

**LAC Minerals**  
**2014 Annual Environmental Audit and Inspection Report**

**Operator:** LAC Minerals (USA) LLC, Richmond Hill Mine  
**Project:** Annual Environmental Audit and Inspection  
**DENR Inspectors:** Mike Cepak, Eric Holm, Mark Keenihan, Roberta Hudson, Ryan Fitzpatrick, and Matt Hicks  
**Operators Present:** Todd Duex, Gene Fuller, and Mark Tieszen  
**Others Present:** Stan Michals, SD Game, Fish and Parks  
**Inspection Dates:** June 23 and 24, 2014  
**Time In/Out:** June 23, 2014: 11:20 am MDT to 12:45 pm MDT  
June 24, 2014: 10:30 am MDT to 2:30 pm MDT

The annual environmental audit and field inspection of LAC's Richmond Hill Mine site occurred on June 23 and 24, 2014. The audit meetings and field inspections for both the Homestake Mine and LAC Mine were held concurrently on both days.

On June 23, the Homestake meeting began at 9:30 am MDT, followed immediately by the LAC meeting at 11:20 am MDT. Both meetings were held at the Homestake Mine office at the Blacktail Water Treatment Plant in Central City. The field inspection for Homestake Mine took place on the afternoon of June 23 and was completed the morning of June 24. The field inspection for the LAC's Richmond Hill Mine began at 10:30 am MDT on June 24. Mike Cepak, Eric Holm, Mark Keenihan, Roberta Hudson, Ryan Fitzpatrick, and Matt Hicks (DENR), Stan Michals (GF&P), and Todd Duex, Gene Fuller, and Mark Tieszen, (Barrick) participated in the LAC audit meeting and inspection.

**Audit Meeting**

Issues discussed during the audit meeting are summarized below:

1. 2013 Annual Performance Report: Gene Fuller presented the 2013 annual performance report. Precipitation at the Richmond Hill Mine was above normal for 2013 with 43.61 inches, compared to only 19.08 inches in 2012. 2013 weather was notable for the heavy rains in May and for the massive blizzard in early October (Storm Atlas). The official report with all associated documentation was submitted to the department in March 2014.

2013 Mine Pit Backfill Monitoring: Although precipitation was above normal in 2013, monitoring results are similar to previous years. Measurements from the barrel lysimeters show an average annual infiltration rate of 0.04 inches, as compared to 0.032 inches in 2012 (note: the design infiltration is 0.5 inch per year). Measurements from the basin lysimeters show an infiltration rate of 0.087 inches, as compared to 0.086 inches in 2012. Neutron logging and heat-dissipation unit (HDU) data continues to indicate the clay cap is performing as designed, limiting infiltration into the backfilled waste rock. Piezometer measurements showed piezometer #2 (south) had 6.08 feet of water in 2013 (this piezometer was dry in 2012). Piezometer #1 (west) remained dry in 2013 and has been dry since the installation of the cap. Oxygen levels measured below the cap remain

under three percent, which shows the cap continues to limit oxygen. Impoundment temperature profiles remained stable.

2013 Leach Pad Monitoring: Effluent from Pad 1 flowed at an average rate of 14.7 gallons per minute (gpm) for a total annual volume of 7.5 million gallons. In 2012, the rate and volume were 7.61 gpm and 4 million gallons. Effluent from Pad 3 flowed at an average rate of 15.8 gpm, for a total annual volume of 8.1 million gallons. In 2012, the rate and volume were 7.56 gpm and 4 million gallons. Trends in leach pad effluent chemistry remained stable. For Pad 1 during 2013, pH ranged between 5.8 and 7.0, and selenium values were from 0.022 to 0.072 mg/L. Pad 3 pH levels ranged from 6.3 to 7.0 and selenium values ranged from 0.026 to 0.049 mg/L. Compared to 2012 values, the leach pad pH slightly increased and the selenium concentrations slightly decreased.

2013 Reclamation Success Monitoring: Vegetative cover on the pit impoundment in 2013 averaged 63% liver cover, 83% standing cover and 3% bare ground. Live cover on the pit impoundment increased 11% over 2012 values. Also, vegetative cover on the leach pads averaged 73% percent live cover, 86% standing cover and 3% bare ground in 2013. Live cover on the leach pads increased 15% over 2012 values. LAC also continued weed control and removing bug trees around the reclaimed areas in 2013.

