APPENDIX C

Water Management
Cost Estimate Summary Report

Appendix C
Water Management Cost Estimate
Summary Report

Prepared for

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December 2014

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TELESTO SOLUTIONS INCORPORATED

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Table of Contents

List of Tables

List of Appendices

1.0 INTRODUCTION

As part of the 2014 Continental Mine Closure Closeout Plan (CCP) update, a water management reclamation cost estimate for financial assurance was prepared by Telesto Solutions Inc. (Telesto) for Freeport-McMoRan Cobre Mining Company (Cobre). This water management reclamation cost estimate includes operations and maintenance, replacement, and removal costs related to post closure water management. The cost estimate is based on the configuration of facilities as described in the end-of-year (EOY) 2019 mine plan, and assumes reclamation would begin in 2020 (Reclamation Year 0).

This document is organized into several major sections. Section 1 provides an introduction and overview, Section 2 describes the estimated quantity of water to be managed, Section 3 describes the reclamation cost estimate, and Section 4 provides the cost estimate totals.

Impacted stormwater and seeps are currently captured in ponds and tanks and piped to Chino for treatment and/or inclusion in Chino's process water stream. Following reclamation and establishment of revegetation, infiltration will be reduced, waste rock facility seeps are expected to decrease and eventually cease flowing (Condition 83; Golder, 2009), stormwater runoff from reclaimed surfaces will no long be impacted and will be released (Appendix C.1), and the Main Tailings Impoundment (MTI) seeps are expected to decrease and eventually cease flowing (Appendix C.2). The reduction in the aforementioned sources will result in a decrease in the amount of water requiring management. Facilities and post closure uses, based on EOY 2019 mine plan, are show in Table C.1. Water quality monitoring is assumed to continue for a 100-year period.

2.0 QUANTITY OF WATER TO BE MANAGED

The sources and quantities of water used in the cost estimate were determined by:

- Estimating average annual pre-reclamation stormwater runoff
- Estimating average annual post-reclamation stormwater runoff
- Estimating post-reclamation flows from WRF seeps
- Estimating post-reclamation seepage from MTI draindown

Average annual stormwater runoff was determined using the SCS Curve Number Method (USDA, 2004a). A 100-year stochastic daily precipitation data set was developed using the stochastic weather generator CLIGEN (USDA, 2004b), precipitation data from Ft. Bayard, New Mexico, and Continental Mine area precipitation records. Stormwater basins for the site were determined using EOY 2019 topography. The EOY 2019 stormwater basins are roughly equivalent to post reclamation stormwater basins, and were used for both the pre and post reclamation stormwater runoff calculations. The runoff calculations are presented in Appendix C.1.

Appendix C.2 describes the calculation method used to estimate the seepage from the MTI seeps. A spreadsheet model was employed to execute a water balance of the zones above (unsaturated) and below (saturated) the phreatic surface within the MTI. The unsaturated zone inputs included infiltration pre and post-reclamation driven by precipitation (CLIGEN), and the output was leakage into the saturated zone. The saturated zone had three main discharges: 1) east toe seeps, 2) southern toe seeps, and 3) vertical drainage. The future hydrologic behavior of current toe seeps was estimated using semi-empirical relationship to the total saturated volume of water stored at any time in the saturated zone of the MTI (currently estimated at over 1.5 billion gallons), and the premise that additional tailing deposition will not occur in the current plan. The spreadsheet model was calibrated to closely match current measured toe seepage rates, providing confidence that the model represents the existing seepage system.

Seeps from the WRFs flow seasonally. They are sourced from storage of monsoonal meteoric infiltration, which is subsequently released through seepage over the following months, and typically go dry before the following season's monsoon (Golder, 2009). These seeps occur near the WRFs outslopes due to the high permeability and large rocks present on the outslopes, which promotes meteoric infiltration. Because of the source and nature of the WRF seeps, they are expected to cease flowing after outslopes are covered with finer grained material or at facility reclamation. The Buckhorn Waste Rock Facility Seep and the WWRDF Inceptor Trenches (Grand Canyon Seeps) will be buried with finer grained waste rock by EOY 2019 and are expected to cease flowing before EOY 2019. The East WRF, Union Hill and Estrada seeps, due to their location, will remain active during the growth of the SWRDF and until after reclamation when meteoric infiltration is considerably reduced. The East WRF, Union Hill and Estrada seeps are assumed to cease flowing shortly after reclamation, assumed to be no later than 5-years after closure. The average 2013 WRF seepage flow rates from the East WRF, Union Hill, and Estrada Seeps (Golder, 2014) were used to approximate post reclamation flow rates in the SWRDF at EOY 2019. Thus, the cost estimate assumes these seeps cease flowing at reclamation Year 5.

Assumptions used in determining the quantity of water to be managed include:

- A Curve Number of 85 was used for pre reclamation stormwater runoff based on recent stormwater modeling efforts.
- A Curve Number of 62 was used for post reclamation stormwater runoff (Telesto, 2008).
- Surface runoff capture from: the MTI, Magnetite Tailings Impoundment (MGTI), Waste Rock Facilities (WRFs), Ore Stockpiles and the areas contributing stormwater to Upper Creek Containment Pond 1 and Grape Gulch Pond #3.
- Capture of surface seepage from the MTI, MGTI, and the South Waste Rock Disposal Facility (SWRDF).
- Table C.2 describes the expected seepage flow rates during pre and post reclamation. Seep flow rates for reclamation Year 0-5 use the 2013 seepage flow rate totals (Golder, 2014) for the WRFs and the MTI seepage rates predicted in Appendix C.2.
- Future hydrologic behavior of current toe seeps was estimated using a semi-empirical relationship to the total saturated volume of water stored at any time in the saturated zone for the MTI.
- The Bullfrog Pipeline has a maximum capacity of 1,230 gpm and has an Industrial PMLU.

Yearly average seepage quantities are summarized in Table C.2. Managed water volumes as a function of time are summarized in Table C.3.

3.0 WATER MANAGEMENT COST ESTIMATE

The water management cost estimate is divided into five components: (1) ponds and tanks, (2) pumps, (3) pipelines, (4) electrical infrastructure, and (5) water monitoring. Table C.4 provides a brief description of each worksheet (Sheet) used in the cost estimate. Cost calculations are located in Appendix C.3 and are organized by Sheet number and/or name. Throughout this document, the items described are followed by a reference to the location of the corresponding calculation Sheet. An electronic copy of the cost estimate, Water Management Sheets 1 through 4, Cobre_WM_2014.xlsx spreadsheet, is provided in CCP Appendix D. A summary of the estimate is included in Table C.5.

Assumptions and methods common throughout the cost estimate include the following:

- Miscellaneous unit costs were taken from several sources including R.S. Means Heavy Construction Cost Data Edition 26 (R.S. Means, 2014). All costs taken from R.S. Means were adjusted using the location factor for Las Cruces (84.7%). Miscellaneous unit costs are summarized on Table C.6 and used on Water Management Sheets 1 and 2. Supporting documentation is included in Appendix C.4.
- Water management variables are provided in Table C.7 and used on Water Management Sheet 1.
- Reclamation begins in 2020 (Reclamation Year 0).
- Infrastructure used for the capture and conveyance of water is removed on or by reclamation Year 12 (Table C.1). The Reclaim Pond and all associated infrastructure is removed when the MTI is reclaimed, assumed no later than reclamation Year 5. Removal costs for ponds, tanks, and dams are included in earthwork portion of the cost estimate (CCP Appendix B).
- Pond volumes, pipeline lengths and diameters, and flow rates were obtained from 1) *DP-1403 Condition 36 – 2013 Annual Water Management Model Update* letter (Telesto, 2014) and 2) *Water Management System Analysis and Upgrade Recommendations Report* (Telesto, 2012).
- Capital Indirect Costs of 28.3% were applied to the capital direct costs (water management facility replacement or removal) per MMD (1996) and OSM (2000) guidance. The indirect costs are comprised of:
  - Mobilization and Demobilization (3.8%)
  - Contingencies (4.0%)
  - Engineering Redesign Fee (2.5%)
  - Contractor Profit and Overhead (15.0%)
  - Project Management Fee (3.0%).

  Indirect cost percentages are identical to the percentages presented to MMD and the New Mexico Environment Department (NMED) in meetings with Tyrone on September 20, 2012, and on November 2, 2012. (Water Management Sheet 3 and 4)
- Operations and Maintenance Indirect Costs of 17% were applied for long term operations and maintenance per MMD (1996) and OSM (2000) guidance. The indirect costs are comprised of:
  - Contingencies (4.0%)
  - Contractor Profit and Overhead for long term operations and maintenance (10.0%, which accounts for the long term contract and repetitive annual work)
  - Project Management Fee (3.0%).
  - Mobilization and Demobilization as well as Engineering Redesign

Fee are 0% for long term maintenance costs. Indirect cost percentages are identical to the percentages presented to MMD and the NMED in meetings with Tyrone on September 20, 2012, and on November 2, 2012. (Water Management Sheet 3 and 4)

3.1 Ponds and Tanks

Water management information and costs for ponds and tanks can be found in Appendix C.3 Water Management Sheets 1 and 3. Assumptions and methods for this portion of the cost estimate include:

- Replacement costs are based on replacement ages from Table C.7 and age at reclamation. The SWRF Dams 1-3 are currently 15 years old, all membrane lined ponds are 25 years old, the Surge Tank is 45 years old, and the East Waste Rock Facility Containment pumps are new in 2019
- New and replacement costs for lined ponds assume excavating 1/3 the capacity of the pond and replacing with a double liner
- The Reclaim Pond and North Tailings Decant Pond require no maintenance beyond what is already included in the Earthwork cost estimate for the site as a whole

3.2 Pumps

Water management information and costs for pumps can be found in Appendix C.3, Water Management Sheets 1 and 3. Assumptions and methods for this portion of the cost estimate include:

- Replacement costs are based on replacement ages from Table C.7 and age at reclamation. Currently the SWRF Dam 1-3 pond and booster pumps are 11 years old, the Surge Tank and Reclaim Pond pumps are 6 years old, the Union Hill Adit Seep and Estrada Seep pumps are 5 years old, the East Waste Rock Facility Containment pumps are new in 2019, and all other pumps are 20 years old.
- Pipe head loss calculations use average combined pumping rate when multiple pumps are present.
- Pump operating time was calculated by dividing average annual water volume by the average pump capacity.

3.3 Pipelines

Water management information and costs for pipelines can be found in Appendix C.3 Water Management Sheets 1 and 3. Replacement costs are based on replacement ages from Table C.7 and age at reclamation. Assumptions and methods for this portion of the cost estimate include:

- The Bullfrog Pipeline was assumed to be 3 years old,
- The SWRF Dams 1, 2 and 3 pipelines are 11 years old
- East WRF Containment pipelines are new at the start of reclamation.
- All other pipelines were assumed to be 20 years old at the start of reclamation.

3.4 Electrical Infrastructure

Water management information and costs for electrical infrastructure can be found in Appendix C.3, Water Management Sheets 1 and 3. Assumptions and methods for this portion of the cost estimate include:

- Electric power lines currently follow major pipeline corridors
- All power lines are high voltage and require a transformer and electrical panel

3.5 Water Monitoring

Closure and post-closure monitoring of surface and groundwater is required in the New Mexico Energy and Natural Resources Department, Mining and Minerals Division (MMD) Permits and DP-1403. Sampling and analysis is quarterly for reclamation years 0 through 5, decreasing to semi-annually for reclamation years 5 through 12 and then to annually for reclamation years 12 through 99. Sampling information and costs can be found in Appendix C.3, Water Management Sheets 2 and 3. Unit rate information can be found in Table C.6.

4.0 TOTAL COST ESTIMATE FOR WATER MANAGEMENT

The total current dollar cost for water management during and after reclamation is estimated to be **$2,911,000**. A summary of the estimate is provided in Table C.5. The costs presented in this estimate are current (2014) dollar costs, a net present value calculation will be presented separately that will include water management costs.

5.0 REFERENCES

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TABLES

Table C.1 Facility Overview

Impoundment Designation	Surface Area (acres)	Mine Use	Liner	Reclamation Schedule
Decant Pond #4	0.62	Seep and Stormwater	HDPE	Removed Reclamation Year 12
Grape Gulch Pond #3	0.38	Stormwater	HDPE	Removed Reclamation Year 12
North Tailings Decant Pond	0.46	Stormwater	Concrete Dam Unlined	Removed Reclamation Year 12
Magnetite Seepage Pond	0.2	Seep and Stormwater	HDPE	Removed Reclamation Year 12
Reclaim Pond	16	Emergency Water Management, Seep and Stormwater	Concrete Dam Unlined	Reclaimed with MTI by Reclamation Year 5
Surge Tank	0.18	Emergency Water Management, Seep and Stormwater	Stainless Steel	Industrial PMLU
SWRF Dam 1 (181-2003-Dam 1)	0.52	Stormwater	Concrete Dam Unlined	Removed Reclamation Year 12
SWRF Dam 2 (181-2003-Dam 2)	0.34	Stormwater	Concrete Dam Unlined	Removed Reclamation Year 12
SWRF Dam 3 (181-2003-Dam 3)	0.84	Stormwater	Concrete Dam Unlined	Removed Reclamation Year 12
Upper Creek Containment Pond 1	0.74	Seep and Stormwater	HDPE Lined	Removed Reclamation Year 12
Seeps Routed to Upper Creek Containment Pond 1				
Borehole Seep and Borehole Access Road (Vent Seep)	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9
Blackman's Seep	0.01	Seep	HDPE	Removed Reclamation Year 9
East Haul Road & Rock Dam Seep	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9

Table C.1 Facility Overview (Continued)

Unnamed Seep	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9
Cottonwood Seep	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9
Seeps Routed to Decant Pond # 4				
Dam Toe Seep	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9
Cement Pond (Replaced by East WRF Containment by EOY 2019)	NA	Seep and Stormwater	HDPE Lined	Seepage ceases flow by Reclamation Year 5, Continue use for Stormwater Removed Reclamation Year 12
Estrada Seep	NA	Seep	Unlined	Seepage Ceases flow by Reclamation Year 5
Magnetite Seepage Pond (Magnetite Interceptor Trench seepage reports to Magnetite Seepage Pond then to Decant Pond #4)	NA	Seep	Unlined	Seepage Ceases flow and, Reclaimed with Magnetite Tailings Impoundment by Reclamation Year 5
Peach Tree Spring Seep	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9
Union Hill Adit Seep	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9
Weber Pond	NA	Seep	Unlined	Seepage ceases flow by Reclamation Year 9

Table C.2 Estimated Seepage Quantity

Seep		Stormwater Volume (acre-ft)	Seepage Volume (acre-ft)	Stormwater Flow Rate, Pre-Reclamation (gpm)	Average Seepage Flow Rate, Pre-Reclamation (gpm)
Main Tailing Impoundment Seeps	Stormwater and Seeps Routed to Upper Creek Containment Pond 1 (excludes Cottonwood Seep)[1]	46.63		28.91	
	Cottonwood Seep[1]	-	3.15	-	1.95
	Upper Creek Containment Pond 1 Average Estimated Yearly Stormwater Runoff [2]	16.35	-	10.14	-
	Estimated Seepage Routed to Upper Creek Containment Pond 1	**-**	**33.43**	**-**	**20.73**
	Dam Toe Seep[1]	-	116.8	-	72.42
	Peach Tree Spring Seep[1]	-	19.57	-	12.13
	Weber Pond[1]	-	0	-	0.00
	Total Main Tailing Impoundment Seepage	-	**169.8**	-	**105.27**
Estrada Seep[1]		-	2.34	-	1.45
Union Hill Adit Seep[1]		-	0.52	-	0.32
Cement Pond (Replaced by EOY 2019 with East WRF Containment)[1]		-	1.30	-	0.81
Magnetite Interceptor Trench[1]		-	0.45	-	0.28

[1] Measured 2013 seepage volumes (Golder 2014).
[2] The estimated yearly stormwater runoff for Upper Creek Containment 1 is based on EOY 2019 mine configuration and calculations in Appendix C.1

Table C.3 Water Management Volumes

Closure Year	Average SWRDF Seeps (gpm)[1]	Average Main Tailings Impoundment (gpm)[2]	Average Storm Water Runoff (gpm)[3]	Average Magnetite Tailings Impoundment (gpm)[4]	Total Average to Chino via Bull Frog (gpm)
0	2.6	62.7	66.5	0.3	**132.0**
1	2.6	56.4	66.5	0.3	**125.7**
2	2.6	50.2	66.5	0.3	**119.5**
3	2.6	43.9	66.5	0.3	**113.2**
4	2.6	37.7	66.5	0.3	**107.0**
5	2.6	31.4	66.5	0.3	**100.7**
6	0.0	25.1	3.5	0.0	**28.6**
7	0.0	18.6	3.5	0.0	**22.1**
8	0.0	11.8	3.5	0.0	**15.3**
9	0.0	4.7	3.5	0.0	**8.2**
10	0.0	0.0	3.5	0.0	**3.5**
11	0.0	0.0	3.5	0.0	**3.5**
12…	0.0	0.0	0.0	0.0	**0.0**
…100	0.0	0.0	0.0	0.0	**0.0**

[1]Average seep flow rate at EOY 2019 based on average East WRF, Union Hill, and Estrada Seeps flow rates 2013 (Golder 2014)
[2] Calculated draindown rates, see Appendix C.2
[3] Calculated stormwater runoff for reclaimed areas, See Appendix C.1
[4]Average seep flow rate at EOY 2019 based on average Magnetite Interceptor Trench Seeps flow rates 2013 (Golder 2014)

Table C.4 Cost Estimate Sheet Descriptions

Worksheet	Description
Cobre_WM_2014.xlsx (Water Management Sheets)	
1 Reclamation and O&M Costs	Ponds/Tanks, Pumps, Pipelines, and Electrical Infrastructure capital and operation and maintenance direct cost calculations.
2 Sampling Cost	Post closure sampling cost development and sampling schedule.
3 WM Cash Flow	Capital cost over time
4 Summary	Cost summary including indirect cost percentages and direct costs calculated on Sheets 1and 2

Table C.5 Cost Estimate Summary

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost
Capital and Replacement		**28.3%**	
Ponds and Tanks	$642,853	$181,927	$824,780
Pumps	$570,399	$161,423	$731,822
Pipelines	$0	$0	$0
Electrical	$0	$0	$0
Subtotal	**$1,213,252**	**$343,350**	**$1,556,602**
Removal[1]		**28.3%**	
Pumps	$145,000	$41,035	$186,035
Pipelines	$95,129	$26,922	$122,051
Electrical	$48,038	$13,595	$61,633
Subtotal	**$288,167**	**$81,552**	**$369,719**
Operations and Maintenance		**17%**	
Ponds and Tanks	$185,842	$31,593	$217,435
Pumps	$110,100	$18,717	$128,817
Pipelines	$156,272	$26,566	$182,838
Electrical Infrastructure	$110,007	$18,701	$128,708
Materials		**0%**	
Electricity and Fuel	$36,148	$0	$36,148
Environmental Sampling	$290,360	$0	$290,360
Subtotal	**$888,729**	**$95,577**	**$984,306**
Total Estimated Cost	**$2,390,000**	**$520,000**	**$2,911,000**

[1] Removal costs for ponds and tanks are included in the earthwork portion of the cost estimate

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Table C.6 Miscellaneous Unit Costs

Activity	Base[1] Unit Cost $/unit	Units	Scaled Cost Las Cruces 84.7%[2]	Means Line Item	Means Page	Reference
Utility Pole Demo	$199.50	ea	$168.98	024113.80 0100	36	Selective Demo, utility poles, wood, 20'-30' high
Cross Arm Demo	$85.50	ea	$72.42	024113.80 0300	36	Selective Demo, cross arms, wood, 4'-6' long
Wood Electrical Utility Poles a.)	$601	ea	$509	337116.33 6020	376	Wood, class 1 type C, CCA/ACA-treated, 30' high, excludes excavation, backfill and cast-in-place concrete
Utility Pole Installation b.)	$1,245	ea	$1,055	337116.23 6010	376	Digging holes in rock
Utility Pole Installation c.)	$1.85	ea	$1.57	337116.33 9000	376	Disposal of pole and hardware surplus material, assumes 100 feet of wire per pole
Utility Pole Installation d.)	$319	ea	$270	337116.33 7600	376	Cross arms 4' long, includes hardware and insulators
Electrical Wiring Installation a.)	$575	wire mi	$487	337139.13 0110	380	Material handling and spotting-conductors, primary circuits
Electrical Wiring Installation b.)	$13,175	wire mi	$11,159	337139.13 0150	380	Conductors, per wire, 210-636 kcmil
Electrical Wiring Installation c.)	$294	wire mi	$249	337139.13 0810	380	Disposal of surplus material, high voltage conductors
Potential Transformers	$4,783	ea	$4,051	337126.26 4100	380	13 to 26 kV
Pipe Removal	$1.40	lf	$1.19	024113.38-1600	29	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 3/4"-4" diameter
Pipe Removal	$1.96	lf	$1.66	024113.38-1700	29	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 6"-8" diameter
Pipe Removal	$3.27	lf	$2.77	024113.38-1800	29	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 10"-18" diameter
Excavation of Soil	$5.31	cy	$4.49	G1030120 1600	474	3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mi round trip. This value removes the overhead and profit (34% based on RS Means Crews O&P markup)
Reservoir Liners HDPE	$2.58	sf	$2.19	334713.53 1200	365	Membrane lining, 2X60 mil thick
Small Concrete Dam	$82,000	ea	$69,454	323213.10 3100	321	Assume similar to 10' high 33 degree slope concrete retaining wall, cast concrete reinforced concrete cantilever, including excavation, backfill & reinforced.
Water Treatment Tank	$202,000	ea	$171,094	331613.13 1000	351	250,000 gallon steel tank, not including foundation., height/diameter Less than 1
Pump	$10,000	ea	-	-	-	Professional Judgment 15 to 30 gpm - includes pump control, control panel, installation, and flow meter.
Pump	$15,000	ea	-	-	-	Professional Judgment 50 gpm - includes pump control, control panel, installation, and flow meter.
Pump	$25,000	ea	-	-	-	Professional Judgment 100 to 700 gpm - includes pump control, control panel, installation, and flow meter.
Pump	$30,000	ea	-	-	-	Professional Judgment 800 to 2000 gpm - includes pump control, control panel, installation, and flow meter.
Water Supply Piping	$9.98	lf	$8.45	331113.35 0100	345	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 4" diameter
Water Supply Piping	$14.35	lf	$12.15	331113.35 0200	345	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 6" diameter
Water Supply Piping	$17.97	lf	$15.22	331113.35 0300	345	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 8" diameter
Water Supply Piping	$27.81	lf	$23.56	331113.35 0400	345	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 10" diameter
Water Supply Piping	$31.50	lf	$26.68	331113.35 0500	346	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 12" diameter
Water Supply Piping	$51.15	lf	$43.32	331113.35 0600	346	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 14" diameter
Water Supply Piping	$59.45	lf	$50.35	331113.35 0700	346	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 16" diameter
Facility Water Distribution Piping	$200	lf	$169	221113.48 1780 and 1210	168	Steel Pipe Schedule 40, black 24" diameter (221113.48 1210) without coupling and hanger
Electric Rate	$0.0587	kWh	-	-	-	Industrial rate date looked up 9/11/2014 (http://www.electricitylocal.com/states/new-mexico/silver-city/)
Pump Removal Cost	$5,000	ea	-	-	-	Engineering Judgment
Electric Panel Cost	$10,000	ea	-	-	-	Engineering Judgment
Diesel Fuel Cost ($/gall)	$3.215	gal	-	-	-	Western Refining Quote, Lordsburg NM (June 18, 2014).
Environmental Sampler	$60	hr	-	-	-	Engineering Judgment
Environmental Sampling Reviewer	$70	hr	-	-	-	Engineering Judgment
Environmental Sampling	$230	sample	-	-	-	23 Constituents. Energy Laboratories, Inc., 2013. Published price list (www.energylab.com).
Shipping Environmental Sampling	$70	cooler	-	-	-	Energy Labs prepaid shipping Overnight UPS or FedEx $70 for a 10 lb. package 30"x18"x18" Silver City, NM to any Energy Labs location; Quote 11/26/2013.

