phelps dodge Tyrone Inc. P. O. Drawer 571, Tyrone, New Mexico 88065 • (505) 538-5331

December 16, 2005

Via Certified Mail #70041160000099653043
Return Receipt Requested

Mr. Clint Marshall
New Mexico Environment Department
Mining Environmental Compliance Section
P.O. Box 26110
Santa Fe, New Mexico 87502

Dear Mr. Marshall:

Re: Phelps Dodge Tyrone, Inc., Discharge Permit 27 Settlement Agreement Paragraph 18, Analysis for Discharge Elimination of Seepage Collected from the Little Rock Mine

Phelps Dodge Tyrone, Inc. (Tyrone) submits the attached Analysis for Discharge Elimination of Seepage Collected from the Little Rock Mine in partial fulfillment of article three (3) of Paragraph 18 of the Stipulated Final Order, DP 27. Specifically this document addresses seepage elimination analysis from the Little Rock Mine to the No. 1X Tailing Impoundment.

Two additional analyses will be forwarded next week that address articles 1 and 2 of Paragraph 18. These documents will address mine dewatering and 1X interceptor well discharge elimination analyses to the 1X Tailing Impoundment.

Should you have questions or comments please contact Mr. Michael Jaworski at (505) 538-7181.

Very truly yours,

Thomas L. Shelley
For
E. L. (Ned) Hall, Manager
Environment, Land & Water
New Mexico Operations

ELH:mj
Attachment
20051216-100

cc: Holland Shepherd, MMD
GRIP
CEGEP

ANALYSIS FOR DISCHARGE ELIMINATION OF SEEPAGE COLLECTED FROM THE LITTLE ROCK MINE

DP-27 Settlement Agreement, Paragraph 18

Prepared by:
Phelps Dodge Tyrone, Inc.
Tyrone, New Mexico

December 16, 2005

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1.0 INTRODUCTION

Phelps Dodge Tyrone, Inc. (Tyrone) is submitting this document in partial fulfillment of the requirements of Paragraph 18 (Elimination of Discharges to Tailing Impoundments) of the Settlement Agreement and Stipulated final Order dated October 11, 2003 for Discharge Permit 27 (DP-27) for the Tyrone Mine tailing area. Specifically, this document addresses item number three (3) of Paragraph 18 of the Final Order, which relates to the discharge of seepage from the Little Rock Mine to the No. 1X Tailing Dam. The objective of this document is to present Tyrone's preferred alternative for eliminating the discharges from Little Rock to the No. 1X Tailing Dam. The study reported herein was conducted in accordance with the Discharge Elimination Work Plan for Seepage Collected from the Little Rock Mine Tyrone Mine Facility submitted by Tyrone (Tyrone, January 14, 2004) and subsequent correspondence with the New Mexico Environment Department (NMED).

The selected alternative would need to be implemented before construction (reclamation) begins on Tailing Dam 1X. According to Tyrone's current permit conditions, construction (reclamation) is expected to begin in the second quarter of 2008 for this facility. However, Tyrone is currently pursuing a construction schedule that would allow closure to begin in the second quarter of 2007. For the purposes of this report, Tyrone assumed that each option would require that seepage discharges cease by the fourth quarter of 2006.

The anticipated period of operation for the alternatives listed herein is assumed to be from the fourth quarter of 2006 until such time as the Little Rock Mine leach stockpiles are mined out. The various mine plans that Tyrone is currently evaluating show the Little Rock Mine starting somewhere between 2009 and 2012. For the purposes of this evaluation, Tyrone assumed that the operational life of the alternatives would be not more than 10 years.

1.1 Background

The Little Rock Mine was most recently operated as a copper mine and leach facility between 1970 and 1972 by United States Natural Resources, Inc. (USNR). Tyrone obtained a lease agreement to conduct exploration and environmental permitting activities at the site in 1990 and later purchased the private holdings in anticipation of renewed mining activities.

Operational discharge Permit 1236 was issued on December 27, 2000 and two of the conditions required that Tyrone rebuild the collection systems at the leach stockpiles to stop the discharge of impacted storm water from entering California Gulch. In January 2001, Tyrone obtained a temporary permit to discharge the collected impacted storm water to the 1X Tailing Impoundment where it could be neutralized with lime. The permit authorized the discharge of an average of 20 gallons per minute from Little Rock to Tailing Dam 1X.

2.0 ALTERNATIVES ANALYSIS

Tyrone evaluated eight alternatives for eliminating the discharge of seepage from the Little Rock Mine to Tailing Dam 1X. The alternatives are the same as those identified in the work plan dated January 14, 2004, except that two new alternatives were added to this analysis. A description of each alternative is provided in the following list.

