RWP Underliner during the Care and Maintenance period. Monitoring well MW08-14B was not sampled throughout 2012 because there was insufficient water in the well for proper well purging following established quality assurance methods outlined in the Rock Creek Monitoring Plan (SRK, November 2008) Quality Assurance Project Plan (QAPP). A summary of the number of exceedences of AWQS for RWP monitoring wells is summarized in table 16.

Table 16: RWP Monitoring Well Summary

Parameter	MW08-14A
	# AWQS Exceedences
Arsenic (total)	2
Iron (total)	4
Manganese (total)	3
TDS	2

Exceedences of AWQS for total iron were consistently observed in RWP monitoring well MW08-14A. Total iron values ranged from 1040µg/L to 1980µg/L. AWQS exceedences for total arsenic, total manganese, and TDS were also observed periodically during 2012 sampling. Values for total arsenic ranged from 17.7µg/L to 74.9µg/L, for total manganese from 51.9µg/L to 119µg/L, and for TDS from 514mg/L to 524mg/L. Observed values are within natural background values observed around the mine site for arsenic and manganese. TDS was not significantly above AWQS. There is no background data available for this well to establish well-specific background levels. The intent of this well is to monitor for impacts to water quality from leakage, if any, of RWP water through the primary and secondary liners. There was no correlation of water chemistry results between MW08-14A and the RWP.

Exceedences of AWQS for RWP monitoring wells observed during 2012 were reported to ADEC by memoranda dated May 15, August 30, October 7, and November 30, 2012.

Analytical data for RWP monitoring well samples are reported in appendix A17.

8.3.3 IWF Monitoring Wells

The IWF is operated as authorized by UIC Permit No. AK-5X27-001-A issued by EPA Region 10. Three monitoring wells are located down-gradient of the IWF. Two wells (MW08-15A and MW07-11) are converted injection test wells completed in bedrock and are located along the west side of the Glacier Creek Road, north of the mine entrance gate, and down-gradient of the lower IWF. MW07-11 is located north of MW08-15A. One well (MW09-17) is located southwest of the mine haul road, and down-gradient of the upper IWF. MW09-17 is a replacement monitoring well installed in bedrock which replaces the original monitoring well MW03-07 that collapsed due to permafrost activity. These wells are intended to measure possible water quality influences from injected treated waste water. All 3 IWF wells were monitored quarterly under the temporary closure plan. Monitoring well MW09-17 was not

sampled during the third quarter of 2012 due to insufficient water levels required for proper well purging. Only wells MW07-11 and MW08-15 are required to be monitored quarterly under post closure monitoring requirements beginning in the fourth quarter of 2012.

In 2012, sample results showed elevated levels above AWQS for arsenic, iron, and manganese as shown in table 17.

Table 17: IWF Monitoring Well Summary

Parameter	MW07-11	MW08-15A	MW09-17
	# AWQS Exceedences	# AWQS Exceedences	# AWQS Exceedences
Arsenic (total)	4	4	2
Iron (total)	3	4	-
Manganese (total)	-	-	2

Arsenic

Total arsenic is consistently above AWQS for IWF monitoring wells. Total arsenic values ranged from 110µg/L to 136µg/L in MW07-11, from 138µg/L to 275µg/L in MW08-15, and from 399µg/L to 437µg/L in MW09-17. Results remain consistent throughout the year and are within ranges observed for water quality around the mine site. The intent of these wells is to measure possible water quality influences from the injection of treated waste water. There was one isolated exceedence for total arsenic (217µg/L) in WTP effluent on September 10, 2012 one week prior to final shutdown of the WTP. IWF monitoring wells were sampled on October 2, 2012 and results for total arsenic were 136µg/L in MW07-11 and 175µg/L in MW08-15. Although total arsenic exceeded AWQS, the values are within expected natural background ranges for these wells and are not believed to be the result of the isolated arsenic exceedence in WTP effluent.

Iron

Exceedences of AWQS for total iron have been consistently observed in MW08-15A (range 1070µg/L to 2180µg/L). There were two exceedences of AWQS for total iron in MW07-11; 1260µg/L on September 14, 2012 sampling and 1020µg/L on October 2, 2012 sampling. There are no established background values for total iron in these wells. Elevated iron levels are attributed to natural background variations that are observed around the mine site. The intent of this well is to measure possible influences on groundwater chemistry from the injection of treated waste water. There was one isolated exceedence of total iron (3680µg/L) in the May 24, 2012 WTP effluent sample. However, IWF groundwater samples collected on June 20, 2012 showed no exceedences for total iron in MW07-11 and MW09-17. The total iron exceedence in MW08-15 on June 20, 2012 (1290µg/L) is within normal ranges observed for this well and is not believed to be a result of the isolated iron exceedence in the WTP effluent.

Manganese

Total manganese consistently exceeded AWQS in monitoring well MW09-17 in 2012 samples. There is no background value established for the well, but total manganese is within natural background values observed around the mine site. The intent of these wells is to measure

possible water quality influences for the injection of treated waste water. There was one isolated exceedence for total manganese in the WTP effluent on March 1, 2012 (51.8µg/L). However, observed ranges for total manganese in IWF groundwater monitoring wells are consistently above this level further indicating that manganese in groundwater reflects natural conditions.

Exceedences of AWQS in IWF monitoring wells observed during 2012 were reported to ADEC by memoranda dated May 15, August 30, October 7, and November 30 2012.

Analytical data for IWF monitoring well samples are reported in appendices A16, A18, and A19.

8.3.4 Other Groundwater Monitoring Wells

Groundwater monitoring well MW03-05 is located on Rock Creek below the mine site and is sampled in order to observe trends in water chemistry down-gradient of the mine site. This well is sampled quarterly under TCP and post closure monitoring requirements.

Total arsenic was consistently above AWQS in MW03-05 with values ranging from 74.9µg/L to 94.1µg/L. Observed values are within ranges historically observed in this well and around the mine site. No adverse trends were identified in 2012.

Exceedences of AWQS in MW03-05 observed during 2012 were reported to ADEC by memoranda dated May 15, August 30, October 7, and November 30, 2012.

Analytical data for monitoring well MW03-05 samples are reported in appendix A11.

8.4 Water Treatment Plant

During 2012, the WTP was used to treat water from the TSF, Main Sump, RWP, and CIL tanks for injection to the IWF. Injected water is subject to effluent limitations contained in UIC Permit Section 7, which are also incorporated into WMP Section 1.6. WTP effluent samples for injection water are collected weekly directly from the injection well line past the treated water tank at the IWF booster pump. No surface discharge to Rock Creek occurred during 2012. Effluent samples collected for water chemistry analysis are analyzed by SGS labs in Anchorage for parameters listed in table 7. WTP effluent samples are monitored daily for physical parameters (pH, conductivity, and temperature) using a hand held multi-meter.

During 2012, weekly sampling data showed isolated exceedences of AWQS for select analytes. These exceedences were related to changes in WTP treatment chemistry required for treatment of changing influent water chemistries during Phase I Closure activities. WAD cyanide limits were exceeded during the first quarter 2012 and are likely due to “false positive” measurement for WAD cyanide. There were also periods of elevated TDS and sulfate above permit limits.

Antimony and Manganese

The total manganese exceedence (51.8µg/L) occurred on March 1, 2012. The result was only slightly above the AWQS limit of 50µg/L. The exceedence was the result of a brief operational

upset related to a problem with caustic dosing which resulted in the pH dropping below target levels. The total antimony exceedence (6.3µg/L) occurred on May 4, 2012. The result was only slightly above the AWQS limit of 6µg/L. WTP chemical treatment parameters were immediately adjusted in order to maintain compliance with AWQS. No further exceedences for antimony and manganese were observed in 2012.

