

Freeport-McMoRan Chino Mines Company P.O. Box 10 Bayard, NM 88023 Thomas L. Shelley, Manager Environmental/Sustainable Development Telephone: 575-912-5773 e-mail: tshelley@fmi.com

May 21, 2018

Certified Mail #70173040000031902005 Return Receipt Requested

Mr. Fernando Martinez, Director Energy, Minerals and Natural Resources Department Mining and Minerals Division 1220 South St. Francis Drive Santa Fe, New Mexico 87505

Certified Mail #70173040000031902012 Return Receipts Requested

Mr. Bruce Yurdin, Director Water Protection Division New Mexico Environment Department P.O. Box 26110 Santa Fe, New Mexico 87502

Dear Messrs. Martinez and Yurdin:

Re: Freeport-McMoRan Chino Mines Company – Continental Mine Financial Assurance Proposal, Permit No. GR002RE and DP-1403

Freeport-McMoRan Chino Mines Company (Chino) submitted to the Mining and Minerals Division (MMD) and the New Mexico Environmental Department (NMED), an application to update the Continental Mine Closure/Closeout Plan (CCP) in a letter dated December 12, 2014. This CCP provided a conceptual plan for closure and reclamation (technical scope of work) of the site. In a letter dated April 19, 2018, the MMD deemed the Continental Mine CCP technically approvable and requested that Chino submit a financial assurance (FA) proposal associated with the approved CCP. This letter transmits the required FA proposal.

Revised Current Dollar Cost Estimate

Since December 2014, Chino has responded to comments and agreed to incorporate changes in the CCP and cost estimate. The primary changes that are incorporated into this revised cost estimate include: update of unit rates to 2018 unit rates for the Continental Mine and the connecting haul road, adjusting cover haul distances from the North Overburden Stockpile, addition of regrading and cover for for the No. 3 Shaft Stockpile (shown as No. 3 Stockpile in cost estimate tables), revision of demolition costs to reflect recent demolition activities, addition of 50 acres of contingency reclamation area to account for small changes in disturbance areas over the next five years, and adjustment of the costs for Upper Creek Containment expansion. The cost estimate includes costs for 3 feet of imported cover material for facilities requiring reclamation cover material except the top of the Main Tailing Impoundment (MTI) which will have 2 feet of imported cover material and 1 foot of the tailing material (also suitable as cover material). Chino agreed to calculate the additional cost of importing 3 feet of cover material (i.e., an additional foot of cover) for the top of the MTI. That additional cost is \$465,996 in current dollars. Tables 4, and 8 through 10 have been revised to summarize the changes and are provided in Attachment 1 to this letter. Attachment 2 contains the Earthwork and Water Management Cost Estimates with an accompanying letter explaining the estimating process as well as derivation and standard practice sources for unit rates. The revised total current dollar cost is \$26,835,620.

Messrs. Martinez and Yurdin May 21, 2018 Page 2

Net Present Value (NPV) and Financial Assurance (FA) Proposal

Attachment 3 to this letter contains the NPV calculations. Based upon application of 19.10.12.1205(C) NMAC and established agreements for the FA cost estimate calculation with MMD and NMED (See Attachment 3), the proposed NPV amount is \$23,937,772.

The MMD's Guidance was used to calculate the discount and escalation rates. A summary of the indices used is included in Attachment 3. Chino calculated the appropriate discount rates for both earthwork and water management to be 7.27% and 7.42% applied to cash flow years 1 -10 and 11- 100 respectively based on Barclays US Government/Credit and Barclays US Aggregate Indices (see Attachments 3A and 3B). Chino also calculated the appropriate escalation rate for earthwork at 3.14% and water management as 2.43%, which are composites calculated from various consumer price indices (see Attachment 3 for details).

Attachment 4 contains an electronic copy of the cost estimate (including the work books and spreadsheets for the cost estimate and NPV calculations).

As committed in previous meetings, Chino will leave in place the existing total FA amount of \$27,987,884.00 (net present value, including the costs for the Cobre Haul Road) until the proposed FA amount has been review and accepted by the MMD and NMED. The existing FA is secured by instruments including a cash trust, collateral and third party guarantee. Once the review process is completed, Chino will re-evaluate the instruments associated with this FA proposal for the Continental Mine.

Thank you for taking the time to review and approve this information. Please contact me at (575) 912-5773 if you have any questions.

Sincerely,

Thomas L. Shelley, Manager Environmental/Sustainable Development

TLS:rlm 20180521-001 Enclosures

xc: Holland Shepherd, Manager, MMD
 James Hollen, Reclamation Specialist, MMD
 Kurt Vollbrecht, Manager, Mining Environmental Compliance Section, NMED
 Anne Maurer, Mining Environmental Compliance Section, NMED



21 May 2018

Via Electronic Mail

Mrs. Rita Lloyd-Mills Freeport-McMoRan Chino Mines Company 99 Santa Rita Mine Road Vanadium, New Mexico 88043

Subject: 2014 Continental Mine Closure/Closeout Cost Estimate Update

Dear Rita:

We appreciate once again the opportunity to serve Freeport-McMoRan Chino Mines Company (Chino). The purpose of this letter is to provide cost updates to the 2014 Continental Mine Closure/Closeout (CCP) report produced by Telesto Solutions, Inc. (Telesto, 2014). This letter also provides an overview of the cost estimating process that we have developed over time with New Mexico Mining and Minerals Division's (MMD) and the New Mexico Environmental Department, Groundwater Bureau (NMED) as provided in Appendices A, B and C.

COST UPDATE

Tables 8, 9 and 10 in the 2014 CCP summarize the estimated costs upon which financial assurance estimate is made. We have included these in Figures 1, 2 and 3, respectively, in this letter. Chino, with our support, has updated the costs presented in the 2014 CCP by:

- Utilizing 2018 unit costs from RSMeans (RSMeans, 2018), EquipmentWatch (Pendton Media, 2018) and the New Mexico Department of Labor (NMDOL, 2018)
- Adding reclamation costs for the No. 3 Shaft Stockpile, additional disturbance areas, a contingency area, and the Cobre Haul Road (CHR)
- Dividing out borrow material areas
- Providing cost estimates to handle special wastes during building demolition

We have retained the table titles and numbering to be consistent with the 2014 CCP. Accompanying Tables 8, 9 and 10 are Appendices A, B and C from the 2014 CCP, which we have updated to reflect the aforementioned changes.

Grand Junction 751 Horizon Court, Suite 109 Grand Junction, Colorado 81506 970-697-1550

ltem	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost		
Capital					
Tailing Ponds					
Magnetite Tailing Pond	\$840,196	\$237,776	\$1,077,97		
Main Tailings Impoundment	\$2,313,012	\$654,582	\$2,967,59		
Subtotal	\$3,153,208	\$892,358	\$4,045,56		
Waste Rock and Ore Piles					
SWRDF	\$8,860,289	\$2,507,462	\$11,367,75		
Hanover Mountain Deposit	\$1,122,318	\$317,616	\$1,439,93		
No. 3 Shaft Stockpile**	\$56,522	\$15,996	\$72,51		
Low Grade WRF	\$323,121	\$91,443	\$414,56		
Subtotal	\$10,362,250	\$2,932,517	\$13,294,76		
Continental Pit					
Subtotal	\$ 84,223	\$ 23,835	\$108,05		
Surface Impoundments					
Subtotal	\$97,518	\$27,598	\$125,11		
Historic Sites					
Pearson-Barnes Mine Area	\$163,263	\$46,204	\$209,46		
Other Disturbed Areas					
Haul and Exploration Roads	\$75,291	\$21,307	\$96,59		
Dist. Area Near SWRDF**	\$17,895	\$5,064	\$22,95		
Contingency Disturbance Area**	\$632,427	\$178,977	\$811,40		
Borrow Areas**	\$47,750	\$13,513	\$61,26		
Wells	\$7,421	\$2,100	\$9,52		
Subtotal	\$780,783	\$220,962	\$1,001,74		
Demolition					
Buildings	\$1,389,430	\$393,209	\$1,782,63		
Cover	\$102,002	\$28,867	\$130,86		
Rip & Revegetation	\$1,068	\$302	\$1,37		
Subtotal	\$1,492,500	\$422,378	\$1,914,87		
Total Capital Cost	\$16,133,746	\$4,565,850	\$20,699,59		
CHR Total Capital Cost*	\$433,176	\$122,589	\$555,76		
Total	\$16,566,922	\$4,688,439	\$21,255,36		

Table 9 Earthwork O&M Costs								
Total Earthwork O&M Cost ¹								
			Revegetation	Total				
Period (years)	Erosion Control	Road Maintenance	Maintenance	(Current Year \$)				
Overall Site								
0 to 19	\$501,874	\$460,107	\$256,388	\$1,218,370				
20 to 39	\$308,846	\$296,843	\$0	\$605,689				
40 to 99	\$231,634	\$445,265	\$0	\$676,899				
Totals	\$1,042,355	\$1,202,215	\$256,388	\$2,500,958				
CHR ²								
0 to 11	\$74,610	-	\$17,384	\$91,994				
Totals	\$74,610	\$0	\$17,384	\$91,994				

Earthwork O&M costs include 23.3% indirect costs.

²Updated from the 2014 Cobre Haul Road Closeout Plan (Telesto, 2014)

Update to Table 9 of the 2014 CCP Figure 2

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost		
Capital and Replacement					
Ponds and Tanks	\$520,595	\$147,328	\$667,923		
Pumps	\$659,426	\$186,618	\$846,044		
Pipelines	\$0	\$0	\$0		
Electrical	\$0	\$0	\$0		
Subtotal	\$1,180,021	\$333,946	\$1,513,967		
Removal ¹					
Pumps	\$149,324	\$42,259	\$191,583		
Pipelines	\$114,136	\$32,301	\$146,43		
Electrical	\$52,381	\$14,824	\$67,20		
Subtotal	\$315,841	\$89,384	\$405,225		
Operations and Maintenance					
Ponds and Tanks	\$225,298	\$38,301	\$263,599		
Pumps	\$113,383	\$19,275	\$132,658		
Pipelines	\$128,879	\$21,909	\$150,788		
Electrical Infrastructure	\$117,759	\$20,019	\$137,778		
Materials					
Electricity and Fuel	\$30,408	\$5,169	\$35,578		
Environmental Sampling	\$297,192	\$50,523	\$347,715		
Subtotal	\$912,920	\$155,196	\$1,068,116		
Total Estimated Cost	\$2,408,782	\$578,526	\$2,987,308		

Update to Table 10 of the 2014 CCP Figure 3

COST ESTIMATING OVERVIEW

Appendix A

Appendix A (attached) of the 2014 CCP and the update as attached describes the facilities associated with Chino's Continental Mine that are subject to reclamation in the upcoming 5 years. The format is in that which the MMD provides. Appendix A briefly provides a summary of the facility's current condition, the planned reclamation, and the facility's estimated reclamation cost in current dollars. Table 1 summarizes the planned reclamation activities as described in Appendix A.

Appendix B

Appendix B provides the information utilized to develop the earthwork cost estimate and its structure is as follows:

- **Main Text** the main texts describes the specifics of the cost estimating process along with the sub-appendices, which provide back up and support. It describes the reclamation processes utilized to complete the cost estimate
- Appendix B.1 is a hard copy print out of the excel spreadsheets from which we develop the costs. It contains only the earthworks as water management is provided in Appendix C. Electronic versions are provided in Appendix D
- **Appendix B.2** provides the equations and descriptions of data which we use to populate the variables of the cost estimate and we divide Appendix B.2 into the following sub-appendices:
 - Appendix B.2.1 provides the production and miscellaneous calculations used to support the earthworks cost estimate
 - **Appendix B.2.2** tabularizes the only the labor rates from the NMDOL which we use in the estimate
 - Appendix B.2.3 contains copies of the EquipmentWatch sheets from which we obtain unit equipment rates
 - Appendix B.2.4 consists of the pages from RSMeans (RSMeans, 2018) utilized in the cost estimate
 - **Appendix B.2.5** provides the curve fits that we use in the production sheets for dozers, and haul trucks
 - Appendix B.2.6 contains copies of the pertinent pages from the Caterpillar Handbook
 - **Appendix B.2.** lists referenced miscellaneous unit costs used throughout the cost estimating spreadsheets

Table 1 Summary of Reclamation Activities

	Rough Grading	Dozer Assist Cover Load	Load Cover	Haul Cover	Rip Rough Grade	Place Cover & Grade	Scarify & Seed / Revegetate	Excavate Down Drains	Excavate Bench Channels	Rip Liner	Load Rip-Rap	Haul Rip-Rap	Place Rip-Rap Down Drains	Place Rip- Rap Bench Channels	Other Processes (e.g., Fence,
			Tailing	s Ponds											
Main Tailings Impoundment	Х	Х	Х	Х	Х	Х		Х	Х		Х	Х	Х	Х	Х
Magnetite Tailings Impoundment	Х	Х	Х	Х	Х	Х		Х	Х		Х	Х	Х	Х	
			Stoc	kpiles											
South Waste Rock Disposal Facility	Х	Х	Х	Х	Х	Х	Х	Х	Х		Х	Х	Х	Х	Х
Low Grade Waste Rock Facility		Х	Х	Х		Х	Х								
No. 3 Shaft Stockpile	Х	Х	Х	Х	Х	Х	Х								
			Mi	nes										-	-
Continental Pit		Х	Х	Х		Х	Х								Х
Hanover Mountain Deposit		Х	Х	Х		Х	Х								Х
		Su	Irface Im	ooundme	nts		<u> </u>								
Grape Gulch Pond #3 (HDPE lined; reclaimed year 12)		Х	Х	Х		Х	Х			Х					Х
Blackman's Seep (HDPE Lined; reclaimed year 5)						1	d is closed	as part of	tailings re						
Upper Creek Containment Pond 1 (HDPE Lined; Reclaimed year 12)		Х	Х	Х		X	X			X					Х
Magnetite Seepage Pond (HDPE Lined) (Reclaimed year 12)		X	X	X		X	X			X					X
SWRF Dam 1 (Reclaimed year 12)		Х	Х	Х		Х	Х								
SWRF Dam 2 (Reclaimed year 12)		X	X	X		X	X								
SWRF Dam 3 (Reclaimed year 12)		Х	Х	Х		Х	Х								
SWRF Dam 1 (Reclaimed year 12)		Х	Х	Х		Х	Х								
SWRF Dam 2 (Reclaimed year 12)		Х	Х	Х		Х	Х								
SWRF Dam 3 (Reclaimed year 12)		Х	Х	Х		Х	Х								
Decant Pond #4 (HDPE lined; reclaimed year 12)		Х	Х	Х		Х	Х			Х					Х
North Tailings Decant Pond (Reclaimed year 12)		Х	Х	Х		Х	Х			Х					Х
East WRF Containment (Proposed; Reclaimed Year 12)		Х	Х	Х		Х	Х			Х					Х
			Histor	ic Sites			<u> </u>								
Pearson-Barnes Mine Area		Х	Х	X	Х	Х	Х								
Disturbed Area Adjacent and North of the SWRDF		X	X	X	X	X	X								
				her											
Remaining Internal Haul Roads	Х	Х	X	X		Х	X								
Exploration Roads	X X	X	X	X		X	X								
Borrow Areas			~				X								
Demolition		Х	Х	х	х	Х	X								Х
Cobre Haul Road	X	X	X	X	X	X	X	Х		х	Х	x	x		X

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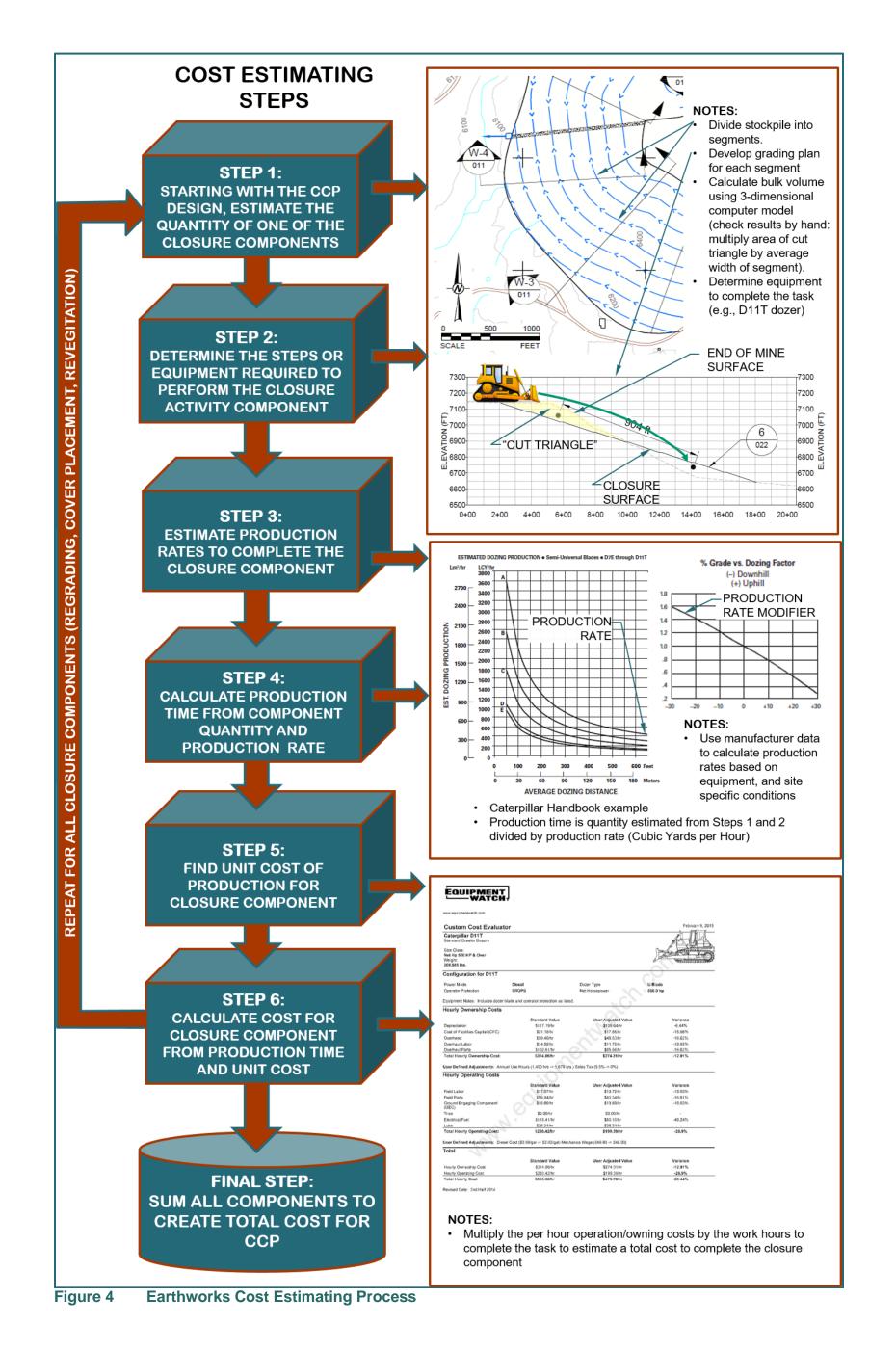
• **Appendix B.3** provides the basis for the quantities utilized in the cost estimating process. We base the quantities upon the conceptual mine plan at the end of year (EOY) for which we estimate has the highest reclamation cost in the upcoming 5-year period (2023 for the Continental Mine). We have updated the EOY drawings from the 2014 CCP and have attached them to this letter

Overall, the cost estimating process is typical, standard, approach used in the engineering and construction industries (consistent with the RSMeans Construction Cost Estimating Handbook). The earthworks cost estimate is an iterative process. We first assume the type of equipment to complete the desired construction steps. Then, we evaluate the number of equipment pieces needed (e.g., number of trucks, loaders, bulldozers) to form a "fleet." We change the number and type of equipment, recalculate the cost and compared to a base cost, which is the lowest of the previous iterations. We repeat this until the most efficient fleet is found, and once found we utilize the unit costs associated with equipment in the fleet to estimate the total reclamation cost utilizing the spreadsheets, which are include as Appendix D. Figure 4 summarizes the costing steps we use for one piece of equipment in developing our fleet.

Appendix C

Appendix C provides the components that we utilize to develop the water management costs associated with reclamation. This appendix would also contain water treatment cost estimates, but these are not necessary for the Continental Mine as Chino will process any water requiring treatment. Appendix C consists of the following:

- The main text, which describes the inputs and approach to estimating water management costs and reclaiming water management systems after closure. The main text references four sub appendices:
 - **Appendix C.1** provides the calculations from which we estimate stormwater management volumes during and after closure
 - Appendix C.2 is a calculation documentation of the estimated long-term drain down of the water stored within the pore space of the Main Tailings impoundment
 - Appendix C.3 is akin to Appendix B.1 except for water management. We provide the cost calculation spreadsheets in Appendix D as well
 - **Appendix C.4** contains copies of the unit rates and reference material from which we develop unit costs for the water management cost estimate



20180521_ContinentMine_CCP_Cost_Update.docx



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Estimating the water management costs for the 2014 CCP is a straightforward task as it does not rely on an iterative process to find efficiency as does the earthworks cost estimate. We quantify the facilities, and physical nature (e.g., pumping distances, hydraulic heads, flow rates, facility age, and power consumption) of the water management system at EOY 2023. From the quantifications we develop reclamation activities and schedules to which we apply unit costs and apply to the cost estimating spreadsheets.

Appendix D

Appendix D contains the electronic version of the cost estimating spreadsheets from which Appendices A through C are based. Within the spreadsheets, assumptions and other information is provided that we may not have captured in the narrative of the appendices texts. For example, some unit costs include indirect costs, which we remove for the base cost estimating calculation, and then include as part of the total after all of the direct costs are summarized. This is especially true for such things as unit costs developed from EquipmentWatch. EquipmentWatch (Pendton Media, 2018) notes that certain costs (e.g., equipment depreciation, profit, overhead) included in their standard values are typical indirect costs and adjustments to the standard values may be needed if the estimator plans to later add indirect costs (which is our approach). We have removed most of the indirect costs from the EquipmentWatch direct costs and apply them to the total direct costs with the exception of equipment depreciation. RSMeans describes depreciation as an indirect cost (RSMeans, 2018). We retained equipment depreciation as a direct cost in this update to the 2014 CCP as to provide a conservative estimate. Chino should consider removing depreciation cost in its future submittals.