1. Treatment and direct discharge of water;

2. Passive evaporation of the water;

3. Eliminating the discharge by removal and reclamation of the stockpiles during an approved and permitted mining plan for the Little Rock deposit;

4. Collection of seepage solutions and discharge onto existing Tyrone leach stockpiles for inclusion into the SX/EW process;

5. Collection of seepage solutions and discharge into the mine water surge pond for inclusion into the SX/EW process;

6. During active mining of the Little Rock deposit, divert the impacted water to the mine dewatering system for discharge onto an existing stockpile or into the mine surge pond for inclusion into the SX/EW process;

7. Continue to collect the impacted water and transport via gravity or a pumped/piping system to a tank or lined pond and transfer the solutions to the No. 3 PLS pond for use in the SX/EW process. The tank or lined pond would include a pumping system, equipped with automated high and low level controls. The tank or lined pond and pump back system would be a shared system for DP-Settlement Agreement, Paragraph 18, Item 2, Interceptor System water from No. 1X Tailing Impoundment, and Item 3, seepage collected from the Little Rock Mine.

8. Continue to collect the impacted water and transport via gravity or a pumped/piping system to a tank or lined pond and transfer the solutions to the plant raffinate tank, utilizing an existing booster pump station, for use in the SX/EW process. The tank or lined pond would include a pumping system, equipped with automated high and low level controls. The tank or lined pond and pump back system would be a shared system for DP-Settlement Agreement, Paragraph 18, Item 2, Interceptor System water from No. 1X Tailing Impoundment, and Item 3, seepage collected from the Little Rock Mine.

The new alternatives evaluated are Alternatives 2 and 8. Alternative 8 is a variation on Alternative 7.

2.1 Assessment Criteria

Tyrone compared the eight alternatives for eliminating the discharge of seepage from Little Rock to the 1X Tailing Dam with respect to five primary criteria. These criteria include:

1. Impact on closure schedule;
2. Environmental considerations;
3. Permitting requirements;
4. Cost of implementation and
5. Operational compatibility.

2.1.1 Impact to Schedule

The impact on closure schedule was evaluated according to anticipated time periods required to:

- Establish a valid project scope;
- Develop an effective project design;
- Obtain NMED approval;
- Procure materials and
- Construct the project.

2.1.2 Environmental Considerations

Environmental considerations included an analysis of performance of each alternative with respect to New Mexico groundwater regulations and if appropriate other environmental regulations.

2.1.3 Permitting Requirements

The analysis included a review of the permitting steps, estimated timeline and cost for each alternative at a conceptual level to assess the level of difficulty and potential impacts to the reclamation schedule.

2.1.4 Cost of Implementation

The cost of implementation was developed through the use of a number of sources, including:

- "Scoping Study, Treatment and Disposal Options for Water in Main Pit, Phelps Dodge Tyrone Inc.", M3 Engineering & Technology Corp., December 2000.
- "Discharge Elimination Work Plan for Seepage Collected from the Little Rock Mine Tyrone Mine Facility", Phelps Dodge Tyrone, Inc., January 14, 2004.
- "Building Construction Cost Data 2004", RS Means.
- "Heavy Construction Cost Data 1999", RS Means.
- Recent Phelps Dodge Tyrone Inc. project cost data.
- Recent Engineers Inc. project cost data.

Because this is a relatively short-lived project, operating costs were given minimal consideration.

2.1.5 Operational Compatibility

As this project must be operated within the framework of the existing SX/EW and mine operations; the advantages to and/or interferences with operations were also considered.

2.2 Alternative Discussion and Evaluation

In the following sections each alternative is discussed in the context of the criteria listed above. Table 3 contains a Summary of the Alternatives Analysis and provides a side by side comparison.

2.2.1 Alternative 1, Water Treatment

Treatment is the general heading for processing the effluent in such a way as to lower the concentrations of contaminants to insure the tested water is suitable for discharge or use in other applications. For this alternative, Tyrone assumed that the water would be treated to levels acceptable for direct discharge to a surface water course or to groundwater. Two methods for water treatment were evaluated: dilution and contaminant removal.

Although the annual average discharge from the Little Rock stockpiles is less than 20 gallons per minute (gpm), the discharge pipeline to the 1X Tailing Impoundment was sized to handle flows associated with a 100-year, 24 hour storm event at a peak discharge in the pipeline of 850 gpm (see DP 1236 correspondence dated May 31, 2001). A water treatment plant would require a design with sufficient capacity to treat a selected peak flow with a sufficient effluent storage capacity to allow the anticipated storm flow to be stored and treated at a lower, constant flow rate. The typical pipeline flow rates reported in DP1236 range from 0 to approximately 15 gallons per minute. In 2004, the maximum volume reported as discharge to Tailing Dam 1X was 700,000 gallons over a period of one month (this equates to a flowrate of 16 gpm).