Sulfate and TDS

Sulfate was above AWQS for brief periods throughout 2012, and TDS was above AWQS for most of 2012. Sulfate and TDS exceedences are a result of increased levels for these analytes in the source water, particularly as water treatment focused on the Main Sump, CIL, and RWP water during the Phase I closure activities. TDS exceedences were also a result of chemical dosing required for water treatment. As discussed with ADEC staff, there were limited options for reducing TDS and sulfate concentrations without major modifications to the WTP. The WTP chemical treatment process is monitored continuously at set-points located at select internal monitoring sites in order to ensure that chemical dosing is optimized for effective metals removal. This internal monitoring allows water to be treated with the minimum addition of chemicals and therefore keeps TDS increases as low as practicable. AGC has closely communicated with ADEC regarding elevated sulfate and TDS values, and it is recognized that no associated adverse impacts have been observed in IWF monitoring wells.

It is important to recognize that while the limit is based on the applicable AWQS, there are no adverse effects on the ambient environment from TDS or sulfate discharged via the injection wells.

WAD Cyanide

In the early part of the first quarter of 2012, AGC identified 4 WAD cyanide exceedences in WTP effluent. In all cases the WAD cyanide value exceeded the total cyanide value indicating the results were likely false positive values resulting from analytical interferences. AGC confirmed that source waters for the WTP did not contain WAD cyanide above AWQS.

No further false positive WAD cyanide exceedences were identified after the first quarter.

Iron, Copper, and Zinc

From May 24 through Jun 14, 2012 AWQS exceedences were observed one time for total iron, two times for dissolved zinc, and four times for dissolved copper. Iron, copper and zinc exceedences had not occurred in effluent samples for the past several years. The exceedences documented in the second quarter sampling events were found to be the result of corrosion of brass and copper containing valves and fittings in the WTP and injection system. The shift from sump to RWP water in mid-May and the continuing variations in effluent quality required changes to chemical addition parameters in the plant. Specifically, increases in hypochlorite usage likely resulted in elevated free chlorine concentrations, which caused the corrosion. In response to the exceedences, AGC and Tetra Tech staff worked to limit hypochlorite addition to the minimum necessary for effective water treatment. In addition, the corroding valves and

fittings were replaced. Subsequent samples were then taken and iron, copper and zinc concentrations were below AWQS.

Other

There was an exceedence of total arsenic (217µg/L), chlorine (1700mg/L), dissolved copper (44µg/L), total cyanide (0.28mg/L), WAD cyanide (0.018mg/L), and TDS (3450mg/L) in the weekly effluent sample collected on September 10, 2012 during the last week of water treatment. These sample results were collected just prior to the last day of plant operations at Rock Creek during Phase I closure activities. During the final days of plant operation, the final small volumes of water were treated intermittently during limited plant operations of only a few hours. The WTP can take several hours to balance chemically even when prior set-points are left unchanged. The previous WTP effluent sample collected on August 31, 2012 showed no exceedences of AWQS, and the same influent water chemistry was being treated during these times. It is believed that the intermittent plant operation contributed to these exceedences. Groundwater sampling for the fourth quarter was completed on October 2, 2012 for IWF monitoring wells. Other than arsenic which is naturally elevated in these wells, there were no exceedences for those parameters in exceedence of AWQS in the September 10, 2012 WTP sample.

pH

Readings for pH are collected daily from WTP effluent at the injection pipeline sample port at the IWF booster pump during periods of injection. There were no exceedences of upper and lower pH limits during 2012 plant operations. The pH results for injected water are shown in figure 7.

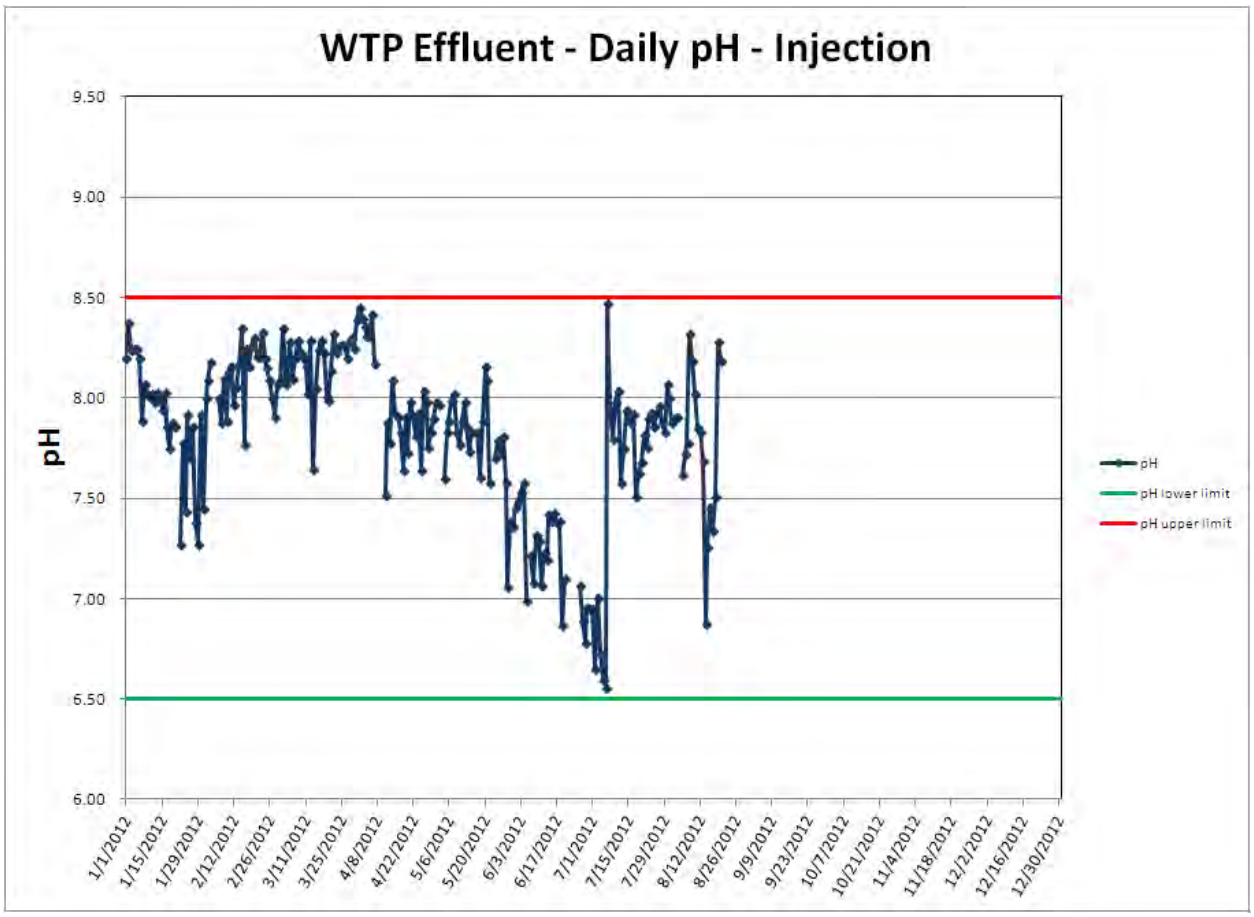

Figure 7: Injected Water Daily pH

Exceedences of AWQS in WTP effluent observed during 2012 were reported to ADEC by memoranda dated February 2, April 10, May 25, July 3, and October 8, 2012.