Again, thank you for the opportunity to serve you and your team. Should you have any questions or concerns with this letter or the attached update, please do not hesitate to contact Eddie Humphrey or me.

Sincerely, *Telesto Solutions, Inc.*

Miceah Walter L. Niccoli, PE

Walter L. Niccoli, PE Principal/Senior Engineer

WLN:jeh Enclosure cc:

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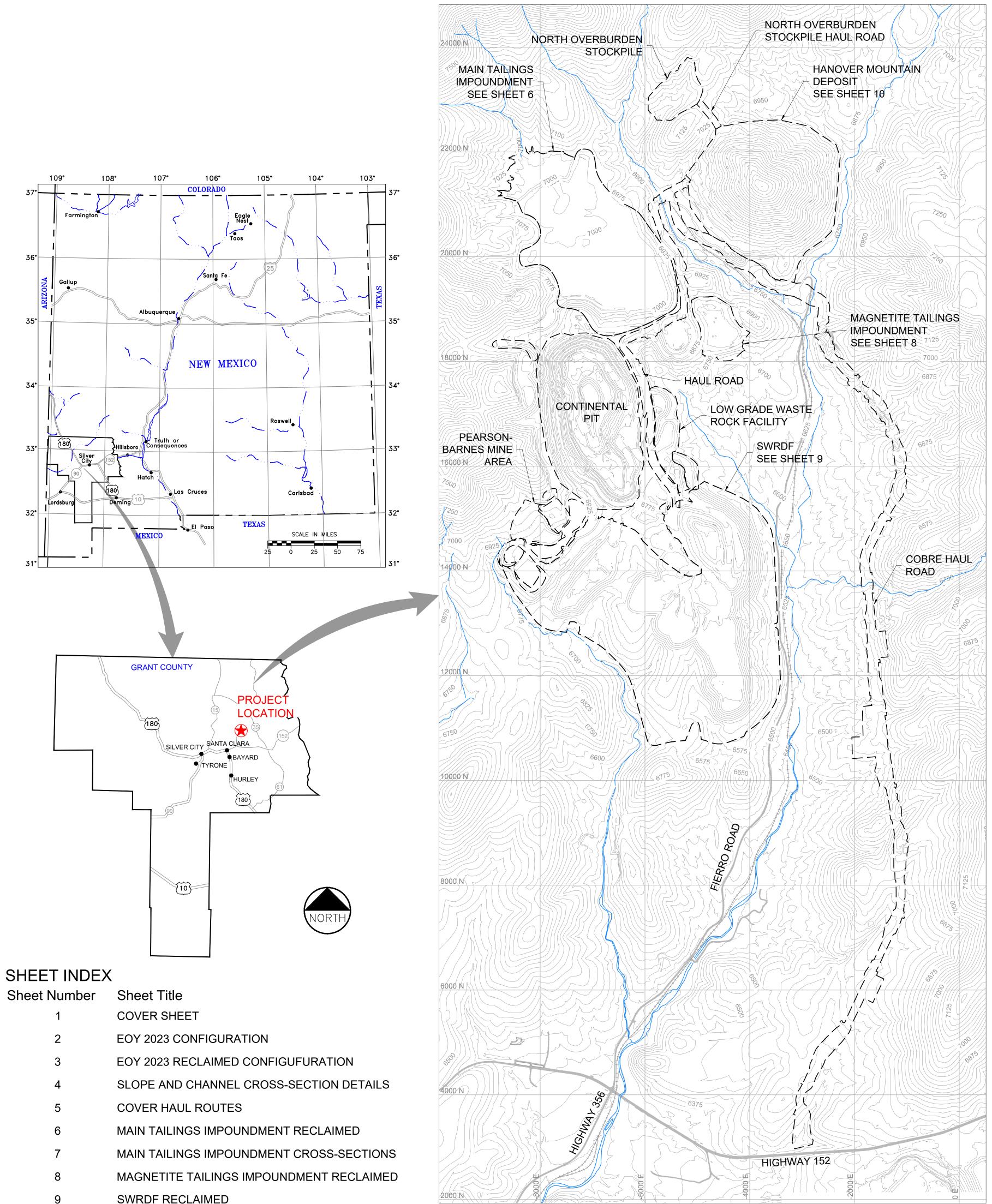
To: Rita Lloyd-Mills Date: May 21, 2018 Page 9

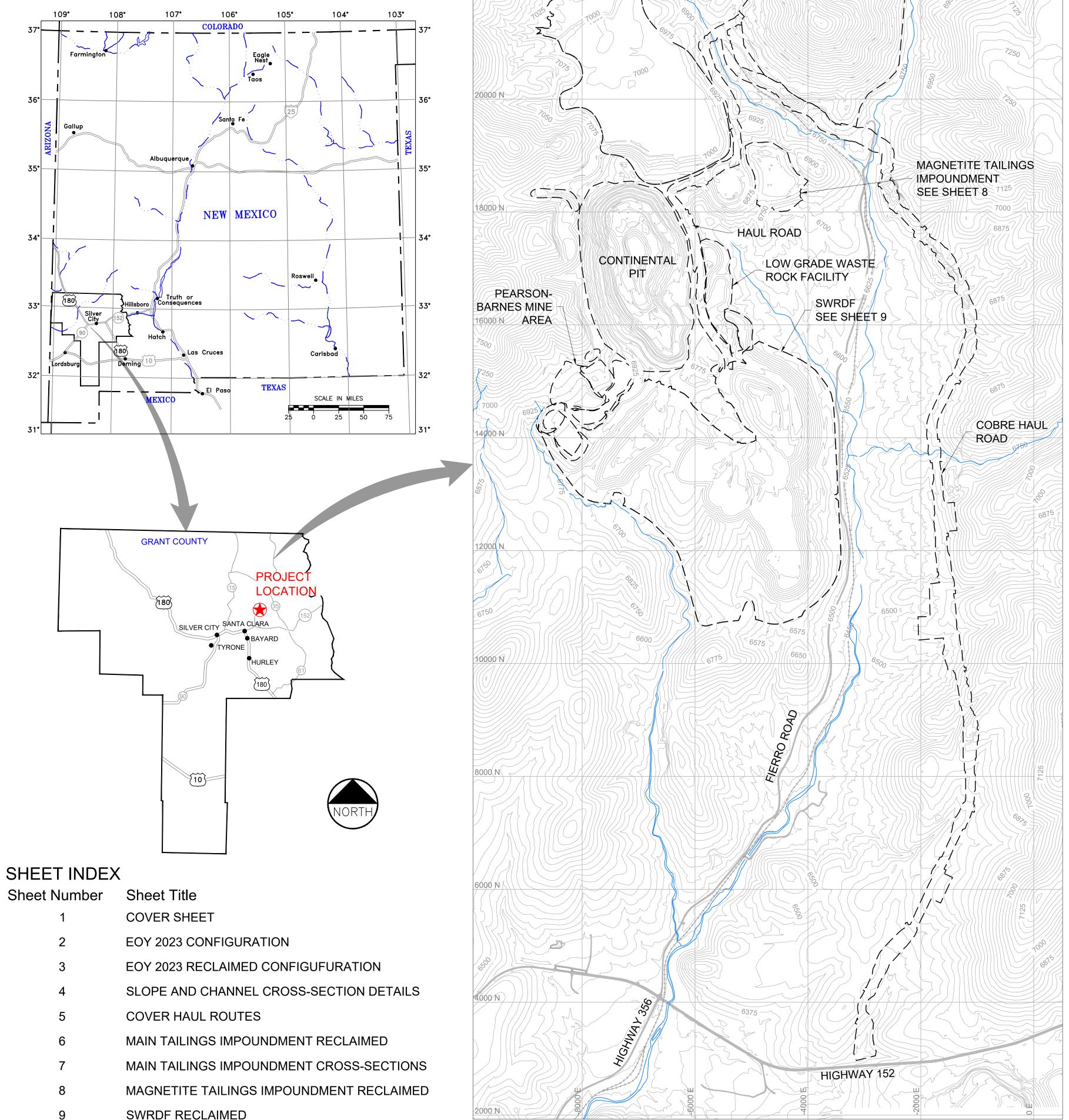
REFERENCES

- NMDOL. (2018, 3 30). *Prevailing Wage Poster H 2018*. Retrieved from New Mexico Department of Labor: https://www.dws.state.nm.us/Portals/0/DM/Labor
- Pendton Media. (2018, 03 01). *EquipmentWatch Construction Estimator*. Retrieved from EquipmentWatch: https://www3.equipmentwatch.com
- RSMeans. (2018). *Heavy Construction Cost Data. 32nd Edition*. Rockland, MA: RSMeans Construction Publishers & Consultants.
- Telesto. (2014). Freeport-McMoRan Cobre Mining Company 2014 Continental Mine Closure/Closeout Plan Update. Telesto Solutions, Inc. Fort Collins, Colorado: Fort Collins, Colorado. December 2014.

DRAWINGS

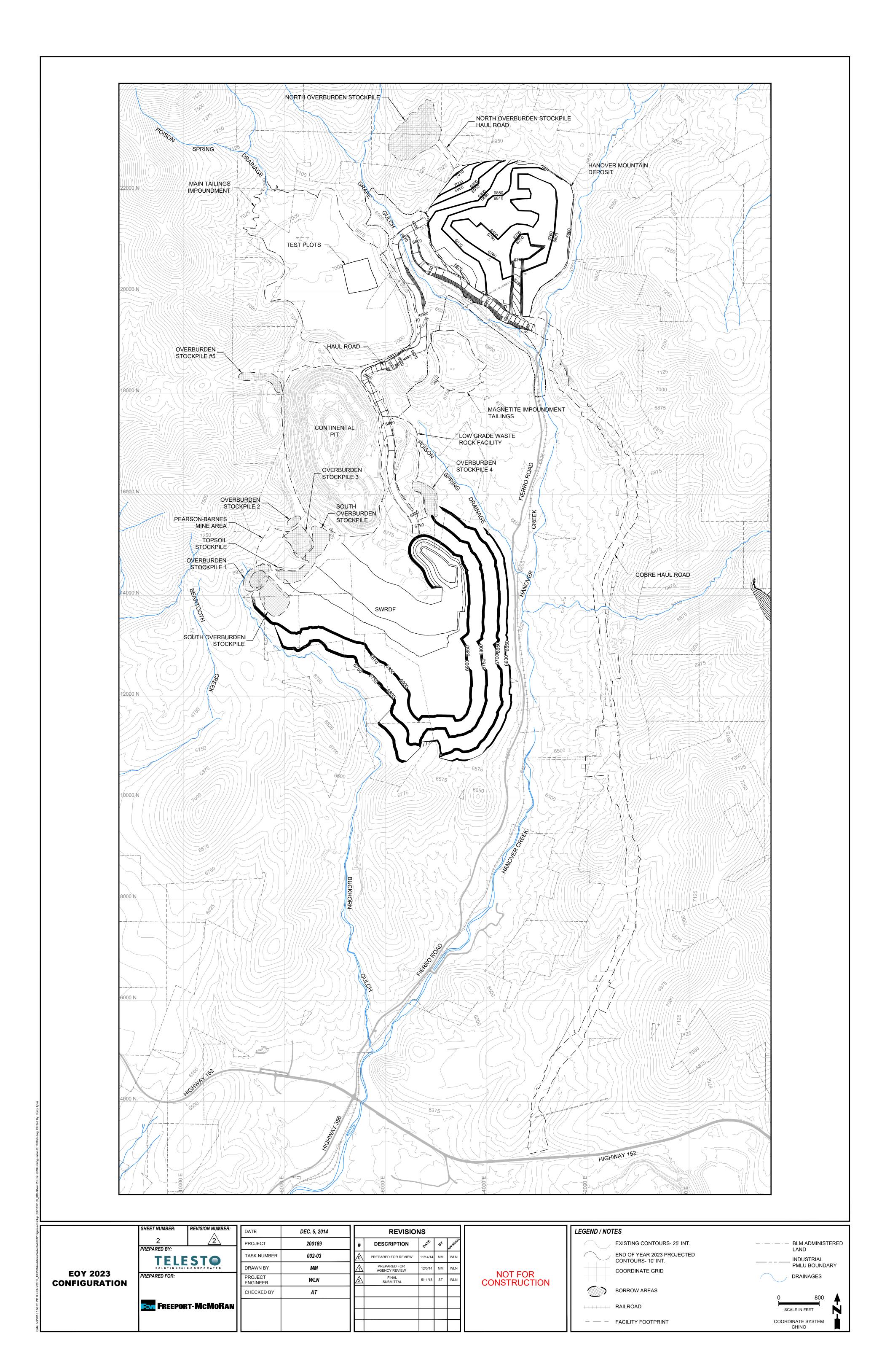
CONTINENTAL MINE END OF YEAR 2023 **CONCEPTUAL RECLAMATION** DRAWINGS

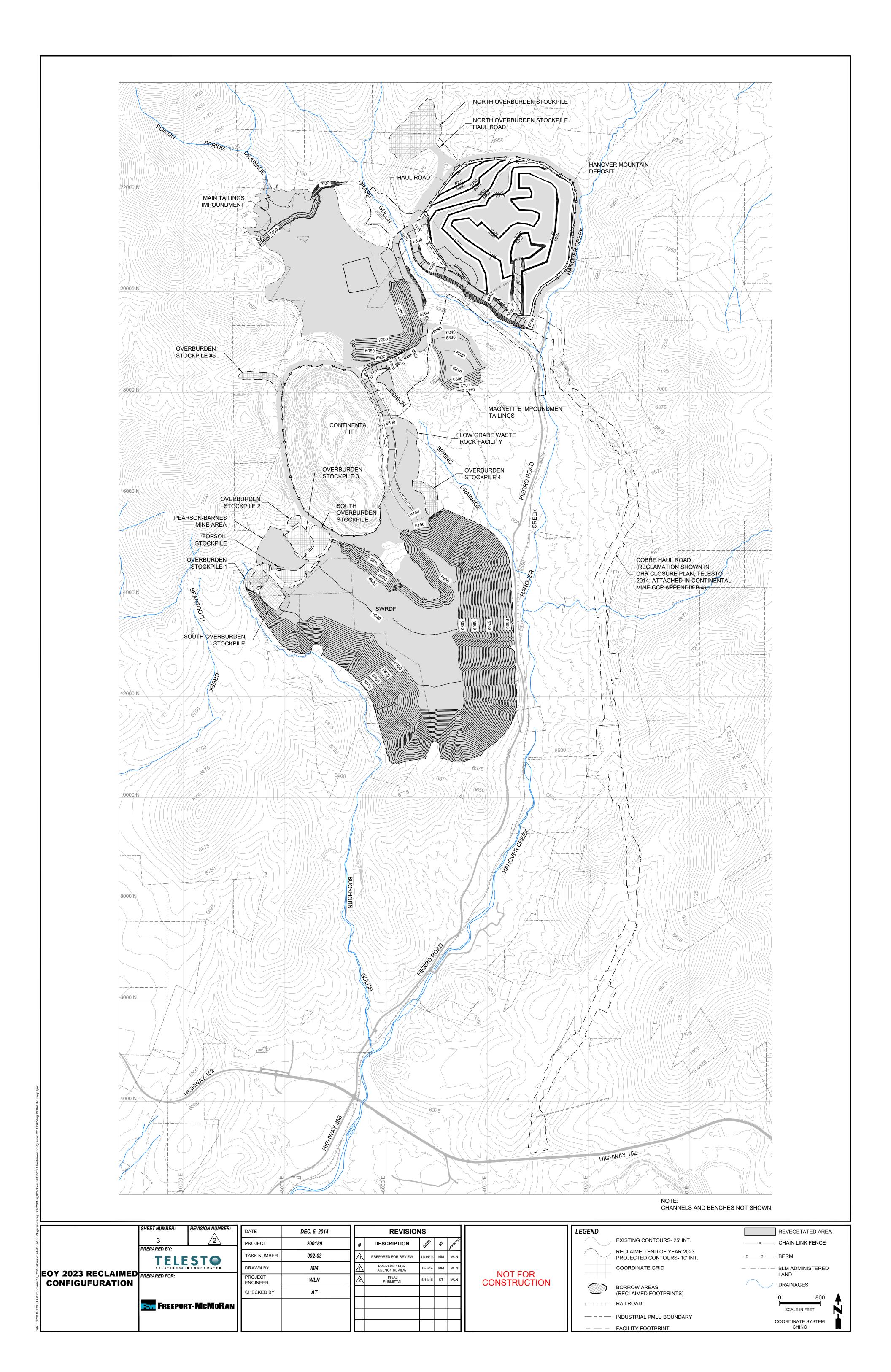


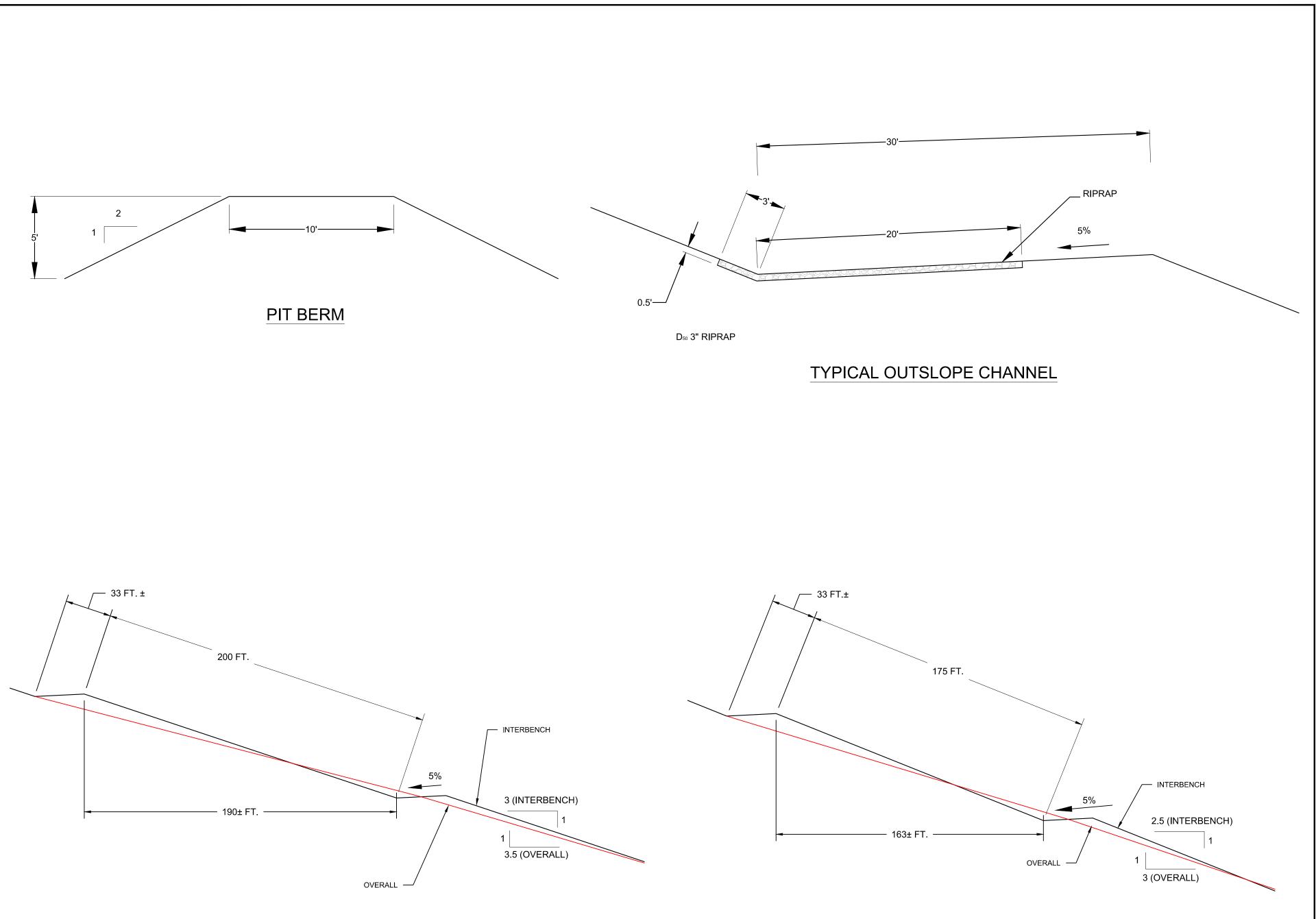


SWRDF RECLAIMED 9 HANOVER MOUNTAIN DEPOSIT RECLAIMED POST 10 END OF YEAR 2023 MINING

	SHEET NUMBER:	DATE	DEC. 5, 2014	REVISIO	NS		LEGEND / NOTES	
		PROJECT	200189	# DESCRIPTION	DATE BY POROUN		EXISTING CONTOURS- 25' INT.	ACRONYMS:
	PREPARED BY:	TASK NUMBER	002-03	PREPARED FOR REVIEW	11/14/14 MM WLN		COORDINATE GRID	PMLU POST MINING LAND USE
	SOLUTIONSOINCORPORATED	DRAWN BY	ММ	PREPARED FOR AGENCY REVIEW	12/5/14 MM WLN			SWRDF SOUTH WASTE
COVER SHEET	PREPARED FOR:	PROJECT ENGINEER	WLN	FINAL SUBMITTAL	5/11/18 ST WLN	NOT FOR CONSTRUCTION	RAILROAD	ROCK DISPOSAL FACILITY
		CHECKED BY	AT				ROADS	EOY END OF YEAR
	FREEPORT-MCMoRAN	FREEPORT-MCMORAN					— — – FACILITY FOOTPRINT	0 1000 SCALE IN FEET
							DRAINAGES	COORDINATE SYSTEM CHINO