Description Notes:

1) Overhead and Profit are added in with the indirect costs.

2) City Cost Index Las Cruces-Total 84.7% (weighted average) R.S. Means Heavy Construction Cost Data, 28th Annual Edition, 2014, pg. 594.

Table C.7 Water Management Variables

Description	Variable
RSMeans NM Discount Rate	0.847
Steel Tank Life Expectancy (yr)	50
Lined Pond Life Expectancy (yr)	30
Small Concrete Dam Life Expectancy (yr)	50
Pump Life Expectancy (yr)	20
HDPE Pipeline Life Expectancy (yr)	100
Pump / Motor Efficiency	0.70
Reclaim Pond Pump Fuel Consumption Rate (gal/hr)	1.0
Chezy Head Loss Coefficient	150
Power Pole Spacing (ft)	100
Annual Pond Maintenance to Capital Factor	1.5%
Annual Pump Maintenance to Capital Factor	1.5%
Annual Pipeline Maintenance to Capital Factor	1.0%
Annual Electrical Infrastructure Maintenance to Capital Factor	1.5%
Estimated average stormwater runoff non-revegetated (CN=85, gal/year/acre)	48,155
Estimated average stormwater runoff, after 12-year vegetation establishment period (Condition 87 CN=62, gal/year/acre)	2,530
Reclamation Start Year (2020)	0
Reclamation Finished	5
Vegetation Established Assume stormwater released	12

APPENDIX C.1
RUNOFF CALCULATIONS

TELESTO SOLUTIONS INCORPORATED

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Fort Collins, Colorado 80528
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TECHNICAL MEMORANDUM

DATE:	**September 30, 2014**	**Telesto #**	**200189**
TO:	**Cobre Mining Company**		
FROM:	**April Tischer and Jon Cullor**		
SUBJECT:	**Sample Runoff Calculation: SCS Curve Number Method**		

Problem Statement

As part of the 2014 Closure/Closeout Plan Update, Cobre Mining Company must complete a water management cost estimate. As part of the cost estimate, the amount of surface water runoff to be pumped must be estimated so that related costs can be assigned.

Objectives

1. Estimate average annual stormwater runoff pumping rates for disturbed areas and reclaimed areas.

Approach

1. Estimate daily runoff depth using SCS Curve Number Method (USDA, 1986).
2. Use Surface Impoundment Study (Telesto, 2008) curve number for disturbed areas (CN=85) and covered and revegetated areas (CN=62).
3. A stochastic weather generator CLIGEN (USDA, 2004) was used to create a synthetic 100-year daily precipitation record for Ft. Bayard, New Mexico and then the data was scaled for the Continental Mine, such that the mean annual precipitation for the data set is equal to the 18.29 inches (Multiply by 18.26 in/yr / 15.10 in/yr).
4. Use the two CN's with the stochastic precipitation data for years 1-100 to estimate the average yearly runoff for disturbed and reclaimed areas. Divide total depth by 100 yrs to get average annual runoff depth.
5. Developed stormwater basins based on end of year 2019 areas contributing stormwater runoff to surface impoundments used for closure.
6. Use the average annual runoff depth and basin areas to estimate average annual

runoff volume in the water management cost estimate.

Data and Assumptions

1. Disturbed areas have minimal vegetation to limit runoff. Consequently, an average curve number (CN) of 85 was selected for disturbed areas based on recent stormwater modeling efforts. This represents a soil type with high runoff potential and high percentage of impervious area.

2. During post-closure, cover material has been placed and vegetation established. A curve number of 62 has been selected for this condition and represents a soil type in good hydrologic condition with moderate infiltration rates an cover including grass, weeds, and low growing brush (USDA, 1986; Table 2-2d cover type “herbaceous”, hydrologic soil group “B”), (Telesto, 2008).

3. CLIGEN command line:

   cligen522564.exe -b1 -y100 -iNm293265.par -oFtBa100y

   Runs a 100-year simulation (-y100) beginning in Year 1 (-b1) for Ft Bayard, New Mexico, Indiana, using "Nm293265.par" as the station parameter file, and puts the output into "FtBa100y".

   Notes:

   1. FtBa100y.txt renamed to FtBayard100y.txt
   2. FtBayard100y.txt reformatted to FtBayard100y_LineFormat.txt
   3. FtBayard100y_LineFormat.txt > FtBayarad100yr.xls

4. Ft. Bayard average annual rainfall = 15.10 in/yr.

5. Cobre average annual rainfall = 18.29 in/yr (SMI, 1999).

6. CobreAdjusted100yr.xls adjusted daily data [Ft. Bayard * (18.29/15.100)].

Calculations and Results

Disturbed Areas (CN = 85), the average yearly runoff is 48,155 gal/year/acre

Reclaimed Areas (CN = 62), the average yearly runoff is 2,530 gal/year/acre

See spreadsheet excerpt below.

$$S(in) = \frac{1000}{CN} - 10$$

$$I_a(in) = 0.2\,S$$

$$Q(in/day) = \frac{(P - I_a)^2}{(P - I_a) + S} \quad P > I_a$$
$$Q(in/day) = 0 \quad P \le I_a$$

$$Q(gpm) = Q\left(\frac{in}{day}\right) * \frac{1}{12}\left(\frac{ft}{in}\right) * \frac{1}{1440}\left(\frac{day}{\min}\right) * 43560\left(\frac{ft^2}{ac}\right) * 1(ac) * 7.48\left(\frac{gal}{ft^3}\right)$$

Yr	t time (day)	P precipitation (in)	CN curve number	S storativity (in)	Ia initial abstraction (in)	Q runoff depth (in/day)	Q runoff volume (gallons/day)	Q runoff volume (gpm/ac)	Annual Precip
1	44	0.00	85	1.76	0.35	0.000	0	0.0	
1	45	0.00	85	1.76	0.35	0.000	0	0.0	
1	46	0.07	85	1.76	0.35	0.000	0	0.0	
1	47	0.00	85	1.76	0.35	0.000	0	0.0	
1	48	0.00	85	1.76	0.35	0.000	0	0.0	
1	49	0.00	85	1.76	0.35	0.000	0	0.0	
1	50	0.64	85	1.76	0.35	0.041	1,106	0.8	
1	51	0.13	85	1.76	0.35	0.000	0	0.0	
1	52	0.00	85	1.76	0.35	0.000	0	0.0	
1	53	0.00	85	1.76	0.35	0.000	0	0.0	
1	54	0.08	85	1.76	0.35	0.000	0	0.0	
1	55	0.56	85	1.76	0.35	0.021	576	0.4	
1	56	0.00	85	1.76	0.35	0.000	0	0.0	
1	57	0.00	85	1.76	0.35	0.000	0	0.0	
1	58	0.00	85	1.76	0.35	0.000	0	0.0	

References:

Shepherd Miller, Inc. (SMI). 1999. Baseline Characterization of the Hydrology, Geology, and Geochemistry of the Proposed Continental Mine Expansion Project, Cobre Mining Company, Inc. Prepared for Cobre Mining Company, Inc. (Hurley, NM) by Shepherd Miller, Inc. (Fort Collins, CO).

Telesto Solutions, Inc. (Telesto). 2008. Condition 87 Continental Mine Surface Impoundment Study, Revision II, June 2008.

USDA. 1986. Urban Hydrology for Small Watersheds TR-55. Natural Resources Conservation Service, Conservation Engineering Division. Second Edition, June 1986.

USDA. 2004. Cligen Weather Generator v522564, October, 26, 2004.

APPENDIX C.2
MTI DRAINDOWN CALCULATIONS

Problem Statement:

As part of the 2014 Closure/Closeout Plan (CCP) Update, Cobre Mining Company must complete a water management cost estimate. In order to estimate closure costs associated with the CCP, an estimate of the amount of drainage from the MTI is needed.

Objectives:

1. Provide a reasonable estimate of the drain down rates from the MTI
2. Support the CCP cost estimate

Approach:

1. Review previous drain down estimates
2. Evaluate the change in storage since tailings deposition ceased in 1999
   a. Use final topography and estimate water table elevation in 1999
   b. Use piezometric contour maps provided by URS as the basis for estimating water in tailings storage
   c. Use a few different estimating methods (surfaces, cross-sections) to estimate the change
3. Update the drain down conceptual model
4. Update the water balance and drain down estimates based on the conceptual model update and data gathered since 2008.

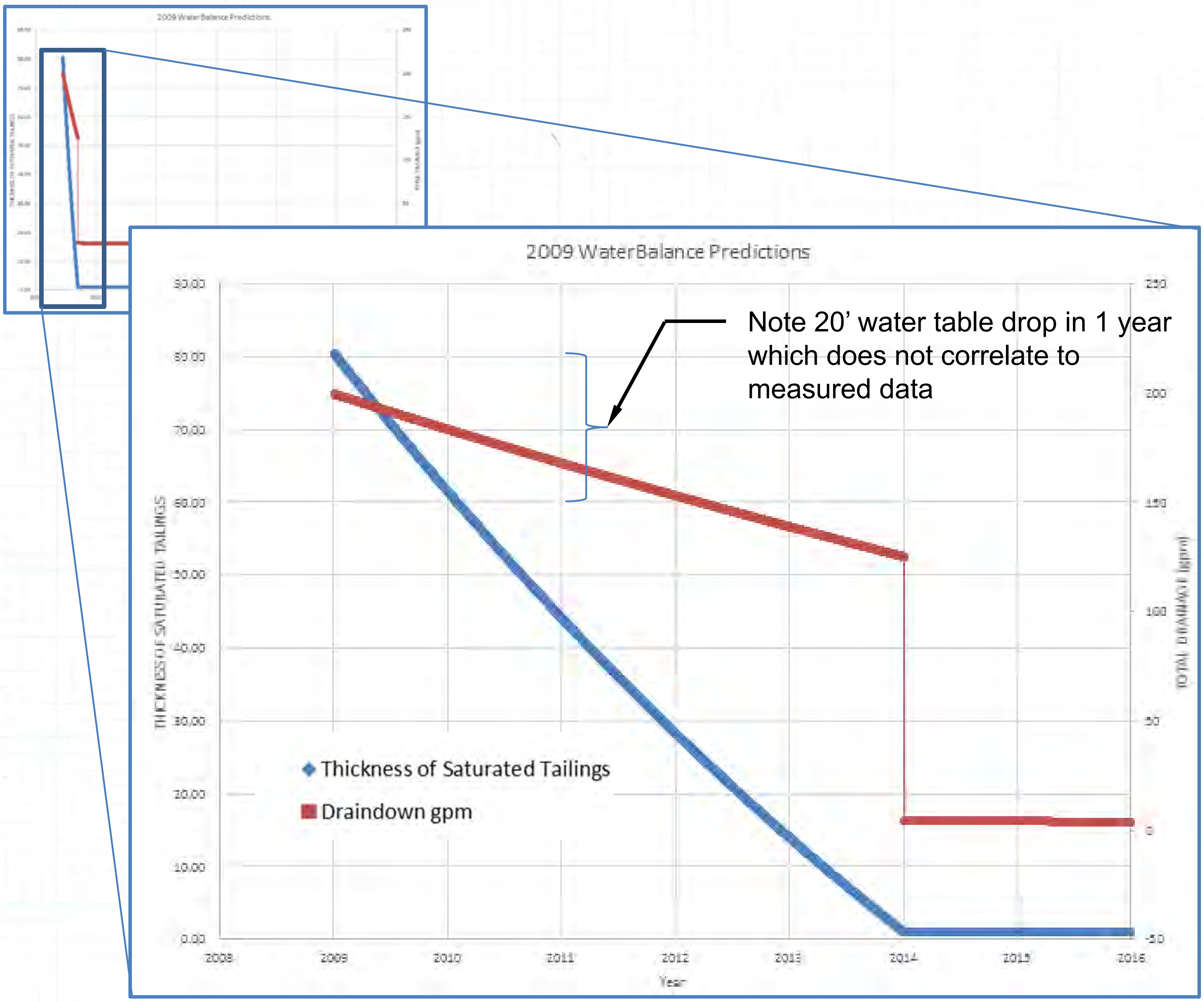
Data and Assumptions:

1. Golder Associates measurements of MTI seepage since 2006
2. Piezometric maps/data from URS since 2004
3. Current, 2013, flyover topography (Cobre, 2013)
4. 1948 topography (USGS, topo map)
5. See calculation sections for various assumptions

TELESTO SOLUTIONS • INCORPORATED	Job No.: 200189-002-02	Client: FCX-Cobre Mining Co.	Page 2 of 15
	Task: MTI Drain Down	Computed By: W. Niccoli	Date: 10/07/14
		Checked By: D. Bauer	Date: 10/10/14

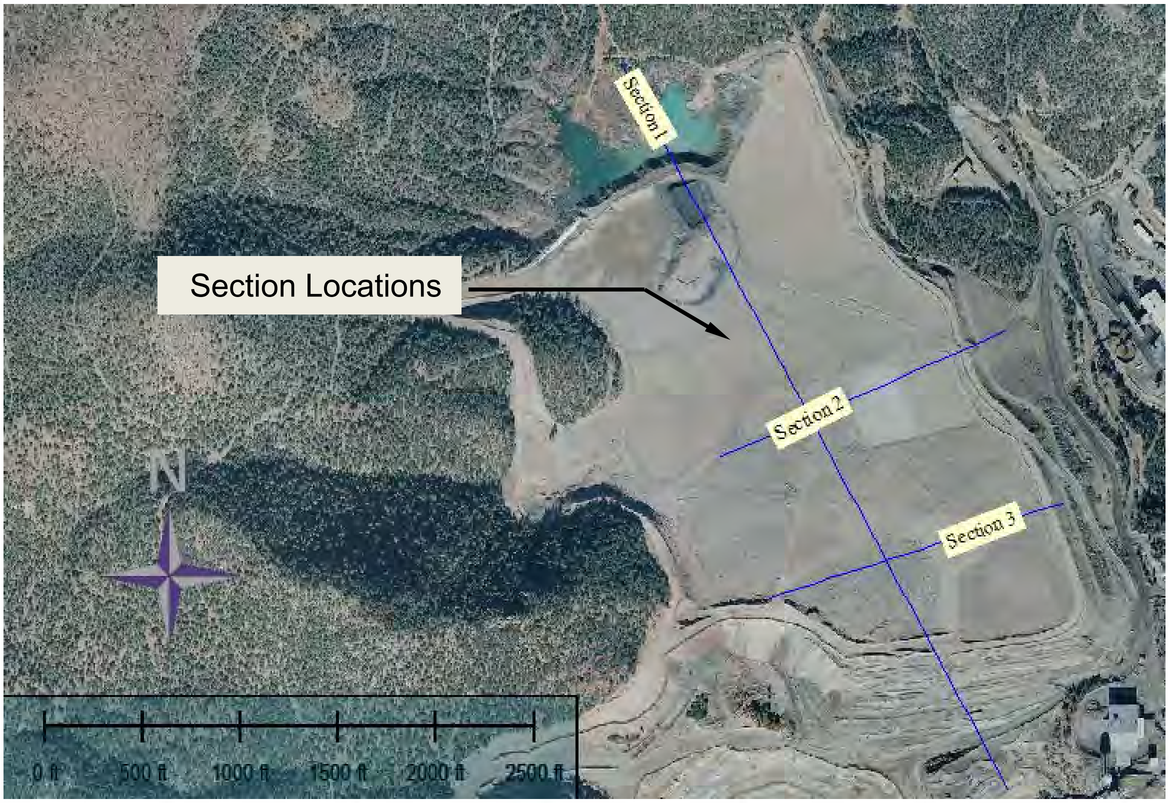
Calculations:

1. The previous drain down model is:
   a. The model is a mass balance approach that estimates the change in storage term by considering the relationship between the unsaturated and saturated zone within the MTI
   b. Inflows considered are net precipitation infiltration
   c. Outflows are a sum of the bottom seepage, and toe seepage
   d. It is “calibrated” to flows measured at the toe seeps plus the amount presumed to leak vertically to the underlying formations
   e. Results are summed here (Assuming predictions start at 1/1/2009):



Calculations Continued:

2. Using Global Mapper, terrain models were built for the current and 1948 topography (also the approach used in 2004 and 2009, FYI), and for 2004, 2008 and 2012 piezimetric surfaces from URS:
   a. Cross-sections were developed and plotted for each surface as shown herein
   b. The terrain models had roughly the same areal extent to each other and extended beyond the eastern and southern ends of the MTI
   c. Volumetric estimates were made of the total water in storage (beginning water volume in the Unsaturated zone was estimated at 30% volumetric moisture content)
   d. Initial volume calculations and relationships to saturated thickness are documented herein:



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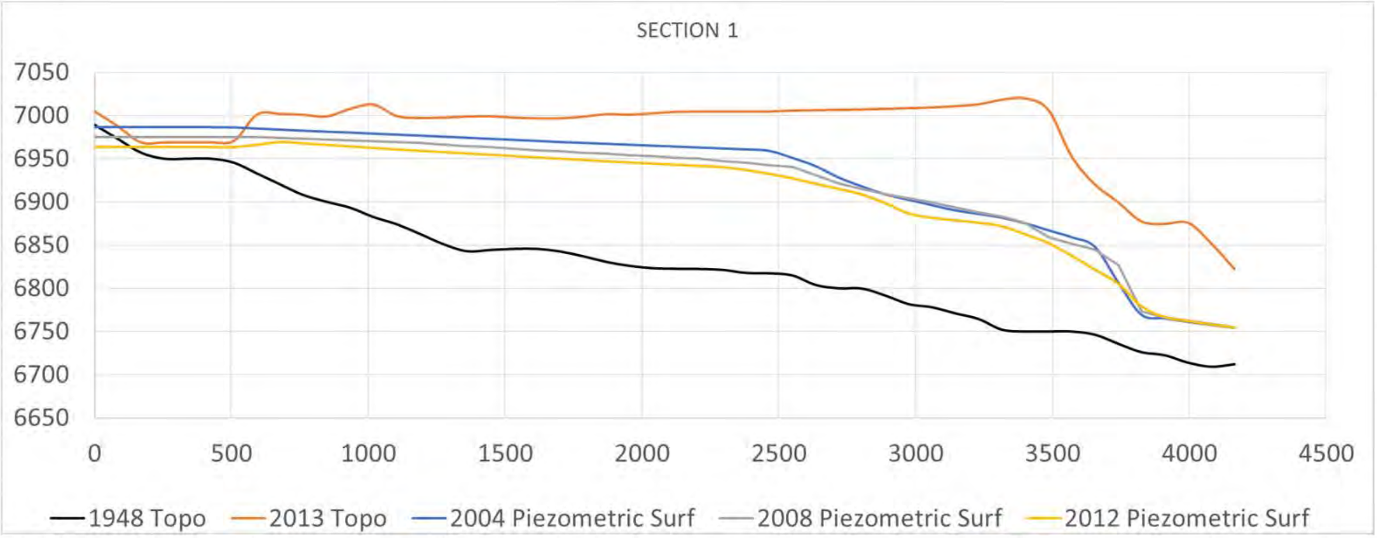
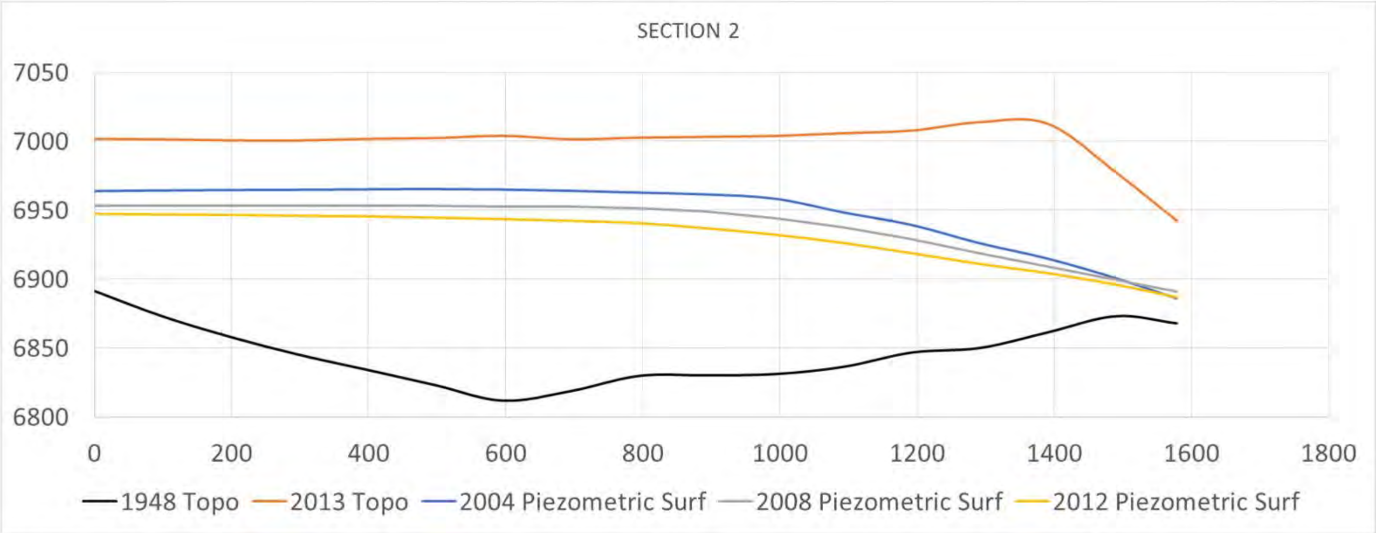
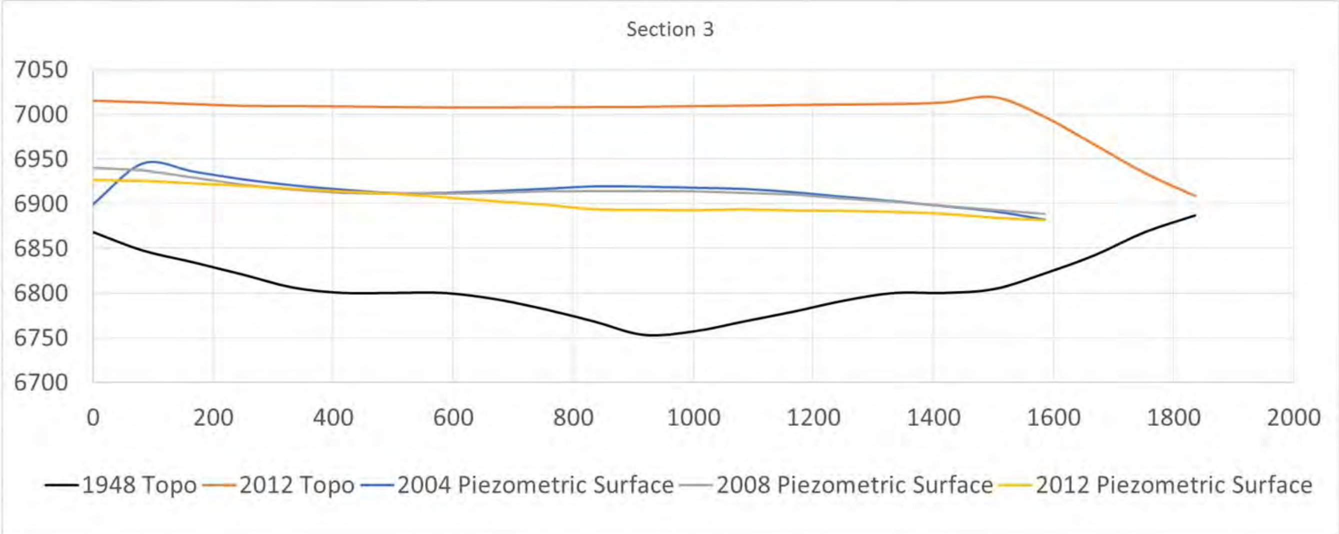
Job No.: 200189-002-02	Client: FCX-Cobre Mining Co.	Page 4 of 15
Task: MTI Drain Down	Computed By: W. Niccoli	Date: 10/07/14
	Checked By: D. Bauer	Date: 10/10/14