<u>Dilution</u>

Dilution would be accomplished by mixing the impacted Little Rock discharge with Tyrone's fresh water sources to allow the effluent to comply with surface and groundwater standards prior to direct discharge.

For the purposes of this analysis, a suitable location for the plan was assumed to be outside the projected area of closure for the 1X Tailing Impoundment and near to the Little Rock Mine. With these assumptions in mind Tyrone selected a location in Deadman Canyon upstream of the Whitewater Canyon diversion for construction of the treatment plan (see Figure LR1).

The requirement for dilution of specific contaminants in the seep effluent may range from zero to 216 times, as shown in Table 1: Water Quality Data and Dilution Requirement – No Pretreatment. The dilution requirement was established by comparing concentrations of contaminants in samples, as reported in Appendix 1 of the January 14, 2004 Work Plan (Attached), to the New Mexico Water Quality Control Commission Regulations Title 20.6.2.3103.A, B and C and past test results for makeup water, a dilutent, from the Mimbres well field.

The dilution requirement for the contaminant of greatest concentration, as compared to the allowable limit, was 216 for manganese. The dilution requirement for copper was 177.

Testing performed as part of the Main Pit Water Management Project report on Evaluation of Treatment Alternatives, John Shomaker & Associates, Inc., July 14, 2002 showed that from 30% to 50% of the dissolved iron and from 20% to 30% of the dissolved manganese in the Main Pit well water could be removed through aeration and the subsequent precipitation of iron and manganese minerals. If 40% of the iron and 25% of the manganese in the pit lake water could be eliminated through aeration; the dilution requirement for Little Rock discharge would be reduced to 161:1. See Table 2, attached.

The greatest dilution requirement would be for either copper or manganese at dilution ratios of approximately 177:1 and 161:1 after pretreatment. Because of the impractical flow requirements of make up or fresh water required to perform this level of dilution, this process was considered unrealistic and will be dropped from further evaluation.

Contaminant Removal

Contaminants can be removed from the effluent through filtering, chemical reaction and electrostatic precipitation. The "Scoping Study: Treatment and Disposal Options for Water in Main Pit" for Tyrone by M3 Engineering & Technology Corporation (December 2000) was used as a source for a portion of the data.

- Chemical Reaction: Metals can be precipitated from the influent water by increasing the pH through the use of lime or other alkaline chemicals. The resultant sludge may be difficult to dewater, greatly increasing its disposal cost. The construction cost of a chemical precipitation plant would be approximately $4 million. It would also likely require an additional polishing or dilution step to remove sulfates to meet standards. The estimated operating cost for a large (2,000 gpm) precipitation plant was approximately $7.27/ thousand gallons.

- Filtering/Membrane Technology: Reverse osmosis (RO) systems can effectively remove a great number of constituents from the process flow. The effluent must first be clarified, neutralized, softened, filtered and softened again prior to being fed into a two-stage nanofilter before discharge to the RO system for removal of constituents like fluorine. The construction cost of a membrane filter plant would be approximately $5 million. The estimated operating cost for a large (2,000 gpm) membrane filter plant was approximately $4.42/thousand gallons.

- Bioremediation: Small scale bioremediation cells have been used to process effluent from mine water outfalls, especially from gob piles at coal cleaning plants. The major contaminates in the effluents are typically iron and sulfates. Bioremediation may not be appropriate for all of the metals found in the Little Rock effluent. The cycles of wet and dry weather may also be detrimental to bioremediation. The construction cost of a bioremediation plant may exceed $3 million. The estimated operating cost for a large (2,000 gpm) bioremediation plant was approximately $1/ thousand gallons. Its effectiveness as a stand alone process required to meet New Mexico water quality standards is unlikely and would most likely have to be combined with other technologies.

- Electrocoagulation: Testing has shown that dissolved metals can be removed from effluent through the application of an electrical charge. The process equipment in an electrocoagulation plant may be acceptable for extended idle periods. The construction cost of an electrocoagulation plant may be approximately $2 million. The estimated operating cost for a large (2,000 gpm) electrocoagulation plant was approximately $1.35/ thousand gallons.

The location nearest to Little Rock at which a treatment plant could be constructed is in Deadman Canyon upstream of the Whitewater Canyon diversion. See Figure LR1.