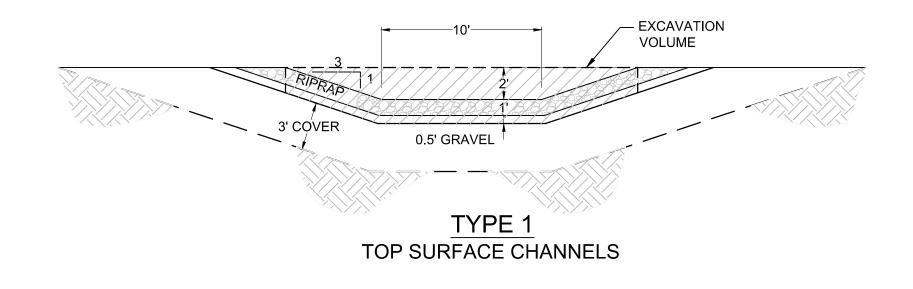


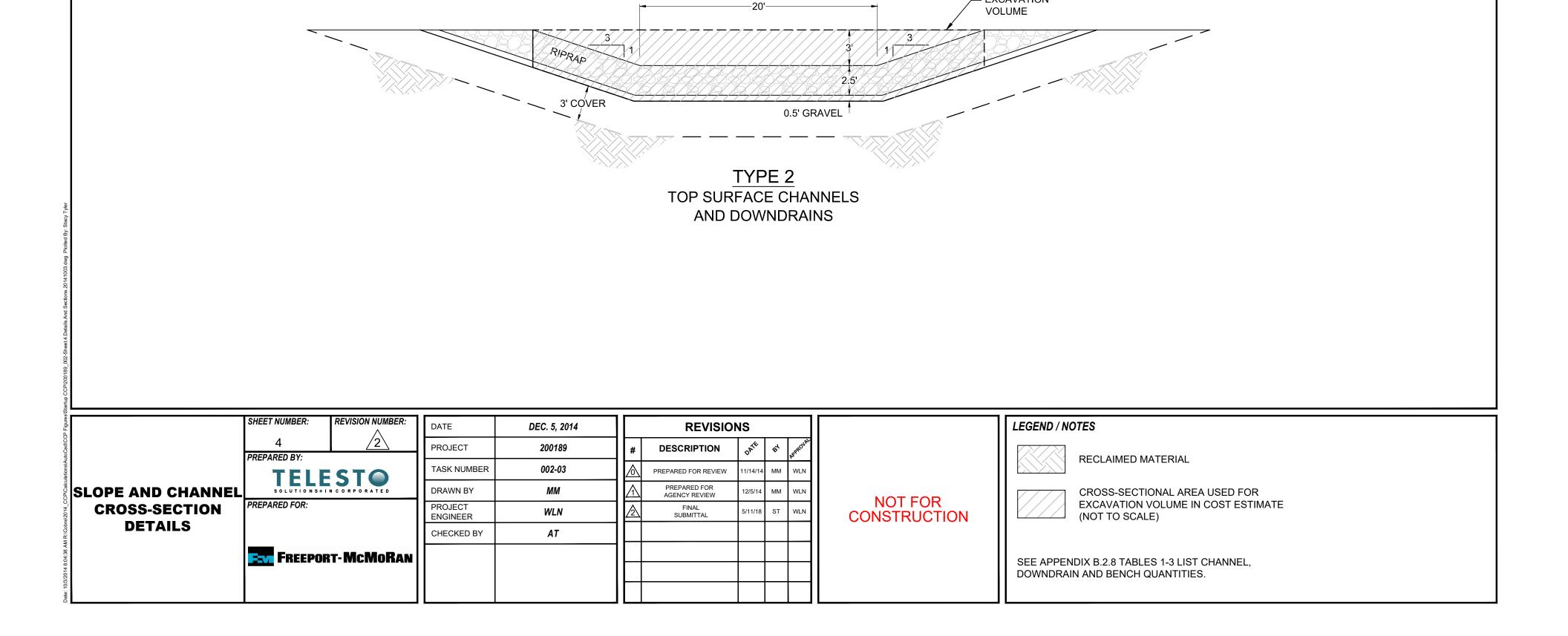


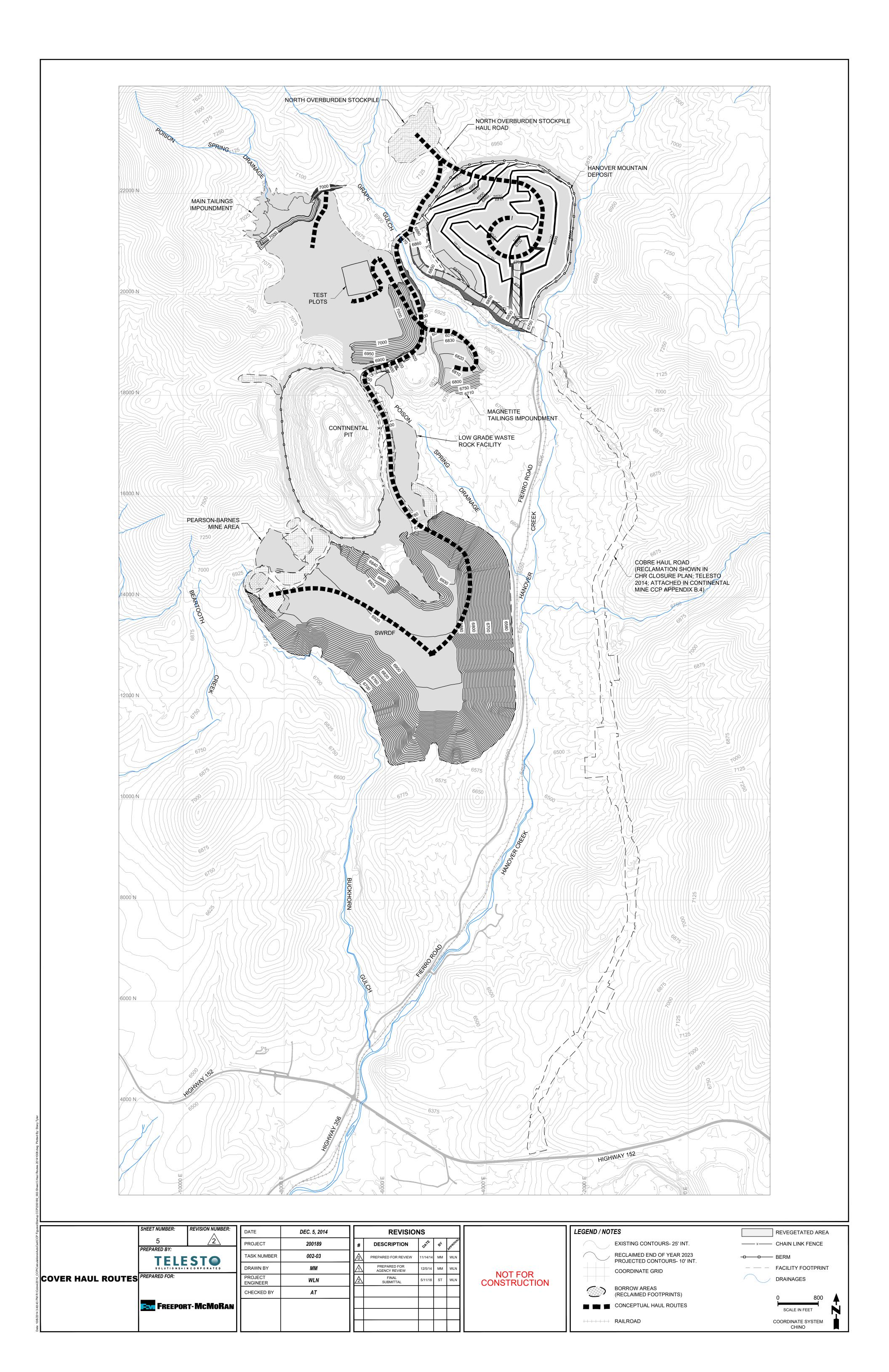
TYPICAL OUTSLOPE BENCH ON A 2.5:1 SLOPE

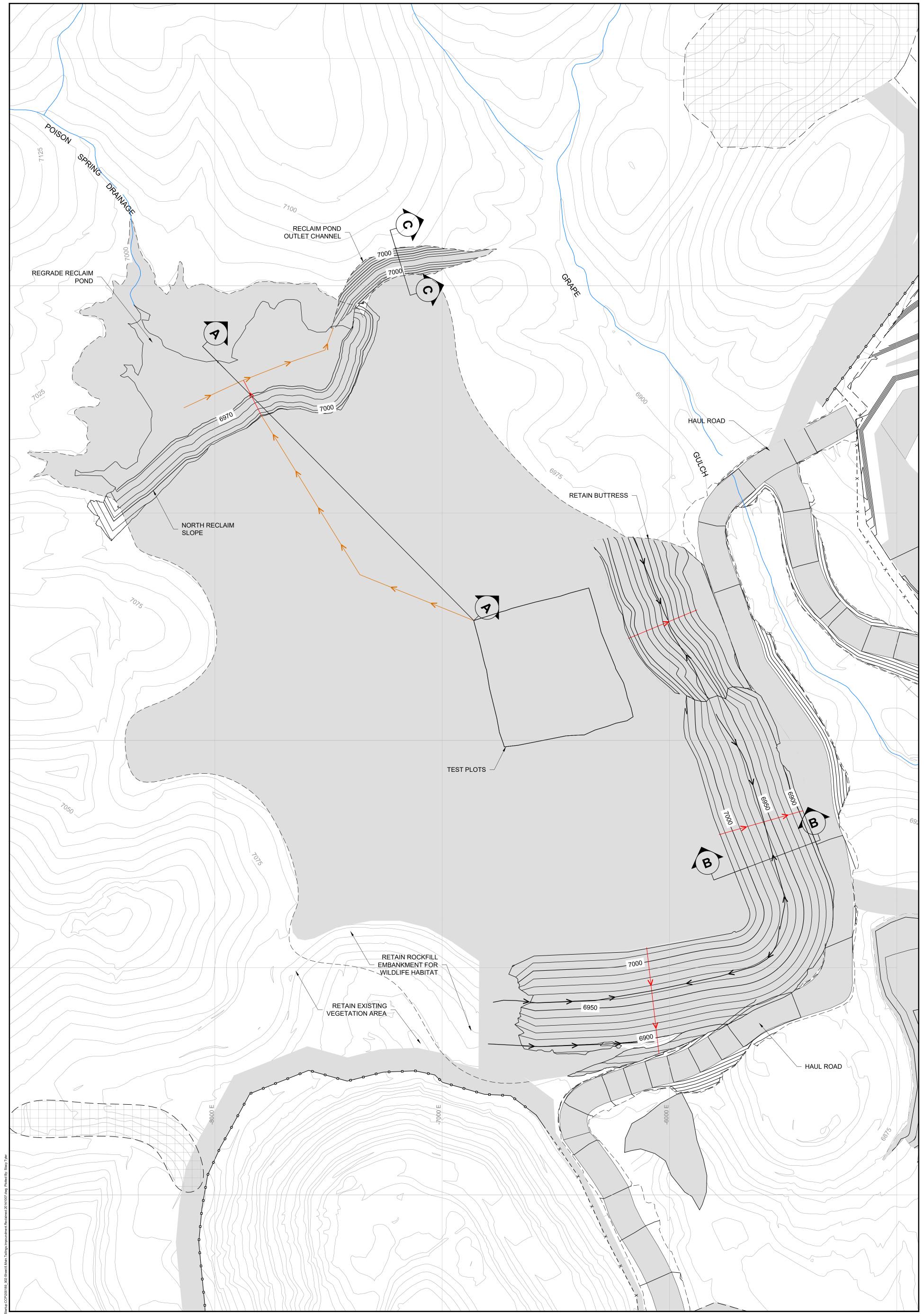
EXCAVATION

TYPICAL OUTSLOPE BENCH ON A 3:1 SLOPE

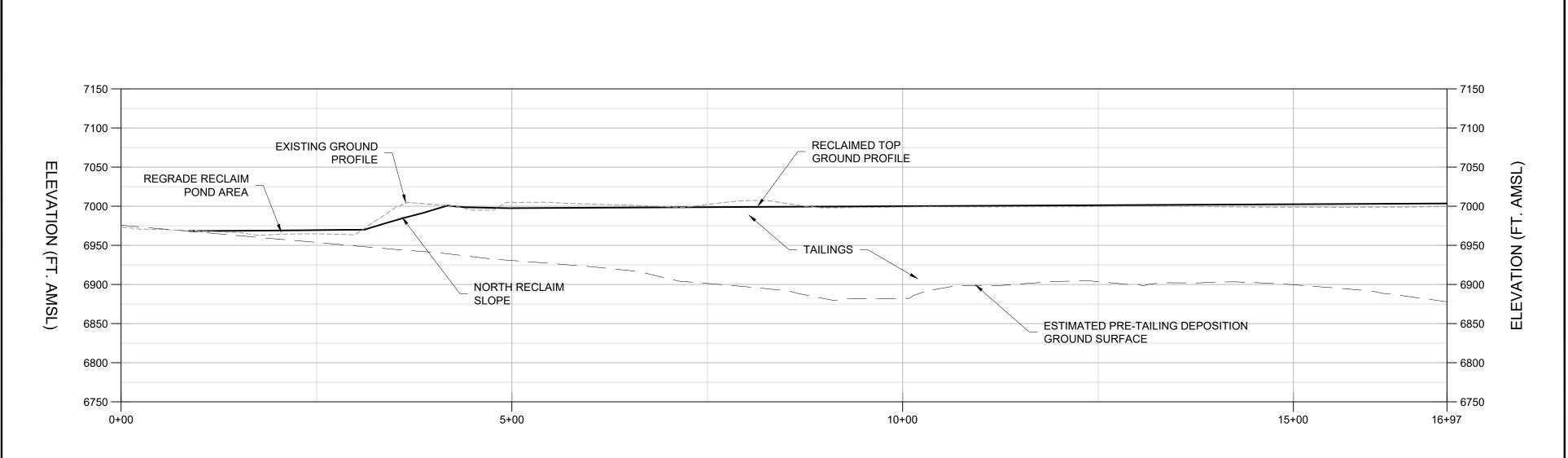






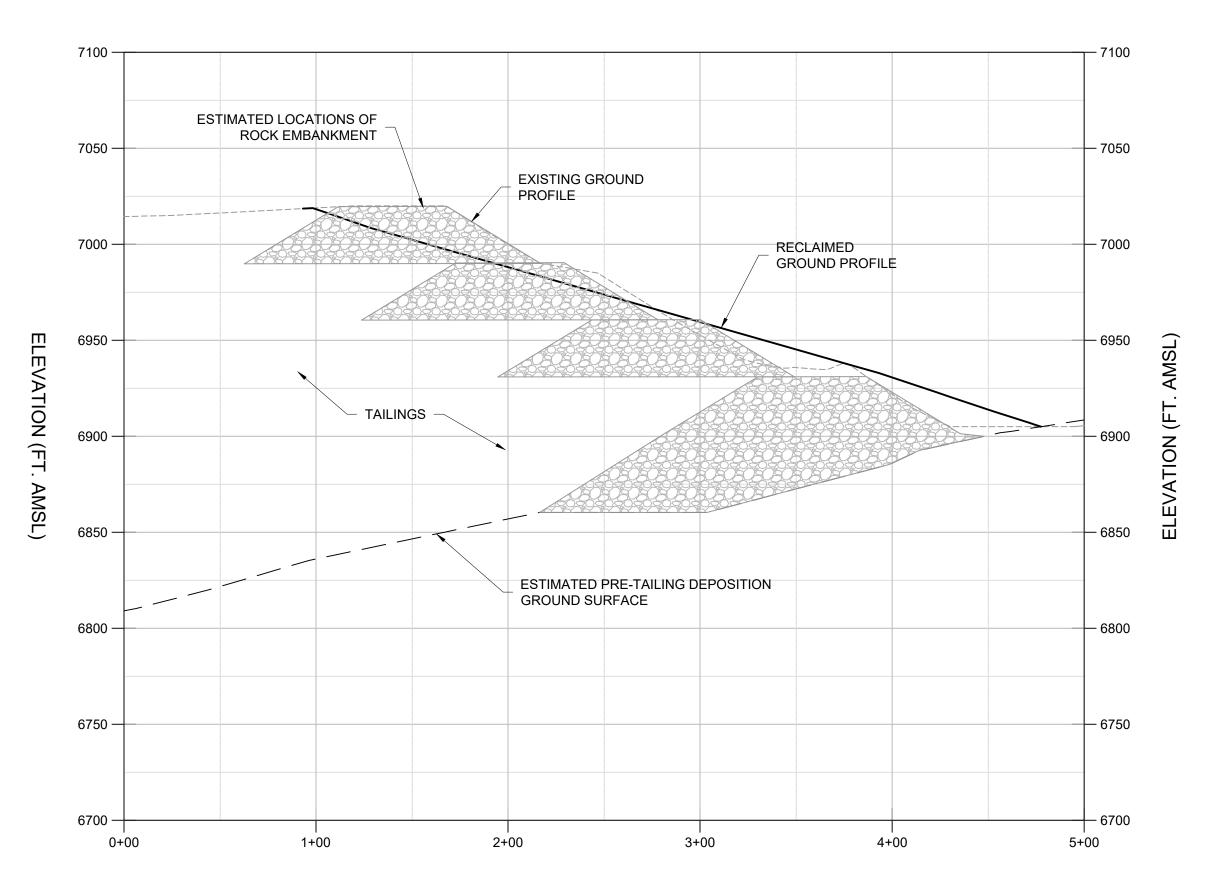


kenues/	SHEET NUMBER: REVISION NUMBER:	DATE	DEC. 5, 2014		REVISION	NS				LEGEND / NOTES EXISTING CONTOURS- 25' INT. (AMSL)	
ations/AutoCad/C	6 2 PREPARED BY: TELESTO	PROJECT TASK NUMBER	200189 002-03	#	DESCRIPTION PREPARED FOR REVIEW	0474	х мм	REPROVAL		RECLAIMED END OF YEAR 2023 PROJECTED CONTOURS- 10' INT.	TYPICAL SECTIONS ON SHEET 4 CONCEPTUAL DOWNDRAIN SEE TYPE 2 CHANNEL ON SHEET 4
MAIN TAILINGS IMPOUNDMENT	PREPARED FOR:	DRAWN BY PROJECT ENGINEER	MM WLN		PREPARED FOR AGENCY REVIEW FINAL SUBMITTAL	12/5/14 5/11/18		WLN WLN	NOT FOR CONSTRUCTION	COORDINATE GRID	CONCEPTUAL TYPE 2 CHANNEL SEE TYPICAL SECTION ON SHEET 4
	Freeport-McMoRan	CHECKED BY	ΑΤ							FACILITY FOOTPRINT BORROW AREAS (RECLAIMED FOOTPRINTS) REVEGETATION AREA	0 200 SCALE IN FEET
Date: 7										× CHAIN LINK FENCE	CHINO



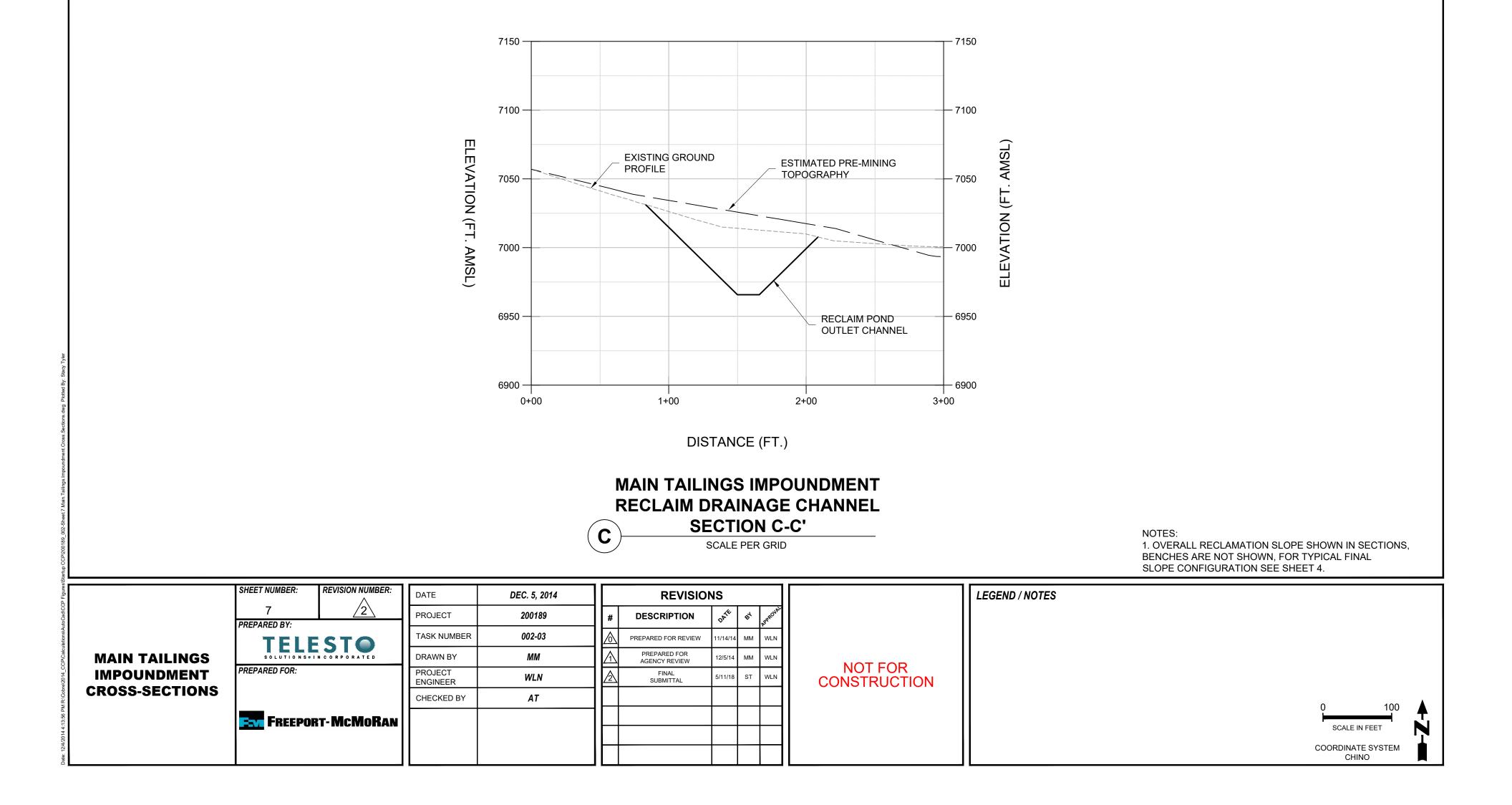
DISTANCE (FT.)