2013 Aquatic Monitoring: The data from 2013 was similar to past years and continues to show healthy aquatic communities in Cleopatra Creek and Rubicon Gulch with no evidence of impacts related to mining.

2013 Water Quality: MW-9B, which is located to the northwest of the Pit Impoundment, continued to show declining sulfate levels which are now below 150 mg/L. Historically, sulfate in MW-9B steadily increased between 2006 and 2010, exceeding the 500 mg/l water quality standard from 2008 – 2009. However, since October 2009, sulfate levels in this well have steadily declined. By 2011, the sulfate levels were below 300 mg/L and were below 200 mg/l in 2012.

Water quality data for MW-26 (deep bedrock well in South Gulch) indicated sulfate levels are stable and continue to be below 500 mg/l, and pH values are stable and currently at 4.5 su.

In terms of general water quality trends, Mr. Fuller characterized Spruce Gulch as, “mostly stable” to “improving”. In addition, no impacts have been detected in Cleopatra Creek from the Richmond Hill Mine.

The Process Area has had some occasional selenium detected at FD-1. No other noticeable changes in water quality were noted in the process area.

2013 Water Treatment: The review of the Annual Performance Report concluded with an overview of water treatment statistics. LAC treated and discharged 5.8 million gallons through the Reverse Osmosis (RO) unit and Bio Plant in 2013. In addition, LAC

collected and treated and subsequently discharged 6.7 million gallons from the South Gulch collection gallery.

2. Water Balance and LDCRS Update. As of May 29, 2014, LAC had approximately 43.1 million gallons stored in the process area ponds. The total capacity of the Stormwater and Pregnant (Feed) Pond is 85 million gallons, so LAC is at 51% capacity. At the time of the audit, LAC was treating and discharging water.
3. Planned 2014 Activities. LAC list of planned 2014 activities, as follows:
  - a. New Reverse Osmosis unit. Todd Duex mentioned LAC has installed a tank containing a Nalco chemical product that helps remove selenium at the Biotreatment Plant. The water treatment plant removes 75% of the selenium and the Nalco product removes an additional 12.5% (total reduction of 87.5%). LAC can now successfully treat water with a selenium concentration of up to 40 parts per billion.

LAC had planned to install a new RO unit in 2014. However, with the use of the Nalco chemical, the installation of the RO unit may not be required. The installation has therefore been deferred while full-scale testing of the Nalco chemical continues.

- b. Closure Documents. LAC has been working on responses to the DENR's and GFP's comments on LAC's postclosure documents (Petition for Release of Reclamation Obligations, Updated Reclamation Plan and Financial Assurance, and Postclosure Plan and Financial Assurance). LAC plans to submit the revised closure documents in July 2014 after final comments and markups have been submitted to ERM who is preparing the final draft of the documents (Note: The revised release and postclosure documents were submitted on July 25, 2014). A hearing before the Board of Minerals and Environment (BME) is tentatively planned for Spring 2015.
  - c. Selenium Passive Treatment Cell. Todd Duex said LAC will complete reclamation of the old selenium passive treatment cell this summer. The cell is currently revegetated, but five ventilation pipes and the distribution system piping remain. LAC plans to remove the ventilation and distribution pipes by the end of summer. However, the lined spillway will remain until water treatment is no longer required in the postclosure period. At that point, the liner will be removed and the spillway will be revegetated. (NOTE: On November 3, 2014, LAC Minerals stated the removal of the pipes had been completed with no significant disturbance of the vegetation).

The company plans to include the reclaimed portion of the passive treatment cell with the reclaimed acreage meeting the postmine land use in the revised release petition since the vegetation meets release criteria. Since there are no water quality issues with the cell, LAC proposes that it not be placed into the postclosure period (NOTE: The passive treatment cell was included with the releasable reclaimed acres meeting the postmine land use that do not need postclosure care in the revised release petition submitted July 25, 2014).

We decided to look at the passive treatment cell during the field inspection portion of the audit.

- d. Blend Pond. The Blend Pond (old Chlorine Pond) will be reclaimed this year. (NOTE: On November 3, 2014, LAC Minerals indicated the reclamation of the Blend Pond has been completed. The area has been graded and is now part of the road/parking area).