Calculations Continued:

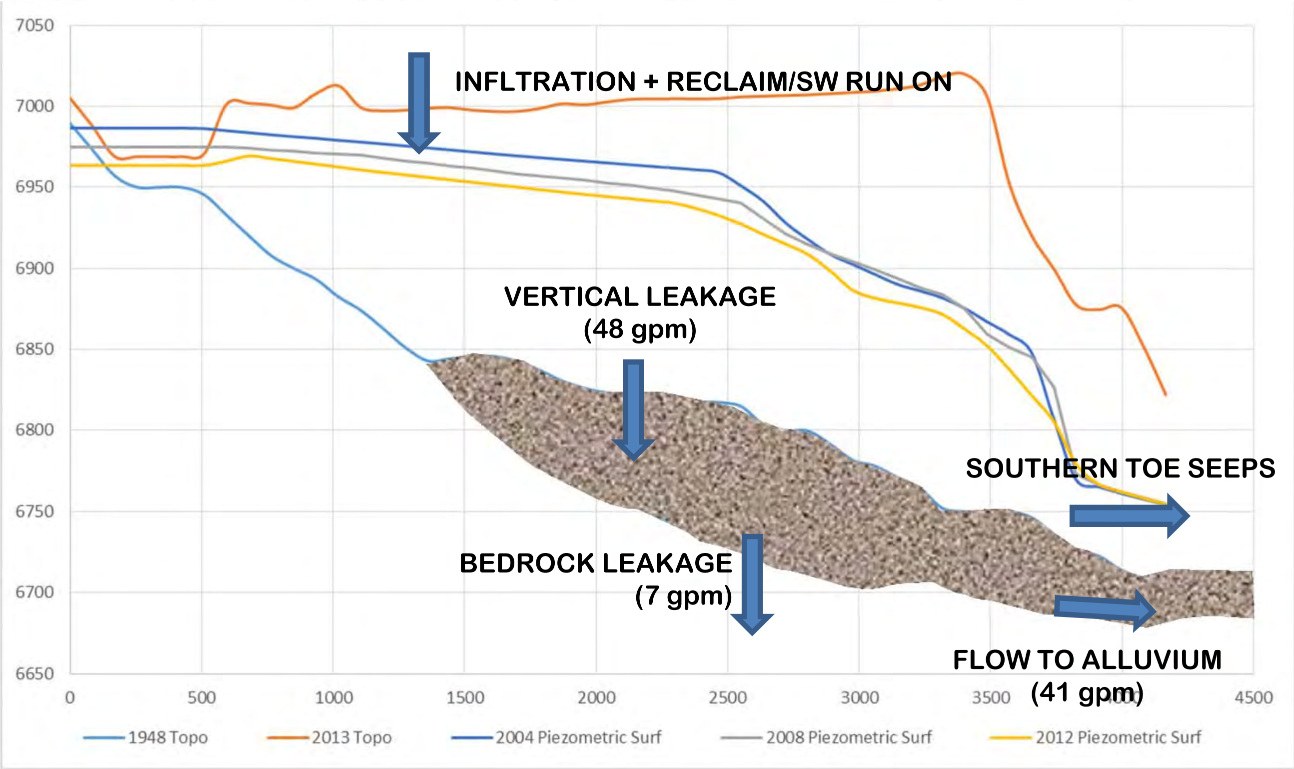


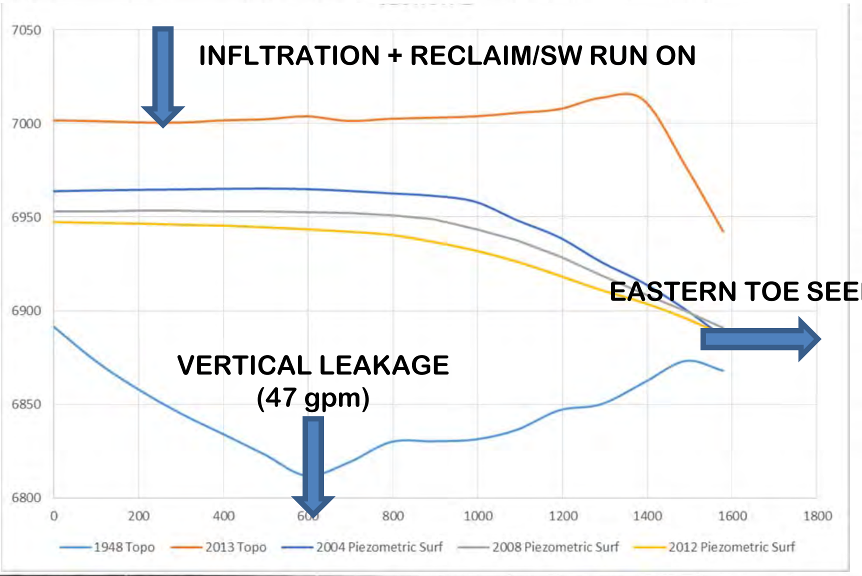




Calculations Con'd:

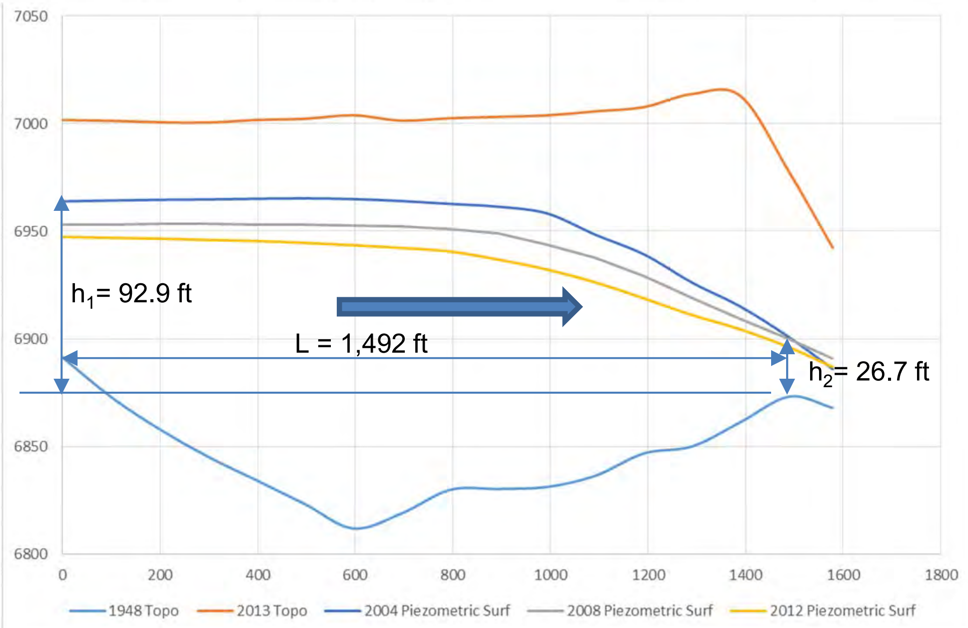
3. Update to the Conceptual Model used in 2009
   a. The 2009 Conceptual Model assumed that all drainage water moved vertically and then was distributed amongst the known (MTI seeps)
   b. For the update, separate the components into the eastern tailings seeps (those reporting to Upper Creek Pond), southern seeps (Dam Toe, Peach Tree, Weber), and bottom drainage

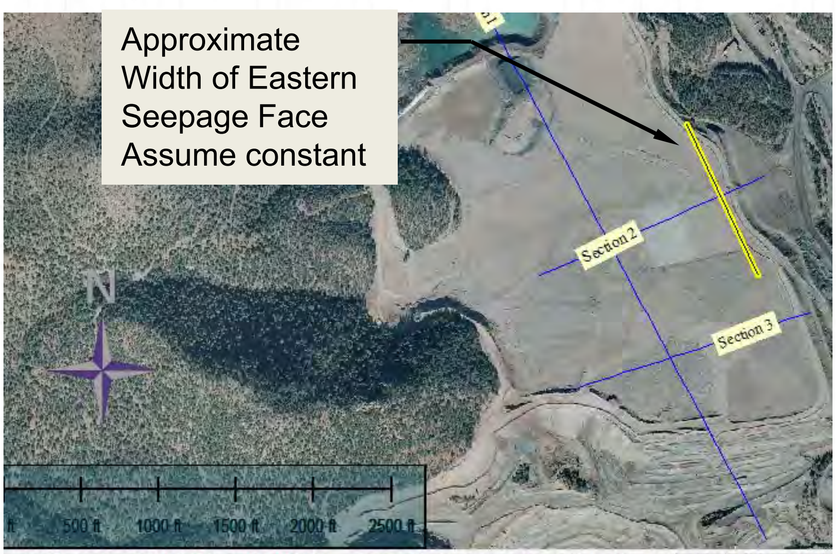




Calculations Con'd:

4. Build mathematical relationships to represent the three main drainage components
   a. Eastern Seeps: 2-D Darcy's Law based on non-confined conditions. Use water balance (adjust 2009 spreadsheet) to update for vertical infiltration. Assume only saturated portion above seep outlet is available for horizontal flow and h_2 = .0.288 h_1

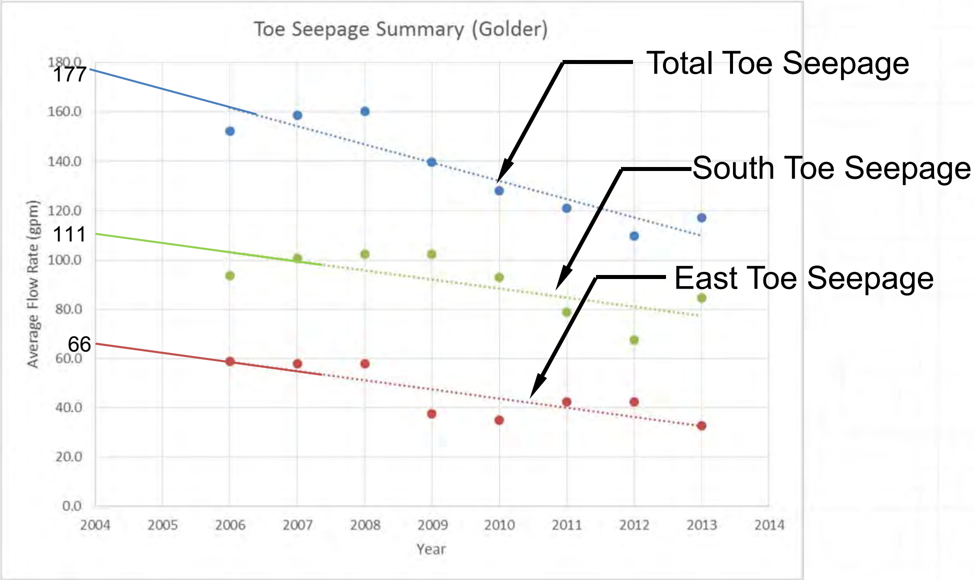




ft, Seq Brg: 154° 43' 53.1", Total Len: 1074 ft --> Cobre Mine Ortho-Dec-2013.sid (Cobre Mine Ort 1:8947 HOM B (NAD83)

Calculations Continued:

4. Build mathematical relationships to represent the three main drainage components
   a. Eastern Seeps: continued – project 2004 seepage rates (dots are from Golder, lines are projections)



Section 2 in 2004

$h_1 := 92.9 \cdot ft$

$h_2 := h_1 \cdot 0.288$

$W_{East} := 1075 \cdot ft$ $\quad L_{East} := 1492 \cdot ft$

Back calculate the horizontal hydraulic conductivity

$Q_{2004\_est} := 66 \cdot gpm$

$$K_{East} := \frac{Q_{2004\_est} \cdot 2 \cdot L_{East}}{(h_1 - h_2)^2 \cdot W_{East}}$$

$$K_{East} = 2.844 \times 10^{-3} \frac{cm}{s}$$

Section 2 in 2012

$h_1 := \frac{42 \cdot 50}{28} \cdot ft$ $\quad h_1 = 75\,ft$

$h_2 := h_1 \cdot 0.288$ $\quad h_2 = 21.6\,ft$

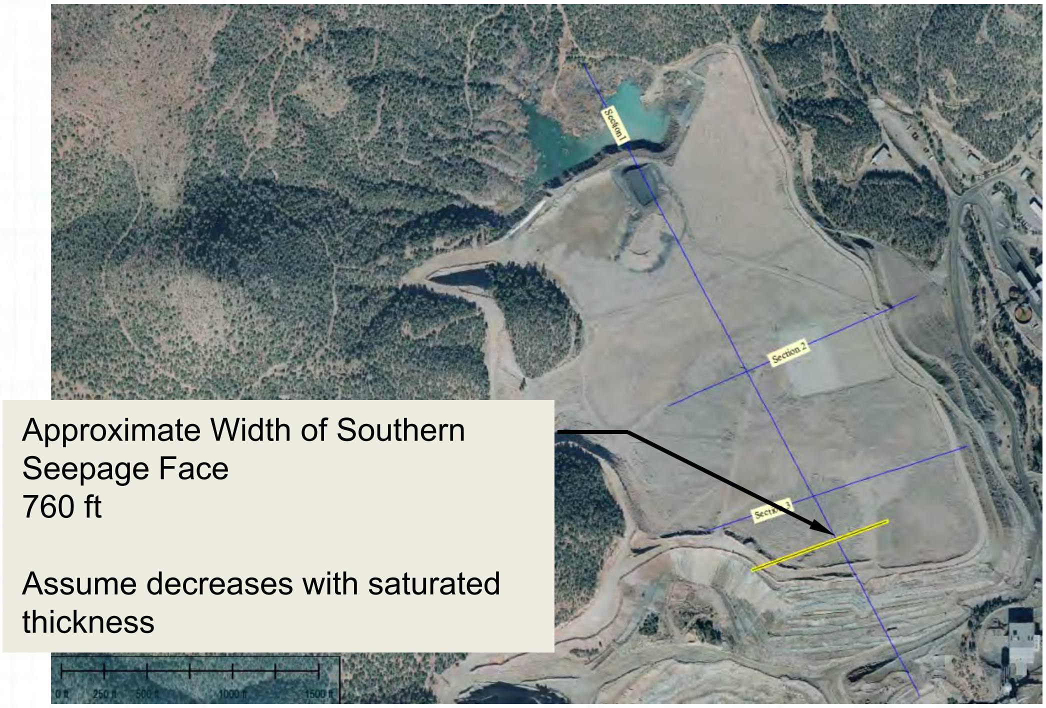
Project what the mathematical relationship would yield with 2012 data. (Golder measured 42 gpm)

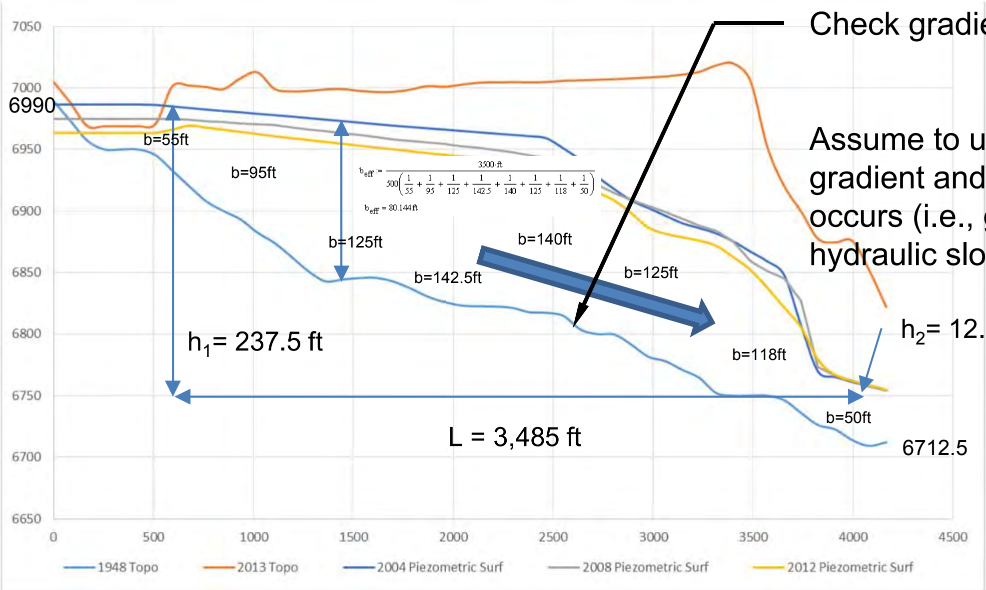
$$Q_{2012} := \frac{(h_1 - h_2)}{2} \cdot \frac{(h_1 - h_2)}{L_{East}} \cdot K_{East} \cdot W_{East}$$

$$Q_{2012} = 43.016\,gpm$$

Calculations Continued:

4. Build mathematical relationships to represent the three main drainage components
   b. Southern Seeps: continued – project 2004 seepage rate





Check gradient influence from slope

$$i_{grnd\_slope} := \frac{6990 - 6712.5}{3485} \qquad i_{grnd\_slope} = 0.08$$

$$i_{h2o} := \frac{237.5 - 12.5}{3485} \qquad i_{h2o} = 0.065$$

Assume to use ground slope as gradient and vary "b_{eff}" as drainage occurs (i.e., geologic slope is > than hydraulic slope)

Calculations Continued:

4. Build mathematical relationships to represent the three main drainage components
   b. Southern Seeps: continued – project 2004 seepage rate

Section 1 in 2004

$W_{south} := 760 \cdot ft$

$Q_{2004\_south\_est} := 111 \cdot gpm$

$$K_{south} := \frac{Q_{2004\_south\_est}}{b_{eff} \cdot W_{south} \cdot i_{grnd\_slope}} \qquad K_{south} = 1.554 \times 10^{-3} \cdot \frac{cm}{s}$$

Back calculate the horizontal hydraulic conductivity. Very close to the K east calculated earlier – good!

Section 1 in 2012

$$b_{eff\_2012} := \frac{3500 \cdot ft}{500\left(\frac{1}{35} + \frac{1}{77.5} + \frac{1}{107.5} + \frac{1}{120} + \frac{1}{115} + \frac{1}{112.5} + \frac{1}{100} + \frac{1}{50}\right)}$$

$b_{eff\_2012} = 65.608\,ft$

$$Q_{south\_2012} := b_{eff\_2012} \cdot W_{south} \cdot i_{grnd\_slope} \cdot K_{south} \qquad Q_{south\_2012} = 90.867 \cdot gpm$$

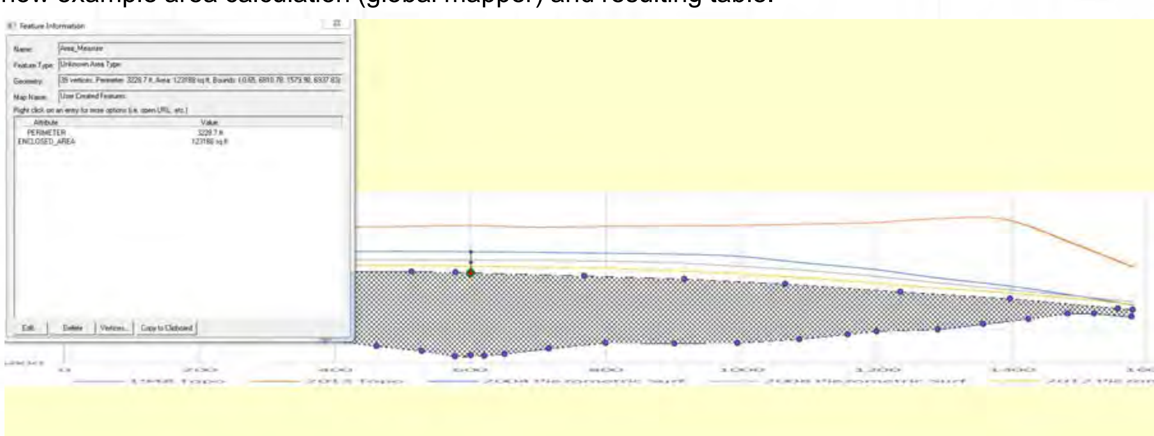
Project what the mathematical relationship would yield with 2012 data. Golder measured 67.3 gpm. 30% rpd…. May have to revisit this relationship. - likely have to vary the width because it gets smaller with shallower depths

Calculations Con'd:

4. Build mathematical relationships to represent the three main drainage components
   c. Vertical leakage – use previous one-dimensional analysis and fit to the 48 gpm estimated vertical leakage rate.