The design of any of these plants assumes the following basic elements beyond existing infrastructure.

- 6,500 foot long, 6 inch HDPE pipeline to transport process water to the treatment plant (assume the distance from the plant to the SXEW Plant for this level of evaluation);
- 6,500 foot long power line from the SXEW plant area to the treatment plant;
- 1.5 million gallon, 160 ft x 120 ft x 20 foot deep lined storage pond capable of containing the storm flow volume of a 100 year storm event plus one month of average seep volume;
- treatment plant;
- 60,000 gallon, (20 gpm @ 48 hrs) 40 ft x 40 ft x 5 foot deep product tank; and
- security fence

As derived from "Heavy Construction Cost Data 1999", the capital cost per gallon of waste water treatment plant capacity for a 20 gpm plant ($ 2005) is approximately $8.76 per gallon of plant capacity, or $260,000. Process water pipeline cost is $147,000. Power line cost is $208,000. The cost of a 1.5 million gallon lined storage pond is $218,000. A plant security fence may cost $90,000. The total construction cost of a treatment plant for these effluents is approximately $923,000. Engineering for such a plant would be approximately 10% of construction costs, or $92,000. The preparation, submittal and approval of a new discharge permit may cost approximately $60,000. Design, permitting and construction costs may total $1,075,000. Adding GRT @ 7% and contingencies of 20% yields an estimated total project capital cost of $1,312,000. Assuming operating costs of $5 per thousand gallons, yields annual operating costs of approximately $50,000. These costs are excessive for a project of this duration and particularly for the anticipated low flow rates.

A discharge permit for the new plant would be required. Permitting would occur after design is complete. Design time for a treatment facility may be 6 months, after the scope and size of project was determined. The preparation, submittal and approval of a new discharge permit may require 12 months. Procurement and construction may require 12 additional months. As stated earlier, the goal is to eliminate the discharges to the 1X Tailings Dam by the fourth quarter of 2006. Given that the activities above would require a minimum of about two years; this alternative does not meet the schedule requirements.

Because of the complexity, cost and scheduling conflicts, this alternative was eliminated from consideration.

2.2.2 Alternative 2, Passive Evaporation of Little Rock discharge water

The water elimination concept of passive evaporation entails construction of a large evaporation pond sufficient to handle seepage discharge from Little Rock. This pond would be sized to evaporate the average seep flow (20 gpm) and 120% of the average annual precipitation at the Tyrone property (19.2 inches). The nearest location to Little Rock Mine for an evaporation pond would be in Deadman Canyon upstream of the Whitewater diversion. See Figure LR2.

The 20 gpm seep will generate approximately 10.5 million gallons of effluent per year. The 30 year average annual precipitation in the Little Rock area of is approximately 16 inches (Monthly and Annual Precipitation, Phelps Dodge Tyrone Inc., 1954-2004). According to pan evaporation rates for Santa Rita from 1949 through 1952 (http://weather.nmsu.edu/Pan_Evaporation/santa_rita_evap.htm), the annual pan evaporation would be approximately 83 inches.

The lined pond was designed to have sufficient surface area to evaporate the 20 gpm discharge effluent plus 120% of the normal rainfall amount over the course of a calendar year. In a lined 7 acre pond, the maximum water depth would be approximately 8.1 inches during the month of February. The pond would be expected to be dry from June through November.

The constructed pond would have approximately 7 acres (302,500 SF) of surface area and 14 acre feet of storage capacity (2 feet deep). A pond liner would consist of with a single layer of 80 mil HDPE overlying a 12 oz. geotextile fabric.

The design of the evaporation system assumes the following basic elements beyond existing infrastructure.

- 7 acre evaporation pond, 2 feet deep, rock and soil excavation;
- pipeline to divert the present effluent flow from 1X into the evaporation pond; and
- security fence

The total cost of the lined pond is approximately $1,079,000. The cost of 300 feet of additional pipeline to tie to existing lines is approximately $4,000. The cost of chain link fence for this large, shallow pond may be approximately $90,000. The total construction cost of this evaporation pond for these effluents may be $1,173,000. Engineering for such a plant would be approximately 5% of construction costs, or $59,000. The preparation, submittal and approval of a discharge permit amendment are considered negligible. Design, permitting and construction costs may total $1,232,000. Adding GRT @ 7% and contingencies of 15% yields an estimated total project cost of $1,503,000.