Analytical data for WTP effluent monitoring samples are reported in appendix A20.

8.5 Cyanide Monitoring of Tailings

No new tailings were generated during the temporary closure period and therefore, no cyanide monitoring of the tailings was performed during 2012.

8.6 Development Rock Stockpile Seepage Analysis

There are no development rock stockpiles at Rock Creek or Big Hurrah. All development rock at Rock Creek was used in mine construction and reclamation. There was no mining at Big Hurrah.

8.7 Geochemical Characterization

During the Care and Maintenance period no development rock or paste tailings were produced. However, as required by ADEC in February 2012, AGC collected 8 samples of the existing tailings in the TSF during the first quarter of 2012 to support facility closure. AGC provided these data in a separate report during July 2012.

The tailings analysis included acid-base accounting. The results showed that the tailing in the TSF do not show acid generating potential (Tetra Tech, June 2012).

There is no development rock or paste tailings storage at the Big Hurrah site.

8.8 Other Water Quality Monitoring

In accordance with ADEC WMP 2003-DB0051, ADEC must be notified in the next quarterly report of any water quality monitoring that is conducted beyond what is required in the monitoring plan.

As part of Phase I closure activities, AGC treated all remaining contained water in the TSF pond, RWP, and CIL tanks. AGC collected additional samples throughout closure activities from the RWP, CIL tanks, and RPW-02 in order to determine treatment options and monitor batch water transfers from these contained water locations. AGC continued to collect various water samples of WTP influent, in-stream, and effluent water for total and dissolved metals analysis. Pit lake water monitoring was continued in the first half of 2012 to characterize storm water run-off in contact with mineralized pit rock which may require future treatment and disposal. AGC also continued background groundwater sampling of well MW11-18 which may be used as a monitoring well for down-gradient monitoring of the main pit. Sample data is available for review upon request from NOVAGOLD.

9.0 Visual Monitoring

Daily and weekly visual monitoring was conducted on the Rock Creek Mine facilities regulated under the WMP 2003-DB0051. Monitoring of erosion control structures and diversion structures was conducted in accordance with the SWPPP. Monitoring of primary and secondary containments for hydrocarbon product storage is conducted in accordance with the site Spill Prevention, Control and Countermeasure (SPCC) plan.

Copies of the daily inspections and activities reports are available from NOVAGOLD for review upon request.

9.1 Tailings Storage Facility

The following sections describe the day-to-day visual monitoring of the TSF.

9.1.1 TSF Dam

There were no inspections of the TSF during 2012. The TSF was drained of all water and breached beginning in late 2011 with completion of the breach in February 2012. No further inspections are required.

9.1.2 TSF Seepage Collection System

The TSF seepage collection system (Main and South sumps) was visually inspected each day to ensure that no abnormal event had occurred. The sumps, pipe line and pumps were inspected each day prior to decommissioning. Flow meters were read and recorded at the time of the inspections.

Water collected in the sump was conveyed by gravity to one of two collection sumps (Main and South). The South Sump water was previously pumped to the Main Sump where it was transferred back to the TSF. As part of Phase I closure activities the seepage collection system was decommissioned in 2012. In order to facilitate TSF pond dewatering and Main Sump closure, water flow was reversed on February 12, 2012 to allow batch transfers of TSF water t to the Main Sump, and both sump and TSF water was pumped directly to the WTP for treatment and disposal. After decommissioning of the Main Sump, South Sump water was land applied directly to the tundra pending South Sump decommissioning.

Decommissioning of the Main Sump was completed on May 18, 2012 and the South Sump was completed on July 1, 2012. Sump closure activities included perforation of the GCL that enclosed the sump culverts, removal of pumps and piping, backfilling of sumps with mine rock, and re-contouring and re-vegetation of filled sumps.

Sump flow data shown in figure 8 reflects changes in flow rates that correspond with Phase I closure activities. Data from January 1 to May 18, 2012 represent the combined flow rates of the Main and South sumps. After May 18, 2012 the data is for the South sump only. The steady decline of sump flow rates from January through early February reflect the reduction of TSF pond water as dewatering progressed in the TSF. Several spikes in late February are the result of the batch transfer of remaining TSF pond water to the Main Sump preceding the completion of the TSF breach in February 2012. From March through mid-April sump flow rates continued a steady decrease associated with seasonal reduction of the groundwater input into the seepage collection system. With the onset of spring break-up, sump flow rates show a rapid increase as groundwater levels increase site wide. South Sump flow rates were erratic as a result of batch pumping of water from the sump to the tundra. Recharge rates in the South Sump were generally low and the installed pump was set to automatically draw down the sump when water levels reached a set level in the sump culvert.

The complete 2012 sump flow data are presented in appendix D.