Relate b_{eff} to saturated volume curve:

Assume Section 2 and that its cross-sectional area is proportional to beff and the total saturated volume
Divide beff into 10 even sections and relate to the saturated volume
Show example area calculation (global mapper) and resulting table.



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Job No.: 200189-002-02	Client: FCX-Cobre Mining Co.	Page 10 of 15
Task: MTI Drain Down	Computed By: W. Niccoli	Date: 10/07/14
	Checked By: D. Bauer	Date: 10/10/14

Calculations Continued:

Relate b_{eff} to saturated volume curve as a starting point – this relationship will become one calibration parameter:

b_eff	Length Reduction Factor	Relative xsect area	Volume Factor	V (ft3)	V^2	V^3	V^4	V^5		predicted b_eff
80.144	1	169717	169717	232,593,015	5.41E+16	1.26E+25	2.93E+33	6.81E+41		80.26
72.1296	1	146119	146119	200,252,531	4.01E+16	8.03E+24	1.61E+33	3.22E+41		71.67
64.1152	1	123188	123188	168,826,154	2.85E+16	4.81E+24	8.12E+32	1.37E+41		64.35
56.1008	1	105846	105846	145,059,365	2.10E+16	3.05E+24	4.43E+32	6.42E+40		56.90
48.0864	1	86444	86444	118,469,397	1.40E+16	1.66E+24	1.97E+32	2.33E+40		47.48
40.072	1	68495	68495	93,870,729	8.81E+15	8.27E+23	7.76E+31	7.29E+39		39.45
32.0576	1	47669	47669	65,329,204	4.27E+15	2.79E+23	1.82E+31	1.19E+39		32.15
24.0432	1	28146	28146	38,573,407	1.49E+15	5.74E+22	2.21E+30	8.54E+37		25.39
16.0288	1	12722	12722	17,435,191	3.04E+14	5.30E+21	9.24E+28	1.61E+36		15.68
8.0144	1	2656.9	2656.9	3,641,217	1.33E+13	4.83E+19	1.76E+26	6.40E+32		4.11
0			0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00		-

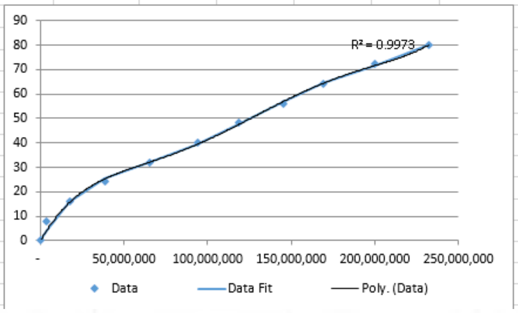
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999619475
R Square	0.999239095
Adjusted R Squ:	0.832065158
Standard Error	1.770888003
Observations	11

ANOVA

	df
Regression	5
Residual	6
Total	11

	Coefficients
Intercept	0
X Variable 1	1.20158E-06
X Variable 2	-2.04999E-14
X Variable 3	1.96227E-22
X Variable 4	-8.27397E-31
X Variable 5	1.26664E-39



Calculations Continued:

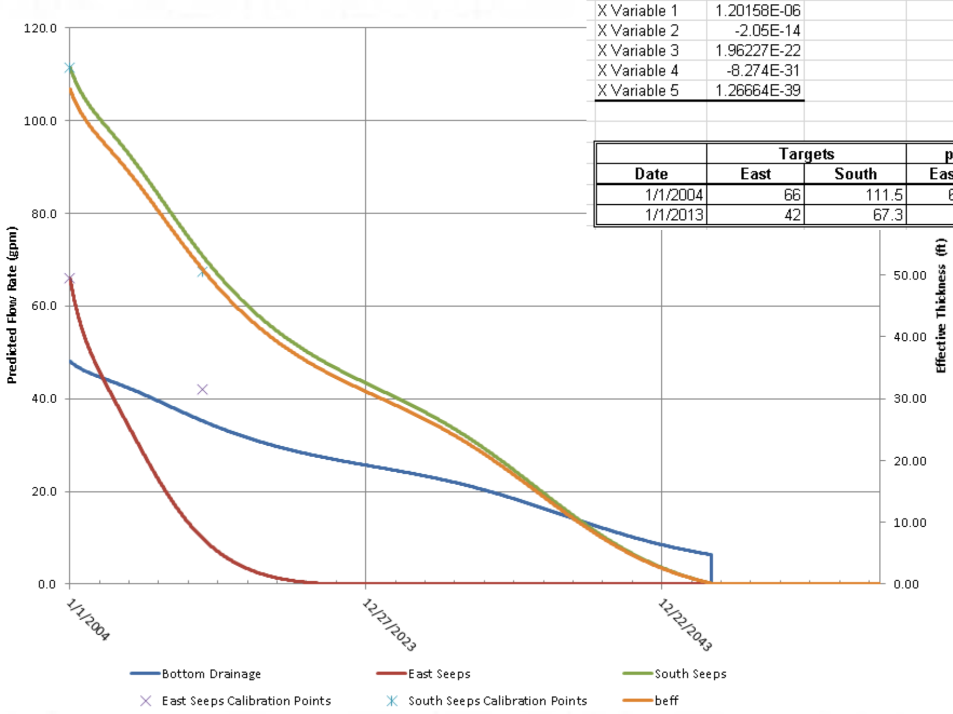
5. Update the water balance and calibrate to the two known drainage values. (Adjust previous xcel sheet)

Try 1

to calculate b_eff

	Coefficients
Intercept	0
X Variable 1	1.20158E-06
X Variable 2	-2.05E-14
X Variable 3	1.96227E-22
X Variable 4	-8.274E-31
X Variable 5	1.26664E-39

	Targets		prediction		RPD	
Date	East	South	East	South	East	South
1/1/2004	66	111.5	66.0	111.5	0%	0%
1/1/2013	42	67.3	9.8	70.7	-124%	5%



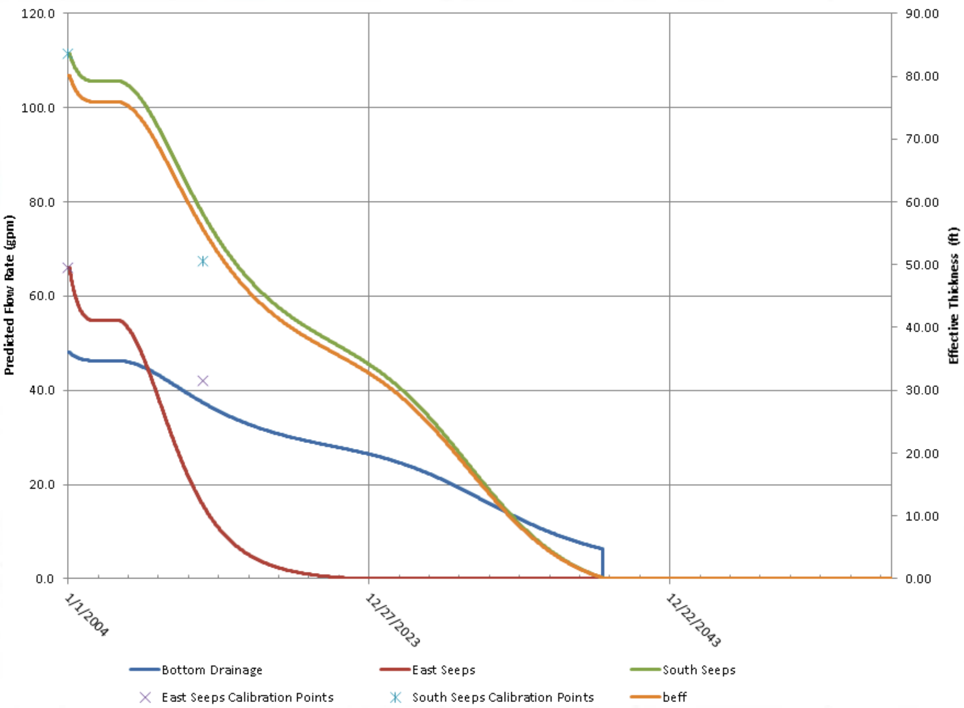
Under predicts drainage rates for east seeps and slightly over predicts south seeps in 2012

Try "flattening" out b_eff relationship

Calculations Continued:

5. Update the water balance and calibrate to the two known drainage values. (Adjust previous xcel sheet)

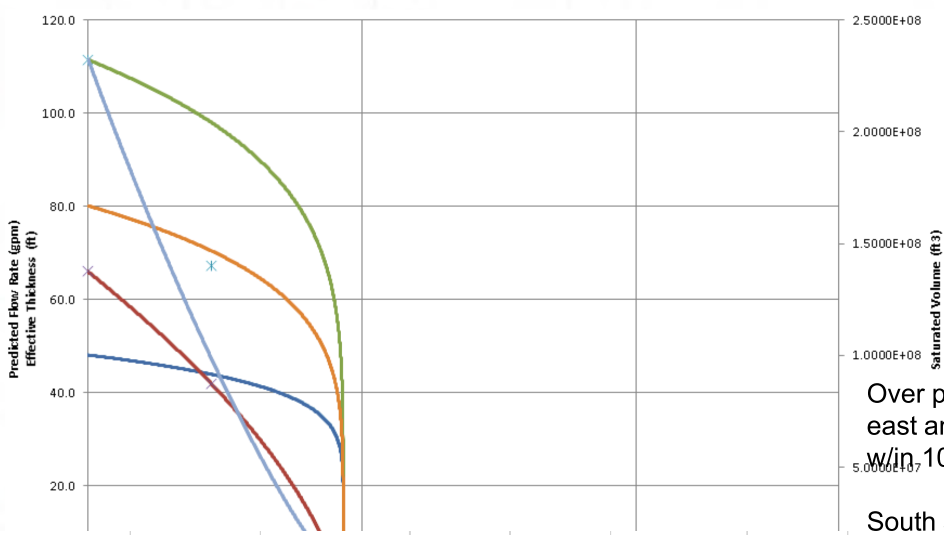
Try 2



Slight improvement over Try 1 - funky

Try flattening in a smoother function

Try 3 – last modification of the b_eff relationship – use power function to flatten out more at upper elevations



Over predicts drainage rates for east and south seeps. East seeps w/in 10% rpd thus acceptable.

South seeps – evaluate width relationship

	Targets		prediction		RPD	
Date	East	South	East	South	East	South
1/1/2004	66	111.5	66.0	111.5	0%	0%
1/1/2013	42	67.3	41.9	98.0	0%	37%

Calculations Continued:

5. Update the water balance and calibrate to the two known drainage values. (Adjust previous xcel sheet)

Try 4 – make the width of south seepage flow a function of b_eff (i.e., the valley narrows as depth / thickness drops) - try directly proportional first. Use Tr y 3 as a basis.

Improvement in the south seepage prediction, not within acceptable error

Try 5 – try 1/(X-y)

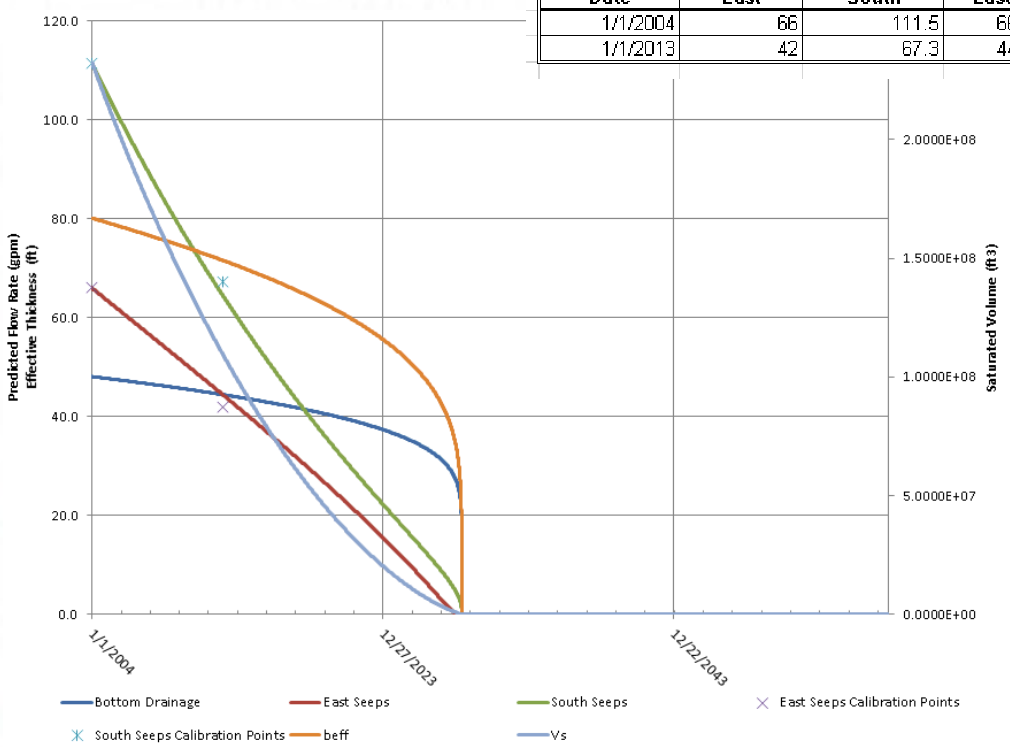
Under predict s south seepage rate - too extreme

Try 6 – a*exp(b*b_eff)

Under predict s south seepage rate – better but not w/in acceptable error

Try 7 – a*exp(b*b_eff+c)

	Targets		prediction		RPD	
Date	East	South	East	South	East	South
1/1/2004	66	111.5	66.0	111.5	0%	0%
1/1/2013	42	67.3	44.4	64.4	6%	-4%



Good error on both east and south seepage predictions – keep this solution.

Results:

The yearly seepage rates , based on try 7, combined east and south, needed in the water management cost estima

Post Cover	Current Average Seepage (gpm)
0	62.7
1	56.4
2	50.2
3	43.9
4	37.7
5	31.4
6	25.1
7	18.6
8	11.8
9	4.7
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0

Other results indirectly related to the predicted toe seepage rates are:

- Approximately 1.5 billion gallons of water are stored in the saturated zone of the MTI
- There are only approximately 20 more years for drain down to of interstitial water to occur

Discussion and Recommendations:

1. The calculation provides a comprehensive update to the 2009 predictions. The update more accurately represents the components of the conceptual model put forth in 2004 and that which is represented in other documents (e.g., Stage 1 GWAP)
2. The model was calibrated to two measured data points (outflows from the east and southern toe seepage areas), and to predictions of the bottom drainage. The model is not intricate enough to match the fluctuations measured in the toe seeps, but represents the average reduction in flows over the measurement period. While the bottom seepage rates cannot be measured, enough anecdotal information and other evidence exists to know that the range is fairly tight. Thus, these three calibration points in space and two in time provide an adequate measure upon which to gauge the current model's appropriateness in light of its intended use (provide drainage predictions for cost estimating)
3. The sensitivity of the model to various parameters was shown in the calculation section. Additionally, the model sensitivity to the following parameters was tested (results are in 20141003_Section.xlsx):
   a. Initial moisture content – not sensitive to calibration or long-term drainage
   b. Saturated moisture content – not sensitive to calibration or long-term drainage
   c. Residual moisture content – not sensitive to calibration or long-term drainage
   d. Calibration parameters – sensitive to calibration and long-term drainage
   e. Infiltration percentage – not sensitive to calibration or long-term drainage

   The model is most sensitivity to the vertical hydraulic conductivity (Kv) of the tailings material. The Kv dictates the bottom seepage rate and in turn impacts the volume of water stored in the tailings, which affects toe seepage rates. Because the bottom seepage rate cannot be measured, the sensitivity of the model to Kv introduces uncertainty. However, for the intent of the model (predicting toe seep quantities for costing purposes), the uncertainty is such that long-term closure water management costs are not greatly affected even if bottom seepage (very low Kv) were zero.
4. The 2004 through 2013 precipitation record used in the model was stochastically generated. Using the actual precipitation record, while more accurate, would not impact the results because the model is not sensitive to precipitation infiltration (as shown by the insensitivity to the infiltration factor).
5. One of the key calculations presented in this document is the total saturated volume in MTI (1.5 billion gallons). This estimate may be less, but probably not more because it is based on the assumed saturated volumetric moisture content (close to the total porosity). For fine grained, densified material 50% is an typical value. It may be as low as 30% , which results in approximately 1 billion gallons of water stored. A lower value would reduce the total water treated and result in a lower cost estimate.

Discussion and Recommendations Continued:

7. Recommend adding a process to describe the fluctuations in toe seepage rates. The measured toe seepage data appears to have a seasonal fluctuation to it, and also appears to correlate to the total precipitation. This model assumes that all of the toe seep flow is from the release of interstitial tailing water. It is likely a combination of infiltrating water on the outslopes and interstitial tailing water release. We know that the seasonal and yearly fluctuations are not large, and thus assuming that the seeps source totally from the interstitial water release will not have a large impact on the estimate of the water volume requiring management after reclamation.
8. Recommend updating the site wide water balance model with this approach as it will allow more accurate predictions of toe seeps and water that can be collected and managed.
9. Recommend repeating this exercise after another 4 or 5 years of data are collected. The passing of time and acquisition of precipitation and toe seepage data will make the analysis more robust and help distinguish the proportion of the different sources contributing to toe seepage.

Conclusions:

The objectives of this calculation set were to:

1. Provide a reasonable estimate of the drain down rates from the MTI
2. Support the 2014 CCP Update cost estimate

The calculation set met the objectives set forth as documented herein. The links in the cost estimating spreadsheets were updated and verified. The model provides a robust estimate of seepage from the MTI and is adequate for closure costing purposes.

APPENDIX C.3
COST CALCULATIONS

Water Management Cost Estimate

Ponds / Tanks

Location	Construction Type	Capacity (gallons)	Capacity (cy)	Pond Area (acres)	Age Today (yr)	Age at Reclamation (yr)	Removal Year** (yr)	First Replacement Year (yr)	Number of Replacements	**Direct Cost New and Replacement ($/ea)**	**Direct Cost New and Replacement ($)**	**Direct Cost Maintenance Ponds Closed Post Closure ($/yr)**	**Direct Cost Maintenance Ponds Closed Post Closure ($)**	**Direct Cost ($)**
SWRF Dam 1 (181-2003-Dam 1)	concrete dan	1,116,800	5,530	-	15	21	12	-	0	$69,454	$0	$1,042	$13,544	$13,544
SWRF Dam 2 (181-2003-Dam 2)	concrete dan	827,700	4,098	-	15	21	12	-	0	$69,454	$0	$1,042	$13,544	$13,544
SWRF Dam 3 (181-2003-Dam 3)	concrete dan	2,925,300	14,485	-	15	21	12	-	0	$69,454	$0	$1,042	$13,544	$13,544
Decant Pond #4	HDPE lined	972,500	4,815	0.62	15	21	12	9	1	$125,250	$125,250	$1,879	$24,424	$149,673
Upper Creek Containment Pond #1	HDPE lined	1,879,200	9,305	1.13	25	31	12	0	1	$229,069	$229,069	$3,436	$44,669	$273,738
Grape Gulch Pond #3	HDPE lined	911,600	4,514	0.38	25	31	12	0	1	$79,107	$79,107	$1,187	$15,426	$94,533
Blackman's Seep (Pond #2)	unlined	25,000	124	-	25	31	9	0	1	$185	$185	$3	$28	$213
Surge Tank***	steel	352,500	1,745	-	45	51	12	0	1	$171,094	$171,094	$2,566	$33,363	$204,457
Magnetite Seepage Pond	HDPE lined	9,600	48	0.20	25	31	12	0	1	$38,147	$38,147	$572	$7,439	$45,586
East WRF Containment	concrete	900,000	4,456	0.50	-5	1	12	-	0	$101,866	$0	$1,528	$19,864	$19,864
									Direct Annual Costs:	-	-	$14,296	-	-
									Direct Cost Subtotals:	-	$642,853	-	$185,842	**$828,695**

*Reclaim Pond and North Tailings Decant require no maintenance beyond what is already included in the Earthwork cost estimate for the site as a whole.
**Removal costs are included in earthwork portion of the cost estimate.
***Surge Tank is Industrial PMLU.

Water Management Cost Estimate

Pumps

$$H_f = \frac{10.44 Q^{1.85}}{C^{1.85} D_i^{4.865}}$$

From	To	Number	Age Today (yr)	Age at Reclamation (yr)	Removal Year (yr)	First Replacement Year (yr)	Number of Replacements	Average Combined Operational Pumping Rate (gpm)	Starting Elevation (ft)	Maximum Elevation (ft)	Head Loss (ft)	Head on Pump (ft)	Power (HP)	Operational Kilowatts (kW)	Stormwater Capture Area, Pumped Water only (acres)	Average Seepage through Reclamation year 5 (gal/year)	Direct Pump Cost New and Replacement ($/replacement)
SWRF Dam 1 (181-2003-Dam 1)	SWRF Dam 3 (181-2003-Dam 3)	2	11	17	12	3	1	1760	6650	6719	61	130	82	61	120.9	0	$60,000
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	2	11	17	12	3	1	1940	6613	6715	54	156	109	81	48.7	0	$60,000
SWRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	2	11	17	12	3	1	940	6556	6745	11	200	68	51	96.9	0	$50,000
Decant Pond #4	Booster Pump 2	2	20	26	12	0	1	3000	6688	6700	1	13	14	10	0	18001800	$50,000
Booster Pump 2	Surge Tank	2	20	26	12	0	1	3000	6700	6925	10	235	254	189	0	0	$50,000
Decant Pond #4	Reclaim Pond	2	20	26	5	0	1	1760	6688	7000	31	343	218	162	0	0	$60,000
Magnetite Interceptor Trench	Magnetite Tailings Seepage Pond	1	20	26	5	0	1	100	6670	6695	0	25	1	1	0	146643	$15,000
Magnetite Seepage Pond	Decant Pond #4	2	20	26	12	0	1	100	6695	6750	7	62	2	2	13.1	0	$30,000
Estrada Seep	Decant Pond #4	2	5	11	5	-	0	45	6575	6688	19	132	2	2	0	762541	$20,000
Union Hill Adit Seep	Decant Pond #4	2	5	11	5	-	0	30	6575	6688	96	209	2	2	0	169454	$20,000
Upper Creek Containment Pond #1	Surge Tank	2	20	26	12	0	1	1980	6810	6925	358	473	338	252	53.7	0	$60,000
Grape Gulch Pond #3	Surge Tank	2	20	26	12	0	1	1100	6775	6925	14	164	65	49	6.5	0	$60,000
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	1	20	26	9	0	1	125	6775	6810	0	35	2	1	0	0	$15,000
Surge Tank	Reclaim Pond	2	6	12	9	8	1	3497	6925	7000	26	101	128	95	0	0	$60,000
Reclaim Pond	Surge Tank	1	6	12	5	-	0	1240	7000	7010	46	56	25	19	316.1	0	$30,000
East WRF Containment	Decant Pond #4	2	-5	1	12	-	0	2000	6560	6688	70	198	143	106	69.8	423634	$20,000
tailings pipeline flushing																	
Mill No 1	Tailings Impoundment Top	1						4318	6825	7000	13	188	293	219			
Mill No 2	Tailings Impoundment Top	1						4318	6950	7000	13	63	98	73			

*Surge tank to bullfrog pipeline is gravity fed and thus pumping costs are not included.