A discharge permit amendment to DP 1236 for the discharge of Little Rock seepage water to the evaporation pond was assumed to be required. Permitting would occur after design is complete. Design time for an evaporation facility may be 3 to 6 months, after the scope and size of project was determined. The preparation, submittal and approval of an amendment to DP 1236 may require 3 months. Procurement and construction may require 6 additional months. As stated earlier, the goal is to eliminate the discharges to the 1X Tailings Dam by the fourth quarter of 2006. Given that the activities above would require a minimum of about one year, this alternative borders on impacting the schedule requirements.

This alternative should meet environmental standards; however, the effects of evapoconcentration of contaminants would need to be evaluated with respect to the effectiveness of the evaporation system. The relatively high capital cost for a single-use lined pond is significant. Additionally, the company may consider that evaporation of this water may not achieve the best use of this water resource. If the water can instead be incorporated into the process system and offset the use of fresh water, this option may be dropped from further consideration. However, it is retained as an option at this stage of the analysis.

2.2.3 Alternative 3, Execute Little Rock Mine Plan

The Little Rock mine plan includes the activity of excavating the historic leach stockpiles at Little Rock and hauling the material to the Tyrone Mine for processing. These stockpiles appear to be the source of residual acidity and impacts to seepage water from the Little Rock leach stockpiles. The mine plan also will result in the excavation of a pit bottom that captures surface flows from California Gulch. This action will also eliminate the discharge of impacted Little Rock water to the 1X Tailing Impoundment.

Current mine plans for Little Rock contemplate the beginning of mining between 2009 and 2012. This timing will not achieve elimination of the discharge in time for the reclamation of the 1X Tailing Impoundment, so this alternative was eliminated from further consideration.

2.2.4 Alternative 4, Collect Little Rock Seepage and Discharge onto 2A Leach Stockpile

The SX/EW process is a net user of water. The greatest proportion of makeup water added to the solution process is to offset losses from evaporation of raffinate solutions applied to the leach stockpiles. The seeps at Little Rock could be a source of make up water for the SX/EW process and offset pumping of fresh water.

A lined pond would be constructed to collect the seepage discharge. The nearest possible point for construction of a collection pond and pump station is directly northeast of Little Rock Mine, at an elevation of approximately 6,000 feet. This pond would be sized according to stormwater capture requirements of approximately 1 million gallons. This catchment pond would be actively dewatered whenever storm water or seepage was collected. See Figure LR3.

Because of the required lift to reach the top of the #2A Leach Stockpile, pumping would require two (2) stages. A pump would be mounted in a sump or upon a float in the collection pond with high/low level controls. The pump discharge line would be constructed across undisturbed terrain to the toe of the west-most point of the #2A leach stockpile. A booster station would be constructed at this location to deliver the effluent through a pipeline to the top of the 2A stockpile.

At the moment, there is an insufficient power supply near the possible plant location to operate such a plant. The installation of line electric power or a generator would be required to power the pumping system and level controls.

The design of the conveyance and pumping system assumes the following basic elements beyond existing infrastructure.

- 160 ft. x 100 ft. x 10 ft. deep HDPE lined catchment pond, rock & soil excavation;
- pump and controls at the lined pond;
- booster pump from toe of stockpile to top of leach stockpile;
- 6,500 foot long power line;
- 6,500 foot long, 8 inch pipeline to 2A Stockpile; and
- security fence.

The lined collection pond would cost approximately $174,000. The pump and controls at the collection pond may cost approximately $80,000. The booster station with pump may cost approximately $100,000. The pipeline from the collection pond to the #2A Leach Stockpile would cost approximately $200,000. The installation of a power line from the SX/EW plant to the collection and booster pump locations would cost approximately $256,000. Chain link fences that surround the pond pump and booster may cost approximately $90,000. The total construction cost of this seepage collection and transfer system is estimated at $900,000. Engineering for such a plant would be approximately 10% of construction costs, or $90,000.

Design and construction costs may total $990,000. Adding GRT @ 7% and contingencies of 15% yields an estimated total project cost of $1,208,000.

This plan could create a number of operational difficulties within the SX/EW operation. Effluent would be transferred into the SX/EW leach system as it accumulated at Little Rock lined effluent pond. This system would provide minimal buffering and would tend to increase the chance of turbidity in the SX/EW system during wet weather. The turbidity of this effluent may also be high and possibly contribute to problems in the solvent extraction process.

Effluent would be added as raw water, without the addition of sulfuric acid or ferric ions. This effluent would contribute little, if any, to leach recoveries in the stockpile and would dilute the receiving pregnant solutions. This dilution would increase pump demand and cost while also increasing costs in the solvent extraction circuit.