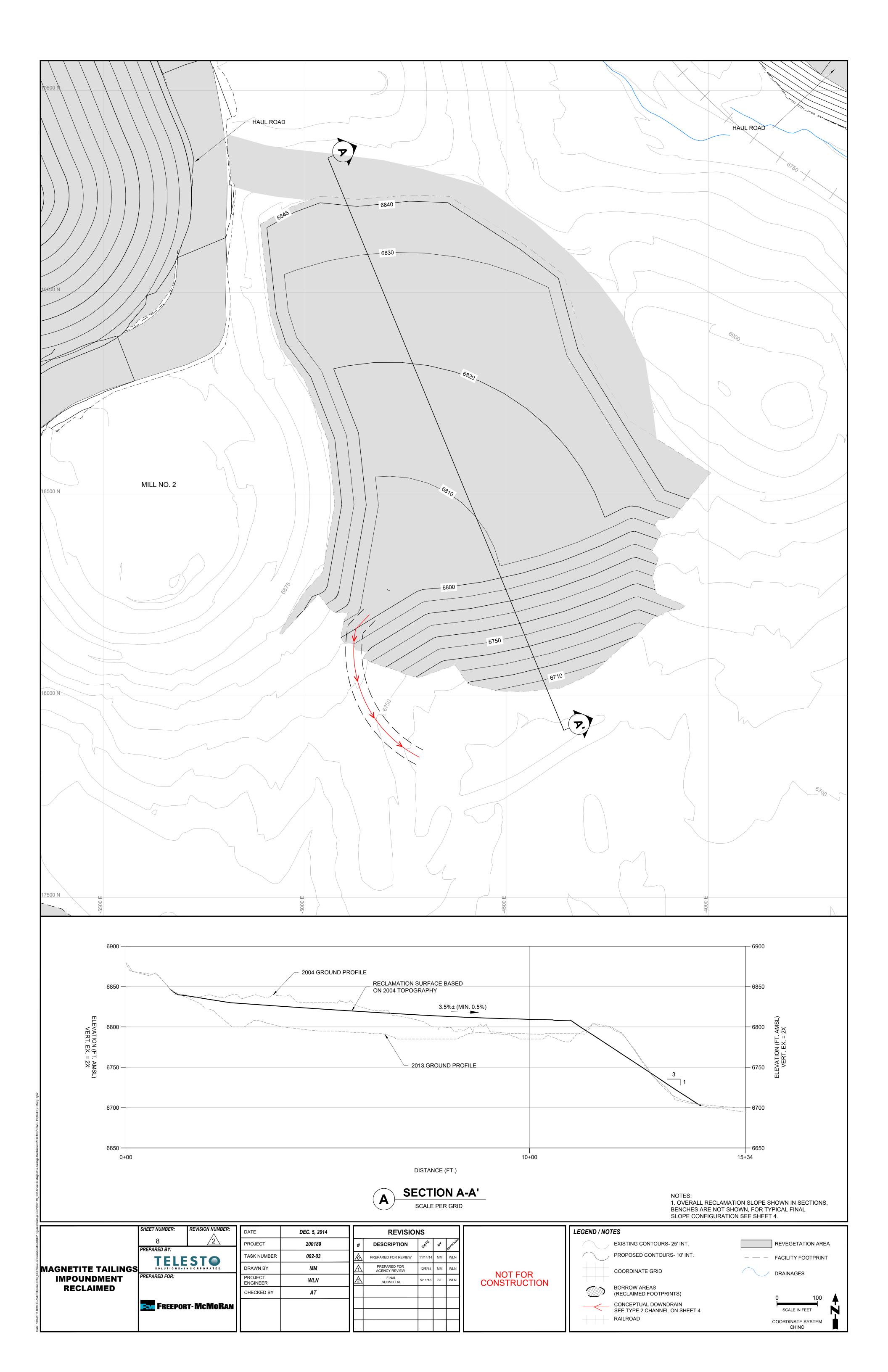
MAIN TAILINGS IMPOUNDMENT NORTH RECLAIM SLOPE AND TOP SECTION A-A' SCALE PER GRID

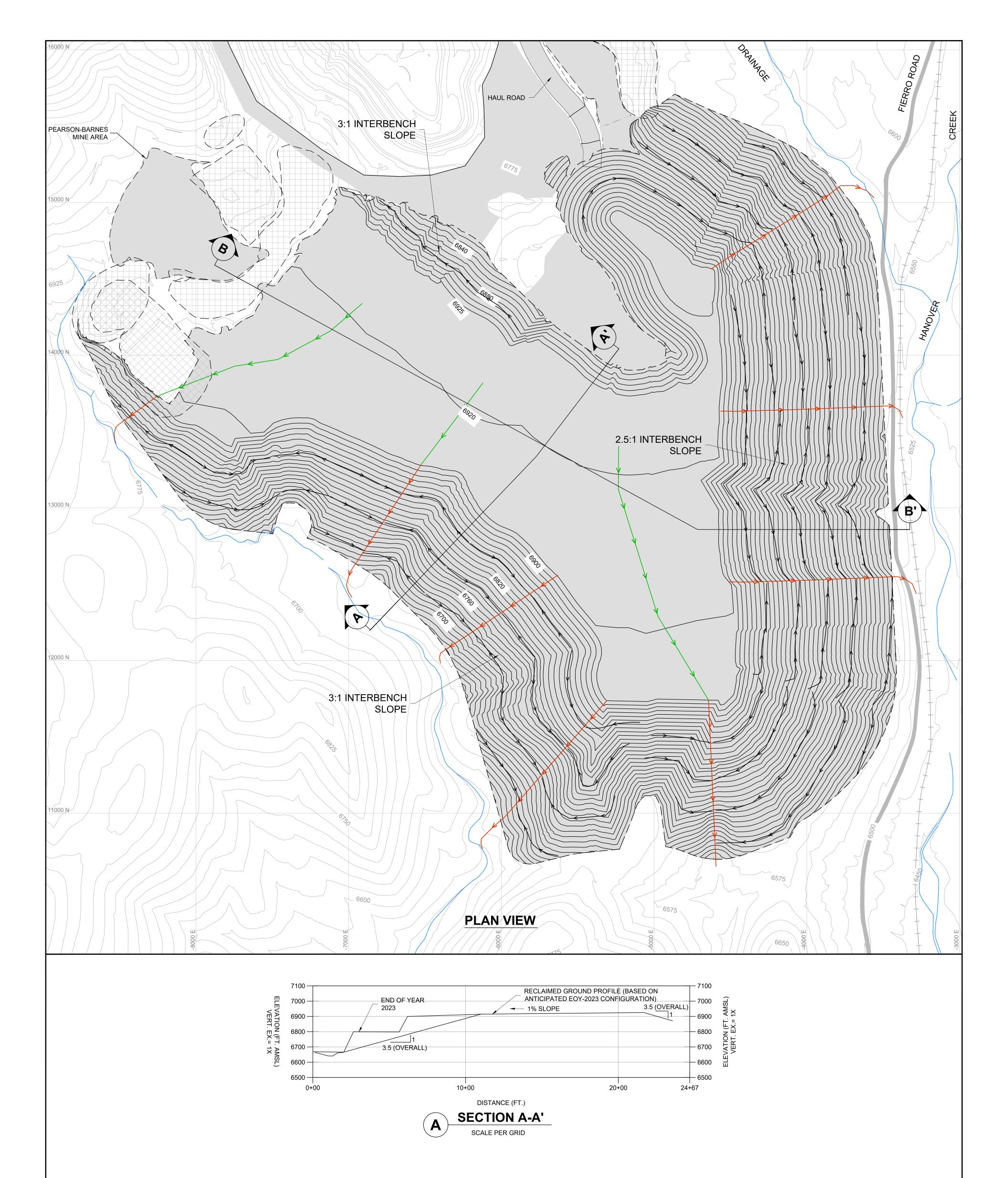


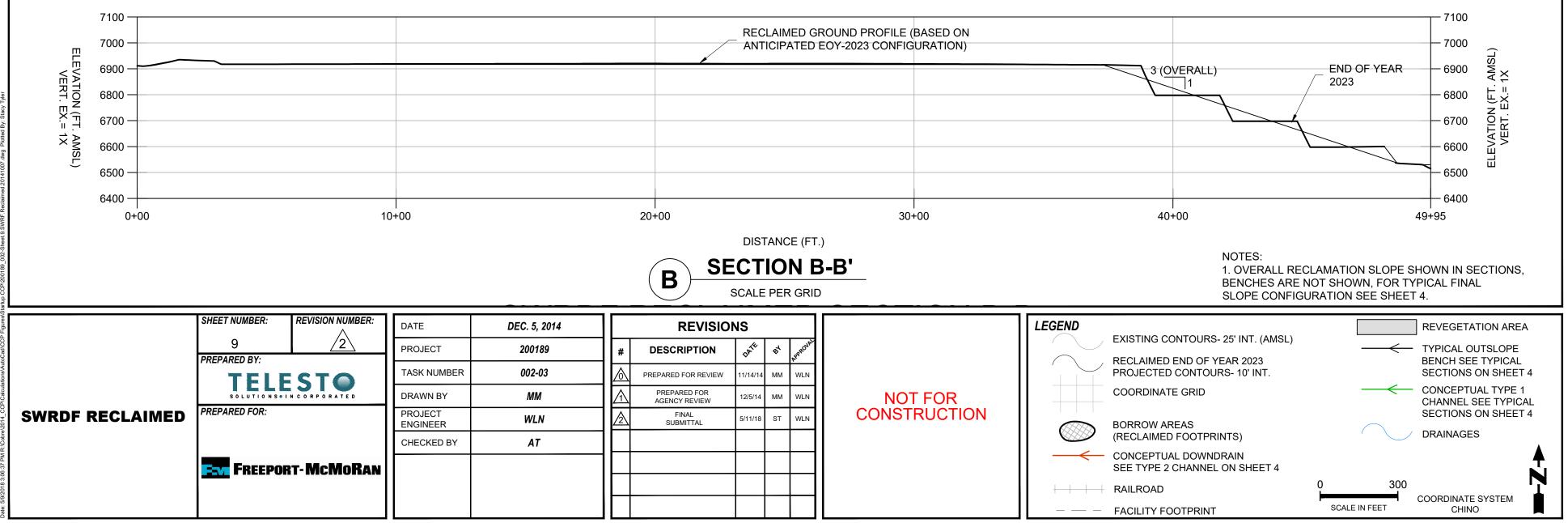
DISTANCE (FT.)

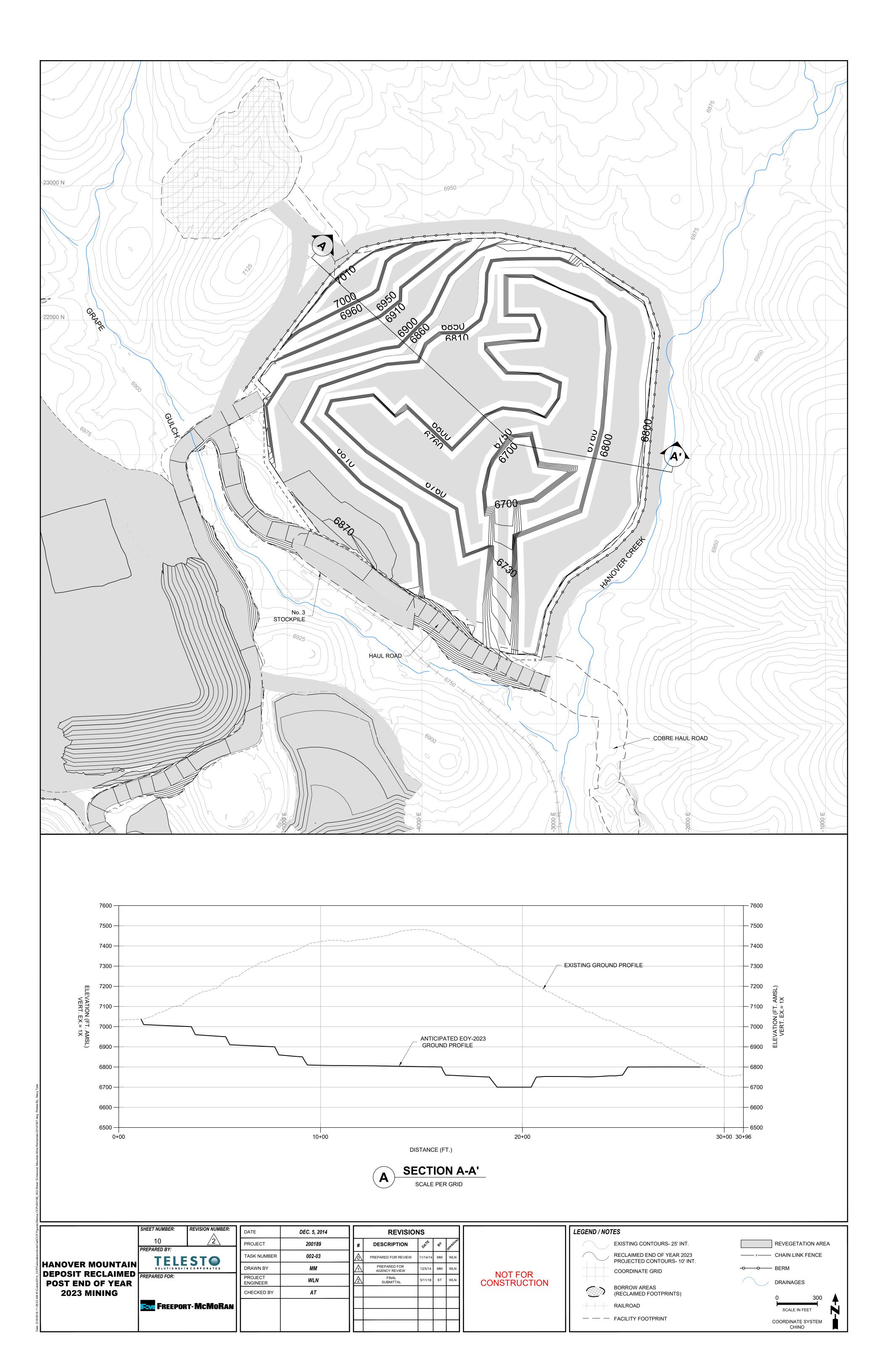
MAIN TAILINGS IMPOUNDMENT SOUTH RECLAIM SLOPE SECTION B-B' SCALE PER GRID











APPENDIX A

FACILITY CHARACTERISTIC FORMS

List of Tables

Continental Pit	1
Low Grade WRF	2
Main Tailings Impoundment and Reclaim Pond	3
Magnetite Tailings Impoundment	4
SWRDF	5
Hanover Mountain Deposit	
Surface Impoundments	
Haul and Exploration Roads	8
Contingency Disturbance Area	9
Cobre Haul Road ²	
Pearson-Barnes Mine Area	11
No. 3 Stockpile	12
Borrow Areas	

NOTES:

- 1. Borrow area reclamation costs can be found in the Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519 spreadsheet in Appendix B.1.
- 2. The costs in these tables only include capital earthwork costs. Building demolition, well closure, water management, and operations and maintenance costs can be found in Appendix B, C, and D.

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Continental Pit

Function	Open Pit
Construction Method	Blasting, loading, and hauling rock in 20-foot benches.
Physical Characteristics	Intrusive and skarn rocks with low primary permeability and medium fracture permeability; Barringer fault trends northeast through the Pit.
Existing Engineering Measures	Visual monitoring, seepage control.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area—Berm and Fence Area Surrounding Pit at Closure (acres)	17.6
Item	Capital Cost
Cover Material (Load, haul, spread)	\$0
Regrade	\$0
Seed & Mulch Berm and Fence Area	\$19,334
Berm and Fence	\$88,724
Capital Cost Totals	\$108,058
Capital Cost/Acre	\$6,140

Low Grade WRF

Function	Inactive; Storage for low grade waste rock
Construction Method	End dumped.
Physical Characteristics	Coarse grained.
	High saturated hydraulic conductivity.
Existing Engineering Measures	Stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	27.8
Item	Capital Cost
Cover Material (Load, haul, spread)	\$381,780
Regrade	\$2,213
Seed & Mulch	\$30,571
Other	\$0
Capital Cost Totals	\$414,565
Capital Cost/Acre	\$14,912

Function	Tailings deposition; Inactive since 1999
Notes	Located in Poison Spring; Poison Spring will be diverted into Grape Gulch Drainage at Closure. Both Poison Spring Drainage and Grape Gulch Drainage are tributaries of Hanover Creek.
Construction Method	Upstream tailings, mine waste rock outer dams.
Physical Characteristics	Fine to coarse grained. Low to medium saturated hydraulic conductivity.
Existing Engineering Measures	Decant sump, seepage collection at toe, filter dike, and reclaim pond and pipelines. Embankment buttresses; 6-inch thick cover on top surface.

Main Tailings Impoundment and Reclaim Pond

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	179
Item	Capital Cost
Cover Material (Load, haul, spread)	\$1,778,293
Regrade	\$95,363
Seed & Mulch	\$196,605
Other ¹	\$897,333
Capital Cost Totals	\$2,967,594
Capital Cost/Acre	\$16,579

¹Other includes channels, down drains

Note: The Main Tailings Impoundment is unchanged by end of year (EOY) 2019. Reclamation costs for the Reclaim Pond are included with the Main Tailings Impoundment. Cost also includes reclaiming south buttress area and burying tailing pipelines in place.

Magnetite Tailings Impoundment

Function	Tailings deposition; Inactive since 1980
Construction Method	Upstream tailings construction.
Disco i ci Characteristica	Fine grained.
Physical Characteristics	Low to medium saturated hydraulic conductivity.
	Ongoing tailing removal operation. Soil binding agent added to
Existing Engineering Measures	reduce fugitive dust. HDPE lined seepage collection pond at
	toe.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	62.5
Item	Capital Cost
Cover Material (Load, haul, spread)	\$803,564
Regrade	\$99,798
Seed & Mulch	\$68,623
Other ¹	\$105,986
Capital Cost Totals	\$1,077,972
Capital Cost/Acre	\$17,248

¹Other includes channels and downdrains

²Although there is the ongoing sale and shipping of magnetite material, the previous Magnetite Tailings Impoundment reclamation plan, based on 2004 topography, is still valid. Therefore, the updated Magnetite Tailings Impoundment reclamation cost was based on 2004 topography.

SWRDF

Function	Planned Waste Rock Stockpile Expansion By EOY 2019 the five WRFs (South, East, West, Buckhorn, Union Hill and additional areas in between) are combined into the South Waste Rock Disposal Facility (SWRDF). By EOY 2019 approximately half the proposed SWRDF material will be placed.
Construction Method	End dumped in 40 to 50 foot lifts; top surface will be bermed.
Dhusiaal Characteristics	Fine to coarse grained.
Physical Characteristics	Variable saturated hydraulic conductivity.
Engineering Measures	Will be managed similar to existing waste rock facilities consisting of seepage collection sumps, and stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres) ¹	386.4
Item	Capital Cost
Cover Material (Load, haul, spread)	\$5,614,570
Regrade	\$1,921,452
Seed & Mulch	\$424,460
Other ²	\$3,430,228
Capital Cost Totals	\$11,390,709
Capital Cost/Acre	\$29,479

¹Includes disturbed area adjacent and north of the SWRDF ²Other includes channels and downdrains

Hanover Mountain Deposit

Function	Planned Mine Area
Construction Method	Blasting, loading, and hauling rock (50 foot benches).
Physical Characteristics	NA
Engineering Measures	Maintenance and stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres) ¹	93.3
Item	Capital Cost
Cover Material (Load, haul, spread)	\$1,225,961
Regrade	\$0
Seed & Mulch	\$102,490
Other	\$111,483
Capital Cost Totals	\$1,439,934
Capital Cost/Acre	\$15,433

¹Includes berm and fence disturbed area.

Surface Impoundments

Function	Stormwater / Seepage Collection
Construction Method	Membrane-lined; soil; concrete; unlined.
Physical Characteristics	Varies.
Existing Engineering Measures	Maintenance and Monitoring.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres) ¹	5.4
Item	Capital Cost
Cover Material (Load, haul, spread)	\$75,889
Regrade	\$429
Seed & Mulch	\$5,932
Other ²	\$42,865
Capital Cost Totals	\$125,116
Capital Cost/Acre	\$23,170

¹Reclaim Pond included with Main Tailing Impoundment ²Other includes reinforced concrete wall demolition

Haul and Exploration Roads

Function	Existing and Planned Site Traffic
Notes	Includes Haul Roads and Exploration roads.
Construction Method	Cut & fill.
Physical Characteristics	12 to 120 feet wide driving surface with roadside berms.
Existing Engineering Measures	Ongoing maintenance and stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	82
Item	Capital Cost
Cover Material (Load, haul, spread)	\$0
Regrade	\$6,521
Seed & Mulch	\$90,077
Other	\$0
Capital Cost Totals	\$96,598
Capital Cost/Acre	\$1,178

Contingency Disturbance Area

Function	Unknown
Notes	Allows for reclamation of land disturbances not currently
Notes	foreseen during the next 5 years.
Construction Method	Scarifying, discing, drill seeding
Physical Characteristics	As needed in disturbed areas not requiring cover placement
Existing Engineering Measures	Ongoing maintenance and stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	50
Item	Capital Cost
Cover Material (Load, haul, spread)	\$625,420
Regrade	\$131,060
Seed & Mulch	\$54,925
Other	\$0
Capital Cost Totals	\$811,404
Capital Cost/Acre	\$16,228

Cobre Haul Road²

Function	Planned Site Traffic
Notes	Haul road from Continental Mine to Chino.
Construction Method	Cut & fill.
Physical Characteristics	120 feet wide driving surface with roadside berms.
Engineering Measures	Maintenance and stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
EOY 2023 Reclaimed Area (acres)	100
Item	Capital Cost
Cover Material (Load, haul, spread)	\$41,758
Regrade	\$342,924
Seed & Mulch	\$109,850
Other ¹	\$61,232
Capital Cost Totals	\$555,764
Capital Cost/Acre	\$5,558

¹Other includes spanning arch demolition ²Cobre Haul Road Closeout Plan was submitted previously. Costs are updated for 2018.

Pearson-Barnes Mine Area

Function	Historical Site; Reclaimed in 2005
	Reclaimed mine site and stockpile, currently requires ongoing
Notes	monitoring and maintenance; ultimately the area will be
Notes	incorporated into the SWRDF. By EOY 2019 the area
	is still in its existing configuration.
Construction Method	Stockpile - end dumped, historical shaft, and highwall.
Physical Characteristics	Barringer fault and associated bedrock, low saturated
Fliysical Characteristics	conductivity.
Existing Engineering Measures	Ongoing monitoring and maintenance.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	11.9
Item	Capital Cost
Cover Material (Load, haul, spread)	\$196,395
Regrade	\$0
Seed & Mulch	\$13,072
Other	\$0
Capital Cost Totals	\$209,467
Capital Cost/Acre	\$17,602

No. 3 Stockpile

Function	Inactive; Stockpile containing overburden removed during advancement of No. 3 Shaft
Construction Method	End dumped.
Disso and Characteristics	Coarse grained.
Physical Characteristics	High saturated hydraulic conductivity.
Existing Engineering Measures	Stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	5.7
Item	Capital Cost
Cover Material (Load, haul, spread)	\$62,278
Regrade	\$3,978
Seed & Mulch	\$6,261
Other	\$0
Capital Cost Totals	\$72,518
Capital Cost/Acre	\$12,722

¹No. 3 Stockpile reclamation covered under reclamation of haul road around southwest flank of Hanover Mountain.