Pumps (continued)

From	To	Post Closure Pre Completed Reclamation (Through Reclamation Year 5)					Post Closure Post Completed Reclamation (Reclamation Year 6 to 12)										
		Average Pumping Rate (gal/yr)	Operating Time (hr/yr)	Annual Electrical Usage (kWh/yr)	Direct Annual Operational Cost ($/yr)	Direct Operational Cost ($)	Average Pumping Rate (gal/yr)	Operating Time (hr/yr)	Annual Electrical Usage (kWh/yr)	Direct Annual Operational Cost ($/yr)	Direct Operational Cost ($)	**Direct Pump Cost New and Replacement ($)**	**Direct Cost Maintenance ($/yr)**	**Direct Cost Maintenance ($)**	**Direct Cost Removal ($)**	**Direct Cost ($)**	**Direct Cost Electricity and Fuel ($)**
SWRF Dam 1 (181-2003-Dam 1)	SWRF Dam 3 (181-2003-Dam 3)	5,821,936	55.1	3,381	198	1,191	305,888	3	178	$10	$73	$60,000	$900	$11,700	$10,000	$81,700	$1,264
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	2,345,147	20.1	1,636	96	576	123,216	1	86	$5	$35	$60,000	$900	$11,700	$10,000	$81,700	$611
SWRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	12,833,300	227.5	11,520	676	4,057	8,412,249	149	7,552	$443	$3,103	$50,000	$750	$9,750	$10,000	$69,750	$7,160
Decant Pond #4	Booster Pump 2	23,496,119	130.5	1,317	77	464	5,494,319	31	308	$18	$127	$50,000	$750	$9,750	$10,000	$69,750	$591
Booster Pump 2	Surge Tank	23,496,119	130.5	24,734	1,452	8,711	23,496,119	131	24,734	$1,452	$10,163	$50,000	$750	$9,750	$10,000	$69,750	$18,875
Decant Pond #4	Reclaim Pond	0	0.0	0	0	0	0	0	0	$0	$0	$60,000	$900	$5,400	$10,000	$75,400	$0
Magnetite Interceptor Trench	Magnetite Tailings Seepage Pond	146,643	24.4	17	1	6	146,643	24	17	$1	$0	$15,000	$225	$1,350	$5,000	$21,350	$6
Magnetite Seepage Pond	Decant Pond #4	777,473	129.6	216	13	76	179,787	30	50	$3	$21	$30,000	$450	$5,850	$10,000	$45,850	$96
Estrada Seep	Decant Pond #4	762,541	282.4	450	26	159	0	0	0	$0	$0	$0	$300	$1,800	$10,000	$11,800	$159
Union Hill Adit Seep	Decant Pond #4	169,454	94.1	159	9	56	0	0	0	$0	$0	$0	$300	$1,800	$10,000	$11,800	$56
Upper Creek Containment Pond #1	Surge Tank	2,585,922	21.8	5,485	322	1,932	135,866	1	288	$17	$118	$60,000	$900	$11,700	$10,000	$81,700	$2,050
Grape Gulch Pond #3	Surge Tank	313,007	4.7	231	14	81	16,446	0	12	$1	$5	$60,000	$900	$11,700	$10,000	$81,700	$86
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	0	0.0	0	0	0	0	0	0	$0	$0	$15,000	$225	$2,250	$5,000	$22,250	$0
Surge Tank	Reclaim Pond	0	0.0	0	0	0	0	0	0	$0	$0	$60,000	$900	$9,000	$10,000	$79,000	$0
Reclaim Pond	Surge Tank	15,221,786	204.6	-	658	3,947	799,763	11	35	$2	$0	$0	$450	$2,700	$5,000	$7,700	$3,947
East WRF Containment	Decant Pond #4	3,784,851	31.5	3,359	197	1,183	176,601	1	157	$9	$64	$0	$300	$3,900	$10,000	$13,900	$1,247
tailings pipeline flushing																$0	$0
Mill No 1	Tailings Impoundment Top	5,764,479	22.2	4,865								$286				$286	$0
Mill No 2	Tailings Impoundment Top	6,800,790	26.2	1,928								$113				$113	$0
	Direct Annual Costs:	-	-	-	$3,740	-	-	-	-	$1,961	-	-	$9,900	-	-	-	-
	Direct Cost Subtotals:	-	-	-	-	$22,439	-	-	-	-	$13,709	$570,399	-	$110,100	$145,000	**$825,499**	**$36,148**

Water Management Cost Estimate

Pipelines

From	To	Material	Length (ft)	Inside Diameter (in)	Age Today (yr)	Age at Reclamation (yr)	Removal Year (yr)	Reclamation Replacement Year (yr)	Number of Replacements	Direct Cost New and Replacement ($/ft)	Direct Cost Removal ($/ft)	Direct Cost New and Replacement ($/ea)	**Direct Cost New and Replacement ($)**	**Direct Cost Maintenance ($/yr)**	**Direct Cost Maintenance ($)**	**Direct Cost Removal ($)**	**Direct Cost ($)**
SWRF Dam 1 (181-2003-Dam 1)	SWRF Dam 3 (181-2003-Dam 3)	HDPE	4,466	10	11	17	12	-	0	$23.56	$2.77	$105,197	$0	$1,051.97	$13,675.60	$12,369	$26,045.04
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	HDPE	3,300	10	11	17	12	-	0	$23.56	$2.77	$77,732	$0	$777.32	$10,105.13	$9,140	$19,245.10
SWRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	HDPE	220	6	11	17	12	-	0	$12.15	$1.66	$2,674	$0	$26.74	$347.62	$365	$712.84
Decant Pond #4	Booster Pump 2	HDPE	100	15	20	26	12	-	0	$50.35	$2.77	$5,035	$0	$50.35	$654.60	$277	$931.57
Booster Pump 2	Surge Tank	HDPE	1,936	15	20	26	12	-	0	$50.35	$2.77	$97,486	$0	$974.86	$12,673.13	$5,362	$18,035.25
Decant Pond #4	Reclaim Pond	HDPE	5,502	12	20	26	5	-	0	$26.68	$2.77	$146,796	$0	$1,467.96	$8,807.77	$15,239	$24,046.60
Magnetite Interceptor Trench	Magnetite Tailings Seepage Pond	HDPE	200	5	20	26	5	-	0	$12.15	$1.66	$2,431	$0	$24.31	$145.85	$332	$477.88
Magnetite Seepage Pond	Decant Pond #4	HDPE	1,188	4	20	26	12	-	0	$8.45	$1.19	$10,042	$0	$100.42	$1,305.49	$1,409	$2,714.22
Estrada Seep	Decant Pond #4	HDPE	3,470	3	20	26	5	-	0	$8.45	$1.19	$29,332	$0	$293.32	$1,759.93	$4,115	$5,874.65
Union Hill Adit Seep	Decant Pond #4	HDPE	5,250	2	20	26	5	-	0	$8.45	$1.19	$44,379	$0	$443.79	$2,662.71	$6,225	$8,888.16
Upper Creek Containment Pond #1	Surge Tank	HDPE	1,770	6	20	26	12	-	0	$12.15	$1.66	$21,513	$0	$215.13	$2,796.74	$2,938	$5,735.15
Upper Creek Containment Pond #1	Surge Tank	HDPE	1,770	8	20	26	12	-	0	$15.22	$1.66	$26,940	$0	$269.40	$3,502.26	$2,938	$6,440.67
Grape Gulch Pond #3	Surge Tank	HDPE	861	8	20	26	12	-	0	$15.22	$1.66	$13,105	$0	$131.05	$1,703.64	$1,429	$3,133.00
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	HDPE	100	5	20	26	9	-	0	$12.15	$1.66	$1,215	$0	$12.15	$121.54	$166	$287.56
Surge Tank	Bullfrog pipeline *	HDPE	31,850	8	3	9	12	-	0	$15.22	-	$484,776	$0	$4,847.76	$63,020.85	$0	$63,020.85
Surge Tank	Reclaim Pond	HDPE	3,923	15	20	26	9	-	0	$43.32	$2.77	$169,960	$0	$1,699.60	$16,996.02	$10,865	$27,861.52
Reclaim Pond	Surge Tank	HDPE	3,855	9	20	26	5	-	0	$15.22	$2.77	$58,675	$0	$586.75	$3,520.52	$10,677	$14,197.68
East WRF Containment	Decant Pond #4	HDPE	4,073	10	-5	1	12	-	0	$23.56	$2.77	$95,940	$0	$959.40	$12,472.17	$11,281	$23,753.12
tailings pipeline flushing																	
Mill No 1	Tailings Impoundment Top	HDPE	6,850	21													
Mill No 2	Tailings Impoundment Top	HDPE	6,850	21													
												Direct Annual Costs:	-	$13,932	-	-	-
												Direct Cost Subtotals:	$0	-	$156,271.59	$95,129	**$251,401**

*Bullfrog pipeline has an Industrial PMLU

Electrical Infrastructure

From	To	Line (ft)	Number of Poles	Removal Year	Direct Cost Pole and crossarm ($)	Direct Cost Wiring Installation ($)	Number Transformer Stations	Direct Cost Transformer ($)	Direct Cost Electrical Panel ($)	Direct Cost New ($)	**Direct Cost Maintenance ($/yr)**	**Direct Cost Maintenance ($)**	**Direct Cost Removal ($)**	**Direct Cost ($)**
SWRF Dam 1 (181-2003-Dam 1)	SWRF Dam 2 (181-2003-Dam 2)	1,166	13	12	$23,859	$2,627	2	$8,102	$20,000	$54,588	$819	$10,645	$3,138	$13,783
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	3,300	34	12	$62,401	$7,434	2	$8,102	$20,000	$97,937	$1,469	$19,098	$8,207	$27,305
SWRF Dam 3 (181-2003-Dam 3)	Road	220	4	12	$7,341	$496	2	$8,102	$20,000	$35,938	$539	$7,008	$966	$7,974
Decant Pond #4	Surge Tank	2,036	22	12	$40,377	$4,587	2	$8,102	$20,000	$73,065	$1,096	$14,248	$5,311	$19,558
Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2)	Office Area	582	7	12	$12,847	$1,311	1	$4,051	$10,000	$28,209	$423	$5,501	$1,690	$7,191
Surge Tank	Upper Creek Containment Pond 1	1,770	19	12	$34,871	$3,987	1	$4,051	$10,000	$52,909	$794	$10,317	$4,587	$14,904
Magnetite Tailings Seepage Pond	Decant Pond #4	1,188	13	5	$23,859	$2,676	1	$4,051	$10,000	$40,586	$609	$3,653	$3,138	$6,791
Estrada Seep	Road	500	6	5	$11,012	$1,126	1	$4,051	$10,000	$26,189	$393	$2,357	$1,448	$3,805
Union Hill Adit Seep	Road	727	9	5	$16,518	$1,638	1	$4,051	$10,000	$32,206	$483	$2,899	$2,173	$5,071
East WRF Containment	Decant Pond #4	4,582	47	12	$86,260	$10,322	1	$4,051	$10,000	$110,633	$1,660	$21,574	$11,346	$32,919
Office Area	Road	2,327	25	12	$45,883	$5,242	1	$4,051	$10,000	$65,176	$978	$12,709	$6,035	$18,744
									Direct Annual Costs:	-	$9,262		-	-
									Direct Cost Subtotals:	-	-	$110,007	$48,038	**$158,045**

Environmental Sampling, Analysis and Reporting [1]

Shipping and Analysis					Reporting						
Shipping (coolers per sample)	Shipping Cost ($/cooler)	Shipping Cost ($/sample)	Analysis ($/sample)	Analysis and Shipping Cost ($/sample)	Labor (hours/sample)	Reporting (hour/sample)	Rate ($/hour)	Review Work per Sample (hours)	Review Work Rate ($/hour)	Reporting Cost ($/sample)	Total Sample Cost ($/sample)
0.14	$ 70	$ 10	$ 230	$ 240	1.0	0.5	$ 60	0.1	$ 70	$ 100	$ 340

[1] Sampling vehicles and equipment are assumed to be included in the routine duty for site personnel.

Sampling Schedule and Cost

	Tailings			Stockpiles			Intercept Wells				Sampling		Yearly
Year	Quarterly	Semi-Annual	Annual	Quarterly	Semi-Annual	Annual	Quarterly	Semi-Annual	Annual	Total Well Locations	Events Per Year	Cost ($/sample)	Cost ($)
0-5	1			4			2			7	4	$ 340	$ 9,520
5 - 12		1			4			2		7	2	$ 340	$ 4,760
12-99			1			4			2	7	1	$ 340	$ 2,380
												Total Cost Years 0-99	**$ 290,360**

Energy Labs Unit Rates:
23 Constituents. Energy Laboratories, Inc., 2013. Published price list (www.energylab.com).

aluminum	$ 10	
arsenic	$ 10	
bicarbonate	$ 10	
cadmium	$ 10	
calcium	$ 10	
carbonate	$ 10	
chloride	$ -	included w/ bicarbonate
chromium	$ 10	
cobalt	$ 10	
copper	$ 10	
fluoride	$ 10	
iron	$ 5	$10/2 only need to sample twice per year as opposed to each quarter
lead	$ 15	
magnesium	$ 10	
manganese	$ 10	
nickel	$ 10	
nitrate	$ 10	
potassium	$ 10	
selenium	$ 10	
sodium	$ 10	
sulfate	$ 10	
total dissolved solids	$ 20	
zinc	$ 10	
	$ 230	

Water Management Cash Flow

Capital Indirect Costs Percentage	28.3%
O&M Indirect Costs Percentage	17%
Electricity, Fuel, and Environmental Sampling Indirect Costs Percentage	0%

PONDS & TANKS

Year	Capital Annual Cost	O&M Annual Cost ($)
0	$664,084	$16,727
1	$0	$16,727
2	$0	$16,727
3	$0	$16,727
4	$0	$16,727
5	$0	$16,727
6	$0	$16,727
7	$0	$16,727
8	$0	$16,727
9	$160,695	$16,727
10	$0	$16,723
11	$0	$16,723
12	$0	$16,723
13	$0	$0
14	$0	$0
15	$0	$0
16	$0	$0
17	$0	$0
18	$0	$0
19	$0	$0
20	$0	$0
21	$0	$0
22	$0	$0
23	$0	$0
24	$0	$0
25	$0	$0
26	$0	$0
27	$0	$0
28	$0	$0
29	$0	$0
30	$0	$0
31	$0	$0
32	$0	$0
33	$0	$0
34	$0	$0
35	$0	$0
36	$0	$0
37	$0	$0
38	$0	$0
39	$0	$0
40	$0	$0
41	$0	$0
42	$0	$0
43	$0	$0
44	$0	$0
45	$0	$0
46	$0	$0
47	$0	$0
48	$0	$0
49	$0	$0
50	$0	$0
51	$0	$0
52	$0	$0
53	$0	$0
54	$0	$0
55	$0	$0
56	$0	$0
57	$0	$0
58	$0	$0
59	$0	$0

PUMPS

Year	Capital Annual Cost	Removal Annual Cost	Electricity and Fuel Annual Cost ($)	O&M Annual Cost ($)
0	$436,732	$0	$3,740	$11,583
1	$0	$0	$3,740	$11,583
2	$0	$0	$3,740	$11,583
3	$218,110	$0	$3,740	$11,583
4	$0	$0	$3,740	$11,583
5	$0	$51,320	$3,740	$11,583
6	$0	$0	$1,958	$9,038
7	$0	$0	$1,958	$9,038
8	$76,980	$0	$1,958	$9,038
9	$0	$19,245	$1,958	$9,038
10	$0	$0	$1,958	$7,722
11	$0	$0	$1,958	$7,722
12	$0	$115,470	$1,958	$7,722
13	$0	$0	$0	$0
14	$0	$0	$0	$0
15	$0	$0	$0	$0
16	$0	$0	$0	$0
17	$0	$0	$0	$0
18	$0	$0	$0	$0
19	$0	$0	$0	$0
20	$0	$0	$0	$0
21	$0	$0	$0	$0
22	$0	$0	$0	$0
23	$0	$0	$0	$0
24	$0	$0	$0	$0
25	$0	$0	$0	$0
26	$0	$0	$0	$0
27	$0	$0	$0	$0
28	$0	$0	$0	$0
29	$0	$0	$0	$0
30	$0	$0	$0	$0
31	$0	$0	$0	$0
32	$0	$0	$0	$0
33	$0	$0	$0	$0
34	$0	$0	$0	$0
35	$0	$0	$0	$0
36	$0	$0	$0	$0
37	$0	$0	$0	$0
38	$0	$0	$0	$0
39	$0	$0	$0	$0
40	$0	$0	$0	$0
41	$0	$0	$0	$0
42	$0	$0	$0	$0
43	$0	$0	$0	$0
44	$0	$0	$0	$0
45	$0	$0	$0	$0
46	$0	$0	$0	$0
47	$0	$0	$0	$0
48	$0	$0	$0	$0
49	$0	$0	$0	$0
50	$0	$0	$0	$0
51	$0	$0	$0	$0
52	$0	$0	$0	$0
53	$0	$0	$0	$0
54	$0	$0	$0	$0
55	$0	$0	$0	$0
56	$0	$0	$0	$0
57	$0	$0	$0	$0
58	$0	$0	$0	$0
59	$0	$0	$0	$0

PIPELINES

Year	Capital Annual Cost	Removal Annual Cost	Maintenance Annual Cost ($)
0	$0	$0	$16,301
1	$0	$0	$16,301
2	$0	$0	$16,301
3	$0	$0	$16,301
4	$0	$0	$16,301
5	$0	$46,943	$16,301
6	$0	$0	$13,006
7	$0	$0	$13,006
8	$0	$0	$13,006
9	$0	$14,153	$13,006
10	$0	$0	$11,003
11	$0	$0	$11,003
12	$0	$60,955	$11,003
13	$0	$0	$0
14	$0	$0	$0
15	$0	$0	$0
16	$0	$0	$0
17	$0	$0	$0
18	$0	$0	$0
19	$0	$0	$0
20	$0	$0	$0
21	$0	$0	$0
22	$0	$0	$0
23	$0	$0	$0
24	$0	$0	$0
25	$0	$0	$0
26	$0	$0	$0
27	$0	$0	$0
28	$0	$0	$0
29	$0	$0	$0
30	$0	$0	$0
31	$0	$0	$0
32	$0	$0	$0
33	$0	$0	$0
34	$0	$0	$0
35	$0	$0	$0
36	$0	$0	$0
37	$0	$0	$0
38	$0	$0	$0
39	$0	$0	$0
40	$0	$0	$0
41	$0	$0	$0
42	$0	$0	$0
43	$0	$0	$0
44	$0	$0	$0
45	$0	$0	$0
46	$0	$0	$0
47	$0	$0	$0
48	$0	$0	$0
49	$0	$0	$0
50	$0	$0	$0
51	$0	$0	$0
52	$0	$0	$0
53	$0	$0	$0
54	$0	$0	$0
55	$0	$0	$0
56	$0	$0	$0
57	$0	$0	$0
58	$0	$0	$0
59	$0	$0	$0

ELECTRICAL INFRASTRUCTURE

Year	Removal Annual Cost	Maintenance Annual Cost ($)
0	$0	$10,836
1	$0	$10,836
2	$0	$10,836
3	$0	$10,836
4	$0	$10,836
5	$8,672	$10,836
6	$0	$9,099
7	$0	$9,099
8	$0	$9,099
9	$0	$9,099
10	$0	$9,099
11	$0	$9,099
12	$52,960	$9,099
13	$0	$0
14	$0	$0
15	$0	$0
16	$0	$0
17	$0	$0
18	$0	$0
19	$0	$0
20	$0	$0
21	$0	$0
22	$0	$0
23	$0	$0
24	$0	$0
25	$0	$0
26	$0	$0
27	$0	$0
28	$0	$0
29	$0	$0
30	$0	$0
31	$0	$0
32	$0	$0
33	$0	$0
34	$0	$0
35	$0	$0
36	$0	$0
37	$0	$0
38	$0	$0
39	$0	$0
40	$0	$0
41	$0	$0
42	$0	$0
43	$0	$0
44	$0	$0
45	$0	$0
46	$0	$0
47	$0	$0
48	$0	$0
49	$0	$0
50	$0	$0
51	$0	$0
52	$0	$0
53	$0	$0
54	$0	$0
55	$0	$0
56	$0	$0
57	$0	$0
58	$0	$0
59	$0	$0