Without the construction of a dedicated system of pipes on the leach stockpile, and possibly a booster station, the effluent from Little Rock seeps would be discharged at one location on the stockpile. This may be an area being prepared for over dumping or an area where no additional solutions are desired. Other alternatives discussed below are considered to be more operationally compatible.

For the purposes of this analysis, it is assumed that a discharge permit amendment may be required. Design time for the pumping facility may be 4 months, after the scope and size of project was determined. The preparation, submittal and approval of a modification to the discharge permit may require 3 months. Procurement and construction may require 6 months. These schedule requirements are not expected to affect the reclamation schedule for the 1X Tailing Impoundment.

This alternative is expected to meet environmental standards.

However, because of the potential SX/EW operational issues, discharge of the effluent from Little Rock seeps directly onto the 2A leach stockpile was eliminated from consideration.

2.2.5 Alternative 5, Collect Little Rock Seepage and Discharge into Mine Water Surge Pond

The SX/EW process is a net user of water. The greatest proportion of added or makeup water to the process is to offset losses from evaporation of raffinate solutions on the leach stockpiles. The seeps at Little Rock could be a source of make up water for the SX/EW process and offset pumping of fresh water.

A lined pond would be constructed to collect seepage discharge. The nearest possible point for construction of a collection pond and pump station is directly northeast of Little Rock Mine, at an elevation of approximately 6,000 feet. This pond would be sized for stormwater capture requirements of approximately 1 million gallons. This catchment pond would be actively dewatered whenever storm water or seepage was collected. See Figure LR3.

Because of the required lift to lift the water over the top of the #2A Leach Stockpile, at a top elevation of approximately 6,500 feet, pumping would require two (2) stages. A pump would be mounted in a sump or upon a float in the collection pond with high/low level controls. The pump discharge line would be constructed across undisturbed terrain to a high point along the west toe of the #2A leach stockpile. A booster station would be constructed at this location to deliver the effluent through a pipeline across the top of stockpiles to discharge into the mine water surge pond. From the mine water surge pond, the effluent would be added into the SX/EW system through the raffinate system.

At the moment, there is an insufficient power supply near the possible plant location to operate such a plant. The installation of a power line or a generator would be required to power the pumping system and level controls.

The presence of this effluent pipeline across active stockpile and, possibly, mine areas could cause conflicts in some mine and leach stockpile operation activities. The pipeline route would have to be investigated prior to installation in order to minimize the amount of interference. This effluent pipeline could be on the order of 15,000 feet long and cost approximately $300,000.

Addition of this effluent into the mine surge water pond may upset the chemistry of the water normally found in the surge water pond; causing the precipitation of mineral salts in the surge pond, making it corrosive to pumping systems or making the water undesirable for road water or other mine uses. It may also necessitate operating the mine surge water pond at a lower level that has been historically maintained in order to provide room for the transfer of storm water surges from Little Rock.

As this effluent would be added into the raffinate side of the SX/EW system, it would be introduced into the system on demand as make-up water. The only apparent source of any leach operation problems from this effluent would be from excessive turbidity during storm surges.

Since this system does not result in a discharge that could impact either surface or groundwater, it is assumed for the purposes of this analysis that no additional discharge permitting requirements would be required.

The design of the conveyance and system assumes the following basic elements beyond existing infrastructure.

- 160 ft. x 100 ft. x 10 ft. deep, rock & soil excavation lined pond;
- pump and controls at the lined pond;
- 6,500 foot long power line;
- 15,000 foot long, 8 inch pipeline to mine water surge pond; and
- security fence.

The lined collection pond would cost approximately $174,000. The pump and controls at the collection pond may cost approximately $80,000. The booster station with pump may cost approximately $100,000. The pipeline from the collection pond to the #2A Leach Stockpile would cost approximately $300,000. The installation of a power line from the SX/EW plant to the collection and booster pump locations would cost approximately $256,000. Chain link fences that surround the pond, pump and booster may cost approximately $90,000. The total construction cost of this transfer system for these effluents is estimated at $1,000,000. Engineering for such a plant would be approximately 10% of construction costs, or $100,000. Design and construction costs may total $1,100,000. Adding GRT @ 7% and contingencies of 15% yields an estimated total project cost of $1,342,000.

This alternative is expected to meet environmental standards.

Because of the SX/EW operational issues discharge of the effluent from Little Rock directly into the mine water surge pond was eliminated from consideration.

2.2.6 Alternative 6, Execute Little Rock Mine Plan and Divert Seepage to SX/EW Process

The Little Rock mine plan will result in the excavation of a pit that mines the existing leach stockpiles, eliminating seepage discharge. Until the leach stockpiles are mined out the seepage would be captured and pumped to an existing stockpile or discharged to the mine water surge pond.