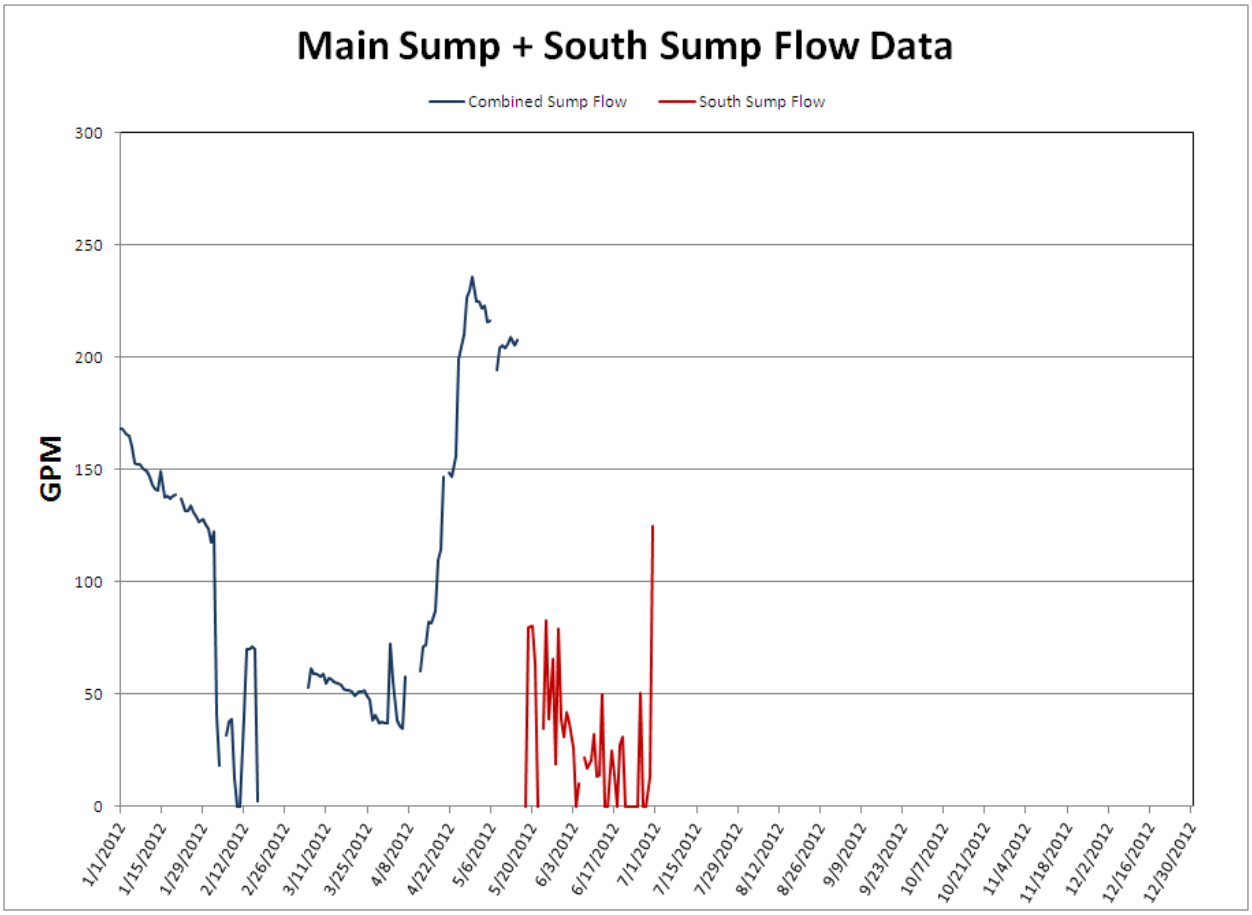

Figure 8: Main and South Sump Flow Data

9.1.3 Thickener

Paste tailings are not discharged from the thickener during the temporary closure period; visual inspections are not conducted.

9.1.4 Support Structures

No visual inspections of the TSF dam structure and support structures were conducted in 2012. The TSF was drained of all water and breached beginning in late 2011 with completion of the breach in February 2012. No further inspections are required.

9.1.5 Water Surface

The water surface elevations have been recorded on the daily TSF Inspection Log as per the Rock Creek Tailings Operations and Maintenance (O&M) Manual (AMEC, April 2008). As part of Phase I closure activities the TSF was drained of water, paste tailings consolidated and covered, and the dam was breached. Water levels steadily decreased through late January and then final, residual water was consolidated and batch transferred to the Main Sump for pumping

to the WTP. The TSF breach project was completed in late February and all remaining water in the TSF pond was removed.

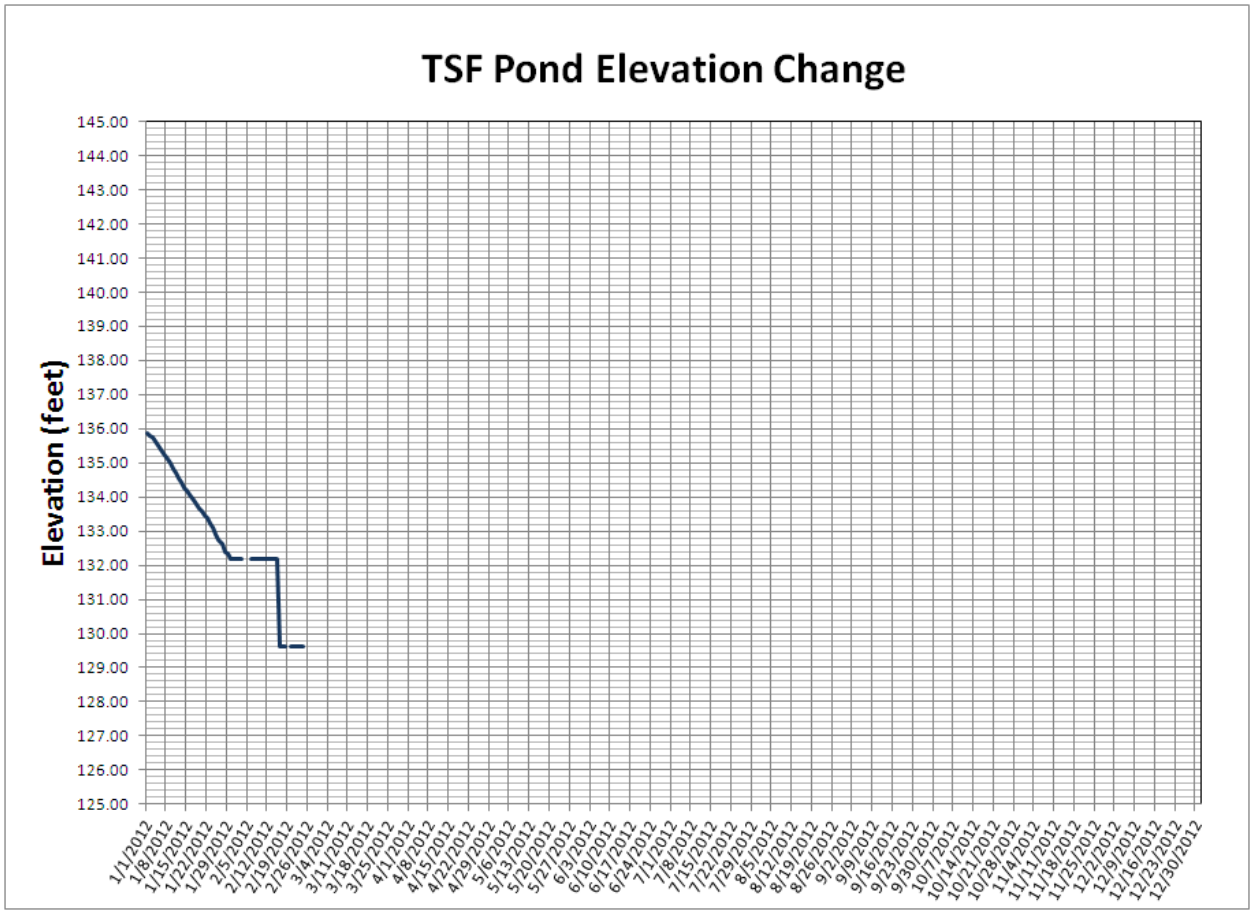

Figure 9: TSF Pond Elevation Change

9.2 Recycle Water Pond

Prior to decommissioning of the RWP in 2012, visual inspections of the RWP included: continuous monitoring of volumes pumped from the LCRS; recording of volumes pumped from groundwater wells RPW-01 and RPW-02; daily recording of the pond surface water elevation; and inspections of the pond liner for signs of compromise.

9.2.1 Leak Collection and Recovery System

The LCRS leak rate design criteria is 492 gallons per day (gpd). On May 18, 2012, AGC began to pump water from the RWP with the plan to empty the pond and implement the Phase I closure plan. Closure of the RWP was completed by the end of September 2012. The LCRS daily volume pumped was greater than 500 gallons per day (gpd) from January 1 through May 25, 2012. The RWP water level was decreased at a steady rate after this date and the LCRS daily rate dropped to less than 10 gpd through June 29, 2012. In conjunction with the closure process, pumping of the LCRS permanently ceased after that date.

LCRS daily flow rate data is presented in appendix B.

9.2.2 Water Surface

The Rock Creek Tailings O&M Manual specifies the operating water level in the RWP be maintained at an elevation of 139 ft amsl in order to accommodate storm water run-off from the mill site. Prior to the 2012 spring break-up period, the pond level was maintained near the 139 ft amsl level. As part of Phase I closure activities, storm water diversions to the RWP were rerouted in order to prevent rises in the RWP pending dewatering and permanent closure during the third quarter of 2012. Water levels in the RWP temporarily exceeded this level as greatly reduced spring break-up flows entered the pond from late April to early May 2012. The pond level rapidly dropped when RWP dewatering began on May 18, 2012 after spring break-up. Water level data for the RWP is shown in figure 10. The RWP was completely emptied as part of the Phase I closure activities in summer 2012 and no further water level data will be collected.