ENVIROMENTAL SAMPLING

Year	Annual Cost ($)	Total Cash Flow ($)
0	$9,520	$1,169,522
1	$9,520	$68,706
2	$9,520	$68,706
3	$9,520	$286,816
4	$9,520	$68,706
5	$4,760	$170,881
6	$4,760	$54,588
7	$4,760	$54,588
8	$4,760	$131,568
9	$4,760	$248,682
10	$4,760	$51,266
11	$4,760	$51,266
12	$2,380	$278,271
13	$2,380	$2,380
14	$2,380	$2,380
15	$2,380	$2,380
16	$2,380	$2,380
17	$2,380	$2,380
18	$2,380	$2,380
19	$2,380	$2,380
20	$2,380	$2,380
21	$2,380	$2,380
22	$2,380	$2,380
23	$2,380	$2,380
24	$2,380	$2,380
25	$2,380	$2,380
26	$2,380	$2,380
27	$2,380	$2,380
28	$2,380	$2,380
29	$2,380	$2,380
30	$2,380	$2,380
31	$2,380	$2,380
32	$2,380	$2,380
33	$2,380	$2,380
34	$2,380	$2,380
35	$2,380	$2,380
36	$2,380	$2,380
37	$2,380	$2,380
38	$2,380	$2,380
39	$2,380	$2,380
40	$2,380	$2,380
41	$2,380	$2,380
42	$2,380	$2,380
43	$2,380	$2,380
44	$2,380	$2,380
45	$2,380	$2,380
46	$2,380	$2,380
47	$2,380	$2,380
48	$2,380	$2,380
49	$2,380	$2,380
50	$2,380	$2,380
51	$2,380	$2,380
52	$2,380	$2,380
53	$2,380	$2,380
54	$2,380	$2,380
55	$2,380	$2,380
56	$2,380	$2,380
57	$2,380	$2,380
58	$2,380	$2,380
59	$2,380	$2,380

Water Management Cash Flow

Capital Indirect Costs Percentage	28.3%
O&M Indirect Costs Percentage	17%
Electricity, Fuel, and Environmental Sampling Indirect Costs Percentage	0%

PONDS & TANKS

Year	Capital Annual Cost	O&M Annual Cost ($)
60	$0	$0
61	$0	$0
62	$0	$0
63	$0	$0
64	$0	$0
65	$0	$0
66	$0	$0
67	$0	$0
68	$0	$0
69	$0	$0
70	$0	$0
71	$0	$0
72	$0	$0
73	$0	$0
74	$0	$0
75	$0	$0
76	$0	$0
77	$0	$0
78	$0	$0
79	$0	$0
80	$0	$0
81	$0	$0
82	$0	$0
83	$0	$0
84	$0	$0
85	$0	$0
86	$0	$0
87	$0	$0
88	$0	$0
89	$0	$0
90	$0	$0
91	$0	$0
92	$0	$0
93	$0	$0
94	$0	$0
95	$0	$0
96	$0	$0
97	$0	$0
98	$0	$0
99	$0	$0
Total Cost	$824,780	$217,436
al Direct Cost	$642,853	$185,842

Total Cost	**$2,910,627**
Total Direct Cost	**$2,390,148**

PUMPS

Year	Capital Annual Cost	Removal Annual Cost	Electricity and Fuel Annual Cost ($)	O&M Annual Cost ($)
60	$0	$0	$0	$0
61	$0	$0	$0	$0
62	$0	$0	$0	$0
63	$0	$0	$0	$0
64	$0	$0	$0	$0
65	$0	$0	$0	$0
66	$0	$0	$0	$0
67	$0	$0	$0	$0
68	$0	$0	$0	$0
69	$0	$0	$0	$0
70	$0	$0	$0	$0
71	$0	$0	$0	$0
72	$0	$0	$0	$0
73	$0	$0	$0	$0
74	$0	$0	$0	$0
75	$0	$0	$0	$0
76	$0	$0	$0	$0
77	$0	$0	$0	$0
78	$0	$0	$0	$0
79	$0	$0	$0	$0
80	$0	$0	$0	$0
81	$0	$0	$0	$0
82	$0	$0	$0	$0
83	$0	$0	$0	$0
84	$0	$0	$0	$0
85	$0	$0	$0	$0
86	$0	$0	$0	$0
87	$0	$0	$0	$0
88	$0	$0	$0	$0
89	$0	$0	$0	$0
90	$0	$0	$0	$0
91	$0	$0	$0	$0
92	$0	$0	$0	$0
93	$0	$0	$0	$0
94	$0	$0	$0	$0
95	$0	$0	$0	$0
96	$0	$0	$0	$0
97	$0	$0	$0	$0
98	$0	$0	$0	$0
99	$0	$0	$0	$0
	$731,822	$186,035	$36,148	$128,817
	$570,399	$145,000	$36,148	$110,100

PIPELINES

Year	Capital Annual Cost	Removal Annual Cost	Maintenance Annual Cost ($)
60	$0	$0	$0
61	$0	$0	$0
62	$0	$0	$0
63	$0	$0	$0
64	$0	$0	$0
65	$0	$0	$0
66	$0	$0	$0
67	$0	$0	$0
68	$0	$0	$0
69	$0	$0	$0
70	$0	$0	$0
71	$0	$0	$0
72	$0	$0	$0
73	$0	$0	$0
74	$0	$0	$0
75	$0	$0	$0
76	$0	$0	$0
77	$0	$0	$0
78	$0	$0	$0
79	$0	$0	$0
80	$0	$0	$0
81	$0	$0	$0
82	$0	$0	$0
83	$0	$0	$0
84	$0	$0	$0
85	$0	$0	$0
86	$0	$0	$0
87	$0	$0	$0
88	$0	$0	$0
89	$0	$0	$0
90	$0	$0	$0
91	$0	$0	$0
92	$0	$0	$0
93	$0	$0	$0
94	$0	$0	$0
95	$0	$0	$0
96	$0	$0	$0
97	$0	$0	$0
98	$0	$0	$0
99	$0	$0	$0
	$0	$122,051	$182,838
	$0	$95,129	$156,272

ELECTRICAL INFRASTRUCTURE

Year	Removal Annual Cost	Maintenance Annual Cost ($)
60	$0	$0
61	$0	$0
62	$0	$0
63	$0	$0
64	$0	$0
65	$0	$0
66	$0	$0
67	$0	$0
68	$0	$0
69	$0	$0
70	$0	$0
71	$0	$0
72	$0	$0
73	$0	$0
74	$0	$0
75	$0	$0
76	$0	$0
77	$0	$0
78	$0	$0
79	$0	$0
80	$0	$0
81	$0	$0
82	$0	$0
83	$0	$0
84	$0	$0
85	$0	$0
86	$0	$0
87	$0	$0
88	$0	$0
89	$0	$0
90	$0	$0
91	$0	$0
92	$0	$0
93	$0	$0
94	$0	$0
95	$0	$0
96	$0	$0
97	$0	$0
98	$0	$0
99	$0	$0
	$61,632	$128,709
	$48,038	$110,007

ENVIROMENTAL SAMPLING

Year	Annual Cost ($)	Total Cash Flow ($)
60	$2,380	$2,380
61	$2,380	$2,380
62	$2,380	$2,380
63	$2,380	$2,380
64	$2,380	$2,380
65	$2,380	$2,380
66	$2,380	$2,380
67	$2,380	$2,380
68	$2,380	$2,380
69	$2,380	$2,380
70	$2,380	$2,380
71	$2,380	$2,380
72	$2,380	$2,380
73	$2,380	$2,380
74	$2,380	$2,380
75	$2,380	$2,380
76	$2,380	$2,380
77	$2,380	$2,380
78	$2,380	$2,380
79	$2,380	$2,380
80	$2,380	$2,380
81	$2,380	$2,380
82	$2,380	$2,380
83	$2,380	$2,380
84	$2,380	$2,380
85	$2,380	$2,380
86	$2,380	$2,380
87	$2,380	$2,380
88	$2,380	$2,380
89	$2,380	$2,380
90	$2,380	$2,380
91	$2,380	$2,380
92	$2,380	$2,380
93	$2,380	$2,380
94	$2,380	$2,380
95	$2,380	$2,380
96	$2,380	$2,380
97	$2,380	$2,380
98	$2,380	$2,380
99	$2,380	$2,380
	$290,360	$2,910,627
	$290,360	-

Water Management Summary

Cobre Mining Company

Based on Projected 2019 Mine Plan			Current Value
DIRECT COSTS			
	Capital		**$1,501,418**
	Operations and Maintenance		**$562,221**
Capital			
INDIRECT COSTS[1]	Mobilization and Demobilization	3.8%	$57,054
	Contingencies	4.0%	$60,057
	Engineering Redesign Fee	2.5%	$37,535
	Contractor Profit and Overhead	15.0%	$225,213
	Project Management Fee	3.0%	$45,043
	State Procurement Cost	0.0%	$0
	Indirect Percentage Sum =	28.3%	
	Subtotal, Indirect Costs		**$424,901**
Operations and Maintenance			
INDIRECT COSTS[1]	Mobilization and Demobilization	0.0%	$0
	Contingencies	4.0%	$22,489
	Engineering Redesign Fee	0.0%	$0
	Contractor Profit and Overhead	10.0%	$56,222
	Project Management Fee	3.0%	$16,867
	State Procurement Cost	0.0%	$0
	Indirect Percentage Sum =	17.0%	
	Subtotal, Indirect Costs		**$95,578**
ELECTRICITY, FUEL, AND SAMPLING			**$326,508**
TOTAL COST			**$2,910,627**

Data Sources:

MMD. 1996. Closeout Plan Guidelines for Existing Mines, Mining Act Reclamation Bureau Mining and Minerals Division New Mexico Energy, Minerals and Natural Resources Department. April 30, 1996.

OSM. 2000. U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement Handbook for Calculation of Reclamation Bond Amounts. April 5, 2000.

Notes:

1) Indirect costs are based on the guidance available from MMD (1996) and OSM (2000).

APPENDIX C.4
SUPPORTING DOCUMENTATION

RSMeans®
Heavy Construction Cost Data

Large civil projects including marine, waterways, airports, highways, and tunnels

2014

28th annual edition *Cost data from the most quoted name in construction*

02 41 Demolition

02 41 13 – Selective Site Demolition

02 41 13.33 Minor Site Demolition		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
6860	6-10 passes	B-59A	35	.686	M.S.F.	54.50	25.50	14.50	94.50	114

02 41 13.34 Selective Demolition, Utility Materials

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, UTILITY MATERIALS R024119-10									
0015	Excludes excavation									
0020	See other utility items in Section 02 41 13.33									
0100	Fire Hydrant extensions	B-20	14	1.714	Ea.		70		70	108
0200	Precast Utility boxes up to 8' x 14' x 7'	B-13	2	28			1,125	375	1,500	2,100
0300	Handholes and meter pits	B-6	2	12			480	183	663	940
0400	Utility valves 4"-12"	B-20	4	6			245		245	380
0500	14"-24"	B-21	2	14			590	70	660	985

02 41 13.36 Selective Demolition, Utility Valves and Accessories

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, UTILITY VALVES & ACCESSORIES									
0015	Excludes excavation									
0100	Utility valves 4"-12" diam.	B-20	4	6	Ea.		245		245	380
0200	14"-24" diam.	B-21	2	14			590	70	660	985
0300	Crosses 4"-12"	B-20	8	3			123		123	189
0400	14"-24"	B-21	4	7			295	35	330	495
0500	Utility cut-in valves 4"-12" diam.	B-20	20	1.200			49		49	76
0600	Curb boxes	"	20	1.200			49		49	76

02 41 13.38 Selective Demo., Water & Sewer Piping & Fittings

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, WATER & SEWER PIPING AND FITTINGS									
0015	Excludes excavation									
0020	See other utility items in Section 02 41 13.33									
0090	Concrete pipe 4"-10" dia	B-6	250	.096	L.F.		3.85	1.46	5.31	7.50
0100	42"-48" diameter	B-13B	96	.583			23.50	11.85	35.35	48.50
0200	60"-84" diameter	"	80	.700			28	14.20	42.20	58.50
0300	96" diameter	B-13C	80	.700			28	21.50	49.50	66.50
0400	108"-144" diameter	"	64	.875			35	26.50	61.50	83
0450	Concrete fittings 12" diameter	B-6	24	1	Ea.		40	15.20	55.20	78.50
0480	Concrete end pieces 12" diameter		200	.120	L.F.		4.81	1.83	6.64	9.40
0485	15" diameter		150	.160			6.40	2.44	8.84	12.55
0490	18" diameter		150	.160			6.40	2.44	8.84	12.55
0500	24"-36" diameter		100	.240			9.65	3.65	13.30	18.75
0600	Concrete fittings 24"-36" diameter		12	2	Ea.		80	30.50	110.50	157
0700	48"-84" diameter	B-13B	12	4.667			186	94.50	280.50	390
0800	96" diameter	"	8	7			279	142	421	585
0900	108"-144" diameter	B-13C	4	14			560	425	985	1,325
1000	Ductile iron pipe 4" diameter	B-21B	200	.200	L.F.		7.95	3.32	11.27	15.85
1100	6"-12" diameter		175	.229			9.10	3.79	12.89	18.10
1200	14"-24" diameter		120	.333			13.25	5.55	18.80	26.50
1300	Ductile iron fittings 4"-12" diameter		24	1.667	Ea.		66.50	27.50	94	133
1400	14"-16" diameter		18	2.222			88.50	37	125.50	177
1500	18"-24" diameter		12	3.333			133	55.50	188.50	265
1600	Plastic pipe 3/4"-4" diameter	B-20	700	.034	L.F.		1.40		1.40	2.17
1700	6"-8" diameter		500	.048			1.96		1.96	3.03
1800	10"-18" diameter		300	.080			3.27		3.27	5.05
1900	20"-36" diameter		200	.120			4.90		4.90	7.60
1910	42"-48" diameter		180	.133			5.45		5.45	8.40
1920	54"-60" diameter		160	.150			6.15		6.15	9.45
2000	Plastic fittings 4"-8" diameter	B-6	75	.320	Ea.		12.85	4.87	17.72	25
2100	10"-14" diameter		50	.480			19.25	7.30	26.55	37.50
2200	16"-24" diameter		20	1.200			48	18.25	66.25	94

02 41 13 – Selective Site Demolition

02 41 13.78 Selective Demolition, Radio Towers		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
0600	400'	K-2	.30	80	Ea.		3,750	1,100	4,850	7,625
0700	Self supported, 60'		.90	26.667			1,250	370	1,620	2,525
0800	120'		.80	30			1,400	415	1,815	2,850
0900	190'		.40	60			2,825	835	3,660	5,725

02 41 13.80 Selective Demolition, Utility Poles and Cross Arms

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, UTILITY POLES & CROSS ARMS									
0100	Utility poles, wood, 20' - 30' high	R-3	6	3.333	Ea.		176	23.50	199.50	291
0200	35' - 45' high	"	5	4			212	28	240	350
0300	Cross arms, wood, 4' - 6' long	1 Elec	5	1.600			85.50		85.50	128

02 41 13.82 Selective Removal, Pavement Lines and Markings

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE REMOVAL, PAVEMENT LINES & MARKINGS									
0015	Does not include traffic control costs									
0020	See other items in Section 32 17 23.13									
0100	Remove permanent painted traffic lines and markings	B-78A	500	.016	C.L.F.		.75	1.68	2.43	2.99
0200	Temporary traffic line tape	2 Clab	1500	.011	L.F.		.39		.39	.60
0300	Thermoplastic traffic lines and markings	B-79A	500	.024	C.L.F.		1.13	2.61	3.74	4.58
0400	Painted pavement markings	B-78B	500	.036	S.F.		1.36	.78	2.14	2.95

02 41 13.84 Selective Demolition, Walks, Steps and Pavers

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, WALKS, STEPS AND PAVERS									
0100	Splash blocks	1 Clab	300	.027	S.F.		.98		.98	1.51
0200	Tree grates	"	50	.160	Ea.		5.85		5.85	9.05
0300	Walks, limestone pavers	2 Clab	150	.107	S.F.		3.91		3.91	6.05
0400	Redwood sections		600	.027			.98		.98	1.51
0500	Redwood planks		480	.033			1.22		1.22	1.88
0600	Shale paver		300	.053			1.95		1.95	3.02
0700	Tile thinset paver		675	.024			.87		.87	1.34
0800	Wood round	B-1	350	.069	Ea.		2.56		2.56	3.95
0900	Asphalt block	2 Clab	450	.036	S.F.		1.30		1.30	2.01
1000	Bluestone		450	.036			1.30		1.30	2.01
1100	Slate, 1" or thinner		675	.024			.87		.87	1.34
1200	Granite blocks		300	.053			1.95		1.95	3.02
1300	Precast patio blocks		450	.036			1.30		1.30	2.01
1400	Planter blocks		600	.027			.98		.98	1.51
1500	Brick paving, dry set		300	.053			1.95		1.95	3.02
1600	Mortar set		180	.089			3.26		3.26	5.05
1700	Dry set on edge		240	.067			2.44		2.44	3.77
1800	Steps, brick		200	.080	L.F.		2.93		2.93	4.52
1900	Railroad tie		150	.107			3.91		3.91	6.05
2000	Bluestone		180	.089			3.26		3.26	5.05
2100	Wood/steel edging for steps		1000	.016			.59		.59	.90
2200	Timber or railroad tie edging for steps		400	.040			1.47		1.47	2.26

02 41 13.86 Selective Demolition, Athletic Surfaces

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, ATHLETIC SURFACES									
0100	Synthetic grass	2 Clab	2000	.008	S.F.		.29		.29	.45
0200	Surface coat latex rubber	"	2000	.008	"		.29		.29	.45
0300	Tennis court posts	B-11C	16	1	Ea.		43	23	66	90.50

02 41 13.88 Selective Demolition, Lawn Sprinkler Systems

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	SELECTIVE DEMOLITION, LAWN SPRINKLER SYSTEMS									
0100	Golf course sprinkler system, 9 hole	4 Skwk	.10	320	Ea.		15,100		15,100	23,400
0200	Sprinkler system, 24' diam. @ 15' O.C., per head	B-20	110	.218	Head		8.90		8.90	13.80
0300	60' diam. @ 24' O.C., per head	"	52	.462	"		18.85		18.85	29

22 11 13.48 Pipe, Fittings and Valves, Steel, Grooved-Joint		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
1150	10" diameter	Q-2	31	.774	L.F.	104	41.50		145.50	177
1160	12" diameter		27	.889		116	48		164	200
1170	14" diameter		20	1.200		119	64.50		183.50	229
1180	16" diameter		17	1.412		179	76		255	310
1190	18" diameter		14	1.714		178	92		270	335
1200	20" diameter		12	2		208	107		315	390
1210	24" diameter		10	2.400		234	129		363	450
1740	To delete coupling & hanger, subtract									
1750	3/4" diam. to 2" diam.					65%	27%			
1760	2-1/2" diam. to 5" diam.					41%	18%			
1770	6" diam. to 12" diam.					31%	13%			
1780	14" diam. to 24" diam.					35%	10%			
1800	Galvanized									
1840	3/4" diameter	1 Plum	71	.113	L.F.	5.85	6.50		12.35	16.25
1850	1" diameter		63	.127		5.55	7.30		12.85	17.15
1860	1-1/4" diameter		58	.138		7.20	7.95		15.15	19.95
1870	1-1/2" diameter		51	.157		8.40	9.05		17.45	23
1880	2" diameter		40	.200		12	11.50		23.50	30.50
1890	2-1/2" diameter	Q-1	57	.281		18.20	14.55		32.75	42
1900	3" diameter		50	.320		23	16.60		39.60	50.50
1910	4" diameter		45	.356		32	18.40		50.40	63.50
1920	5" diameter		37	.432		58.50	22.50		81	98.50
1930	6" diameter	Q-2	42	.571		63.50	30.50		94	117
1940	8" diameter		37	.649		74.50	35		109.50	135
1950	10" diameter		31	.774		120	41.50		161.50	194
1960	12" diameter		27	.889		146	48		194	233
2540	To delete coupling & hanger, subtract									
2550	3/4" diam. to 2" diam.					36%	27%			
2560	2-1/2" diam. to 5" diam.					19%	18%			
2570	6" diam. to 12" diam.					14%	13%			
4690	Tee, painted									
4700	3/4" diameter	1 Plum	38	.211	Ea.	60.50	12.10		72.60	85
4740	1" diameter		33	.242		46.50	13.95		60.45	72.50
4750	1-1/4" diameter		27	.296		46.50	17.05		63.55	77.50
4760	1-1/2" diameter		22	.364		46.50	21		67.50	83
4770	2" diameter		17	.471		46.50	27		73.50	92.50
4780	2-1/2" diameter	Q-1	27	.593		46.50	30.50		77	98
4790	3" diameter		22	.727		64	37.50		101.50	127
4800	4" diameter		17	.941		97	49		146	181
4810	5" diameter		13	1.231		226	64		290	345
4820	6" diameter	Q-2	17	1.412		261	76		337	400
4830	8" diameter		14	1.714		570	92		662	770
4840	10" diameter		12	2		1,150	107		1,257	1,400
4850	12" diameter		10	2.400		1,600	129		1,729	1,950
4851	14" diameter		9	2.667		1,500	143		1,643	1,900
4852	16" diameter		8	3		1,550	161		1,711	1,950
4853	18" diameter	Q-3	11	2.909		1,625	159		1,784	2,050
4854	20" diameter		10	3.200		2,325	175		2,500	2,850
4855	24" diameter		8	4		3,550	219		3,769	4,225
4900	For galvanized tees, add					24%				
4939	Couplings									
4940	Flexible, standard, painted									
4950	3/4" diameter	1 Plum	100	.080	Ea.	16.60	4.60		21.20	25

32 31 Fences and Gates

32 31 29 – Wood Fences and Gates

32 31 29.10 Fence, Wood		Crew	Daily Output	Labor-Hours	Unit	2014 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0500	6′ high	B-80C	125	.192	L.F.	18.45	7.05	2.23	27.73	34
0860	Open rail fence, split rails, 2 rail 3′ high, no. 1 cedar		160	.150		11.70	5.50	1.74	18.94	23
0870	No. 2 cedar		160	.150		10.90	5.50	1.74	18.14	22.50
0880	3 rail, 4′ high, no. 1 cedar		150	.160		12.10	5.85	1.85	19.80	24.50
0890	No. 2 cedar		150	.160		8.70	5.85	1.85	16.40	20.50
0920	Rustic rails, 2 rail 3′ high, no. 1 cedar		160	.150		9.35	5.50	1.74	16.59	20.50
0930	No. 2 cedar		160	.150		8.70	5.50	1.74	15.94	19.95
0940	3 rail, 4′ high		150	.160		9	5.85	1.85	16.70	21
0950	No. 2 cedar		150	.160		7.30	5.85	1.85	15	19.05
1240	Stockade fence, no. 1 cedar, 3-1/4″ rails, 6′ high		160	.150		11.95	5.50	1.74	19.19	23.50
1260	8′ high		155	.155		16.50	5.65	1.79	23.94	29
1270	Gate, 3′-6″ wide		9	2.667	Ea.	235	97.50	31	363.50	445
1300	No. 2 cedar, treated wood rails, 6′ high		160	.150	L.F.	12.30	5.50	1.74	19.54	24
1320	Gate, 3′-6″ wide		8	3	Ea.	80	110	35	225	296
1360	Treated pine, treated rails, 6′ high		160	.150	L.F.	12.80	5.50	1.74	20.04	24.50
1400	8′ high		150	.160	″	18.65	5.85	1.85	26.35	31.50
1420	Gate, 3′-6″ wide		9	2.667	Ea.	90	97.50	31	218.50	283