Current mine plans for Little Rock contemplate the beginning of mining between 2009 and 2012. This timing will not achieve elimination of the seepage discharge in time for the reclamation of the 1X Tailing Impoundment, so this alternative was eliminated from further consideration.

2.2.7 Alternative 7, Collect Little Rock Water and Discharge to No. 3 PLS Pond

The SX/EW process is a net user of water. The greatest proportion of added or makeup water to the process is to offset losses from evaporation of raffinate solutions on the leach stockpiles. The seeps at Little Rock combined with the 1X interceptor wells could be a source of make up water for the SX/EW process and offset pumping of fresh water.

A multiple-use lined pond would be constructed in Deadman Canyon downstream of the Whitewater Diversion to collect the impacted water from the Little Rock Mine and the pumped effluent from the 1X interceptor wells (DP 27 Settlement Agreement, Paragraph 18, Item 2). Flow from the Little Rock seeps into the lined pond would be by the existing gravity conveyance system. This pond would be sized according to existing practices for storm water capture, approximately 1 million gallons. A pump system would transfer the water from the lined pond to the No. 3 PLS Pond. This catchment pond would be actively dewatered whenever stormwater or seepage was collected. See Figure LR5.

The pumped discharge from the 1X interceptor wells is presently being collected in a tank near the well field from which a pump boosts it through a pipeline to the 1X dam. It is assumed that the existing pump that boosts the 1X interceptor effluent has insufficient head to reach the lined pond and must be replaced. Approximately 13,000 feet of new 4" HDPE pipe along the west toe of the 1X dam is required to reach from the existing discharge location to the new lined pond.

The new portable diesel pump used to dewater the #1X tailing dam would be installed at the lined pond. Single stage pumping is assumed to be practical. The pump discharge line would be constructed across disturbed and undisturbed terrain between the #1A tailing dam and the 2A leach stockpile to the No. 3 PLS pond. This 9,000 foot long effluent pipeline would cross the effluent pipeline from the 1, 1A and 1X Tailing Impoundment reclamation storm water dewatering project to discharge into the 3 PLS pond.

This plan could create a number of operational difficulties within the SX/EW operation. Effluent would be transferred into the SX/EW system as it accumulated at Little Rock. This transfer system would provide minimal buffering to storm water surges and would dilute raffinate and ultimately PLS solutions. This dilution would increase PLS pump demand and cost while also increasing costs in the solvent extraction circuit. The turbidity of this effluent during storm events may also be high and contribute to poor recoveries and upsets in the solvent extraction circuit.

Tyrone has presented a design for this system as part of the tailing reclamation storm water management system to NMED and requested approval. Since this system does not result in a discharge that could impact either surface or groundwater (in fact it eliminates the discharge of concern), it is assumed for the purposes of this analysis that no additional discharge permitting requirements are triggered other than the approval as part of the stormwater management system.

The design of the collection and conveyance system assumes the following basic elements beyond existing infrastructure.

- 160 ft. x 100 ft. x 10 ft. deep, rock & soil excavation lined pond;
- 13,000 foot long, 4 inch pipeline from 1X interceptor wells to lined pond;
- new booster pump from 1X intercept wells;
- 9,000 foot long, 8 inch pipeline to 3 PLS Pond; and
- security fence.

Construction cost for the storm water pond may be approximately $174,000. The cost of a new booster pump with switch gear for the 1X Interceptor Wells is approximately $50,000. The cost of the new transfer pipeline for the 1X Interceptor Wells is $77,000. The cost for the discharge pipeline to the #3 PLS pond is approximately $167,000. The perimeter fence will cost approximately $60,000. Total construction cost is approximately $528,000. Engineering for such a plant would be approximately 10% of construction costs, or $53,000. Design and construction costs may total $581,000. Adding GRT @ 7% and contingencies of 15% yields an estimated total project cost of $709,000.

This alternative is expected to meet environmental standards.

Because of the SX/EW operational issues, discharge of the effluent from Little Rock directly into the 3 PLS pond was eliminated from consideration; however, in order to implement this project in a timely manner, Tyrone may need to temporarily discharge the effluent to the 3 PLS pond for a short period as part of construction sequencing.

2.2.8 Alternative 8, Collect Little Rock Water and Discharge to Raffinate Tank

The SX/EW process is a net user of water. The greatest proportion of added or makeup water to the process is to offset losses from evaporation of raffinate solutions on the leach stockpiles. The seeps at Little Rock combined with the 1X interceptor wells could be a source of make up water for the SX/EW process and offset pumping of fresh water.