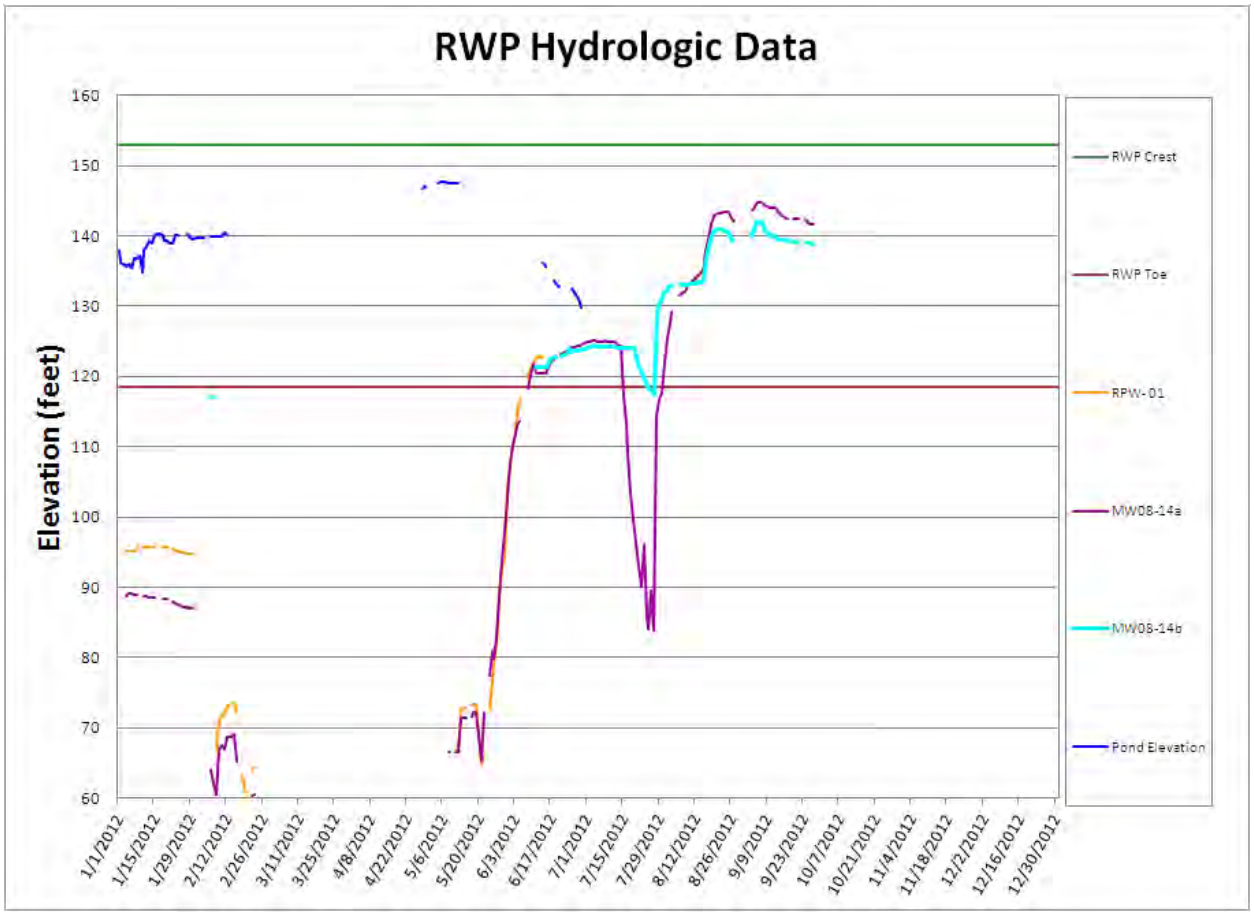

Figure 10: RWP Hydrologic Data

Groundwater pump RPW-01 was not used for dewatering in 2012 and was plugged and abandoned on June 18, 2012 as part of Phase I closure activities. RPW-02 water was discharged to the RWP during normal operations. In order to begin reducing water levels in the RWP, ground water pumped by RPW-02 was re-routed directly to the WTP for treatment and injection.

The underliner pump flow which previously reported directly to the RWP during normal operations was combined with RPW-02 groundwater at the RPW-02 pump and the combined flows were transferred to the WTP for treatment and injection. As a result of this modification, the RPW-02 and underliner flow rates could not be individually recorded. The combined flow averaged 22.1 gpm for the first quarter, 21 gpm during the second quarter, and 35 gpm for an 8 day period in July. The total volume pumped during 2012 was 4,517,362 gallons of water that was transferred to the WTP for treatment and injection. The underliner pump was shut down permanently on May 26, 2012 and RPW-02 was permanently shut down on July 25, 2012.

9.2.3 Pond Liner

Prior to RWP decommissioning, AGC staff conducted daily visual inspection of the liner and did not note any adverse conditions. RWP decommissioning began in May 2012 and was completed in early September 2012. The pond liner was perforated and buried when the pond was filled.

9.3 Monitoring Wells

There are 16 monitoring wells that are monitored for groundwater elevations at Rock Creek. Table 18 lists the locations of these wells.

Table 18: Groundwater Monitoring Well Locations

Well ID	Location	Description
MW08-14a	Down-gradient RWP (deep)	RWP water table monitoring
MW08-14b	Down-gradient RWP (shallow)	RWP water table monitoring
RPW-01	North side RWP	RWP water table monitoring
MW06-8a	South of TSF (deep)	TSF water table monitoring
MW06-8b	South of TSF (shallow)	TSF water table monitoring
MW06-9a	West of TSF (deep)	TSF water table monitoring
MW06-9b	West of TSF (shallow)	TSF water table monitoring
MW06-10a	North of TSF (deep)	TSF water table monitoring
MW06-10b	North of TSF (shallow)	TSF water table monitoring
MW07-11	Down-gradient Lower IWF	IWF water table monitoring
MW08-15	Down-gradient Lower IWF	IWF water table monitoring
MW09-16	Down-gradient Lower IWF	IWF water table monitoring
MW09-17	Down-gradient Upper IWF	IWF water table monitoring
PW-06	South of Upper IWF	IWF water table monitoring
PW-08	South of Upper IWF	IWF water table monitoring
PH-2006	Down-gradient Upper IWF	IWF water table monitoring

9.3.1 Visual Inspections

During 2012, TSF monitoring wells were visually inspected on a quarterly basis. As part of the groundwater monitoring program all sampled monitoring wells were visually inspected at the time of groundwater sampling. No damage or unusual conditions were observed in 2012 during these inspections.

9.3.2 Groundwater Elevations

Down-gradient IWF Water Level Monitoring

During 2012, AGC monitored groundwater elevations daily at seven wells near the IWF to note any instances of upwelling or other sudden changes in groundwater levels.

Three monitoring wells, MW07-11, MW08-15A, and MW09-16, are located down-gradient of the IWF (figure 6). Two wells (MW08-15A and MW07-11) are converted injection test wells completed in bedrock and are located along the west side of the Glacier Creek Road, north of the mine entrance gate, and down-gradient of the lower IWF. MW07-11 is located north of MW08-15A.

Wells MW09-17, PH-2006, PW-06, and PW-08 are also used to monitor groundwater levels in the area of the Upper IWF. Water level data for MW09-17 was unavailable throughout 2012 due to a failure of the permanently installed water level transducer. Well PH-2006 is located south-west of the upper injection well field in the flood plain of Rock Creek below the causeway. Well PW-06 is located west and cross-gradient of the injection wells, and well PW-08 is located down-gradient of the IWF. Monitoring well locations relative to the IWF are shown in figure 6. No impacts on long-term water level elevations have been observed in any of the IWF monitoring wells.