32 31 29.20 Fence, Wood Rail		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**FENCE, WOOD RAIL**									
0012	Picket, No. 2 cedar, Gothic, 2 rail, 3′ high	B-1	160	.150	L.F.	7.55	5.60		13.15	16.95
0050	Gate, 3′-6″ wide	B-80C	9	2.667	Ea.	76.50	97.50	31	205	268
0400	3 rail, 4′ high		150	.160	L.F.	8.45	5.85	1.85	16.15	20.50
0500	Gate, 3′-6″ wide		9	2.667	Ea.	94.50	97.50	31	223	288
5000	Fence rail, redwood, 2″ x 4″, merch. grade 8′	B-1	2400	.010	L.F.	2.39	.37		2.76	3.21
6000	Fence post, select redwood, earthpacked & treated, 4″ x 4″ x 6′		96	.250	Ea.	13.50	9.35		22.85	29.50
6010	4″ x 4″ x 8′		96	.250		18.50	9.35		27.85	35
6020	Set in concrete, 4″ x 4″ x 6′		50	.480		21	17.90		38.90	50.50
6030	4″ x 4″ x 8′		50	.480		22	17.90		39.90	51.50
6040	Wood post, 4′ high, set in concrete, incl. concrete		50	.480		13.50	17.90		31.40	42.50
6050	Earth packed		96	.250		16.50	9.35		25.85	32.50
6060	6′ high, set in concrete, incl. concrete		50	.480		17	17.90		34.90	46
6070	Earth packed		96	.250		12.90	9.35		22.25	28.50

32 32 Retaining Walls

32 32 13 – Cast-in-Place Concrete Retaining Walls

32 32 13.10 Retaining Walls, Cast Concrete		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**RETAINING WALLS, CAST CONCRETE**									
1800	Concrete gravity wall with vertical face including excavation & backfill									
1850	No reinforcing									
1900	6′ high, level embankment	C-17C	36	2.306	L.F.	71.50	110	17.20	198.70	269
2000	33° slope embankment		32	2.594		84	124	19.35	227.35	305
2200	8′ high, no surcharge		27	3.074		90	147	23	260	350
2300	33° slope embankment		24	3.458		109	165	26	300	405
2500	10′ high, level embankment		19	4.368		129	209	32.50	370.50	505
2600	33° slope embankment		18	4.611		178	220	34.50	432.50	575
2800	Reinforced concrete cantilever, incl. excavation, backfill & reinf.									
2900	6′ high, 33° slope embankment	C-17C	35	2.371	L.F.	66	113	17.70	196.70	267
3000	8′ high, 33° slope embankment		29	2.862		76	137	21.50	234.50	320
3100	10′ high, 33° slope embankment		20	4.150		99	198	31	328	450
3200	20′ high, 500 lb. per L.F. surcharge		7.50	11.067		297	530	82.50	909.50	1,225
3500	Concrete cribbing, incl. excavation and backfill									

33 11 13 – Public Water Utility Distribution Piping

33 11 13.25 Water Supply, Polyvinyl Chloride Pipe		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
8100	Tee, 4" diameter	B-20	90	.267	Ea.	58	10.90		68.90	80.50
8120	6" diameter		80	.300		144	12.25		156.25	177
8140	8" diameter		70	.343		184	14		198	224
8160	10" diameter		40	.600		590	24.50		614.50	690
8180	12" diameter		20	1.200		765	49		814	915
8200	45° Bend, 4" diameter		100	.240		42	9.80		51.80	61
8220	6" diameter		90	.267		73	10.90		83.90	97
8240	8" diameter		50	.480		144	19.60		163.60	190
8260	10" diameter		50	.480		330	19.60		349.60	390
8280	12" diameter		30	.800		425	32.50		457.50	515
8300	Reducing tee 6" x 4"		100	.240		126	9.80		135.80	153
8320	8" x 6"		90	.267		224	10.90		234.90	263
8330	10" x 6"		90	.267		380	10.90		390.90	430
8340	10" x 8"		90	.267		395	10.90		405.90	445
8350	12" x 6"		90	.267		450	10.90		460.90	505
8360	12" x 8"		90	.267		470	10.90		480.90	530
8400	Tapped service tee (threaded type) 6" x 6" x 3/4"		100	.240		95	9.80		104.80	120
8430	6" x 6" x 1"		90	.267		95	10.90		105.90	122
8440	6" x 6" x 1-1/2"		90	.267		95	10.90		105.90	122
8450	6" x 6" x 2"		90	.267		95	10.90		105.90	122
8460	8" x 8" x 3/4"		90	.267		140	10.90		150.90	171
8470	8" x 8" x 1"		90	.267		140	10.90		150.90	171
8480	8" x 8" x 1-1/2"		90	.267		140	10.90		150.90	171
8490	8" x 8" x 2"		90	.267		140	10.90		150.90	171
8500	Repair coupling 4"		100	.240		22.50	9.80		32.30	40
8520	6" diameter		90	.267		34.50	10.90		45.40	55
8540	8" diameter		50	.480		83	19.60		102.60	122
8560	10" diameter		50	.480		208	19.60		227.60	260
8580	12" diameter		50	.480		233	19.60		252.60	288
8600	Plug end 4"		100	.240		22.50	9.80		32.30	40
8620	6" diameter		90	.267		40.50	10.90		51.40	61.50
8640	8" diameter		50	.480		69	19.60		88.60	107
8660	10" diameter		50	.480		96.50	19.60		116.10	137
8680	12" diameter		50	.480		119	19.60		138.60	162
8700	PVC pipe, joint restraint									
8710	4" diameter	B-20A	32	1	Ea.	46	44.50		90.50	119
8720	6" diameter		25.60	1.250		57	56		113	148
8730	8" diameter		21.33	1.500		79.50	67		146.50	190
8740	10" diameter		18.28	1.751		141	78.50		219.50	275
8750	12" diameter		16.84	1.900		148	85		233	293
8760	14" diameter		16	2		221	89.50		310.50	380
8770	16" diameter		11.64	2.749		274	123		397	485
8780	18" diameter		11.03	2.901		330	130		460	565
8785	20" diameter		9.14	3.501		400	157		557	680
8790	24" diameter		7.53	4.250		465	190		655	800

33 11 13.35 Water Supply, HDPE

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**WATER SUPPLY, HDPE**									
0011	Butt fusion joints, SDR 21 40' lengths not including excavation or backfill									
0100	4" diameter	B-22A	400	.100	L.F.	4.13	4.19	1.66	9.98	12.80
0200	6" diameter		380	.105		8.20	4.41	1.74	14.35	17.70
0300	8" diameter		320	.125		10.65	5.25	2.07	17.97	22
0400	10" diameter		300	.133		20	5.60	2.21	27.81	33

33 11 13 – Public Water Utility Distribution Piping

33 11 13.35 Water Supply, HDPE		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
0500	12" diameter	B-22A	260	.154	L.F.	22.50	6.45	2.55	31.50	37
0600	14" diameter	B-22B	220	.182		38.50	7.60	5.05	51.15	60
0700	16" diameter		180	.222		44	9.30	6.15	59.45	69
0800	18" diameter		140	.286		49.50	11.95	7.90	69.35	81
0900	24" diameter		100	.400		70.50	16.75	11.10	98.35	116
1000	Fittings									
1100	Elbows, 90 degrees									
1200	4" diameter	B-22A	32	1.250	Ea.	23.50	52.50	20.50	96.50	129
1300	6" diameter		28	1.429		55	60	23.50	138.50	179
1400	8" diameter		24	1.667		148	70	27.50	245.50	300
1500	10" diameter		18	2.222		550	93	37	680	790
1600	12" diameter		12	3.333		550	140	55	745	880
1700	14" diameter	B-22B	9	4.444		760	186	123	1,069	1,250
1800	16" diameter		6	6.667		870	279	185	1,334	1,600
1900	18" diameter		4	10		985	420	277	1,682	2,025
2000	24" diameter		3	13.333		1,325	560	370	2,255	2,725
2100	Tees									
2200	4" diameter	B-22A	30	1.333	Ea.	28	56	22	106	142
2300	6" diameter		26	1.538		68.50	64.50	25.50	158.50	202
2400	8" diameter		22	1.818		175	76	30	281	345
2500	10" diameter		15	2.667		231	112	44	387	475
2600	12" diameter		10	4		865	168	66	1,099	1,275
2700	14" diameter	B-22B	8	5		1,025	210	139	1,374	1,600
2800	16" diameter		6	6.667		1,200	279	185	1,664	1,950
2900	18" diameter		4	10		1,400	420	277	2,097	2,500
3000	24" diameter		2	20		1,875	840	555	3,270	3,975
4100	Caps									
4110	4" diameter	B-22A	34	1.176	Ea.	17.65	49.50	19.45	86.60	117
4120	6" diameter		30	1.333		41	56	22	119	156
4130	8" diameter		26	1.538		71	64.50	25.50	161	205
4150	10" diameter		20	2		310	84	33	427	510
4160	12" diameter		14	2.857		320	120	47.50	487.50	585

33 11 13.40 Water Supply, Black Steel Pipe

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**WATER SUPPLY, BLACK STEEL PIPE**									
0011	Not including excavation or backfill									
1000	Pipe, black steel, plain end, welded, 1/4" wall thk, 8" diam.	B-35A	208	.269	L.F.	32	11.95	7.85	51.80	62
1010	10" diameter		204	.275		40	12.20	8	60.20	71.50
1020	12" diameter		195	.287		49.50	12.75	8.40	70.65	83
1030	18" diameter		175	.320		72	14.20	9.35	95.55	111
1040	5/16" wall thickness, 12" diameter		195	.287		60	12.75	8.40	81.15	94.50
1050	18" diameter		175	.320		89.50	14.20	9.35	113.05	130
1060	36" diameter		28.96	1.934		179	86	56.50	321.50	390
1070	3/8" wall thickness, 18" diameter		43.20	1.296		108	57.50	38	203.50	248
1080	24" diameter		36	1.556		148	69	45.50	262.50	320
1090	30" diameter		30.40	1.842		180	81.50	54	315.50	380
1100	1/2" wall thickness, 36" diameter		26.08	2.147		283	95.50	62.50	441	525
1110	48" diameter		21.68	2.583		420	115	75.50	610.50	725
1135	7/16" wall thickness, 48" diameter		20.80	2.692		385	119	78.50	582.50	690
1140	5/8" wall thickness, 48" diameter		21.68	2.583		545	115	75.50	735.50	860

33 12 19 – Water Utility Distribution Fire Hydrants

33 12 19.10 Fire Hydrants		Crew	Daily Output	Labor-Hours	Unit	2014 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
5120	14' bury	B-21	4	7	Ea.	1,525	295	35	1,855	2,175
5500	Non-adjustable, valve size 4" to 14", 3' bury		10	2.800		800	118	14	932	1,075
5520	3'-6" bury		10	2.800		800	118	14	932	1,075
5540	4' bury		9	3.111		800	131	15.55	946.55	1,100

33 16 Water Utility Storage Tanks

33 16 13 – Aboveground Water Utility Storage Tanks

33 16 13.13 Steel Water Storage Tanks

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**STEEL WATER STORAGE TANKS**									
0910	Steel, ground level, ht./diam. less than 1, not incl. fdn., 100,000 gallons				Ea.				202,000	244,500
1000	250,000 gallons								295,500	324,000
1200	500,000 gallons								417,000	458,500
1250	750,000 gallons								538,000	591,500
1300	1,000,000 gallons								558,000	725,500
1500	2,000,000 gallons								1,043,000	1,148,000
1600	4,000,000 gallons								2,121,000	2,333,000
1800	6,000,000 gallons								3,095,000	3,405,000
1850	8,000,000 gallons								4,068,000	4,475,000
1910	10,000,000 gallons								5,050,000	5,554,500
2100	Steel standpipes, ht./diam. more than 1, 100' to overflow, no fdn.									
2200	500,000 gallons				Ea.				546,500	600,500
2400	750,000 gallons								722,500	794,500
2500	1,000,000 gallons								1,060,500	1,167,000
2700	1,500,000 gallons								1,749,000	1,923,000
2800	2,000,000 gallons								2,327,000	2,559,000

33 16 13.16 Prestressed Conc. Water Storage Tanks

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**PRESTRESSED CONC. WATER STORAGE TANKS**									
0020	Not including fdn., pipe or pumps, 250,000 gallons				Ea.				299,000	329,500
0100	500,000 gallons								487,000	536,000
0300	1,000,000 gallons								707,000	807,500
0400	2,000,000 gallons								1,072,000	1,179,000
0600	4,000,000 gallons								1,706,000	1,877,000
0700	6,000,000 gallons								2,266,000	2,493,000
0750	8,000,000 gallons								2,924,000	3,216,000
0800	10,000,000 gallons								3,533,000	3,886,000

33 16 13.23 Plastic-Coated Fabric Pillow Water Tanks

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**PLASTIC-COATED FABRIC PILLOW WATER TANKS**									
7000	Water tanks, vinyl coated fabric pillow tanks, freestanding, 5,000 gallons	4 Clab	4	8	Ea.	3,600	293		3,893	4,400
7100	Supporting embankment not included, 25,000 gallons	6 Clab	2	24		13,000	880		13,880	15,600
7200	50,000 gallons	8 Clab	1.50	42.667		18,100	1,575		19,675	22,300
7300	100,000 gallons	9 Clab	.90	80		41,500	2,925		44,425	50,000
7400	150,000 gallons		.50	144		59,500	5,275		64,775	73,500
7500	200,000 gallons		.40	180		73,500	6,600		80,100	91,000
7600	250,000 gallons		.30	240		103,500	8,800		112,300	127,500

33 16 19 – Elevated Water Utility Storage Tanks

33 16 19.50 Elevated Water Storage Tanks

		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**ELEVATED WATER STORAGE TANKS**									
0011	Not incl. pipe, pumps or foundation									
3000	Elevated water tanks, 100' to bottom capacity line, incl. painting									
3010	50,000 gallons				Ea.				185,000	204,000

33 47 Ponds and Reservoirs

33 47 13 – Pond and Reservoir Liners

33 47 13.53 Reservoir Liners HDPE		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
0010	RESERVOIR LINERS HDPE									
0011	Membrane lining									
1100	30 mil thick	3 Skwk	1850	.013	S.F.	.52	.61		1.13	1.52
1200	60 mil thick		1600	.015	"	.58	.71		1.29	1.74
1220	60 mil thick		1.60	15	M.S.F.	580	710		1,290	1,750
1300	120 mil thick		1440	.017	S.F.	.71	.79		1.50	2

33 49 Storm Drainage Structures

33 49 13 – Storm Drainage Manholes, Frames, and Covers

33 49 13.10 Storm Drainage Manholes, Frames and Covers		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	STORM DRAINAGE MANHOLES, FRAMES & COVERS									
0020	Excludes footing, excavation, backfill (See line items for frame & cover)									
0050	Brick, 4' inside diameter, 4' deep	D-1	1	16	Ea.	510	660		1,170	1,550
0100	6' deep		.70	22.857		725	945		1,670	2,250
0150	8' deep		.50	32		935	1,325		2,260	3,050
0200	For depths over 8', add		4	4	V.L.F.	83.50	165		248.50	345
0400	Concrete blocks (radial), 4' I.D., 4' deep		1.50	10.667	Ea.	370	440		810	1,075
0500	6' deep		1	16		495	660		1,155	1,550
0600	8' deep		.70	22.857		620	945		1,565	2,125
0700	For depths over 8', add		5.50	2.909	V.L.F.	65	120		185	255
0800	Concrete, cast in place, 4' x 4', 8" thick, 4' deep	C-14H	2	24	Ea.	505	1,075	16.55	1,596.55	2,250
0900	6' deep		1.50	32		725	1,450	22	2,197	3,050
1000	8' deep		1	48		1,050	2,175	33	3,258	4,500
1100	For depths over 8', add		8	6	V.L.F.	118	271	4.14	393.14	550
1110	Precast, 4' I.D., 4' deep	B-22	4.10	7.317	Ea.	775	315	51	1,141	1,375
1120	6' deep		3	10		970	425	70	1,465	1,800
1130	8' deep		2	15		1,100	640	105	1,845	2,325
1140	For depths over 8', add		16	1.875	V.L.F.	125	80	13.15	218.15	275
1150	5' I.D., 4' deep	B-6	3	8	Ea.	1,625	320	122	2,067	2,400
1160	6' deep		2	12		1,675	480	183	2,338	2,775
1170	8' deep		1.50	16		2,350	640	244	3,234	3,850
1180	For depths over 8', add		12	2	V.L.F.	277	80	30.50	387.50	460
1190	6' I.D., 4' deep		2	12	Ea.	2,125	480	183	2,788	3,275
1200	6' deep		1.50	16		2,550	640	244	3,434	4,050
1210	8' deep		1	24		3,150	965	365	4,480	5,325
1220	For depths over 8', add		8	3	V.L.F.	375	120	45.50	540.50	645
1250	Slab tops, precast, 8" thick									
1300	4' diameter manhole	B-6	8	3	Ea.	245	120	45.50	410.50	505
1400	5' diameter manhole		7.50	3.200		405	128	48.50	581.50	695
1500	6' diameter manhole		7	3.429		625	138	52	815	955
3800	Steps, heavyweight cast iron, 7" x 9"	1 Bric	40	.200		19.05	9.10		28.15	35
3900	8" x 9"		40	.200		23	9.10		32.10	39
3928	12" x 10-1/2"		40	.200		26.50	9.10		35.60	43.50
4000	Standard sizes, galvanized steel		40	.200		21.50	9.10		30.60	37.50
4100	Aluminum		40	.200		24	9.10		33.10	40
4150	Polyethylene		40	.200		24.50	9.10		33.60	41
4210	Rubber boot 6" diam. or smaller	1 Clab	32	.250		80	9.15		89.15	102
4215	8" diam.		24	.333		91	12.20		103.20	119
4220	10" diam.		19	.421		104	15.45		119.45	139
4225	12" diam.		16	.500		133	18.35		151.35	175
4230	16" diam.		15	.533		169	19.55		188.55	216

33 71 16.23 Steel Electrical Utility Poles		Crew	Daily Output	Labor-Hours	Unit	2014 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
1660	40'	R-15A	4.20	11.429	Ea.	1,600	535	77.50	2,212.50	2,675
1680	45'		3.85	12.468		1,825	585	84.50	2,494.50	2,975
3400	Galvanized steel, tapered, 10'		15.50	3.097		277	145	21	443	545
3420	12'		11.50	4.174		405	195	28.50	628.50	770
3440	14'		9.20	5.217		299	244	35.50	578.50	740
3460	16'		8.45	5.680		310	266	38.50	614.50	785
3480	18'		7.65	6.275		320	294	42.50	656.50	840
3500	20'		7.10	6.761		300	315	46	661	860
6000	Digging holes in earth, average	R-5	25.14	3.500			163	60	223	315
6010	In rock, average	"	4.51	19.512			910	335	1,245	1,750
6020	Formed plate pole structure									
6030	Material handling and spotting	R-7	2.40	20	Ea.		755	93.50	848.50	1,275
6040	Erect steel plate pole	R-5	1.95	45.128		9,050	2,100	775	11,925	14,000
6050	Guys, anchors and hardware for pole, in earth		7.04	12.500		550	585	215	1,350	1,725
6060	In rock		17.96	4.900		655	228	84.50	967.50	1,150
6070	Foundations for line poles									
6080	Excavation, in earth	R-5	135.38	.650	C.Y.		30.50	11.20	41.70	58.50
6090	In rock		20	4.400			205	75.50	280.50	395
6110	Concrete foundations		11	8		131	375	138	644	860

33 71 16.33 Wood Electrical Utility Poles		Crew	Daily Output	Labor-Hours	Unit	Material	Labor	Equipment	Total	Total Incl O&P
0010	**WOOD ELECTRICAL UTILITY POLES**									
0011	Excludes excavation, backfill and cast-in-place concrete									
1020	12" Ponderosa Pine Poles treated 0.40 ACQ, 16'	R-3	3.20	6.250	Ea.	880	330	44	1,254	1,500
5000	Wood, class 3 yellow pine, penta-treated, 25'	R-15A	8.60	5.581		199	261	38	498	655
5020	30'		7.70	6.234		221	292	42	555	730
5040	35'		5.80	8.276		292	385	56	733	965
5060	40'		5.30	9.057		365	425	61.50	851.50	1,100
5080	45'		4.70	10.213		405	480	69	954	1,250
5100	50'		4.20	11.429		505	535	77.50	1,117.50	1,450
5120	55'		3.80	12.632		605	590	85.50	1,280.50	1,650
5140	60'		3.50	13.714		840	640	93	1,573	2,000
5160	65'		3.20	15		1,125	700	102	1,927	2,400
5180	70'		3	16		1,600	750	108	2,458	3,000
5200	75'		2.80	17.143		2,075	805	116	2,996	3,625
6000	Wood, class 1 type C, CCA/ACA-treated, 25'		8.60	5.581		231	261	38	530	690
6020	30'		7.70	6.234		267	292	42	601	780
6040	35'		5.80	8.276		355	385	56	796	1,050
6060	40'		5.30	9.057		450	425	61.50	936.50	1,200
6080	45'		4.70	10.213		545	480	69	1,094	1,400
6100	50'		4.20	11.429		600	535	77.50	1,212.50	1,550
6120	55'		3.80	12.632		690	590	85.50	1,365.50	1,750
6200	Electric & tel sitework, 20' high, treated wd., see Section 26 56 13.10	R-3	3.10	6.452		223	340	45	608	805
6400	25' high		2.90	6.897		263	365	48.50	676.50	895
6600	30' high		2.60	7.692		430	405	54	889	1,150
6800	35' high		2.40	8.333		495	440	58.50	993.50	1,275
7000	40' high		2.30	8.696		710	460	61	1,231	1,525
7200	45' high		1.70	11.765		865	625	82.50	1,572.50	1,975
7400	Cross arms with hardware & insulators									
7600	4' long	1 Elec	2.50	3.200	Ea.	148	171		319	420
7800	5' long		2.40	3.333		170	178		348	455
8000	6' long		2.20	3.636		165	194		359	470
9000	Disposal of pole & hardware surplus material	R-7	20.87	2.300	Mile		87	10.75	97.75	146