4. Review of Permit Conditions: The following technical revision condition was discussed.

April 21, 2011 Technical Revision, Sludge Disposal Condition No. 1: LAC continues to do required initial TCLP analysis on all new sludge sources. Existing sludge sources are generally analyzed annually or if there is an operational change that could cause a change in the sludge.

At this point, we took a lunch break at 11:50 am MDT. The meeting resumed at 12:40 pm MDT.

5. Water Collection and Management System: LAC personnel said the upgrades to the FD-1 sump have been completed. The system is currently working well.
6. LDCRS Update. Gene Fuller referenced an April 2, 2014 e-mail concerning the Pregnant Pond leak detection, collection and recovery system (LDCRS). LAC reported a new pump was installed in the pond after various problems with the old pump. After two weeks, the new pump failed. LAC discovered since the pump was placed in the horizontal section of the sump, it was pulling fines into the impeller which caused the pump to fail. LAC installed a new pump in the inclined portion of the sump to prevent drawing fines into the pump. A water sensor was also installed to monitor the water level in the sump and automatically turn the pump on when the water level increases. This is a change from the LDCRS monitoring plan in which a pump saver turned the pump on every 90 minutes. Since the new “automatic” pump has not pumped since it was installed, the current water level of 1.3 feet in the pump sump is unchanged. Mr. Fuller added the Pregnant Pond is now known as the “Feed Pond”.

Mr. Fuller also reported that some water is stored in the new Sludge Pond (former Barren Pond) LDCRS. However, this pond is designed to flow off into the Feed Pond. He also mentioned that there was increased flow in the leach pad LDCRS’s this spring, which is typical.

7. Stormwater Pond Reline. LAC plans to reline the Stormwater Pond in 2016. The pond will be relined in its current size, since there are no plans to reduce the pond capacity.
8. Reclamation and Postclosure Bond. We discussed the updated reclamation and postclosure bonds for LAC. After discussions with the South Dakota Investment Council, it appears there is historically a two percent spread between inflation and discount rates. Since we can only place a forfeited bond in the state cash flow fund, we cannot earn a higher yield in other investments such as a trust fund. We are currently

considering setting the inflation rate at 3.5 percent and the discount rate at 5.5 percent for all postclosure bonds. We discussed the impact of the proposed inflation and discount rates for LAC's postclosure bond. Mr. Duex said the department's proposed inflation and discount numbers would have financial implications for Barrick, and it may contest the proposed numbers. Mr. Duex added that LAC's financial experts think a 6 percent discount factor is realistic.

The revised calculations for the updated reclamation bond and the postclosure bond will be included in the revised Updated Reclamation Plan and the Postclosure Plan. Any bond adjustments will be handled with the other closure matters in front of the BME (NOTE: the revised calculations were submitted on July 25, 2014).

9. Update on ARD Mitigation. LAC is not planning any changes for acid rock drainage (ARD) mitigation. Even though there is some acid in well MW-26 and South Gulch, water quality is stable and possibly improving.
10. Update on Haul Road. LAC said there is no change in its plans for the haul road. The road will be left in place during the 100-year postclosure period for access to the water treatment plant. When water treatment is no longer necessary, LAC will remove the road and reestablish it in its original location (over the ridge to the east of Richmond Hill) unless another entity agrees to assume long term liability for it.
11. Weed Control. Mid Dakota is scheduled to begin spraying weeds in July.
12. Other. Other items discussed:
  - a. Old Adits. LAC has been fencing old adits and other mine workings in the area.
  - b. Blizzard Damage. LAC reported on activities to clean-up and repair damage from the October 2013 blizzard (Storm Atlas). Much of the fence line around the mine site had to be repaired after the blizzard.
  - c. DENR Site Hydrologic Evaluation. Roberta Hudson reminded Mr. Duex about the draft hydrologic evaluation the department prepared for the pending reclamation liability release and postclosure packages. Mr. Duex said he would review the report and submit comments in the next couple of months.

The meeting portion of the audit ended at 12:45 pm MDT. The group then began the Homestake audit field inspection, which continued the following morning (June 24). After the Homestake inspection ended at around 10:00 am MDT, the group proceeded to the Richmond Hill Mine for the LAC audit field inspection. We arrived at the LAC gate at 10:30 am MDT.