The water levels in the wells in the lower IWF generally remained consistent throughout 2012. Slight increases and decreases are consistent with seasonal fluctuations that are historically observed. Slight increases correspond to spring break-up flows in spring and heavy rainfall events in the fall. Slight decreases occur during lower precipitation summer months and during winter conditions. There was no influence on groundwater elevations from the continuous injection that occurred during the year nor was there an appreciable decrease in groundwater elevations after injection ceased in early September 2012. None of the water elevations in the lower IWF approached the corresponding ground elevations. Water elevation data in the lower IWF is shown in figure 11.

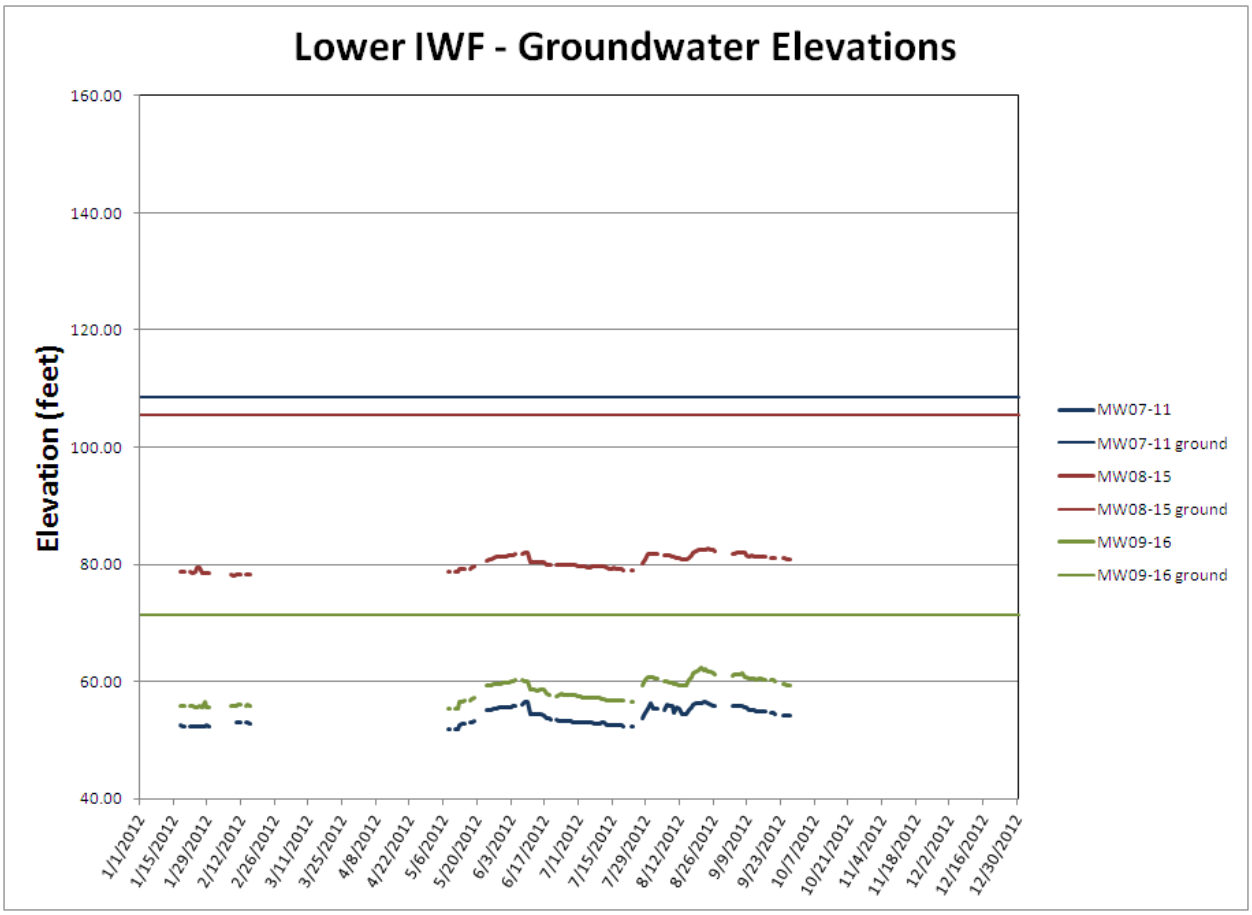

Figure 11: Lower IWF Groundwater Elevations

Similar to the lower IWF, water levels in the upper IWF also showed only slight increases or decreases related to seasonal precipitation. There was no influence on groundwater elevations from the continuous injection that occurred during the year nor was there an appreciable decrease in groundwater elevations after injection ceased in early September 2012. Water levels in PW-06 and PW-08 did not exceed ground elevations. During late August water levels appear to be above the ground elevation in Well PH-2006. Well PH-2006 is located in the flood plain of Rock Creek and heavy August rains resulted in high water levels in Rock Creek including the area around PH-2006. Water levels measured above the ground surface are not the result of groundwater upwelling rather; they are the result of high flow in the Rock Creek flood plain in the vicinity of this well. Water elevation data in the upper IWF is shown in figure 12.