Borrow Areas

Function	Various stockpiles containing cover material
Construction Method	End dumped.
	Coarse grained.
Physical Characteristics	High saturated hydraulic conductivity.
Existing Engineering Measures	Stormwater management.

Matrix of Costs Capital Cost/Facility

	EOY 2023
Reclaimed Area (acres)	55.8
Item	Capital Cost
Cover Material (Load, haul, spread)	\$0
Regrade	\$0
Seed & Mulch	\$61,263
Other	\$0
Capital Cost Totals	\$61,263
Capital Cost/Acre	\$1,099

¹No. 3 Stockpile reclamation covered under reclamation of haul road around southwest flank of Hanover Mountain.

Appendix B Earthwork Cost Estimate Summary Report

Prepared for Freeport-McMoRan Inc. Chino Mines Company 99 Santa Rita Mine Road Vanadium, New Mexico 88043

Prepared by Telesto Solutions, Inc. 2950 East Harmony Road, Suite 200 Fort Collins, CO 80528

> December 2014 Updated May 2018



Signature Page

Appendix B Earthwork Cost Estimate Summary Report

> December 2014 Updated May 2018



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1.0 INTRODUCTION

1.1 Purpose and Summary

As part of the 2014 Continental Mine Closure/Closeout Plan (CCP) Update, an earthwork reclamation cost estimate for financial assurance was prepared by Telesto Solutions Inc. (Telesto) for Freeport-McMoRan Chino Mines Company (Chino). The earthwork reclamation cost estimate is based on a template originally created by the New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division (MMD, 1996). This earthwork estimate includes reclamation earthwork, demolition, and site operations and maintenance costs. Water management related reclamation costs are included in a separate estimate (2014 CCP Update, Appendix C). The earthwork reclamation cost estimate is based on the configuration of facilities as described in the end-of-year (EOY) 2023 mine plan (formerly submitted as the EOY 2019 mine plan), and assumes reclamation would begin in 2024 (Reclamation year 0). The original 2014 CCP mine planning dates have not been retained in this document, and thus there is a four year difference with the submitted 2014 CCP. This update brought all costs and schedules into currency with a 2018 start of mining date.

1.2 Reclamation Overview

A summary of the mine facilities is provided in Table B-1. With the exception of operation and maintenance costs, only facilities requiring reclamation as of EOY 2023 are included in this earthwork reclamation cost estimate.

2.0 COST ESTIMATE

The total current dollar cost for earthwork reclamation is estimated to be **\$23,850,000.** A summary of the estimate is provided in Table B-2. The costs presented in this estimate are current (2018) dollar costs, a net present value calculation is presented.

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2.1 Financial Assurance Cost Estimate Assumptions

Assumptions used throughout the cost estimate include:

- **Dozer Push Distances:** Dozer push distances represent the distance from the centroid of the cut block to the centroid of the fill block.
- **Cover Placement**: Trucks and loaders with dozer assist perform all cover loading and distribution. The economic optimum number of trucks per loader was used for each haul route.
- **Haul Distances**: Haul distances are calculated along a preferred route and assumed to originate at the approximate centroid of the source and terminate at the approximate centroid of the reclamation area. A maximum of three segments are used for each haul route.
- **Borrow Areas**: Overburden and topsoil stockpile material was approved for use as cover material (Condition 81; Golder, 2006). Borrow areas are left in a condition such that they can be directly ripped and revegetated (Table B-1and Table B-2). The Overburden Stockpiles and Top Soil Stockpile are anticipated to be completely removed and the footprints ripped and revegetated.
- **Dust Suppression and Site Maintenance**: A full time water truck and a motor grader are included as part of the fleet during reclamation (Table B-3). The water truck and grader task time is equal to loader task time
- **Labor Rates:** All labor rates were developed based on the New Mexico Department of Labor (NMDOL) Type H (Heavy Engineering) labor rates effective January 1, 2018 (NMDOL, 2018). These rates include the base, fringe benefit, and apprenticeship contribution rates (Table B-3)
- Equipment Rates: Table B-3 summarizes the earth-moving equipment used in the estimate, which would commonly be available to a contractor. The equipment unit operating costs were taken from EquipmentWatch Custom Cost Evaluator (Penton Media, Inc., 2018) and can be found in Appendix B.2.3
- Equipment Production Factors: Table B-4 summarizes equipment production factors from Caterpillar (2014, 2017) for each type of equipment used is presented in Table B-3. Productivity curves were also developed from Caterpillar (2014, 2017) and are described in Appendix B.2.4 and B.2.5.
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Table B-1 Facility Overview¹

Feature	Notes			
Main Tailings Impoundment	Remains in existing configuration by EOY 2023			
Magnetite Tailings Impoundment	Sale and shipping of magnetite material continues through mine life. Reclamation costs use pre-sales configuration.			
No. 3 Shaft Stockpile	Remains in current condition at EOY 2023			
South Waste Rock Disposal Facility	Approximately half planned SWRDF placed by EOY 2023			
South, East, and Union Hill WRF	Covered by SWRDF by EOY 2023. East side is not buried by the expansion.			
West and Buckhorn WRF	Covered by SWRDF by EOY 2023			
Low Grade WRF	Remains in existing configuration by EOY 2023			
Hanover Mountain Deposit	Mining still in progress by EOY 2023			
Pearson Barnes	EOY 2023 the Pearson Barnes Mine area is unchanged			
Cobre Haul Road	Construction completed mid-year 2018			
Haul Roads and Exploration Roads	Various changes to Haul Roads accommodate SWRDF expansion, Hanover Mountain exploration roads are mined out by EOY 2023			
Contingency Disturbance Areas	Areas outside immediate footprint which require grading, cover placement, seeding and mulch			
Overbu	rden and Topsoil Stockpiles			
East OB Stockpile	EOY 2019 covered by SWRDF			
Top Soil Stockpile (TSSP)	Remains in existing configuration by EOY 2019			
NOBS	Proposed Topsoil stockpile, in place by EOY 2019			
South OB Stockpile	Proposed Topsoil stockpile, in place by EOY 2019			
OB Stockpile-1	Remains in existing configuration by EOY 2019			
OB Stockpile -2	Remains in existing configuration by EOY 2019			
OB Stockpile -3	Remains in existing configuration by EOY 2019			
OB Stockpile -4	Remains in existing configuration by EOY 2019			
OB Stockpile -5	Remains in existing configuration by EOY 2019			
Pit				
Continental Pit	GR002RE 01-1 Pit reclamation waiver			

¹ See Appendix C for Surface Impoundments

ltem	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost	
Capital Item		28.3%		
Tailing Ponds				
Main Tailings Impoundment	\$2,313,012	\$654,582	\$2,967,594	
Magnetite Tailings Impoundment	\$840,196	\$237,776	\$1,077,972	
Subtotal	\$3,153,208	\$892,358	\$4,045,566	
Waste Rock and Ore Piles				
SWRDF	\$8,860,289	\$2,507,462	\$11,367,751	
No. 3 Stockpile	\$56,522	\$15,996	\$72,518	
Low Grade WRF	\$323,121	\$91,443	\$414,565	
Subtotal	\$9,239,932	\$2,614,901	\$11,854,833	
Mines	· · · · ·	<u> </u>		
Hanover Mountain Deposit(b)	\$1,122,318	\$317,616	\$1,439,934	
Continental Pit	\$84,223	\$23,835	\$108,058	
Subtotal	\$1,206,541	\$341,451	\$1,547,992	
Surface Impoundments and Wells				
Surface Impoundment Earthworks	\$97,518	\$27,598	\$125,116	
Wells	\$7,421	\$2,100	\$9,521	
Subtotal	\$104,939	\$29,698	\$134,636	
Historic Sites				
Disturbed Area Adjacent and North				
of the SWRDF	\$17,895	\$5,064	\$22,959	
Pearson-Barnes Mine Area	\$163,263	\$46,204	\$209,467	
Subtotal	\$181,158	\$51,268	\$232,425	
Other Disturbed Areas				
Haul and Exploration Roads	\$75,291	\$21,307	\$96,598	
Contingency Disturbance Areas	\$632,427	\$178,977	\$811,404	
Borrow Areas	\$47,750	\$13,513	\$61,263	
Subtotal	\$755,468	\$213,797	\$969,265	
Demolition				
Buildings	\$1,389,430	\$393,209	\$1,782,638	
Rip & Revegetation	\$1,068	\$302	\$1,370	
Cover	\$102,002	\$28,867	\$130,869	
Subtotal	\$1,492,500	\$422,378	\$1,914,878	
Total Capital Cost without CHR	\$16,133,746	\$4,565,850	\$20,699,596	
Cobre Haul Road	\$433,176	\$122,589	\$555,764	
Total Capital Cost with CHR	\$16,566,922	\$4,688,439	\$21,255,360	
O&M		23.30%		
O&M Main Site	\$2,028,352	\$472,606	\$2,500,958	
O&M Cobre Haul Road	\$74,610	\$17,384	\$91,994	
Subtotal	\$2,102,962	\$489,990	\$2,592,952	
Total Earthwork with O&M	\$18,669,883	\$5,178,429	\$23,848,312	

Table B-2 Earthworks Cost Estimate Summary

Desembles Comment							
Parameter	Value	Comment					
Operations and Maintenance Equipment ²							
Caterpillar 14M	\$107.79/hr	Articulated Frame Grader					
Off-Highway Water Tanker Truck	\$92.86/hr	6,000 Gallon					
Caterpillar 980G Loader	\$81.48/hr	4-WD Articulated Loader					
Caterpillar 730 Truck	\$83.36/hr	Mechanical Rear Dump					
	Labor Rates	S					
Dozer Operator	\$26.29/hr	NMDOL Rate					
Mechanic	\$26.39/hr	NMDOL Rate					
Haul Truck Operator	\$23.84/hr	NMDOL Rate					
Truck Driver	\$23.84/hr	NMDOL Rate					
Loader Operator	\$26.56/hr	NMDOL Rate					
Motor Grader	\$26.29/hr	NMDOL Rate					
Eq	uipment for Ear	thwork ³					
Caterpillar D11T	\$414.50/hr	Standard Crawler Dozer					
Caterpillar D11T w/ Multishank		Standard Crawler Dozer					
Ripper	\$448.89/hr						
Caterpillar D9T	\$178.02/hr	LGP Crawler Dozer					
Caterpillar D6T XL SU	\$88.86/hr	Standard Crawler Dozer					
Caterpillar 793		Averaged Komatsu HD 1500 and					
	\$478.45/hr	Caterpillar 797					
Caterpillar 992K	\$294.35/hr	4-WD Articulated Loader					
Caterpillar 16M	\$133.94/hr	Articulated Frame Grader					
Caterpillar 14M	\$99.13/hr	Articulated Frame Grader					
Off-Highway Water Tanker Truck	\$86.99/hr	6,000 Gallon					
Hitachi ZAXES 200LC-3	\$62.57/hr	Excavator					

Table B-3 Labor and Equipment Unit costs

² Equipment Unit Rate Notes: Equipment unit rates from EquipmentWatch Custom Cost Evaluator 2018, first Qtr, adjusted Sales Tax = 0%, Fuel = 2.23/gal (subtracting indirect costs), mechanic wage 26.56/hr. Annual Use Hours increased to correct for 50 min work hour

³ Equipment Unit Rate Notes: Equipment unit rates from EquipmentWatch Custom Cost Evaluator 2018, first Qtr, adjusted Sales Tax = 0%, Fuel = 2.14/gal (subtracting indirect costs), mechanic wage 26.39/hr. Annual Use Hours increased to correct for 50 min work hour

- **Fuel Costs**: Table B-5 lists the off-road diesel fuel cost based on a quote obtained on March 12, 2018 from Griffin Propane for delivery of dyed ultralow sulfur diesel to the Continental Mine
- **Capital Indirect Costs**: Total indirect costs of 28.3% were applied to the capital direct costs 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%), and 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
- **Operations and Maintenance Indirect Costs**: Total indirect costs of 23.3% were applied for long term operations and maintenance per MMD (1996) and OSM (2000) guidance and comprise the same values and factors as the capital indirect costs with exception of Contractor Profit and Overhead. Contractor Profit and Overhead for long term operations and maintenance is 10.0%, to account for the long term contract and repetitive annual work. 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
- **Revegetation Unit Costs**: The revegetation unit cost (Table B-5) was based on a quote obtained on April, 2018 from Rocky Mountain Reclamation of Laramie, WY. It includes scarifying, discing, rangeland drill seeding, mulching, crimping, and daily per diem (Appendix B.2.7).
- **Revegetation and Scarification:** Scarifying of the final surface is performed at the same time as the revegetation and is included in the revegetation quote.
- **Rip Rap**: The rip rap unit cost is based on a quote obtained in March 2018 from T. G. McMauley, Inc. (Table B-5)
- **Miscellaneous Unit Costs**: Other miscellaneous unit costs shown in Table B-5 were taken from several sources including R.S. Means Heavy Construction Cost Data Edition 32 (R.S. Means, 2018). All costs taken from R.S. Means were adjusted using the location factor for Las Cruces (85.6%). Supporting documentation is included in Appendix B.2.7.
- Well Abandonment: The well abandonment unit costs are based on MMD Guidance for wet drill holes and are inflated to 2018 dollars using an inflation factor (MMD, 2013; Appendix B.2.8).

Parameter	Value	Comment/Reference		
		No virgin materials are being regraded as		
		part of closure. Thus a swell factor is not		
		applied when regrading material.		
	0% Pushdown,			
		Cover material volumes are calculated based on the reclaimed area and the cover		
Swell Factor Stockpiles and		depth. This factor accounts for swell when		
Tailings ⁽¹⁾	8% load & haul cover	loading trucks.		
		A portion of the excavation for the Reclaim		
		Pond outlet channel is used for cover		
	15% load & haul cover	material. A cover volume was calculated		
		based on an excavation volume; this		
Pa	arading Tone and Outale	calculation utilizes a swell factor.		
Ke	grading Tops and Outslo	Due to small job size assume average		
Operator Factor ⁽¹⁾		instead of excellent operator		
	0.75 coarse grading	(CPH 44, 19-55, average)		
Material Factor	1.0	CPH 44, 19-55, Loose stockpile		
Work Hour	50 min	(CPH 44, 19-55)		
Grade Factor – Tops	1.0	(CPH 44, 19-55) 1-5% Slope		
Grade Factor - Outslopes ⁽¹⁾	1.6	(CPH 44, 19-55) 1.6 – 3H:1V Slopes		
	3,300 lb/cy Stockpile			
Soil Weight	2,900 lb/cy Tailings	Standard Values		
	4,185 lb/cy Magnetite	Standard values		
	Tailings			
Production Method/	1.2	(CPH 44, 19-55, slot dozing)		
Blade Factor	1.2	(CDH 44, 10,55) Closer		
Visibility Factor Elevation Factor	1.0	(CPH 44, 19-55) Clear (CPH 44, 30-5)		
Direct Drive Transmission	1.0	-		
		nnels (D11T, D9T, 16M, D6T)		
Material Factor	1.2	CPH 44, 19-55, Loose stockpile		
Grade Factor – Tops	1.0	(CPH 44, 19-55) 1-5% slopes		
Grade Factor - Outslopes ⁽¹⁾	1.6	(CPH 44, 19-55) 1.6 – 3H:1V Slopes		
Soil Weight (lb/cy)	3,300 lb/cy	Standard value		
	· · · · · ·	(CPH 44, 19-55, slot dozing)		
Production Method/Blade	1.2	No correction applied channels/down		
	1.0	drains/benches		
	22 D11T Universal Blade	(CPH 44, 19-49)		
Effective Diada Middle (fract)	14.25 D9T Semi Universal	(CPH 44, 19-47)		
Effective Blade Width (feet)	Blade 16 16M	(CPH 44, 11-17)		
	17.5 D6T XL SU	(CPH 44, 11-17) (CPH 44, 19-43)		
	2.5 mph D111 and 16M	(
Speed (miles/hr)	2.5 mph D11T and 16M 1.0 mph D9T and D6T	(CPH 44)		
Speed (miles/hr) Operator	2.5 mph D111 and 16M 1.0 mph D9T and D6T 0.75	· · · · ·		
,	1.0 mph D9T and D6T	(CPH 44) (CPH 44, 19-55, average) (CPH 44, 19-55)		
Operator	1.0 mph D9T and D6T 0.75	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear		
Operator Work Hour (min/hr) Visibility Elevation	1.0 mph D9T and D6T 0.75 50 1.0 1.0	(CPH 44, 19-55, average) (CPH 44, 19-55)		
Operator Work Hour (min/hr) Visibility	1.0 mph D9T and D6T 0.75 50 1.0 1.0 1.0 1.0	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear (CPH 44, 30-5) -		
Operator Work Hour (min/hr) Visibility Elevation	1.0 mph D9T and D6T 0.75 50 1.0 1.0 1.0 Ripper (D11T Multi	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear (CPH 44, 30-5) -		
Operator Work Hour (min/hr) Visibility Elevation	1.0 mph D9T and D6T 0.75 50 1.0 1.0 1.0 Ripper (D11T Multi 1000 large surface areas	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear (CPH 44, 30-5) -		
Operator Work Hour (min/hr) Visibility Elevation Direct Drive Transmission Ripping Length (ft)	1.0 mph D9T and D6T 0.75 50 1.0 1.0 Ripper (D11T Multi 1000 large surface areas 100 liners	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear (CPH 44, 30-5) -		
Operator Work Hour (min/hr) Visibility Elevation Direct Drive Transmission	1.0 mph D9T and D6T 0.75 50 1.0 1.0 1.0 Ripper (D11T Multi 1000 large surface areas	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear (CPH 44, 30-5) - shank) -		
Operator Work Hour (min/hr) Visibility Elevation Direct Drive Transmission Ripping Length (ft) Penetration (in)	1.0 mph D9T and D6T 0.75 50 1.0 1.0 1.0 Ripper (D11T Multi 1000 large surface areas 100 liners 18	(CPH 44, 19-55, average) (CPH 44, 19-55) (CPH 44, 19-55) Clear (CPH 44, 30-5) - shank) -		

Parameter	Value	Comment/Reference		
Speed (mph)	1	-		
Work Hour (min/hr)	50	(CPH 44, 19-55)		
Distance between passes (in)	69	Maintain pocket spacing between passes		
	Loader (992K)			
Net Bucket Capacity (cy)	16.0	(CPH 44, 23-288, Standard, 3000 lb/yd3)		
Loader Cycle Time (min)	0.65	(CPH 44, 23-223) Avg 0.6-0.7		
Bucket Fill Factor		(CPH 44, 30-1) Avg 0.85-0.90 Loose		
BUCKEL FIII FACIOI	.875	Material 1" and over		
Work Hour (min/hr)	50	(CPH 44, 19-55)		
	Trucks (CAT 79	3F)		
Struck Capacity (cy)	126	EquipmentWatch.com		
Heaped Capacity(cy)	169	EquipmentWatch.com		
		(CPH 44, 30-1) Radial tires, dirt road		
Rolling Resistance (%)		maintained fairly regularly, watered, flexing		
	2.5%	slightly		
Truck Exchange Time (min)	0.7	(CPH 44, 10-20) Avg. 0.6-0.8		
Dump/Maneuver Time (min)	1.1	(CPH 44, 10-20) Avg 1.0-1.2		
Work Hour (min/hr)	50	(CPH 44, 19-55)		

Activity	Base Unit Cost \$/unit ¹	Units	Means Line Item	Means Page	Scaled Cost Las Cruces 85.6 % ² Reference
Fuel	\$2.75	gal	-	-	Griffin Propane Quote (March 12, 2018). (\$2.75/gal With indirect costs, \$2.14/gal w/o indirect costs)
Revegetation	\$1,099	Acre	-	-	Rocky Mountain Reclamation Quote (April, 2018), with tax
Erosion Control Crew	\$3,861	day	-	EquipmentWatch and NMDOL	
Riprap	\$39.00	су	-	-	Quote from TG McCauley in March of 2018 which estimates \$39/ ton of D50=15" rip rap; density of 1.316 ton/CUYD
Riprap	\$31.00	су	-	-	Quote from TG McCauley in March of 2018 which estimates \$31/ ton for D50=8" rip rap; density of 1.316 tons/CU YD.
Chain link fence, open pit perimeters	\$21.19	ft	323113.20- 0800	316	Fence, chain link industrial, schedule 40, including concrete, 6 ga. wire, 6' high, but omit barbed wire, galv. Steel
Down drain	\$5.57	ft	-	-	Excavate and waste 7.6 cy/lf material on slopes with D11T CD, 175- foot downslope excavation, 200-foot lateral waste push. Finish grade with D6T XL SU 3 passes 1 mph.
Type 1 Channel	\$3.10	ft	-	-	Excavate and waste 2.4 cy/lf with D11T CD, 175-foot excavation, 200- foot lateral waste push. Finish grade with D9T SU 3 passes 1 mph.
Type 2 Channel	\$8.91	ft	-	-	Excavate and waste 2.4 cy/lf with D11T CD, 175-foot excavation, 200- foot lateral waste push. Finish grade with D9T SU 3 passes 1 mph.
Gravel	\$3.29	су	321123.23- 0301	302	Base Course Drainage Layers, Crushed 1 1/2 ", Compacted to 6" deep, hauled (\$1.86/cy) and placed (\$1.43/cy)
Riprap - Haul	\$1.86	су	-	EquipmentWatch and NM DOL	Load & Haul Rock, Cat 992 Loader, 2-Cat 793 trucks, 3-mile RT
Building Demolition Cover	\$1.76	су			Assumes same unit cost to haul and spread cover as for No. 3 Shaft Stockpile
Outslope Channel	\$045	ft	-	-	Excavate and waste 0.43 cy/lf with D11T CD, 175-foot excavation, 200- foot lateral waste push. Finish grade with D6T XL SU 1 pass 1 mph.
Rip rap, backfill	\$1.43	су	-	EquipmentWatch and NM DOL	Gravel Backfill, 300 hp, 150' haul sand and gravel
3:1 Slope Stockpile Bench Grading	\$1.99	ft	-	-	Excavate and waste 9.26 cy/lf on slopes with D11T CD, 87-foot push. Finish grade with D9T SU 3 passes 1 mph.
3:1 Slope Tailings Bench Grading	\$1.75	ft	-	-	Excavate and waste 9.26 cy/lf on slopes with D11T CD, 87-foot push. Finish grade with D9T SU 3 passes 1 mph.
2.5:1 Slope Stockpile Bench Grading	\$1.71	ft	-	-	Excavate and waste 9.52 cy/lf on slopes with D11T CD, 78-foot push. Finish grade with D9T SU 3 passes 1 mph.
Structure Demolition	\$0.25	cft	024116.13 0100	37	Structure Demolition Building demolition large urban projects inclues 20 mi. haul no foundation or dump fees mixture of types
Reinforced Concrete Wall Demolition	\$194.70	hr	Crew B12C	-	1 Crane Oper., 1 Laborer, 1 Hydraulic Excavator 2 CUYD
Road Maintenance Crew	\$7,421	month	-		6,000-gal Water truck and 14M grader
Plug & Abandon Wells	\$10.60	ft	-	-	\$14.00/ft minus 28.3% indirect costs then added inflation from 2013 to 2018. "Estimated costs for abandoning boreholes using bentonite cement grout ranges from approximately \$14.00 to \$25.00 per foot. For the purposes of estimating a simplified cost of abandoning boreholes the MMD cost is \$14.00/ft. The FA cost estimate could be higher or lower based on site specific characteristics".