Access Road. While driving along the access road north of Wharf Resources, Todd Duex mentioned LAC plans only minimal maintenance of this road. He said LAC does not want to be perceived as the party responsible for continuing maintenance of the road. As we drove along, eight residences or cabins were noted before the LAC gate. We learned later there are three

other residences or cabins beyond the LAC mine site that also use the access road. It should be noted that all of these residences or cabins were built after LAC constructed the road in 1988.

Spruce Gulch. The first stop on the field inspection was the Spruce Gulch area along the old haul road at 10:30 am MDT.

Vegetative cover in Spruce Gulch is now in its nineteenth growing season and continues to be very good to excellent. No new erosion was noted. LAC established four vegetation transects in Spruce Gulch (SG#1, SG#2, SG#3, and SG#4) and collected data in 1997, 1998, 1999, 2000, 2005, 2010, and 2013. Cedar Creek Associates also collected vegetation data in 2008. The overall average of 65 percent live cover for the monitoring period exceeds the 40 percent cover standard established for the mine site.

Average live vegetative cover in the area evaluated was estimated at 65 percent which is close to the overall average and above the 40 percent cover standard. Grasses and legumes present that are part of the approved seed mix include timothy, kentucky bluegrass, smooth brome grass, slender and western wheatgrass, hard fescue, white dutch clover, rocky mountain penstemon, and blue flax. Other species noted include black medic, goatsbeard, mushrooms, moss, and yarrow. Hard fescue and kentucky bluegrass were the dominant species. Noxious and other weeds noted include st. john's wort and houndstongue.

LAC collected containerized tree and shrub survival data from 1997 through 2001, 2003, 2005, 2007, 2009, 2010, 2012, and 2013. Cedar Creek Associates also collected tree and shrub data in 2008. For containerized plantings, LAC established a belt transect in each of the birch, spruce, transition, and oak-aspen zones. Survival rates for all of the zones combined during the monitoring period range from a low of 48 percent in 2007 to a high of 98 percent in 1997. Survival rates have stabilized to around 50 to 55 percent since the 2007 sampling period.

In the shrub seeded areas, LAC established a macroplot in the birch zone. LAC collected data from this macroplot from 1996 through 2001, 2003, 2005, 2007, 2009, 2010, 2012, and 2013. Total shrubs per acre in the macroplot during the seventeen year monitoring period varied from a low of zero in 2009 to a high of 75 in 1996. In 2012 and 2013, two shrubs were noted.

Trees and shrubs noted during the inspection include willows, ceanothus, serviceberry, aspen, birch, ponderosa pine, bur oak, black hills spruce, chokecherry, woods rose, snowberry, and oregon grape. All trees and shrubs appear to be healthy and well established. However, it appears woods rose and ceanothus were somewhat stressed from last October's blizzard. Most of the stressed shrubs appear to be recovering.

We also noted various desirable volunteer species invading along the edge of the reclaimed area.



Photo 1. Looking west on reclamation on Spruce Gulch on old haul road.



Photo 2. View to southwest from old haul road on across former waste rock facility in Spruce Gulch.

Turnaround Area. We arrived at the Turnaround area at 11:13 am MDT.

The area is in its twenty-third growing season. LAC established two vegetation transects in this area, TA#1 and TA#2, and collected data in 1997, 1998, 1999, 2000, 2005, 2010, and 2013. Cedar Creek Associates also collected vegetation data in 2008. The overall live cover average of the two transects for the monitoring period is 54 percent and meets the 40 percent cover standard established for the mine site.

Average live vegetative cover in the area evaluated was estimated at 60 percent which is above the overall average and the 40 percent cover standard. Grasses and legumes present that are part of the approved seed mix include kentucky bluegrass, western wheatgrass, hard fescue, white dutch clover, and blue flax. Other species noted include black medic, oxeye daisy, bedstraw, moss, and yarrow. Hard fescue was the dominant species. Noxious and other weeds noted included st. johns wort.

The area has become a mixed ponderosa pine forest with some black hills spruce, aspen, birch and assorted shrubs. We again noted numerous small pine trees likely killed by bark beetles (“ips”). For the most part the dead trees ranged from 8 to 12 feet in height. LAC has not collected any tree and shrub data in this area.



Photo 3. Turnaround Pit Area view to north.



Photo 4. Turnaround Pit Area pine trees effected by bark beetles (ips).