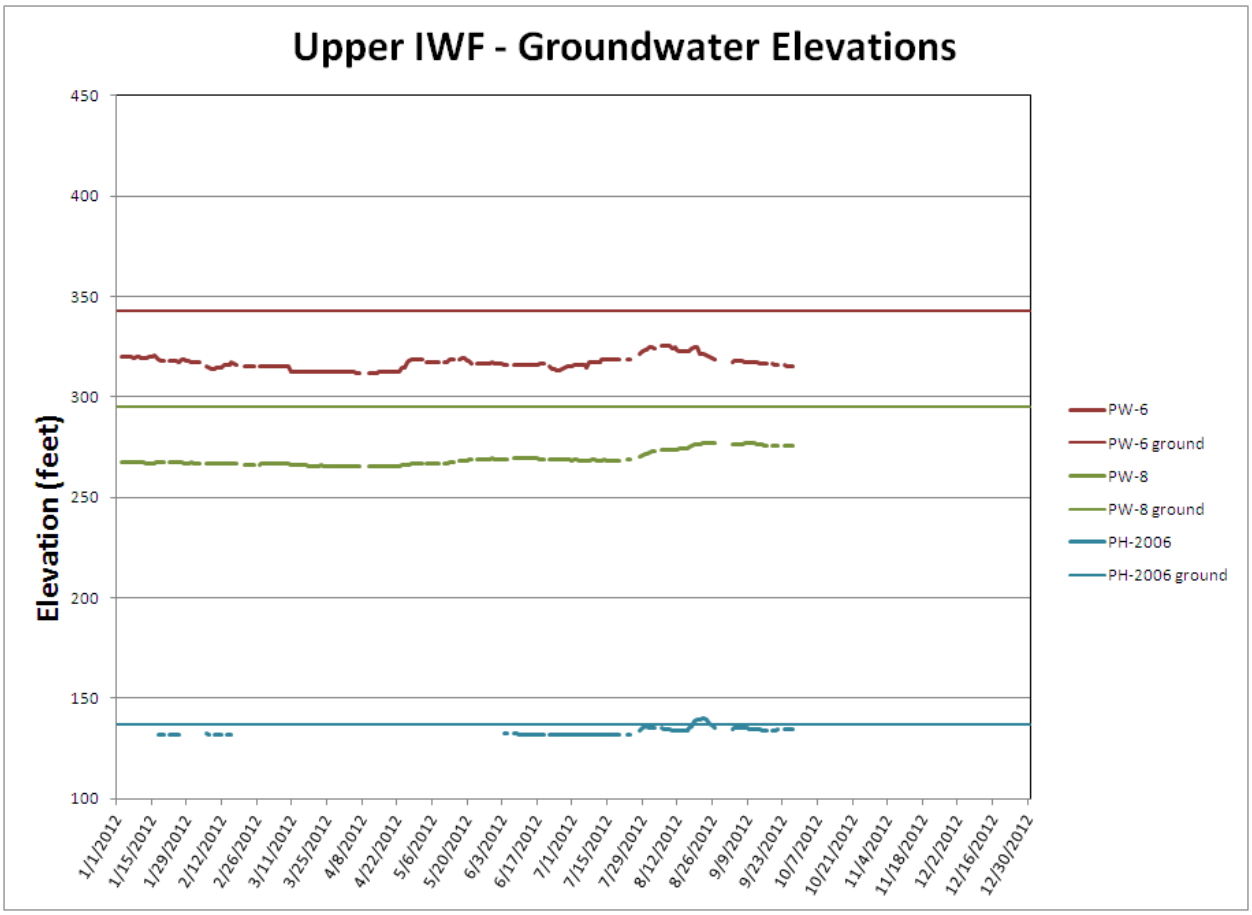

Figure 12: Upper IWF Groundwater Elevations

Down-gradient RWP Water Level Monitoring

During 2012, AGC monitored groundwater elevations daily at three wells near the RWP to note any instances of upwelling, decreasing water levels, or other abnormalities. RPW-01 is a pumping well, MW08-14A is a deep monitoring well screened in bedrock, and MW08-14B is a shallow monitoring well screened mostly in glacial till. Water levels near the RWP depend strongly on pumping from the two pumping wells RPW-01 and RPW-02. RPW-01 was not used for pumping in 2012, and water level measurements are not collected in RPW-02 because the well header is not configured for depth measurement access.

Figure 13 shows groundwater elevations in the vicinity of the RWP for 2012. Groundwater levels in the vicinity of the RWP began to rise after RPW-02 was initially shut down in May. The pump was briefly operated in July 2012 in order to draw water levels below the RWP toe in order to prevent water from entering the RWP during filling activities related to the RWP closure. Once enough fill was placed in the RWP, RPW-02 was permanently shut down and groundwater levels were allowed to return to natural, pre-mining levels. Although groundwater levels approached the ground surface elevation in September 2012, water levels were never above the ground surface and began to decrease after this high point when heavy rainfalls ceased.

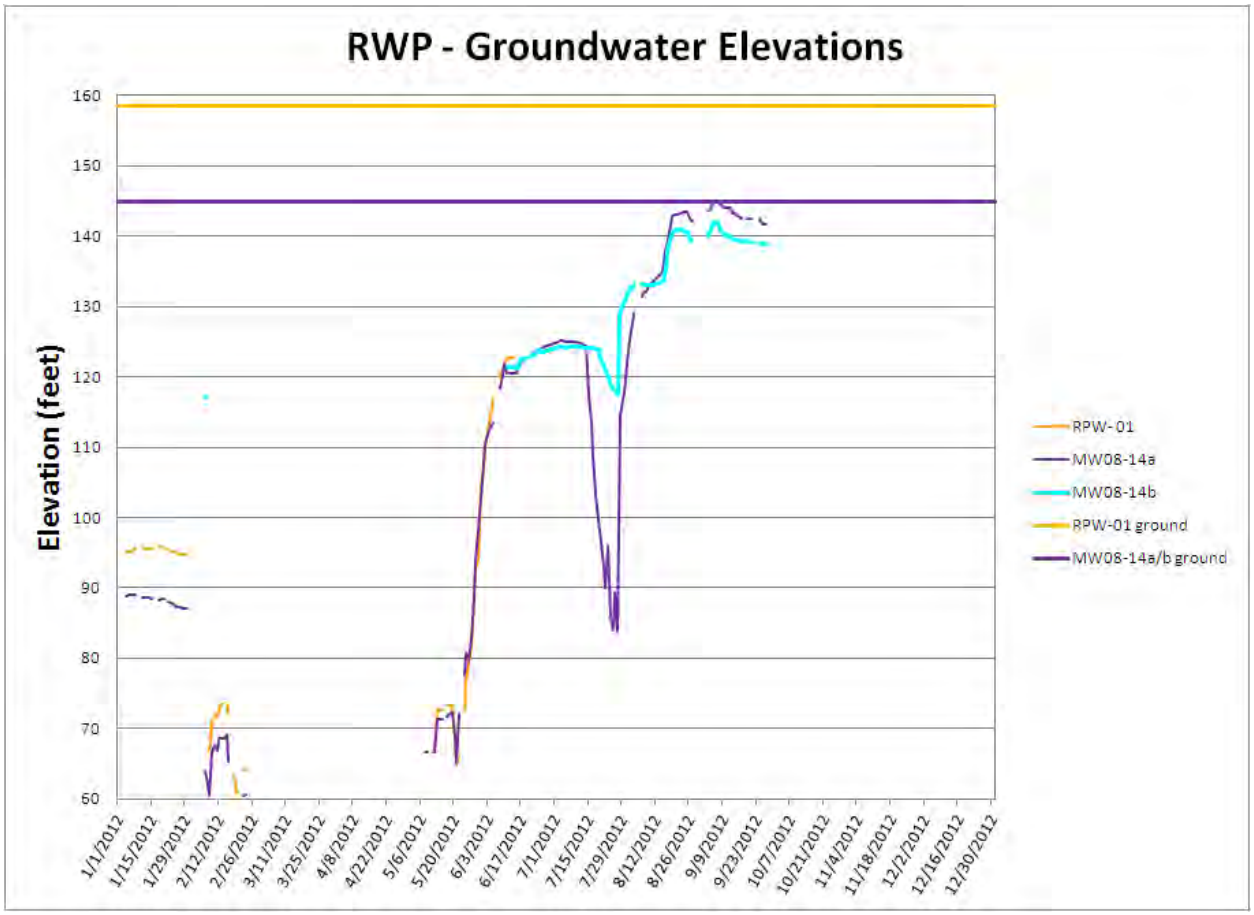

Figure 13: RWP Groundwater Elevations

Down-gradient TSF Water Level Monitoring

Figure 14 shows the groundwater elevations and respective ground surface elevations down-gradient of the TSF. Monitoring wells near the TSF are MW06-8A and B, MW06-9A and B, and MW06-10A and B. Monitoring wells MW06-8B and MW06-10B were dry through the current reporting period.

Prior to spring break-up flows in late April to early May, groundwater elevations gradually decreased or remained static in all TSF monitoring wells. The spring break-up period resulted in increased groundwater levels in most TSF wells except for MW06-10A which was frozen from April 8 to June 22, 2012. Groundwater elevations increased coincident with the decommissioning of the Main Sump; most notably in MW06-9A and B which are immediately down-gradient of the Main Sump. The South Sump was decommissioned on July 1, 2012 and groundwater elevation increases were more noticeable in MW06-8A at this time because of this well's proximity to the South Sump. Fluctuations in groundwater elevations in August were the result of seasonal rainfall events. With the exception of seasonal rainfall influences, groundwater elevations in all TSF monitoring wells appear to have reached consistent, natural levels after both sumps were decommissioned. At no time did water elevations exceed the ground elevation in any of the wells.