Table B-5 Miscellaneous Unit Costs

Freeport-McMoRan Chino Mines Company 20180517d_app_b_text_earthwork_costestimate-final.docx

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Telesto Solutions, Inc. May 2018

2.2 Cost Accounting Updates to the Cobre 2014 CCP

During a thorough review of the 2014 CCP, it was determined there was double counting of indirect costs when utilizing EquipmentWatch. EquipmentWatch indicates that certain costs in their standard values include items that are typical indirect costs and adjustments to the standard values may be needed if the estimator plans to later add indirect costs. To address this duplication, the indirect costs were removed from the EquipmentWatch direct costs. Typical indirect costs were removed except for equipment depreciation in this cost update, even though depreciation is an indirect cost (part of overhead) as discussed in the RSMeans Construction Estimating Handbook. However, including depreciation in the EquipmentWatch direct costs is a duplication and future updates (and other cost estimates) may have depreciation removed from the direct costs. Table B-6 summarizes the deviations from EquipmentWatch Standard Values and any other changes made to the costs estimate presented in the 2014 submittal.

Other changes to the cost estimate process:

- **1.** For consistency purposes, EquipmentWatch and NMDOL rates are now used to calculate all earthwork costs (e.g., hauling and placement of riprap, backfill of riprap, regrading, channel building)
- 2. The earthwork and O&M cost estimate that utilize a 14M motor grader and 6,000-gal water truck are now based on Tyrone Mine's water truck and motor grader actual annual usage with a 793 haul truck fleet

Table B-6 **Changes from the 2014 Cost Estimate**

Costs	Description of Changes to EquipmentWatch Standard Values and Other Costs
	Chino received an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Continental Mine (per MMD's
Diesel Fuel Rate	requirements). The indirect cost is removed from the all-inclusive fuel quote and accounted for in the indirect costs.
	Chino received an all-inclusive quote (direct and indirect costs) for the cost of electricity at the Continental Mine (per
	MMD's requirements). The indirect cost is removed from the all-inclusive fuel quote and accounted for in the indirect
Electricity	costs.
	¹ Per New Mexico statue 11.1.2.8.A, the Mechanics labor rate is developed based on the most current New Mexico
Mechanics Wages ⁴	Department of Labor (DOL) Type H (Heavy Engineering) labor rates.
	¹ Overhead and Depreciation (adjusted in the 'User Defined Adjustments' through the 'Discount') are included in Profit and
	Overhead (RS Means) but also previously included in the EquipmentWatch Total Hourly Cost. RS Means handbook
Overhead &	supplies an industry standard for profit and overhead rates for large construction projects. The RS Means Indirect
Depreciation	Percentage Rate defined this item.
	The Annual Use Hours are adjusted in EquipmentWatch to eliminate the EquipmentWatch 50 minute work hour and is
	accounted for in Worksheets 5, 6, 7, 9, and 10 found in Appendix C for Earthwork. The Annual Use Hours are not
Annual Use Hours	adjusted, in EquipmentWatch, for O&M.
	The Gross receipt sales tax is not applied to NM State contractor projects. Therefore, that item is removed from the
Sales Tax	EquipmentWatch spreadsheet criteria list.
	Per New Mexico statue 11.1.2.8.A the labor rates are developed based on the most current New Mexico Department of
	Labor (DOL) Type H (Heavy Engineering) labor rates. FICA, Medicare, Social Security, Unemployment Taxes, and
All Other Wages ⁵	Workman's Compensation are accounted for in Overhead ⁶ ,.
	Tyrone receives an all-inclusive quote (direct and indirect costs) for revegetation (per MMD's requirements). The indirect
Revegetation	cost is removed from the all-inclusive revegetation quote and accounted for in the indirect costs.
Water Sampling and	Chino received all-inclusive quotes (direct and indirect costs) for water sampling and riprap. The indirect cost is removed
Riprap	from the all-inclusive quotes and accounted for in the indirect costs.
Haul Truck Driver	Was developed based on the most current New Mexico Department of Labor (DOL) Type H (Heavy Engineering) for a
Wages	Haul Truck Driver II

¹Uses RS Means process definition for 'Overhead'

²https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Public_Works_Minimum_Wage_Act_Policy_Manual _Active.pdf

 ⁴ https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Public_Works_Minimum_Wage_Act_Policy_Manual_Active.pdf
 ⁵ https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Public_Works_Minimum_Wage_Act_Policy_Manual_Active.pdf

⁶ Uses RS Means process definition for 'Overhead'

3.0 MAIN TAILINGS IMPOUNDMENT

The Main Tailings Impoundment (MTI) reclamation cost was based on 2013 topography. The MTI is unchanged by EOY 2023. The Reclaim Pond is assumed to be reclaimed with MTI 5. bv reclamation year Cost calculations are located in the Cobre Stockpiles Tails Other 2018 NOBS 20180517.xlsx spreadsheet, Stockpile Sheets 1 through 18, in Appendix B.1. The main activities involved in closing the tailing ponds include:

- Regrading top surface and southeast rock embankment
- Completing surface water channels to route stormwater
- Hauling and grading cover material
- Scarifying and revegetating covered areas, includes

The major assumptions for this cost estimate for areas to be closed include:

- **Regrading:** 200-foot maximum interbench slope length, maximum 3H:1V interbench slopes; 0.5% minimum top surface slope. Rock buttresses, constructed along the east and south portions of the embankments in 2005, are preserved at 3H:1V overall slope. The existing test plots are preserved. Dozers perform all top surface and channel regrading. Southwest rock embankment and Weber Pond area left in existing configuration
- **Top Surface Channels:** Maximum 5% longitudinal slope, 2.5-foot of riprap over 6-inches of gravel bedding underlain by 2-feet of compacted cover material (the cost estimate calculations account for 3 feet of cover; however, in practice, 2 feet of cover is sufficient under channels when accounting for filter and riprap thicknesses in the channels where plant growth is discouraged); constructed to convey runoff from the impoundment top surface and surrounding tributary area to the embankment toe
- **Down drain:** 2.5-foot of riprap over 6-inches of gravel bedding underlain by 3-feet of cover material constructed to drain the top surface and discharge on the west side of the embankment
- **Outslope Channels:** 20-foot wide, 5.0% maximum cross-bench slope, 2.0% longitudinal bench slope, 6-inches of gravel underlain by 2-feet of compacted cover material (see note above).
- **Cover:** 36-inch cover thickness tops and outslopes. A six-inch-thick cover was placed over approximately 90 percent of the impoundment top surface in 2007. Cover criteria would be met with an additional 18 inches of cover material placed over the top surface where a six-inch thickness has already been added. Remaining areas receive a 24-inch thickness of cover material. The upper 12 inches of tailings is included as part of the cover system (DP-

1403, Condition 77) for a total of 36-inches. Chino submitted a report to NMED recently showing that the tailing meets the requirements of the Copper Mine Rule

• **Tailings Pipelines:** Capped and buried in place with 36-inch-thick cover along a 35-foot wide strip. The 35-foot width was based on two 24-inch diameter pipelines, spaced 5 feet apart with 3 feet of cover at 3H:1V sideslopes. It was assumed pipelines on top of the impoundment were covered when the top is covered. Pipeline flushing costs are included separately in the water management portion of the reclamation cost estimate.

4.0 MAGNETITE TAILINGS IMPOUNDMENT

The Magnetite Tailings Impoundment (MGTI) reclamation cost was based on 2004 topography, prior to the sale and shipping of magnetite material. Cost calculations are located in the Cobre_Mag_Tails_2018_NOBS_20180517.xlsx spreadsheet, Magnetite Tailings Sheets 1 through 18, in Appendix B.1. The main activities involved in closing the MGTI include:

- Regrading top and outslope
- Completing a downdrain channel
- Hauling and grading cover material
- Scarifying and revegetating covered areas, includes

The major assumptions for this cost estimate for areas to be closed include:

- **Regrading**: maximum 3H:1V interbench slopes; 0.5% minimum top surface slope. Dozers perform all regrading
- **Down drain:** 2.5-foot of riprap over 6-inches of gravel bedding underlain by 2-feet of compacted cover material constructed to drain the top surface and discharge on the west side of the embankment
- **Cover**: 36-inch cover thickness tops and outslopes

5.0 WASTE ROCK FACILITIES

The existing Waste Rock Facilities (WRF) include the No. 3 Shaft Stockpile, and five contiguous waste rock piles: the South, East, West, Buckhorn, and Union Hill. By EOY 2023 the five facilities are combined into the South Waste Rock Disposal Facility (SWRDF). The SWRDF is at less than half of its anticipated maximum capacity by EOY 2023. This reclamation cost estimate is based on the 2023 projected configuration of the SWRDF. During mining, SWRDF material is placed at a 3.5H:1V overall slope (3H:1V

interbench slope). Material placed on the east side is placed at 3H:1V overall slope (2.5H:1V interbench slope) to preserve the road located at the toe of the stockpile. Cost calculations are located in the Sheets 1 through 18, in Appendix B.1 in the spreadsheet entitled: Cobre_Stockpiles_Tails_Other_2018_NOBS_20180517.xlsx. The main activities involved in closing the SWRDF include:

- Regrading top surfaces and outslope benches
- Hauling and grading cover material
- Completing surface water channels to route
- Scarifying and revegetating covered areas, includes
- Scarifying and revegetating the disturbed area adjacent and North of the SWRDF includes ripping

Due to its small size, the No. 3 Shaft Stockpile did not require benching or drainage channels. Assumptions for this reclamation cost estimate include:

- **Regrading**: 200-foot maximum interbench slope length, maximum 3H:1V interbench slopes; 1% minimum top surface slope; East side 175-foot maximum interbench slope length, maximum 2.5H:1V interbench slope to preserve the road located at the toe of the stockpile
- **Top Surface Channels**: maximum 5% longitudinal slope, 1-foot of riprap over 6-inches of gravel bedding underlain by 2-feet of compacted cover material
- **Benches**: 30-foot bench width, 5.0% maximum cross-bench slope, 2.0% longitudinal bench slope and 3-feet of cover.
- **Outslope Channels**: 20-foot wide, 5.0% maximum cross-bench slope, 2.0% longitudinal bench slope, 6-inches of gravel underlain by 3-feet of cover.
- **Down drains**: 2.5-foot of riprap over 6-inches of gravel bedding underlain by 3-feet of cover material.
- **Cover:** 36-inch cover thickness tops and outslopes. Although, the upper 24 inches of waste rock are approved as part of the cover (DP-1403, Condition 77) on the east side of the East, and Union Hill WRFs unburied by the expansion, the updated estimate includes a full 36 inches of cover material hauled from the NOBS. Chino indicates they may provide additional testing and information at final design to further evaluate and pursue suitability of this material under the Copper Mine Rule in the future

6.0 OTHER STOCKPILES

The cost estimate includes reclamation of the Low-Grade Waste Rock Stockpiles located

east of the Continental Pit. Cost calculations are located in the

Cobre_Stockpiles_Tails_Other_2018_NOBS_20180517.xlsx spreadsheet, Stockpile Sheets 1 through 18, in Appendix B.1. The main activities involved in closing the ore stockpiles include:

- Surface grading
- Hauling and grading cover material
- Completing surface water channels
- Scarifying and revegetating covered areas, includes ripping

Assumptions for this reclamation cost estimate include:

• **Cover:** 36-inch cover thickness tops and outslopes. Although, the upper 24 inches of material is approved as part of the cover (DP-1403, Condition 77), a full 36 inches of cover hauled from the NOBS was assumed for this cost update.

7.0 HANOVER MOUNTAIN DEPOSIT

In the 2014 CCP, the proposed Hanover Mountain Deposit was planned to be mined from 2015 through 2020. At the time of this update, mining is proposed to commence in mid-2018. Cost calculations are located in the Cobre_Stockpiles_Tails_Other_2018_NOBS_20180517.xlsx, Stockpile Sheets 1 through 18, in Appendix B.1. The main activities involved in closing the mining of the Hanover Mountain Deposit include:

- Hauling and grading cover material
- Scarifying and revegetating covered areas, includes
- Safety Fencing and Berms to prevent run-on

Assumptions for this reclamation cost estimate include:

- **Cover**: 36-inch cover thickness tops and outslopes in areas that are 50-feet from highwalls
- **Fencing and Berms**: A combination of 6-foot chain link fencing and 2H:1V slope, 5-feet high, and 10-feet top width berms will be constructed approximately 40 feet from the highwalls for public safety (Sheet 15). Revegetation is included for an approximately 25-foot-wide disturbance area used to construct the chain link fencing, and approximately 100-foot-wide disturbance area used to construct the berm (Sheet 14).

8.0 CONTINENTAL PIT

In the MMD permit GR002RE 01-1 the Continental Pit was granted a conditional waiver from achieving a self-sustaining ecosystem. The Continental Pit extent was delineated using 2013 topography. Reclamation of the open pit consists of a combination of fencing and berms to prevent access and minimize runoff into the open pit (Stockpile Sheet 15).

Assumptions for this reclamation cost estimate include:

• **Fencing and Berms**: A combination of 6-foot chain link fencing and 2H:1V slope, 5-feet high, 10-feet top width berms will be constructed approximately 40 feet from the open pit highwalls for public safety (Sheet 15). Revegetation is included for an approximately 25-foot-wide disturbance area used to construct the chain link fencing, and approximately 100-foot-wide disturbance area used to construct the berm (Sheet 14).

9.0 BUILDING DEMOLITION/RECLAMATION

A number of facilities are used for Industrial Post Mining Land Use (PMLU). Those facilities not designated for Industrial PMLU will be demolished, removed, and/or buried or otherwise closed in accordance with an approved plan. Cost calculations, to demolish buildings and other miscellaneous structures upon closure, are located in Cobre_Demolition_2018_NOBS_20180517.xlsx, Demolition Sheets 1 through 4, in Appendix B.1.

The main activities and assumptions for this reclamation cost estimate include:

- All equipment and above-grade structures are demolished and removed from the area or buried (Demolition Sheet 1). The definition of demolition from RS Means (2018) is used and includes all internal equipment minus those containing wastes requiring special handling
- Wastes requiring special handling are removed and hauled to the appropriate facility in Phoenix, Arizona
- Debris is placed either into the stockpiles or other designated area
- Demolition debris is covered with 36-inches of cover material (Demolition Sheet 2)

- Demolition areas are covered with 36-inches of cover material, scarified and revegetated (Demolition Sheets 2 and 3)
- Salvage value for all structures and equipment is zero
- Any new buildings constructed prior to reclamation have an Industrial PMLU

10.0 OTHER MISCELLANEOUS COSTS

This category includes miscellaneous estimated closure costs such as wells, surface impoundments, Pearson-Barnes Mine Area, and roads. Additionally, a generic 50-acre surface disturbance contingency was added to account for disturbances not specifically foreseen, but which might be incurred during the term of this closure-closeout plan. Post closure capital and operation and maintenance costs associated with utilities such as tanks, ponds, pumps, pipelines, and electrical infrastructure are located in a separate water management cost estimate. Cost calculations located are in the Cobre_Demolition_2018_NOBS_20180517.xlsx spreadsheet, Stockpile Sheets 1 through 18, in Appendix B.1.

10.1 Wells

Costs are included for the abandonment of post closure monitoring wells. It was assumed that 7 monitoring wells are used for post closure monitoring and are abandoned at reclamation year 99 (Appendix B.1, Stockpile Sheet 15). Well abandonment unit cost estimates are based on MMD guidance for abandoning wet drill holes (MMD, 2013;Table B-5, Appendix B.2.8).

10.2 Surface impoundments

Surface impoundments are stormwater and seepage retention structures. Existing and planned impoundments and their PMLU are listed in Appendix B.3. The operation and maintenance (O&M) costs for surface impoundments are included in a separate water management cost estimate.

Costs are included to close non-Industrial PMLU surface impoundments used during reclamation years 0 to 12. A table describing water management surface impoundments is included in Table C-1 in Appendix C of the 2014 CCP Update. The main activities involved in closing surface impoundments include:

- Ripping liners and burying in place
- Grading to drain
- Hauling and grading cover material
- Scarifying and revegetating covered areas, includes ripping

Assumptions for this reclamation cost estimate include:

• **Cover**: 36-inch cover thickness

10.3 Pearson-Barnes Mine Area

The Pearson-Barnes Mine Area is ultimately incorporated into the SWRDF expansion. By EOY 2023 the Pearson-Barnes Mine area is unchanged. The main activities involved in closing the Pearson-Barnes Mine Area include:

- Hauling and grading cover material
- Scarifying and revegetating covered areas, includes ripping

Assumptions for this reclamation cost estimate include:

• **Cover**: 36-inch cover thickness, tapering down to existing channels. Existing channels will remain in their current configuration

10.4 Roads

A closeout plan, including reclamation costs, was recently completed for the Cobre Haul Road . The costs have been updated and are included in Table B-2. The main activities involved in closing other roads not needed post-closure include:

- Grading to drain
- Hauling and grading cover material
- Scarifying and revegetating covered areas, includes ripping

Assumptions for this reclamation cost estimate include:

- **Exploration Roads**: Approximately 15 miles of average 20-feet wide roads located in the area to the west of the MTI, and areas on Hermosa Mountain west of the Continental Pit
- **Haul Roads:** Roads located outside facility footprints are included as a separate line item in the reclamation cost estimate. Roads located within a facility footprint are reclaimed along with that facility
- **Cover**: 36-inch cover thickness

10.5 Contingency Disturbance Area

A 50-acre contingency disturbance area was added to account for surface disturbances which might become necessary during the term of this plan. An example would be the potential need for linear infrastructure (road, pipeline, etc.). This contingency is to account for scarifying and revegetating these potentially disturbed areas. The estimated costs are integrated into Table B-2.

11.0 OPERATIONS AND MAINTENANCE

Operations and maintenance estimated costs relate to periodic erosion control, road maintenance, and vegetation maintenance. Cost calculations are located in Cobre_O&M_2018_NOBS_20180517.xlsx spreadsheet, O&M Sheet 19 through 21, in Appendix B.1. Operations and maintenance costs are assumed to diminish with time:

Erosion Control (O&M Sheet 20):

- Reclamation Years 0–12: 12 days/year
- Reclamation Years 13–39: 4 days/year
- Reclamation Years 40–99: 1 day/year

Road Maintenance (O&M Sheet 20):

- Reclamation Years 0–19: 4 months/year at 24 hours/month
- Reclamation Years 20–39: 2 months/year at 24 hours/month
- Reclamation Years 40–99: 1 month/year at 24 hours/month

Revegetation Maintenance (O&M Sheet 19):

• Reclamation Years 0–11 Based on observations of previously reclaimed areas, the annual vegetation failure is conservatively estimated to be 2% failure every year for a total of 12 years, starting the year reclamation is completed.