Pit Impoundment. The inspection group arrived at the top of the Pit Impoundment at 11:36 am MDT. Vegetative cover on the pit impoundment is now in its nineteenth growing season and continues to be very good to excellent. No new erosion was noted. LAC established four vegetation transects on the pit impoundment (PI#1, PI#2, PI#3, and PI#4) and collected data from 1997 through 2013. The overall live coverage average of 57 percent for the 17 year monitoring period exceeds the 40 percent cover standard established for the mine site.

Average live vegetative cover was estimated at 55 percent which is close to the overall average and above the 40 percent cover standard. Grasses and legumes present that are part of the approved seed mix include kentucky bluegrass, smooth brome, western wheatgrass, hard fescue, white dutch clover, blue flax, and rocky mountain penstemon. Other species present include black medic, goatsbeard, assorted vetches, and yarrow. Noxious and other weeds present include st. johns wort. The company needs to continue to remove pine trees from the impoundment and spray ceanothus.

At this point, we took a lunch break at 12:07 pm MDT at the old Home Run Shaft. During the lunch break the group visited the historic Ironside and Seabury Calkin Mine areas. The inspection resumed at 1:05 pm MDT.



Photo 5. Pit Impoundment.

Old Sludge Pond. At 1:07 pm MDT we stopped at the Old Sludge Pond. LAC placed some spent carbon from the old Process Plant into the pond. Some grasses are growing on the sludge. LAC personnel said it is unlikely the sludge pond will be reclaimed this year. The company still plans to place a soil cover over the sludge during final reclamation.



Photo 6. Old Sludge Pond.

Water Treatment Plant (WTP). We entered the WTP at 1:22 pm MDT. The old carbon tanks (more recently used as water treatment tanks) have been removed. A small area near where the old carbon tanks had been located has been set up as the area where the Nalco additive will be used in assisting the removal of selenium from the water. The tanks were set up and ready for start-up. LAC personnel indicated the Nalco circuit will be up and running very soon. In the remainder of the treatment plant, parts of the main floor of the building are being remodeled, and a new lunch/meeting room (with a water treatment plant control panel), a laboratory and dry facilities have been constructed. As we left the plant, we noted the liner has been removed from the Blend Pond (old Chlorine Pond) which will be reclaimed later this year. We also noted some spotted knapweed around the Storm Water Pond which needs to be sprayed and controlled.



Photo 7. Nalco Water treatment pilot selenium removal tanks.

Passive Treatment Area. At 1:44 pm MDT we visited the Passive Treatment Area. Vegetative cover was excellent and meets the postmine land use criteria for wildlife habitat. The only work remaining prior to reclamation liability release was to cut off the PVC ventilation pipes and

remove distribution system piping. (NOTE: The pipes have been removed with no significant disturbance of the vegetation).



Photo 8. Selenium passive treatment circuit.

FD-1. We stopped by the FD-1 area at 1:51 pm MDT. A construction crew was at the FD-1 site and was in the process of finishing concrete on a manhole for a valve. Water from FD-1 flows into the FD-1 sump. The water then flows out of the sump top and is discharged to Outfall 004 and Rubicon Gulch, or it can be pumped from the sump to the water treatment plant feed pond if necessary. The FD-1 water sample point was moved to the area where the FD-1 sump normally discharges.



Photo 9. Sump at FD-1.

The field portion of the LAC audit ended at 2:16 pm MDT. We returned to the Homestake office in Central City via the Maitland area. On the drive back to the office, we noted sediment from subdivision roadwork had entered a stream along the Ida Grey road (this matter was reported to the Department's Surface Water Quality Program).

After the inspection, we returned to the Central City office at 2:45 pm MDT. Since there were no additional items to discuss, a close-out meeting was not necessary.

### **Comments/Recommendations**

1. LAC continues to do a very good job of reclamation and site-wide environmental management.
2. LAC needs to continue spraying st. john's wort, spotted knapweed, and other noxious weeds in areas covered by the mine permit.
3. LAC needs to continue removing pine trees, ceanothus, and other deep rooting vegetation from the pit impoundment and leach pad areas of the mine.

4. LAC will need to submit a technical revision if HDPE liner is used as part of the cover over the sludge in the old Sludge Pond during final reclamation.

Inspectors: \_\_\_\_\_ \s/ \_\_\_\_\_

Date: November 10, 2014

# LAC Minerals Environmental Audit 2014 Location Map