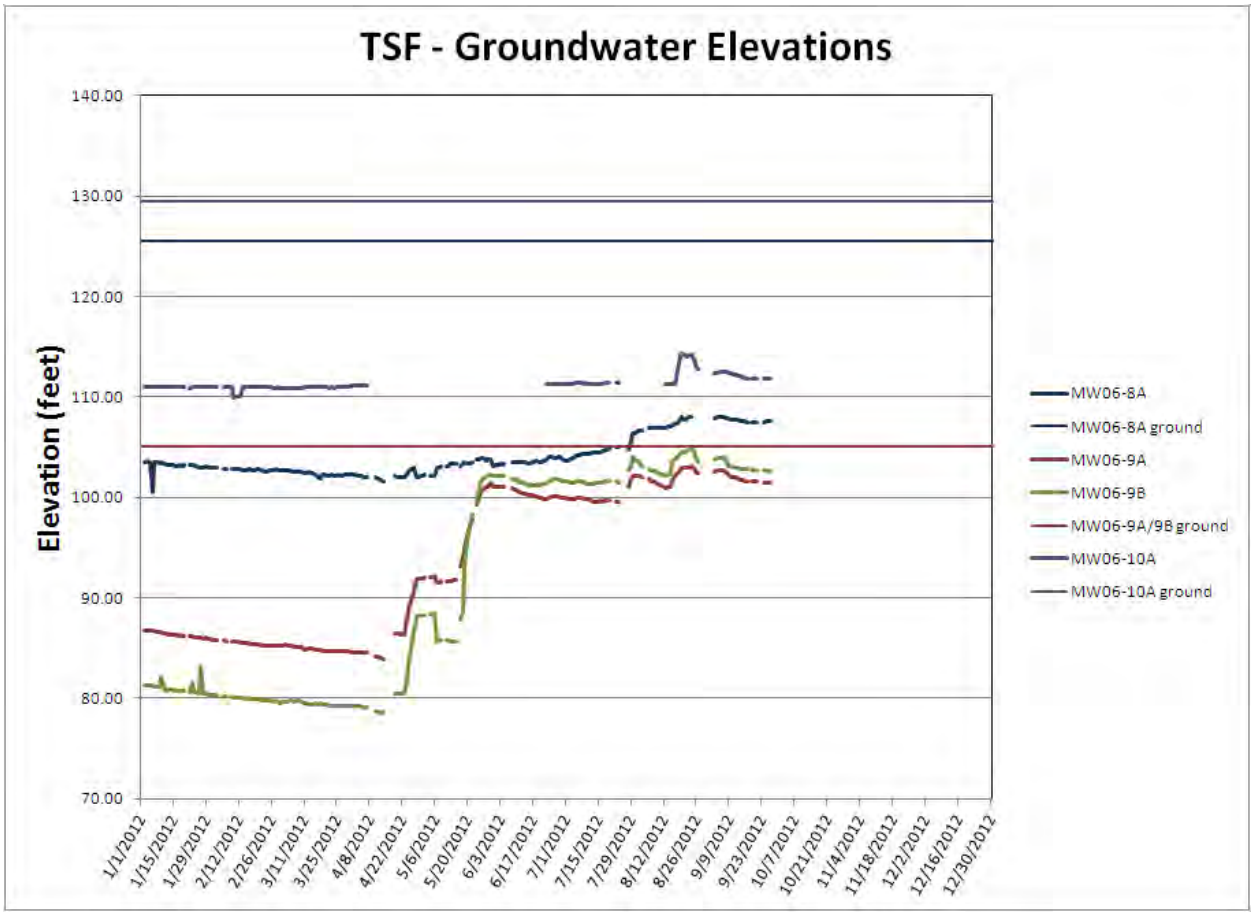

Figure14: TSF Groundwater Elevations

9.4 Pit Dewatering Wells

The pit dewatering wells are not in operation during the temporary closure period. There are no inspections of the wells at this time.

9.5 SPCC – Containment

Daily undocumented visual checks of fuel containments and monthly documented fuel containment inspections are conducted at Rock Creek. Reports are available at the Rock Creek Environmental Department for review. No physical damage was observed in containment structures during 2012.

9.6 Air Quality

Air quality monitoring is required by Air Quality Control Minor Permits AQ0978MSS01 and AQ0978MSS02 for construction, operation, and relocation of a rock crusher. The crusher is not in operation during the temporary closure period.

Inspections of the ambient air boundary signage are required monthly under the TCP. Any broken signs or signs knocked over by high wind were fixed when identified during routine inspections.

On May 17, 2012, ADEC sent a letter to AGC requesting information regarding compliance with specific provisions of the facility's air permits. AGC responded to this request by letter to ADEC on June 6, 2012.

9.7 Wildlife

Numerous wildlife observations were made in 2012, including reindeer, moose, fox, bear, muskoxen, and nesting ravens. There were no observed wildlife mortalities in 2012. Current policy is to contact the Safety or Environmental Office when wildlife is observed. AGC continued to work with the local Fish and Game office in dealing with any potential wildlife problems including: wildlife hazing and rabid fox encounters.

9.8 Climatic Monitoring

Monitoring of climate conditions is achieved through an on-site weather station that records temperatures, precipitation amount, and wind speed and direction. The on-site weather station sustained damage from winter storms and is currently unavailable. Weather data is retrieved from NOAA which compiles regional weather data from stations located in and around Nome, Alaska.

10.0 Financial Responsibility

AGC originally posted financial assurance in the amount of $6,844,700.00 which is backed by an Irrevocable Standby Letter of Credit between AGC and Wells Fargo Bank. During 2010 and 2011, AGC worked with the State to update the reclamation and closure plan, and associated financial assurance, for the Rock Creek Mine in its current condition. In the first quarter of 2012, the State of Alaska approved the updated reclamation and closure plan for the Rock Creek Mine. This approval required an increase in the financial assurance to $20,272,000.
On October 15, 2012, the State of Alaska indicated by letter that Phase I closure activities had been completed at Rock Creek and authorized a $6,766,168 reduction in the financial assurance. With this reduction, the financial assurance for the Rock Creek Mine was $13,505,832 as of the end of October 2012.

11.0 References

AMEC Earth & Environmental, Inc., April 2008. *Rock Creek Project Tailings Storage Facility Operations and Maintenance Manual*

HydroGeo, Inc., January 2011. *Rock Creek Mine, Water Quality Issue; TechMemoManganese*

SRK, 2008. *Rock Creek Mine and Big Hurrah Project Nome, Alaska.*

SRK, November 2008. *Monitoring Plan*.

Tetra Tech, January 2010, *Rock Creek Mine, Background Baseline Ground Water Quality Statistics*

Tetra Tech, June 2012, *Rock Creek Paste Tailings Geochemical Characterization*

From: Shelley Hicks [mailto:shelley.hicks.consultant@novagold.net]
Sent: Friday, March 08, 2013 12:12 PM
To: Stambaugh, Sharmon M (DNR); Pilon, Timothy A (DEC); McGee, William D (DEC); Thor Cutler (cutler.thor@epa.gov)
Cc: Ron Rimelman; frank.b@gci.net
Subject: Rock Creek 2012 annual report

Please find attached the Rock Creek Mine and Big Hurrah Project 2012 annual report. Electronic data and smaller appendices are also attached. Due to the large file size, the water chemistry graph appendix is being submitted on a CD with the hard copy of the report. The complete hard copy of this report is being sent certified mail.

If you need any other information please contact me at shelley.hicks.consultant@novagold.com or Ron Rimelman at ron.rimelman@novagold.com.

Thanks,
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