A multiple-use lined pond would be constructed in Deadman Canyon downstream of the Whitewater Diversion to collect the impacted water from the Little Rock Mine and the pumped effluent from the 1X interceptor wells (DP 27 Settlement Agreement, Paragraph 18, Item 2). Flow from the Little Rock seeps into the lined pond would be by the existing gravity conveyance system. This pond would be sized according to existing practices for storm water capture, approximately 1 million gallons. A pump system would transfer the water from the lined pond to the SXEW Raffinate Tank. This catchment pond would be actively dewatered whenever storm water or seepage was received. See Figure LR6.

The pumped discharge from the 1X interceptor wells is presently being collected in a tank near the well field from which a pump boosts it through a pipeline to the 1X dam. It is assumed that the existing pump that boosts the 1X interceptor effluent has insufficient head to reach the lined pond and must be replaced. Approximately 13,000 feet of new 4" HDPE pipe along the west toe of the 1X dam is required to reach from the existing discharge location to the new lined pond.

The new portable diesel pump used to dewater the 1X tailing dam would be used to pump water from the lined pond when there is no storm water present on top of the 1X Tailing Impoundment. If there is storm water present, then the water will be pumped directly off the top surface of the 1X Tailing Impoundment. The pump discharge line would be constructed across disturbed and undisturbed terrain between the #1A tailing dam and the 2A leach stockpile and connect to the new 1X Tailing Dam dewatering booster station. From here, the water will be pumped to the SXEW raffinate tank.

As this effluent would be added into the raffinate side of the SX/EW system, it would be introduced into the system on demand as make-up water. The only apparent source of any leach operation problems from this effluent would be from excessive turbidity during storm surges.

Tyrone has presented a design for this system as part of the tailing reclamation storm water management system to NMED and requested approval. Since this system does not result in a discharge that could impact either surface or groundwater (in fact it eliminates the discharge of concern when storm water from the 1X Tailing Impoundment is not present), it is assumed for the purposes of this analysis that no additional discharge permitting requirements are triggered other than the approval as part of the storm water management system that has been requested.

The design of the collection and conveyance system assumes the following basic elements beyond existing infrastructure.

- 160 ft. x 100 ft. x 10 ft. deep, rock & soil excavation lined pond;
- 13,000 foot long, 4 inch pipeline from 1X interceptor wells to lined pond;
- new booster pump from 1X intercept wells;
- 6,500 foot long, 8 inch pipeline to 1X dewatering booster station at the toe of the #3 Leach Stockpile; and
- security fence.

Construction cost for the storm water pond may be approximately $174,000. The cost of a new booster pump with switch gear for the 1X Interceptor Wells is approximately $50,000. The cost of the new transfer pipeline for the 1X Interceptor Wells is $77,000. The cost for the effluent pipeline from the diesel pump to the 1X booster is approximately $122,000. The perimeter fence will cost approximately $60,000. Total construction cost is approximately $483,000. Engineering for such a plant would be approximately 10% of construction costs, or $48,000. Design, permitting and construction costs may total $531,000. Adding GRT @ 7% and contingencies of 15% yields an estimated total project cost of $648,000.

This alternative is expected to meet environmental standards. The system has been designed and presented to NMED previously. This is the timeliest option available to meet reclamation requirements for the 1X Tailing Impoundment. This option is also the most compatible with the reclamation schedules, stormwater management plan and current Tyrone Mine operations.

3.0 CONCLUSION

Tyrone has evaluated eight alternatives for the elimination of the Little Rock Mine impacted water to the 1X Tailing Impoundment. This analysis was based on five criteria, which considered 1) impact on closure schedule, 2) permitting requirements, 3) operational compatibility, 4) environmental considerations, and 5) costs. Permitting issues, operational compatibility and the ability to meet the required reclamation schedules are the primary determining factors. Unreasonable costs as compared to alternatives of similar results were also a factor in some cases.

As discussed in the analysis above Tyrone rejected alternatives 1, 3, 4, 5, 6 and 7 due to adverse impacts on the closure schedule, operational incompatibility and cost. Alternative 2 is passive evaporation of the water and Alternative 8 is collection of the water in a lined pond followed by pumping to the SXEW raffinate tank. Alternative 2 is less desirable than alternative 8 because it does not incorporate the reuse of the water from the Little Rock seeps. It is also significantly more costly than Alternative 8.

Alternative 8 was selected because it is the most compatible alternative with the reclamation water management plan, it achieves multiple uses of constructed facilities and it is the most compatible alternative with operations.