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12.0 REFERENCES

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APPENDIX B.1 COST CALCULATIONS

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EOY 2023

UNIT COSTS for SPREADSHEETS

EARTHWORK EQUIP		Fuel Consumption (gal/hr)	Fuel Cost (\$/hr)	Owning and Operating Cost (w/out fuel) (\$/hr)	Fuel- Adjusted Own/Op Cost (\$/hr)	Reference
Cat D11T		29.8	\$63.77	\$350.73	\$414.50	1
Cat D11T Bulldozer w/	multi shank ripper	29.8	\$63.77	\$385.12	\$448.89	1
Cat D6T XL		7.8	\$16.72	\$72.14	\$88.86	1
Cat D9T		14.4	\$30.76	\$147.26	\$178.02	1
Komatsu HD 1500-5		28.1	\$60.27	\$160.14	\$220.41	1
CAT 797B Truck		67.4	\$144.47	\$592.01	\$736.48	1
Cat 793 truck	(Ave. Costing for Komatsu HD 1500 & CAT 797B)	47.8	\$102.37	\$376.08	\$478.45	1
Cat 992K Loader		25.6	\$54.94	\$239.41	\$294.35	1
Cat 980G Loader		9.6	\$20.58	\$55.30	\$75.88	1
Cat 16M	Motor Grader	9.5	\$20.37	\$113.57	\$133.94	1
Cat 14M	Motor Grader	8.3	\$17.76	\$81.37	\$99.13	1
Off-Hwy Water Tanker Truck,6,000-gal.		11.3	\$24.12	\$62.87	\$86.99	1
Hitachi ZAXES 200LC-3		6.68	\$14.31	\$48.26	\$62.57	1

					Fuel-	
				Owning and	Adjusted	
O&M EQUIPMEN	Г	Fuel Fue		Operating Cost	Own/Op	
		Consumption	Cost	(w/out fuel)	Cost	
Equipment Descrip	otion	(gal/hr)	(\$/hr)	(\$/hr)	(\$/hr)	Reference
Cat 14M	Motor Grader	8.3	\$18.48	\$89.31	\$107.79	1
Off-Hwy Water Ta	nker Truck,6,000-gal.	11.2	\$25.09	\$67.77	\$92.86	1
Cat 980G Loader		9.6	\$21.41	\$60.07	\$81.48	1
Cat 730 Truck		6.3	\$14.14	\$69.22	\$83.36	1

FUEL		
Earthwork Oil Broker Quote	\$2.14 per gallon	2
O&M Oil Broker Quote	\$2.23 per gallon	2
Electric cost	\$0.06 per kWhr	3

EARTHWORK AND O&M LABOR			Total 2018	
	NMDOL Type A	NMDOL Type A	Rate	
Labor Description	Operator Group	Operator Classification	(\$/hr)	
Cat D11T Bulldozer	Equipment Operator IV	Bulldozer (mult. Units)	\$26.29	4
Cat D11T Bulldozer w/ multi shank ripper		Bulldozer (mult. Units)	\$26.29	4
Cat D9T SU	Equipment Operator IV	Bulldozer (mult. Units)	\$26.29	4
Cat D6T XL SU	Equipment Operator IV	Bulldozer (mult. Units)	\$26.29	4
Cat 793 truck	Truck Driver III	Haul Truck	\$23.84	4
Cat 992K Loader	Equipment Operator VI	Loader (over 10 cy)	\$26.56	4
Cat 16M Motor Grade		Motor Grader	\$26.29	4
Cat 14M Motor Grade		Motor Grader	\$26.29	4
Off-Hwy Water Tanker Truck,6,000-gal.	Truck Driver III	N/A	\$23.84	4
Mechanic	Operator Group V	N/A	\$26.39	4
Cat 980G Loader	Equipment Operator VI	Loader (over 10 cy)	\$26.56	4
Foreman	Laborer II	N/A	\$23.48	4
Laborer	Laborer I	N/A	\$22.73	4
Hitachi ZAXES 200LC-3	Equipment Operator VIII	Bulldozer (mult. Units)	\$28.37	4
Well plugging and abandon	\$10.60	MMD 2013 using bento	onite cement grout range ndoning boreholes the M	ats then added inflation from 2013 to 2018. "Estimated costs for abandoning boreholes ges from approximately \$14.00 to \$25.00 per foot. For the purposes of estimating a simplified MMD cost is \$14.00/ft. The FA cost estimate could be higher or lower based on site specific
New Mexico Las Cruces	85.6%	Location RS Means Heavy	Construction Cost Data	a (32nd Annual Edition, 2018)
Rocky Mountain Reclamation Quote April, 2018 (before taxes)	\$1,099 /acre	Includes Direct and Indirect (Costs	
Inflation Adjustment 2013 to 2018	1.05607	https://edzarenski.com/2016/10/	24/construction-inflation-inc	ndex-tables-2017/

Erosion Control and Monitoring (O&M)

Equivalent to RS Means Modified Crew B-13A (1 Labor Foreman, 2 laborers, 1 equip. operators (med.), 2 truck drivers (heavy), 1 crawler loader (4 cy), 2 dump trucks (8 cy, 220 HP)

NM Dept of Labor Prevailing Wage Poster H and EquipmentWatch online estimator)

Modified Crew B-13C (for O&M)	#	\$/hour	\$/day
Labor Foreman (outside)	1	\$23.48	\$187.84
Laborers	2	\$22.73	\$363.68
Equipment Operators (med.)	1	\$26.56	\$212.48
Truck Drivers (heavy)	2	\$23.84	\$381.44
		\$/hour	\$/day
Loader,980G	1	\$81.48	\$651.84
Dump Trucks, Cat730	2	\$83.36	\$1,333.76

Road Maintenance crew (for O&M)

Equipment - Equipment Watch March 2018 Labor - NM Department of Labor Type H (Heavy Engineering) labor rates.

See Attachments for rate development.

	Operating	Labor	Subtotal
	Cost	Rate	24 hrs/month
	(\$/hr)	(\$/hr)	(\$/month)
Cat 14M Motor Grader	\$107.79	\$26.29	\$3,218
6,000-gal Water Truck	\$92.86	\$23.84	\$2,801

Total Direct Cost	\$6,019
Indirect Cost Percentage	23.30% for O&M
Total Cost	\$7,421

Subtotal	\$3,131	\$/day
	100%	Location Adjustment
Total Direct Cost	\$3,131	\$/day
Indirect Cost Percentage	23.30%	(for O&M See attachment for determination)
Total Cost	\$3,861	\$/day

References

1. Equipment unit rates from EquipmentWatch Custom Cost Evaluator March 2018 (http://www.equipmentwatch.com). See attachments for rate development.

2. Griffin Propane March 12, 2018; Cobre receives an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Cobre Mine (per MMD's requirements). The indirect cost is removed from the all-inclusive fuel quote and accounted for in the indirects.

3. https://www.electricitylocal.com/states/new-mexico/silver-city/

4. Labor rates based on NM Department of Labor Type H (Heavy Engineering) 2018 labor rates. https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Prevailing Wage Poster H 2018.pdf

outslope rip rap D50=15"				D50 =15"	top surface to	tal Riprap	D50 =8"	Average	
CU YD	CU YD	total CU YD	\$/CU YD	total cost	CU YD CI	U YD \$/CU YD	total cost	\$/cu yd	
36,959	17,023	53,982	\$ 40.00	0 \$ 2,159,448	3,817	57,799	31.80 \$ 12	1,370 \$	39.46
5,818	1,647	7,465	\$ 40.00	, ,	9,206	16,671	31.80 \$ 29	2,726 \$	35.47
			=cost of \$/ton	1.316 tons/ CU YD					
This is from a quote from TG	McCauley in March of :	2018 which estimates \$39							
and \$31/ ton for D50=8" rip ra									
		•							
The above is a weighted avera		•		l					

Cobre Stockpile Worksheet #1 5/17/2018

General Information

Applicant	Cobre Mining Company Hanover, New Mexico 88401	
Disturbed Surface Area (acres)	915	
Type of Operation	Existing/Surface/Copper	
Current value before escalation and discounting	\$17,706,746	Stockpiles, Main Tailings Impoundment, Surface
Based on Projected EOY 2023 M	line Plan	Impoundments, Haul Roads, Borrow Areas, Wells and Continental Pit

Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 1 Page 2 of 23

Cobre Stockpile Worksheet #2 5/17/2018

Demolition

Demo cost are addressed elsewhere.

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Cobre Stockpile Worksheet #3 5/17/2018

Material Handling Plan Summary Sheet

tem Description		Location 1	Location 2	Haul/Push Distance (ft)	Grade (%)	Equipment		
) Regrade Top	SWRDF	-	540	see dozer	Cat D111		
	Regrade Outslope Regrade Top	SWRDF MTI	-	99 200	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
	B Regrade Outslope	MTI Reclaim Pond MTI	-	200 250	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
1105	Regrade Top	No. 3 Stockpile Top	-	60 128	see dozer	Cat D11 ⁻ Cat D11 ⁻		
1105	3 Regrade Outslope 5 Dozer Assist	No. 3 Stockpile Outslope NOBS	- SWRDF Top	-	see dozer see dozer	Cat D11		
	6 Dozer Assist 7 Dozer Assist	NOBS NOBS	SWRDF Outslopes SWRDF Top	-	see dozer see dozer	Cat D11 Cat D11		
	B Dozer Assist B Dozer Assist	NOBS NOBS	Hanover Mountain Deposit No. 3 Stockpile Top	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
1109	Dozer Assist	NOBS	No. 3 Stockpile Outslope	-	see dozer	Cat D11		
) Dozer Assist Dozer Assist	NOBS NOBS	Pearson-Barnes Mine Area Low Grade WRF	-	see dozer see dozer	Cat D11 Cat D11		
	2 Dozer Assist 2 Dozer Assist	NOBS NOBS	MTI Reclaim Pond MTI Top	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
1113	B Dozer Assist	NOBS	MTI Outslope	-	see dozer	Cat D117		
	Dozer Assist Dozer Assist	Reclaim Pond Outlet Channel NOBS	MTI Top Tailing Pipeline Corridor	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
	6 Dozer Assist 6 Dozer Assist	NOBS NOBS	Grape Gulch Pond #3 Magnetite Seepage Pond	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
1117	' Dozer Assist	NOBS	SWRF Dam 1	-	see dozer	Cat D11		
	3 Dozer Assist 9 Dozer Assist	NOBS NOBS	SWRF Dam 2 SWRF Dam 3	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
) Dozer Assist) Dozer Assist	NOBS NOBS	North Tailings Decant Pond East WRF Containment	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
1121	Dozer Assist	NOBS	Blackman's Seep (Pond #2)	-	see dozer	Cat D11		
	2 Dozer Assist 3 Dozer Assist	NOBS NOBS	Decant Pond #4 Upper Creek Containment Pond 1	-	see dozer see dozer	Cat D11 ⁻ Cat D11 ⁻		
	Dozer Assist Load cover soil	NOBS NOBS	Contingency Disturbance Area	-	see dozer	Cat D11		
	Load cover soil	NOBS	SWRDF Top SWRDF Outslopes			992 992		
	2 Load cover soil 3 Load cover soil	NOBS NOBS	SWRDF Top Hanover Mountain Deposit			992 992		
1204	Load cover soil	NOBS	No. 3 Stockpile Top			992		
	5 Load cover soil 5 Load cover soil	NOBS NOBS	No. 3 Stockpile Outslope Pearson-Barnes Mine Area			992 992		
	′ Load cover soil 3 Load cover soil	NOBS NOBS	Low Grade WRF MTI Reclaim Pond			992 992		
1209	Load cover soil	NOBS	MTI Top			992		
) Load cover soil Load cover soil	NOBS Reclaim Pond Outlet Channel	MTI Outslope MTI Top			992 992		
	2 Load cover soil 3 Load cover soil	NOBS NOBS	Tailing Pipeline Corridor Grape Gulch Pond #3			992 992		
	Load cover soil	NOBS	Magnetite Seepage Pond			992		
	5 Load cover soil 6 Load cover soil	NOBS NOBS	SWRF Dam 1 SWRF Dam 2			992 992		
1217	Load cover soil	NOBS	SWRF Dam 3			992		
	3 Load cover soil 9 Load cover soil	NOBS NOBS	North Tailings Decant Pond East WRF Containment			992 992		
) Load cover soil Load cover soil	NOBS NOBS	Blackman's Seep (Pond #2) Decant Pond #4			992 992		
1222	2 Load cover soil	NOBS	Upper Creek Containment Pond 1			992		
	3 Load cover soil) Haul cover soil	NOBS NOBS	Contingency Disturbance Area SWRDF Top	12,559	see Trucks	992 Cat 793 truc		
	Haul cover soil 2 Haul cover soil	NOBS NOBS	SWRDF Outslopes SWRDF Top	12,559	see Trucks	Cat 793 truc Cat 793 truc		
1303	B Haul cover soil	NOBS	Hanover Mountain Deposit	12,559 5,707	see Trucks see Trucks	Cat 793 truc		
	Haul cover soil Haul cover soil	NOBS NOBS	No. 3 Stockpile Top No. 3 Stockpile Outslope	4,251 4,251	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
	Haul cover soil	NOBS	Pearson-Barnes Mine Area	12,559	see Trucks	Cat 793 truc		
	' Haul cover soil 3 Haul cover soil	NOBS NOBS	Low Grade WRF MTI Reclaim Pond	10,620 7,193	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
) Haul cover soil) Haul cover soil	NOBS NOBS	MTI Top MTI Outslope	7,193 7,193	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
1311	Haul cover soil	Reclaim Pond Outlet Channel	MTI Top	1,172	see Trucks	Cat 793 truc		
-	2 Haul cover soil 3 Haul cover soil	NOBS NOBS	Tailing Pipeline Corridor Grape Gulch Pond #3	7,193 3,856	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
	Haul cover soil Haul cover soil	NOBS NOBS	Magnetite Seepage Pond SWRF Dam 1	6,480 12,559	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
1316	B Haul cover soil	NOBS	SWRF Dam 2	12,559	see Trucks	Cat 793 truc		
	' Haul cover soil 3 Haul cover soil	NOBS NOBS	SWRF Dam 3 North Tailings Decant Pond	12,559 4,110	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
) Haul cover soil) Haul cover soil	NOBS NOBS	East WRF Containment Blackman's Seep (Pond #2)	4,110 3,856	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
1321	Haul cover soil	NOBS	Decant Pond #4	4,110	see Trucks	Cat 793 truc		
	2 Haul cover soil 3 Haul cover soil	NOBS NOBS	Upper Creek Containment Pond 1 Contingency Disturbance Area	3,856 0	see Trucks see Trucks	Cat 793 truc Cat 793 truc		
) Rip liners Rip liners	East WRF Containment Decant Pond #4	-	1,000 1,000		D11T w/ rippe D11T w/ rippe		
1402	2 Rip liners	Blackman's Seep (Pond #2)	-	1,000		D11T w/ rippe		
	8 Rip liners I Rip liners	Grape Gulch Pond #3 Magnetite Seepage Pond	-	1,000 1,000		D11T w/ rippe D11T w/ rippe		
1405	Rip surface	Reclaim Pond Outlet Channel	-	1,000		D11T w/ rippe		
1500	6 Rip liners 9 Grade surface	Upper Creek Containment Pond 1 Haul Roads	-	1,000		D11T w/ rippe Cat 16N		
	Grade surface Grade surface	Exploration Roads Low Grade WRF	-			Cat 16N Cat 16N		
1503	B Grade surface	Grape Gulch Pond #3	-			Cat 16M		
1505	Grade surface	Magnetite Seepage Pond SWRF Dam 1	-			Cat 16N Cat 16N		
	6 Grade surface 7 Grade surface	SWRF Dam 2 SWRF Dam 3	-			Cat 16N Cat 16N		
1508	B Grade surface	North Tailings Decant Pond	-			Cat 16N		
) Grade surface) Grade surface	East WRF Containment Blackman's Seep (Pond #2)	-			Cat 16N Cat 16N		
	Grade surface 2 Grade surface	Decant Pond #4 Upper Creek Containment Pond 1	-			Cat 16N Cat 16N		
1512	2 Grade surface	Contingency Disturbance Area	-			Cat 16N		
	B Grade cover soil F Grade cover soil	SWRDF Top SWRDF Outslopes	-			Cat D11 Cat D11		
	5 Grade cover soil 6 Grade cover soil	SWRDF Top Hanover Mountain Deposit	-			Cat D11 ⁻ Cat D11 ⁻		
1517	' Grade cover soil	No. 3 Stockpile Top	-			Cat D117		
	3 Grade cover soil 9 Grade cover soil	No. 3 Stockpile Outslope Pearson-Barnes Mine Area	-			Cat D11 Cat D11		
1520) Grade cover soil	Low Grade WRF	-			Cat D117		
1522	Grade cover soil Grade cover soil	MTI Reclaim Pond MTI Top	-			Cat D11 Cat D11		
	B Grade cover soil Grade cover soil	MTI Outslope MTI Top	-			Cat D11 ⁻ Cat D11 ⁻		
1525	5 Grade cover soil	Tailing Pipeline Corridor	-			Cat D11		
	Grade cover soil Grade cover soil	Grape Gulch Pond #3 Magnetite Seepage Pond	-			Cat D11 ⁻ Cat D11 ⁻		
1528	B Grade cover soil	SWRF Dam 1	-			Cat D11		
) Grade cover soil) Grade cover soil	SWRF Dam 2 SWRF Dam 3	-			Cat D11 ⁻ Cat D11 ⁻		
1531	Grade cover soil Grade cover soil	North Tailings Decant Pond East WRF Containment	-			Cat D11 ⁻ Cat D11 ⁻		
1533	B Grade cover soil	Blackman's Seep (Pond #2)	-			Cat D11		
	Grade cover soil Grade cover soil	Decant Pond #4 Upper Creek Containment Pond 1	-			Cat D11 ⁻ Cat D11 ⁻		
	6 Grade cover soil	Contingency Disturbance Area				Cat D11		

OB = Overburden WRF= Waste Rock Facility

> Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 3 Page 4 of 23

Cobre Stockpile Worksheet #4

Swell Cover Bank/stockpile Loose/stockpile Depth Volume Factor Volume Location 1 Location 2 Area (%) (bcy) (lcy) ltem Description (ac) (in) Тор 1100 Regrade Top SWRDF 666,680 0% 666,680 SWRDF Outslope 4,438,079 0% 4,438,079 1101 Regrade Outslope 50,795 0% 50,795 1102 Regrade Top MTI Тор Top and Outslope 1103 Regrade Outslope MTI Reclaim Pond 67,765 0% 67,765 1104 Regrade Outslope MTI Outslope 170,294 0% 170,294 1105 Regrade Top No. 3 Stockpile Top Тор 9,438 0% 9,438 14,489 1106 Regrade Outslope No. 3 Stockpile Outslope Outslope 0% 14,489 1105 Dozer Assist NOBS SWRDF Top 381,822 0% 381,822 1106 Dozer Assist NOBS SWRDF Outslopes 1,145,467 0% 1,145,467 1107 Dozer Assist NOBS SWRDF Top 110,693 0% 110,693 1108 Dozer Assist NOBS Hanover Mountain Deposit 418,122 0% 418,122 1108 Dozer Assist NOBS No. 3 Stockpile Top 5,826 0% 5,826 1109 Dozer Assist NOBS No. 3 Stockpile Outslope 19,719 0% 19,719 NOBS Pearson-Barnes Mine Area 53,330 0% 53,330 1110 Dozer Assist NOBS Low Grade WRF 124,720 0% 124,720 1111 Dozer Assist NOBS MTI Reclaim Pond 147,889 0% 147,889 1112 Dozer Assist NOBS 0% MTI Top 242,448 242,448 1112 Dozer Assist NOBS MTI Outslope 162,812 0% 162,812 1113 Dozer Assist 62,226 15% 1114 Dozer Assist Reclaim Pond Outlet Channel MTI Top 71,560 Tailing Pipeline Corridor 1115 Dozer Assist NOBS 0% 6,480 6,480 1116 Dozer Assist NOBS Grape Gulch Pond #3 1,703 0% 1,703 896 NOBS Magnetite Seepage Pond 0% 896 1116 Dozer Assist SWRF Dam 1 2,330 0% 2,330 1117 Dozer Assist NOBS 0% NOBS SWRF Dam 2 1,524 1,524 1118 Dozer Assist NOBS SWRF Dam 3 3,764 0% 3,764 1119 Dozer Assist 2,061 NOBS North Tailings Decant Pond 2,061 0% 1120 Dozer Assist East WRF Containment 2,241 1120 Dozer Assist NOBS 0% 2,241 NOBS 45 0% 45 1121 Dozer Assist Blackman's Seep (Pond #2) 2,779 1122 Dozer Assist NOBS Decant Pond #4 0% 2,779 6,857 6,857 1123 Dozer Assist NOBS Upper Creek Containment Pond 1 0% 1124 Dozer Assist NOBS Contingency Disturbance Area 224,074 0% 224,074 36 1200 Load cover soil NOBS SWRDF Top 85 381,822 8% 412,368 36 NOBS SWRDF Outslopes 256 1,145,467 8% 1,237,104 1201 Load cover soil NOBS SWRDF Top 25 36 110,693 8% 119,548 1202 Load cover soil NOBS Hanover Mountain Deposit 93 36 418,122 8% 451,572 1203 Load cover soil NOBS 1204 Load cover soil 36 8% No. 3 Stockpile Top 1 5,826 6,292 NOBS No. 3 Stockpile Outslope 36 1205 Load cover soil 4 19,719 8% 21,296 NOBS 36 8% 1206 Load cover soil Pearson-Barnes Mine Area 12 53,330 57,596