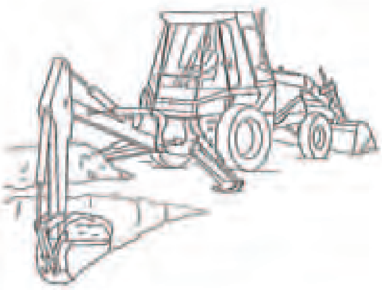
33 71 26 – Transmission and Distribution Equipment

33 71 26.26 Potential Transformers		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
0010	**POTENTIAL TRANSFORMERS**									
4100	Potential transformers, 13 to 26 kV	R-11	11.20	5	Ea.	4,450	253	79.50	4,782.50	5,350
4110	46 kV		8	7		9,125	355	111	9,591	10,700
4120	69 kV		6.22	9.003		9,675	455	143	10,273	11,400
4130	161 kV		2.24	25		20,900	1,275	395	22,570	25,300
4140	500 kV		1.40	40		62,500	2,025	635	65,160	72,500

33 71 39 – High-Voltage Wiring

33 71 39.13 Overhead High-Voltage Wiring		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
0010	**OVERHEAD HIGH-VOLTAGE WIRING**									
0100	Conductors, primary circuits									
0110	Material handling and spotting	R-5	9.78	8.998	W.Mile		420	155	575	805
0120	For river crossing, add		11	8			375	138	513	715
0150	Conductors, per wire, 210 to 636 kcmil		1.96	44.898		10,300	2,100	775	13,175	15,300
0160	795 to 954 kcmil		1.87	47.059		20,500	2,200	810	23,510	26,700
0170	1000 to 1600 kcmil		1.47	59.864		35,100	2,800	1,025	38,925	44,000
0180	Over 1600 kcmil		1.35	65.185		49,100	3,050	1,125	53,275	60,000
0200	For river crossing, add, 210 to 636 kcmil		1.24	70.968			3,300	1,225	4,525	6,350
0220	795 to 954 kcmil		1.09	80.734			3,750	1,400	5,150	7,200
0230	1000 to 1600 kcmil		.97	90.722			4,225	1,550	5,775	8,125
0240	Over 1600 kcmil		.87	101			4,725	1,750	6,475	9,050
0300	Joints and dead ends	R-8	6	8	Ea.	1,400	380	63.50	1,843.50	2,200
0400	Sagging	R-5	7.33	12.001	W.Mile		560	207	767	1,075
0500	Clipping, per structure, 69 kV	R-10	9.60	5	Ea.		252	65	317	450
0510	161 kV		5.33	9.006			455	117	572	810
0520	345 to 500 kV		2.53	18.972			955	247	1,202	1,700
0600	Make and install jumpers, per structure, 69 kV	R-8	3.20	15		380	710	119	1,209	1,625
0620	161 kV		1.20	40		765	1,900	320	2,985	4,050
0640	345 to 500 kV		.32	150		1,275	7,075	1,200	9,550	13,500
0700	Spacers	R-10	68.57	.700		76	35	9.10	120.10	147
0720	For river crossings, add	"	60	.800			40.50	10.40	50.90	72
0800	Installing pulling line (500 kV only)	R-9	1.45	44.138	W.Mile	755	1,950	264	2,969	4,075
0810	Disposal of surplus material, high voltage conductors	R-7	6.96	6.897	Mile		261	32.50	293.50	435
0820	With trailer mounted reel stands	"	13.71	3.501	"		133	16.40	149.40	222
0900	Insulators and hardware, primary circuits									
0920	Material handling and spotting, 69 kV	R-7	480	.100	Ea.		3.79	.47	4.26	6.30
0930	161 kV		685.71	.070			2.65	.33	2.98	4.43
0950	345 to 500 kV		960	.050			1.89	.23	2.12	3.17
1000	Disk insulators, 69 kV	R-5	880	.100		77.50	4.66	1.72	83.88	94.50
1020	161 kV		977.78	.090		89	4.19	1.55	94.74	106
1040	345 to 500 kV		1100	.080		89	3.73	1.38	94.11	105
1060	See Section 33 71 23.16 for pin or pedestal insulator									
1100	Install disk insulator at river crossing, add									
1110	69 kV	R-5	586.67	.150	Ea.		7	2.58	9.58	13.40
1120	161 kV		880	.100			4.66	1.72	6.38	8.95
1140	345 to 500 kV		880	.100			4.66	1.72	6.38	8.95
1150	Disposal of surplus material, high voltage insulators	R-7	41.74	1.150	Mile		43.50	5.40	48.90	73
1300	Overhead ground wire installation									
1320	Material handling and spotting	R-7	5.65	8.496	W.Mile		320	40	360	540
1340	Overhead ground wire	R-5	1.76	50		2,975	2,325	860	6,160	7,750
1350	At river crossing, add		1.17	75.214			3,500	1,300	4,800	6,725
1360	Disposal of surplus material, grounding wire		41.74	2.108	Mile		98.50	36.50	135	188
1400	Installing conductors, underbuilt circuits									

G1030 Site Earthwork



The Excavation of Common Earth System balances the productivity of the excavating equipment to the hauling equipment. It is assumed that the hauling equipment will encounter light traffic and will move up no considerable grades on the haul route. No mobilization cost is included. All costs given in these systems include a swell factor of 25% for hauling.

The Expanded System Listing shows Excavation systems using backhoes ranging from 1/2 Cubic Yard capacity to 3-1/2 Cubic Yards. Power shovels indicated range from 1/2 Cubic Yard to 3 Cubic Yards. Dragline bucket rigs range from 1/2 Cubic Yard to 3 Cubic Yards. Truck capacities range from 8 Cubic Yards to 20 Cubic Yards. Each system lists the number of trucks involved and the distance (round trip) that each must travel.

System Components	QUANTITY	UNIT	COST PER C.Y. EQUIP.	LABOR	TOTAL
SYSTEM G1030 120 1000					
EXCAVATE COMMON EARTH, 1/2 CY BACKHOE, TWO 8 CY DUMP TRUCKS, 1 MRT					
Excavating, bulk hyd. backhoe wheel mtd., 1/2 C.Y.	1.000	B.C.Y.	.97	2.10	3.07
Hauling, 8 CY truck, cycle 0.5 mile, 20 MPH, 15 min. wait/Ld./Uld.	1.280	L.C.Y.	2.53	2.53	5.06
Spotter at earth fill dump or in cut	.020	Hr.		.90	.90
TOTAL			3.50	5.53	9.03

G1030 120	Excavate Common Earth	COST PER C.Y. EQUIP.	LABOR	TOTAL
1000	Excavate common earth, 1/2 C.Y. backhoe, two 8 C.Y. dump trucks, 1 mile RT	3.50	5.55	9.05
1200	Three 8 C.Y. dump trucks, 3 mile round trip	7.15	9.30	16.45
1400	Two 12 C.Y. dump trucks, 4 mile round trip	7.80	7.15	14.95
1600	3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mile round trip	3.49	4.55	8.04
1700	Five 8 C.Y. dump trucks, 3 mile round trip	7.05	8.55	15.60
1800	Two 12 C.Y. dump trucks, 2 mile round trip	6.50	5.50	12
1900	Two 16 C.Y. dump trailers, 3 mile round trip	6.10	4.67	10.77
2000	Two 20 C.Y. dump trailers, 4 mile round trip	5.80	4.61	10.41
2200	1-1/2 C.Y. backhoe, eight 8 C.Y. dump trucks, 3 mile round trip	6.95	7.55	14.50
2300	Four 12 C.Y. dump trucks, 2 mile round trip	6.20	4.69	10.89
2400	Six 12 C.Y. dump trucks, 4 mile round trip	7.50	5.40	12.90
2500	Three 16 C.Y. dump trailers, 2 mile round trip	5	3.48	8.48
2600	Two 20 C.Y. dump trailers, 1 mile round trip	3.97	2.87	6.84
2700	Three 20 C.Y. dump trailer, 3 mile round trip	5.25	3.56	8.81
2800	2-1/2 C.Y. excavator, six 12 C.Y. dump trucks, 1 mile round trip	4.47	3.16	7.63
2900	Eight 12 C.Y. dump trucks, 3 mile round trip	6.45	4.41	10.86
3000	Four 16 C.Y. dump trailers, 1 mile round trip	4.38	2.88	7.26
3100	Six 16 C.Y. dump trailers, 3 mile round trip	5.90	3.90	9.80
3200	Six 20 C.Y. dump trailers, 4 mile round trip	5.50	3.59	9.09
3400	3-1/2 C.Y. backhoe, six 16 C.Y. dump trailers, 1 mile round trip	4.64	2.74	7.38
3600	Ten 16 C.Y. dump trailers, 4 mile round trip	6.65	3.87	10.52
3800	Eight 20 C.Y. dump trailers, 3 mile round trip	5.30	3.07	8.37
4000	1/2 C.Y. pwr. shovel, four 8 C.Y. dump trucks, 2 mile round trip	6	6.90	12.90
4100	Two 12 C.Y. dump trucks, 1 mile round trip	4.95	4.29	9.24
4200	Four 12 C.Y. dump trucks, 4 mile round trip	7.70	5.70	13.40
4300	Two 16 C.Y. dump trailers, 2 mile round trip	5.20	4.19	9.39
4400	Two 20 C.Y. dump trailers, 4 mile round trip	6	4.80	10.80
4800	3/4 C.Y. pwr. shovel, six 8 C.Y. dump trucks, 2 mile round trip	5.90	6.65	12.55
4900	Three 12 C.Y. dump trucks, 1 mile round trip	4.86	3.68	8.54
5000	Five 12 C.Y. dump trucks, 4 mile round trip	7.75	5.50	13.25
5100	Three 16 C.Y. dump trailers, 3 mile round trip	6.35	4.46	10.81
5200	Three 20 C.Y. dump trailers, 4 mile round trip	5.90	4.15	10.05
5400	1-1/2 C.Y. pwr. shovel, six 12 C.Y. dump trucks, 1 mile round trip	4.49	3.15	7.64
5500	Ten 12 C.Y. dump trucks, 4 mile round trip	7.40	4.96	12.36

DIVISION		NEW JERSEY																	
		NEW BRUNSWICK			NEWARK			PATERSON			POINT PLEASANT			SUMMIT			TRENTON		
		088 - 089			070 - 071			074 - 075			087			079			085 - 086		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		98.4	98.4		100.6	100.6		100.6	100.6		98.4	98.4		100.6	100.6		98.4	98.4
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	111.8	105.3	107.3	114.4	105.4	108.1	110.9	105.5	107.1	113.5	105.3	107.7	110.1	105.4	106.8	96.6	105.3	102.7
0310	Concrete Forming & Accessories	104.6	128.9	125.6	97.2	129.0	124.6	99.4	128.9	124.8	99.3	120.3	117.4	100.2	129.0	125.0	99.9	128.6	124.6
0320	Concrete Reinforcing	80.0	128.6	104.3	103.3	128.6	116.0	103.8	128.6	116.2	80.0	128.5	104.2	80.0	128.6	104.3	103.3	115.7	109.5
0330	Cast-in-Place Concrete	103.9	132.3	115.7	109.6	127.3	117.0	101.6	127.3	112.3	103.9	128.4	114.1	84.9	127.3	102.5	99.5	132.0	113.0
03	CONCRETE	109.8	128.9	119.3	106.9	127.4	117.0	103.4	127.3	115.2	109.5	123.7	116.5	92.3	127.4	109.6	102.3	126.3	114.1
04	MASONRY	96.6	125.9	114.7	93.4	125.9	113.5	87.8	125.9	111.4	86.4	124.6	110.0	89.3	125.9	112.0	92.1	125.4	112.7
05	METALS	95.7	111.2	100.4	102.8	113.6	106.1	95.7	113.5	101.2	95.7	110.7	100.3	95.6	113.6	101.1	100.4	105.7	102.0
06	WOOD, PLASTICS & COMPOSITES	108.9	130.1	120.9	99.0	130.2	116.6	104.1	130.2	118.8	101.6	119.1	111.5	105.3	130.2	119.3	101.4	130.1	117.6
07	THERMAL & MOISTURE PROTECTION	104.8	129.9	115.0	102.0	130.6	113.6	101.6	123.3	110.4	104.8	122.1	111.8	101.9	130.6	113.6	104.2	123.1	111.9
08	OPENINGS	97.2	127.9	104.5	107.5	127.9	112.3	111.6	127.9	115.4	99.1	122.2	104.6	113.6	127.9	117.0	106.7	124.4	110.9
0920	Plaster & Gypsum Board	103.9	130.5	122.0	99.9	130.5	120.7	103.2	130.5	121.8	99.4	119.1	112.8	101.7	130.5	121.3	99.9	130.5	120.7
0950, 0980	Ceilings & Acoustic Treatment	88.9	130.5	116.6	102.4	130.5	121.1	99.5	130.5	120.1	88.9	119.1	109.0	88.6	130.5	116.5	101.4	130.5	120.8
0960	Flooring	100.0	172.3	121.6	98.5	172.3	120.6	97.7	172.3	120.0	97.8	150.6	113.6	98.0	172.3	120.2	99.3	172.3	121.1
0970, 0990	Wall Finishes & Painting/Coating	93.0	119.3	108.8	96.0	119.3	110.0	94.6	119.3	109.4	93.0	117.3	107.6	94.6	119.3	109.4	98.3	117.3	109.7
09	FINISHES	99.7	135.4	119.6	98.6	135.5	119.1	100.0	135.5	119.8	98.5	125.9	113.7	98.0	135.5	118.9	100.1	136.0	120.1
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	113.4	102.7	100.0	113.6	102.7	100.0	113.6	102.7	100.0	104.2	100.8	100.0	113.6	102.7	100.0	110.4	102.1
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	99.6	122.9	108.9	100.0	122.8	109.1	100.0	123.4	109.4	99.6	122.5	108.7	99.6	122.8	108.9	100.0	122.5	109.0
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	93.4	137.6	116.5	99.2	139.7	120.3	95.5	137.6	117.5	92.7	131.5	112.9	91.5	137.6	115.6	101.4	138.7	120.8
MF2010	WEIGHTED AVERAGE	99.7	125.2	110.8	101.9	125.6	112.2	100.2	125.2	111.1	99.2	121.4	108.8	98.7	125.3	110.3	100.8	124.0	110.9

DIVISION		NEW JERSEY			NEW MEXICO														
		VINELAND			ALBUQUERQUE			CARRIZOZO			CLOVIS			FARMINGTON			GALLUP		
		080,083			870 - 872			883			881			874			873		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		98.8	98.8		109.6	109.6		109.6	109.6		109.6	109.6		109.6	109.6		109.6	109.6
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	102.7	104.7	104.1	82.2	104.1	97.6	102.9	104.1	103.7	91.2	104.1	100.2	88.4	104.1	99.4	96.0	104.1	101.7
0310	Concrete Forming & Accessories	96.8	128.4	124.1	101.4	65.0	70.0	99.2	65.0	69.7	99.1	64.9	69.6	101.4	65.0	70.0	101.5	65.0	70.0
0320	Concrete Reinforcing	79.1	118.5	98.7	100.5	71.1	85.8	109.9	71.1	90.5	111.2	71.1	91.2	109.9	71.1	90.5	105.2	71.1	88.2
0330	Cast-in-Place Concrete	90.7	132.2	107.9	96.9	71.2	86.2	95.4	71.2	85.3	95.3	71.1	85.3	97.8	71.2	86.8	92.1	71.2	83.4
03	CONCRETE	97.6	126.7	111.9	101.9	69.4	85.9	119.1	69.4	94.6	107.6	69.3	88.7	105.7	69.4	87.8	112.5	69.4	91.2
04	MASONRY	87.9	125.4	111.1	99.5	60.6	75.4	101.6	60.6	76.2	101.7	60.6	76.2	106.3	60.6	78.0	95.4	60.6	73.8
05	METALS	95.6	106.0	98.8	103.8	87.9	98.9	98.4	87.9	95.2	98.1	87.8	94.9	101.4	87.9	97.2	100.6	87.9	96.6
06	WOOD, PLASTICS & COMPOSITES	98.5	130.2	116.4	92.8	65.5	77.4	88.9	65.5	75.7	88.9	65.5	75.7	92.9	65.5	77.4	92.9	65.5	77.4
07	THERMAL & MOISTURE PROTECTION	104.4	123.2	112.1	99.4	71.8	88.2	100.7	71.8	89.0	99.6	71.8	88.3	99.6	71.8	88.3	100.5	71.8	88.8
08	OPENINGS	98.6	125.0	104.9	101.4	68.5	93.6	98.6	68.5	91.5	98.8	68.5	91.6	104.0	68.5	95.6	104.1	68.5	95.7
0920	Plaster & Gypsum Board	98.0	130.5	120.1	88.3	64.1	71.8	75.4	64.1	67.7	75.4	64.1	67.7	81.6	64.1	69.7	81.6	64.1	69.7
0950, 0980	Ceilings & Acoustic Treatment	88.9	130.5	116.6	106.3	64.1	78.2	104.2	64.1	77.5	104.2	64.1	77.5	103.1	64.1	77.2	103.1	64.1	77.2
0960	Flooring	97.1	150.6	113.1	100.2	67.2	90.3	100.2	67.2	90.4	100.2	67.2	90.4	101.7	67.2	91.4	101.7	67.2	91.4
0970, 0990	Wall Finishes & Painting/Coating	93.0	117.3	107.6	107.1	68.1	84.4	102.9	68.1	82.0	102.9	68.1	82.0	102.9	68.1	82.0	102.9	68.1	82.0
09	FINISHES	97.2	132.5	116.8	98.3	65.5	80.0	99.0	65.5	80.3	97.6	65.5	79.7	96.9	65.5	79.4	98.1	65.5	79.9
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	110.5	102.1	100.0	76.3	95.2	100.0	76.3	95.2	100.0	76.3	95.2	100.0	76.3	95.2	100.0	76.3	95.2
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	99.6	119.6	107.6	100.2	70.7	88.4	97.2	70.7	86.6	97.2	70.5	86.5	100.1	70.7	88.3	97.1	70.7	86.6
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	92.7	141.4	118.1	88.5	72.9	80.4	90.6	72.9	81.4	88.1	72.9	80.2	86.8	72.9	79.6	86.0	72.9	79.2
MF2010	WEIGHTED AVERAGE	97.5	123.4	108.8	99.2	73.6	88.0	100.1	73.6	88.5	98.1	73.5	87.4	99.7	73.6	88.3	99.3	73.6	88.1

DIVISION		NEW MEXICO																	
		LAS CRUCES			LAS VEGAS			ROSWELL			SANTA FE			SOCORRO			TRUTH/CONSEQUENCES		
		880			877			882			875			878			879		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		86.0	86.0		109.6	109.6		109.6	109.6		109.6	109.6		109.6	109.6		86.1	86.1
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	91.6	83.8	86.1	87.8	104.1	99.2	93.3	104.1	100.9	92.9	104.1	100.7	84.3	104.1	98.2	101.9	83.8	89.2
0310	Concrete Forming & Accessories	95.6	63.8	68.2	101.4	65.0	70.0	99.2	65.0	69.7	100.1	65.0	69.8	101.5	65.0	70.0	98.7	63.8	68.6
0320	Concrete Reinforcing	107.3	71.0	89.1	106.9	71.1	89.0	111.2	71.1	91.2	106.0	71.1	88.6	109.1	71.1	90.1	102.8	71.0	86.9
0330	Cast-in-Place Concrete	89.9	63.7	79.0	95.2	71.2	85.2	96.3	71.2	86.3	103.2	71.2	89.9	93.2	71.2	84.1	102.1	63.7	86.1
03	CONCRETE	86.1	65.9	76.1	103.1	69.4	86.4	108.3	69.4	89.1	105.6	69.4	87.7	102.0	69.4	85.9	95.1	65.9	80.7
04	MASONRY	97.5	60.2	74.4	95.6	60.6	73.9	112.2	60.6	80.3	99.5	60.6	75.4	95.5	60.6	73.9	93.1	60.2	77.8
05	METALS	97.1	81.3	92.2	100.3	87.9	95.4	99.3	87.9	95.8	97.7	87.9	94.7	100.6	87.9	98.6	100.1	81.4	94.3
06	WOOD, PLASTICS & COMPOSITES	78.8	64.4	70.7	92.9	65.5	77.4	88.9	65.5	75.7	94.6	65.5	78.2	92.9	65.5	77.4	84.6	64.4	73.2
07	THERMAL & MOISTURE PROTECTION	86.2	67.2	78.5	99.2	71.8	88.1	99.7	71.8	88.4	101.7	71.8	89.5	99.1	71.8	88.0	86.9	67.2	78.9
08	OPENINGS	91.5	67.9	88.9	100.3	68.5	92.8	98.6	68.5	91.5	102.4	68.5	94.4	100.1	68.5	92.7	93.3	67.9	87.3
0920	Plaster & Gypsum Board	74.2	64.1	67.3	81.6	64.1	69.7	75.4	64.1	67.7	91.6	64.1	72.9	81.6	64.1	69.7	83.4	64.1	70.3
0950, 0980	Ceilings & Acoustic Treatment	91.4	64.1	73.2	103.1	64.1	77.2	104.2	64.1	77.5	103.6	64.1	77.3	103.1	64.1	77.2	90.4	64.1	72.9
0960	Flooring	129.3	67.2	110.7	101.7	67.2	91.4	100.2	67.2	90.4	108.8	67.2	96.4	101.7	67.2	91.4	132.2	67.2	112.7
0970, 0990	Wall Finishes & Painting/Coating	90.1	68.1	76.8	102.9	68.1	82.0	102.9	68.1	82.0	107.7	68.1	83.9	102.9	68.1	82.0	93.7	68.1	78.3
09	FINISHES	107.1	64.6	83.4	96.8	65.5	79.3	97.7	65.5	79.8	101.9	65.5	81.6	96.7	65.5	79.3	109.0	64.6	84.3
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	73.6	94.7	100.0	76.3	95.2	100.0	76.3	95.2	100.0	76.3	95.2	100.0	76.3	95.2	100.0	73.6	94.7
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	100.4	70.5	88.4	97.1	70.7	86.6	100.0	70.7	88.3	100.1	70.7	88.3	97.1	70.7	86.6	97.0	70.5	86.4
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	89.9	72.9	81.0	88.5	72.9	80.4	89.6	72.9	80.9	100.8	72.9	86.3	86.5	72.9	79.4	90.1	72.9	81.1
MF2010	WEIGHTED AVERAGE	95.8	70.4	84.7	97.7	73.6	87.2	99.8	73.6	88.4	100.5	73.6	88.8	97.3	73.6	87.0	97.0	70.4	85.4