Low Grade WRF

MTI Outslope

MTI Top

MTI Reclaim Pond

36

36

18

36

124,720

147,889

242,448

162,812

8%

8%

8%

8%

134,697

159,720

261,844

175,837

28

33

108

36

05/17/18

1211 Load cover soil	Reclaim Pond Outlet Channel	MTI Top	-	-	62,226	15%	71,560
1212 Load cover soil	NOBS	Tailing Pipeline Corridor	1.4	36	6,480	8%	6,999
1213 Load cover soil	NOBS	Grape Gulch Pond #3	0.4	36	1,703	8%	1,839
1214 Load cover soil	NOBS	Magnetite Seepage Pond	0.2	36	896	8%	968
1215 Load cover soil	NOBS	SWRF Dam 1	0.5	36	2,330	8%	2,517
1216 Load cover soil	NOBS	SWRF Dam 2	0.3	36	1,524	8%	1,646
1217 Load cover soil	NOBS	SWRF Dam 3	0.8	36	3,764	8%	4,066
					•		
1218 Load cover soil	NOBS	North Tailings Decant Pond	0.5	36	2,061	8%	2,226
1219 Load cover soil	NOBS	East WRF Containment	0.5	36	2,241	8%	2,420
1220 Load cover soil	NOBS	Blackman's Seep (Pond #2)	0.0	36	45	8%	48
1221 Load cover soil	NOBS	Decant Pond #4	0.6	36	2,779	8%	3,001
1222 Load cover soil	NOBS	Upper Creek Containment Pond 1	1.5	36	6,857	8%	7,405
1223 Load cover soil	NOBS	Contingency Disturbance Area	50.0	36	224,074	8%	242,000
1300 Haul cover soil	NOBS	SWRDF Top			412,368	0%	412,368
1301 Haul cover soil	NOBS	SWRDF Outslopes			1,237,104	0%	1,237,104
1302 Haul cover soil	NOBS	SWRDF Top			119,548	0%	119,548
1303 Haul cover soil	NOBS	Hanover Mountain Deposit			•	0%	
		•			451,572		451,572
1304 Haul cover soil	NOBS	No. 3 Stockpile Top			6,292	0%	6,292
1305 Haul cover soil	NOBS	No. 3 Stockpile Outslope			21,296	0%	21,296
1306 Haul cover soil	NOBS	Pearson-Barnes Mine Area			57,596	0%	57,596
1307 Haul cover soil	NOBS	Low Grade WRF			134,697	0%	134,697
1308 Haul cover soil	NOBS	MTI Reclaim Pond			159,720	0%	159,720
1309 Haul cover soil	NOBS	MTI Top			261,844	0%	261,844
1310 Haul cover soil	NOBS	MTI Outslope			175,837	0%	175,837
1311 Haul cover soil	Reclaim Pond Outlet Channel	MTI Top			71,560	0%	71,560
1312 Haul cover soil	NOBS	Tailing Pipeline Corridor			6,999	0%	6,999
1313 Haul cover soil	NOBS	o 1					
		Grape Gulch Pond #3			1,839	0%	1,839
1314 Haul cover soil	NOBS	Magnetite Seepage Pond			968	0%	968
1315 Haul cover soil	NOBS	SWRF Dam 1			2,517	0%	2,517
1316 Haul cover soil	NOBS	SWRF Dam 2			1,646	0%	1,646
1317 Haul cover soil	NOBS	SWRF Dam 3			4,066	0%	4,066
1318 Haul cover soil	NOBS	North Tailings Decant Pond			2,226	0%	2,226
1319 Haul cover soil	NOBS	East WRF Containment			2,420	0%	2,420
1320 Haul cover soil	NOBS	Blackman's Seep (Pond #2)			48	0%	48
1321 Haul cover soil	NOBS	Decant Pond #4			3,001	0%	3,001
1322 Haul cover soil	NOBS					0%	
		Upper Creek Containment Pond 1			7,405		7,405
1323 Haul cover soil	NOBS	Contingency Disturbance Area	~ -		242,000	0%	242,000
1400 Rip liners	East WRF Containment	-	0.5				
1401 Rip liners	Decant Pond #4	-	0.6				
1402 Rip liners	Blackman's Seep (Pond #2)	-	0.0				
1403 Rip liners	Grape Gulch Pond #3	-	0.4				
1404 Rip liners	Magnetite Seepage Pond	-	0.2				
1405 Rip surface	Reclaim Pond Outlet Channel	-	1.7				
1406 Rip liners	Upper Creek Containment Pond 1	<u>-</u>	1.5				
1500 Grade surface	Haul Roads		45				
1501 Grade surface	Exploration Roads		37				
	-	-					
1502 Grade surface	Low Grade WRF	-	28				
1503 Grade surface	Grape Gulch Pond #3	-	0.4				
1504 Grade surface	Magnetite Seepage Pond	-	0.2				
1505 Grade surface	SWRF Dam 1	-	0.5				
1506 Grade surface	SWRF Dam 2	-	0.3				
1507 Grade surface	SWRF Dam 3	-	0.8				
1508 Grade surface	North Tailings Decant Pond	-	0.5				
1509 Grade surface	East WRF Containment	-	0.5				
1510 Grade surface	Blackman's Seep (Pond #2)	-	0.0				
1511 Grade surface	Decant Pond #4		0.6				
1512 Grade surface	Upper Creek Containment Pond 1	-	1.5				
1512 Grade surface	Contingency Disturbance Area	-	50.0		440.000	00/	440.000
1513 Grade cover soil	SWRDF Top	-			412,368	0%	412,368
1514 Grade cover soil	SWRDF Outslopes	-			1,237,104	0%	1,237,104
1515 Grade cover soil	SWRDF Top	-			119,548	0%	119,548
1516 Grade cover soil	Hanover Mountain Deposit	-			451,572	0%	451,572
1517 Grade cover soil	No. 3 Stockpile Top	-			6,292	0%	6,292
1518 Grade cover soil	No. 3 Stockpile Outslope	-			21,296	0%	21,296
1519 Grade cover soil	Pearson-Barnes Mine Area	-			57,596	0%	57,596
1520 Grade cover soil	Low Grade WRF	-			134,697	0%	134,697
1521 Grade cover soil	MTI Reclaim Pond	_			159,720	0%	159,720
1522 Grade cover soil	MTI Top	_			261,844	0%	261,844
	•	_			•		
1523 Grade cover soil	MTI Outslope	-			175,837	0%	175,837
1524 Grade cover soil	MTI Top	-			71,560	0%	71,560
1525 Grade cover soil	Tailing Pipeline Corridor	-			6,999	0%	6,999
1526 Grade cover soil	Grape Gulch Pond #3	-			1,839	0%	1,839
1527 Grade cover soil	Magnetite Seepage Pond	-			968	0%	968
1528 Grade cover soil	SWRF Dam 1	-			2,517	0%	2,517
1529 Grade cover soil	SWRF Dam 2	-			1,646	0%	1,646
1530 Grade cover soil	SWRF Dam 3	-			4,066	0%	4,066
1531 Grade cover soil	North Tailings Decant Pond	-			2,226	0%	2,226
1532 Grade cover soil	East WRF Containment	_			2,420	0%	2,420
1533 Grade cover soil		_			48		48
	Blackman's Seep (Pond #2)	-				0%	
1534 Grade cover soil	Decant Pond #4	-			3,001	0%	3,001
1535 Grade cover soil	Upper Creek Containment Pond 1	-			7,405	0%	7,405
1536 Grade cover soil	Contingency Disturbance Area	-			242,000	0%	242,000
1600 Off-Hwy Water Tanker	Truck 6,000 gal						
1601 Motor Grader 14M							

1601 Motor Grader 14M

Earthwork Quantity Worksheet

1207 Load cover soil

1208 Load cover soil

1209 Load cover soil

1210 Load cover soil

NOBS

NOBS

NOBS

NOBS

Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 4 Page 5 of 23

Productivity and Hours Required for Dozer Use---Earthmoving

						Total	PERFOR	MANCE	FACTOF	RS Production	Maximum						Direct	
				Loose		Task			Soil	Method/	Push	Normal		Work			Drive	Grade
Task Description	Location 1	Location 2	Equipment	Volume	Productivity	Time	Material	Grade	Weight	Blade	Distance	Production	Operator	Hour	Visibility	Elevation	Trans.	Ciddo
			_ qpe	(cy)	(cy/hr)	(hours)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor	(%)
						、 ,								, ,				
Regrade Top	SWRDF	Тор	Cat D11T	666,680	498	1,338	1.0	1.02	3,300	1.20	540	701	1.00	50	1.00	1.00	1.00	-1.0
Regrade Outslope	SWRDF	Outslope	Cat D11T	4,438,079	2,154	2,060	1.0	1.02	3,300	1.20	99	3031	1.00	50	1.00	1.00	1.00	-1.0
Regrade Top	MTI	Тор	Cat D11T	50,795	1,330	38	1.0	1.02	2,900	1.20	200	1651	1.00	50	1.00	1.00	1.00	-0.8
Regrade Outslope	MTI Reclaim Pond	Top and Outslope	Cat D11T	67,765	1,910	35	1.0	1.66	3,300	1.20	200	1651	1.00	50	1.00	1.00	1.00	-33.0
Regrade Outslope	MTI	Outslope	Cat D11T	170,294	1,793	95	1.0	1.66	2,900	1.20	250	1362	1.00	50	1.00	1.00	1.00	-33.0
Regrade Top	No. 3 Stockpile Top	Тор	Cat D11T	9,438	3,773	3	1.0	1.02	2,900	1.20	60	4664	1.00	50	1.00	1.00	1.00	-1.0
Regrade Outslope	No. 3 Stockpile Outslope	Outslope	Cat D11T	14,489	3,197	5	1.0	1.66	2,900	1.20	128	2428	1.00	50	1.00	1.00	1.00	-33.0
Dozer Assist	NOBS	SWRDF Top	Cat D11T	N/A	N/A	383	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	SWRDF Outslopes	Cat D11T	N/A	N/A	1,149	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	SWRDF Top	Cat D11T	N/A	N/A	111	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Hanover Mountain Deposit	Cat D11T	N/A	N/A	419	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	No. 3 Stockpile Top	Cat D11T	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	No. 3 Stockpile Outslope	Cat D11T	N/A	N/A	20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Pearson-Barnes Mine Area	Cat D11T	N/A	N/A	53	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Low Grade WRF	Cat D11T	N/A	N/A	125	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	MTI Reclaim Pond	Cat D11T	N/A	N/A	148	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	MTI Top	Cat D11T	N/A	N/A	243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	MTI Outslope	Cat D11T	N/A	N/A	163	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Reclaim Pond Outlet Channel	MTI Top	Cat D11T	N/A	N/A	66	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Tailing Pipeline Corridor	Cat D11T	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Grape Gulch Pond #3	Cat D11T	N/A	N/A	1.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Magnetite Seepage Pond	Cat D11T	N/A	N/A	0.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	SWRF Dam 1	Cat D11T	N/A	N/A	2.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	SWRF Dam 2	Cat D11T	N/A	N/A	1.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	SWRF Dam 3	Cat D11T	N/A	N/A	3.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	North Tailings Decant Pond	Cat D11T	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	East WRF Containment	Cat D11T	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Blackman's Seep (Pond #2)	Cat D11T	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Decant Pond #4	Cat D11T	N/A	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Upper Creek Containment Pond 1	Cat D11T	N/A	N/A	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	NOBS	Contingency Disturbance Area	Cat D11T	N/A	N/A	225	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		. .																

Cobre Stockpile Worksheet #5 05/17/18

Productivity and Hours Required for Dozer Use---Grading

Task Description	Location 1	Location 2	Equipment	Volume	Area	Productivity	Productivity	Task Time	Material	Grade	Soil Weight	Production Method/ Blade	Effective Blade Width	Speed	Work Hour	Visibility	Elevation	Direct Drive Trans.	Grade	Operator	Maximum Push Distance	Normal Production
				(су)	(acres)	(acres/hr)	(cy/hr)	(hours)		Factor	(lb/cy)		(feet)	(miles/hr)	(min/hr)				(%)		(feet)	(cy/hr)
Grade surface	Haul Roads	-	Cat 16M	-	45.0	2.6		17.4	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Exploration Roads	-	Cat 16M	-	37.0	2.6		14.3	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Low Grade WRF	-	Cat 16M	-	27.8	2.6		10.8	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Grape Gulch Pond #3	-	Cat 16M	-	0.4	2.6		0.1	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Magnetite Seepage Pond	-	Cat 16M	-	0.2	2.6		0.1	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	SWRF Dam 1	-	Cat 16M	-	0.5	2.6		0.2	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	SWRF Dam 2	-	Cat 16M	-	0.3	2.6		0.1	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	SWRF Dam 3	-	Cat 16M	-	0.8	2.6		0.3	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	North Tailings Decant Pond	-	Cat 16M	-	0.5	2.6		0.2	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	East WRF Containment	-	Cat 16M	-	0.5	2.6		0.2	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Blackman's Seep (Pond #2)	-	Cat 16M	-	0.0	2.6		0.0	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Decant Pond #4	-	Cat 16M	-	0.6	2.6		0.2	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Upper Creek Containment Pond 1	-	Cat 16M	-	2	2.6		0.6	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade surface	Contingency Disturbance Area	-	Cat 16M	-	50	2.6		19.3	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	-1.0	0.75	-	
Grade cover soil	SWRDF Top	-	Cat D11T	412,368		-	1,921	214.7	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	SWRDF Outslopes	-	Cat D11T	1,237,104		-	3,032	408	1.2	1.6	3,300	1.2	-	-	50	1	1	1	-30.5	0.75	100	3002
Grade cover soil	SWRDF Top	-	Cat D11T	119,548		-	1,921	62	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Hanover Mountain Deposit	-	Cat D11T	451,572		-	1,921	235.1	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	No. 3 Stockpile Top	-	Cat D11T	6,292		-	3,522	1.8	2.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	No. 3 Stockpile Outslope	-	Cat D11T	21,296		-	8,336	2.6	3.2	1.7	3,300	1.2	-	-	50	1	1	1	-33	0.75	100	3002
Grade cover soil	Pearson-Barnes Mine Area	-	Cat D11T	57,596		-	1,243	46.3	1.2	0.7	3,300	1.2	-	-	50	1	1	1	17	0.75	100	3002
Grade cover soil	Low Grade WRF	-	Cat D11T	134,697		-	3,126	43.1	1.2	1.7	3,300	1.2	-	-	50	1	1	1	-33	0.75	100	3002
Grade cover soil	MTI Reclaim Pond	-	Cat D11T	159,720		-	3,126	51.1	1.2	1.7	3,300	1.2	-	-	50	1	1	1	-33	0.75	100	3002
Grade cover soil	MTI Top	-	Cat D11T	261,844		-	1,912	136.9	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-0.8	0.75	100	3002
Grade cover soil	MTI Outslope	-	Cat D11T	175,837		-	3,126	56.2	1.2	1.7	3,300	1.2	-	-	50	1	1	1	-33	0.75	100	3002
Grade cover soil	МТІ Тор	-	Cat D11T	71,560		-	1,912	37.4	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-0.8	0.75	100	3002
Grade cover soil	Tailing Pipeline Corridor	-	Cat D11T	6,999		-	1,921	3.6	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Grape Gulch Pond #3	-	Cat D11T	1,839		-	1,921	1.0	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Magnetite Seepage Pond	-	Cat D11T	968		-	1,921	0.5	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	SWRF Dam 1	-	Cat D11T	2,517		-	1,921	1.3	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	SWRF Dam 2	-	Cat D11T	1,646		-	1,921	0.9	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	SWRF Dam 3	-	Cat D11T	4,066		-	1,921	2.1	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	North Tailings Decant Pond	-	Cat D11T	2,226		-	1,921	1.2	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	East WRF Containment	-	Cat D11T	2,420		-	1,921	1.3	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Blackman's Seep (Pond #2)	-	Cat D11T	48		-	1,921	0.0	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Decant Pond #4	-	Cat D11T	3,001		-	1,921	1.6	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Upper Creek Containment Pond 1	-	Cat D11T	7,405		-	1,921	3.9	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
Grade cover soil	Contingency Disturbance Area	-	Cat D11T	242,000		-	1,921	126.0	1.2	1.0	3,300	1.2	-	-	50	1	1	1	-1.0	0.75	100	3002
	,			,			,			_	, ·								-	_	_	

*Push distances: Assumed 100 feet.

Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 6 Page 7 of 23

PERFORMANCE FACTORS

Productivity and Hours Required for Ripper-Equipped Dozer Use

Note: Scarifying/Ripping Covered Areas Currently Included in Revegetation Costs

		PERFORMANCE FACTORS:														
Task Description	Location 1	Location 2	Equipment	Area Volum		Productivity	Task Time	Ripping Length	Ripper Penetration	Pocket Spacing	No. of Pockets	Turn Time	Work Hour	Speed	1000 ft	ripper path width
				(acres)	(cy)	(acres/hr)	(hours)	(feet)	(in)	(in)		(min/pass)	(min/hr)	(mph)	(passes/acre)	(feet)
Rip liners	East WRF Containment	-	D11T w/ ripper	0.50	1,210	1.70	0.3	1,000	18	69	3	0.25	50	1	2.53	17.3
Rip liners	Decant Pond #4	-	D11T w/ ripper	0.62	1,500	1.70	0.4	1,000	18	69	3	0.25	50	1	2.53	17.3
Rip liners	Blackman's Seep (Pond #2)	-	D11T w/ ripper	0.01	24	1.70	0.01	1,000	18	69	3	0.25	50	1	2.53	17.3
Rip liners	Grape Gulch Pond #3	-	D11T w/ ripper	0.38	920	1.70	0.2	1,000	18	69	3	0.25	50	1	2.53	17.3
Rip liners	Magnetite Seepage Pond	-	D11T w/ ripper	0.20	484	1.70	0.1	1,000	18	69	3	0.25	50	1	2.53	17.3
Rip surface	Reclaim Pond Outlet Channel	-	D11T w/ ripper	1.70	4,114	1.70	1.0	1,000	18	69	3	0.25	50	1	2.53	17.3
Rip liners	Upper Creek Containment Pond 1	-	D11T w/ ripper	1.53	3,703	1.70	0.9	1,000	18	69	3	0.25	50	1	2.53	17.3

Cobre Stockpile Worksheet #7 05/17/18

Cobre Stockpile Worksheet #8 05/17/18

Productivity and Hours Required for Hydraulic Excavator

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Productivity and Hours Required for Truck Use

<u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

	arance, Cat 992G - 153							PERFO	RMANCE F	ACTORS													Haul	Haul	Haul
					Truck	Optimum					Loader	Total	Haul	Haul	Haul	Haul	Haul	Haul		Haul	Haul	Haul	Effective	Effective	Effective
					Cycle	No. of		Task	Struck	Heaped	Cycles	Haul	Distance	Distance	Distance	Grade	Grade	Grade	Rolling	Distance	Distance	Distance	Grade	Grade	Grade
Task Description	Location 1*	Location 2	Equipment	Volume	Time	Trucks	Productivity	Time	Capacity	Capacity	per Truck	Distance	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3	Resistance	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3
				(cy)	(min)		(cy/hr)	(hrs)	(cy)	(cy)		(feet)	(feet)	(feet)	(feet)	(%)	(%)	(%)	(%)	(meters)	(meters)	(meters)	(%)	(%)	(%)
Haul cover soil	NOBS	SWRDF Top	Cat 793 truck	,	20.4	2	825	500	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-0.96%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	SWRDF Outslopes	Cat 793 truck	1,237,104	20.4	2	825	1,500	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-0.96%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	SWRDF Top	Cat 793 truck	119,548	20.4	2	825	145	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-1.0%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	Hanover Mountain Deposit		451,572	15.9	2	1,057	427	126	169	12	5,707	1,759	2,466	1,482	-9.9%	-8.1%	6.7%	2.5%	536	752	452	-7%	-6%	9%
Haul cover soil	NOBS	No. 3 Stockpile Top	Cat 793 truck	6,292	12.5	2	1,342	6	126	169	12	4,251	1,357	1,451	1,443	-1.8%	-3.3%	-2.2%	2.5%	414	442	440	1%	-1%	0%
Haul cover soil	NOBS	No. 3 Stockpile Outslope	Cat 793 truck	21,296	12.5	2	1,342	20	126	169	12	4,251	1,357	1,451	1,443	-1.8%	-3.3%	-2.2%	2.5%	414	442	440	1%	-1%	0%
Haul cover soil	NOBS	Pearson-Barnes Mine Area	Cat 793 truck	57,596	20.4	2	825	70	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-1.0%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	Low Grade WRF		134,697	17.8	2	941	143	126	169	12	10,620	5,310	2,310	3,000	0.0%	-8.9%	-2.3%	2.5%	1,618	704	914	3%	-6%	0%
Haul cover soil	NOBS	MTI Reclaim Pond	Cat 793 truck	159,720	16.7	2	1,007	159	126	169	12	7,193	2,310	1,940	2,943	-8.9%	1.6%	3.6%	2.5%	704	591	897	-6%	4%	6%
Haul cover soil	NOBS	MTI Top	Cat 793 truck	261,844	16.7	2	1,007	260	126	169	12	7,193	2,310	1,940	2,943	-8.9%	1.6%	3.6%	2.5%	704	591	897	-6%	4%	6%
Haul cover soil	NOBS	MTI Outslope	Cat 793 truck	175,837	16.7	2	1,007	175	126	169	12	7,193	2,310	1,940	2,943	-8.9%	1.6%	3.6%	2.5%	704	591	897	-6%	4%	6%
Haul cover soil	Reclaim Pond Outlet Channel	MTI Top	Cat 793 truck	71,560	10.6	2	1,592	66	126	169	12	1,172	1,172	-	-	0.9%	-	-	2.5%	357	0	0	3%	0%	0%
Haul cover soil	NOBS	Tailing Pipeline Corridor	Cat 793 truck	6,999	16.7	2	1,007	7	126	169	12	7,193	2,310	1,940	2,943	-8.9%	1.6%	3.6%	2.5%	704	591	897	-6%	4%	6%
Haul cover soil	NOBS	Grape Gulch Pond #3	Cat 793 truck	1,839	13.1	2	1,282	2	126	169	12	3,856	2,310	1,546	-	-8.9%	-7.8%	-	2.5%	704	471	0	-6%	-5%	0%
Haul cover soil	NOBS	Magnetite Seepage Pond	Cat 793 truck	968	15.0	2	1,118	1	126	169	12	6,480	2,310	1,940	2,230	-8.9%	1.6%	-4.0%	2.5%	704	591	680	-6%	4%	-2%
Haul cover soil	NOBS	SWRF Dam 1	Cat 793 truck	2,517	20.4	2	825	3	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-1.0%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	SWRF Dam 2	Cat 793 truck	1,646	20.4	2	825	2	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-1.0%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	SWRF Dam 3	Cat 793 truck	4,066	20.4	2	825	5	126	169	12	12,559	2,310	7,312	2,937	-8.9%	-1.0%	4.1%	2.5%	704	2,229	895	-6%	2%	7%
Haul cover soil	NOBS	North Tailings Decant Pond	Cat 793 truck	2,226	13.0	2	1,288	2	126	169	12	4,110	2310	1800	-	-8.9%	-1.1%	-	2.5%	704	549	0	-6%	1%	0%
Haul cover soil	NOBS	East WRF Containment	Cat 793 truck	2,420	13.0	2	1,288	2	126	169	12	4,110	2310	1800	-	-8.9%	-1.1%	-	2.5%	704	549	0	-6%	1%	0%
Haul cover soil	NOBS	Blackman's Seep (Pond #2)	Cat 793 truck	48	13.1	2	1,282	0	126	169	12	3,856	2,310	1,546	-	-8.9%	-7.8%	-	2.5%	704	471	0	-6%	-5%	0%
Haul cover soil	NOBS	Decant Pond #4	Cat 793 truck	3,001	13.0	2	1,288	3	126	169	12	4,110	2,310	1,800	-	-8.9%	-1.1%	-	2.5%	704	549	0	-6%	1%	0%
Haul cover soil	NOBS	Upper Creek Containment Pond 1	Cat 793 truck	7,405	13.1	2	1,282	7	126	169	12	3,856	2,310	1,546	-	-8.9%	-7.8%	-	2.5%	704	471	0	-6%	-5%	0%
Haul cover soil	NOBS	Contingency Disturbance Area	Cat 793 truck	242,000	16.5	2	1,020	237	126	169	12	8,477	2,284	3,573	2,621	-7.5%	-2.2%	2.4%	2.5%	696	1,089	799	-5%	0%	5%

*Cover material supplied from North Overburden Stockpile for each facility. Suitable cover material from Reclaim Pond spillway applied to the MTI as cover with balance from North Overburden Stockpile.

Cobre Stockpile Worksheet #9 05/17/18

Productivity and Hours Required for Truck Use

<u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

Task Descriptior	n Location 1*	Location 2	Return Effective Grade Segment 1 (%)	Return Effective Grade Segment 2 (%)	Return Effective Grade Segment 3 (%)	Haul Time (min)	Return Time (min)	Loading Time (min)	Load/ Maneuver Time (min)	Dump/ Maneuver Time (min)	Work Hour (min/hr)	Travel Time Loaded Segment 1 (min/m)	Travel Time Loaded Segment 2 (min/m)	Travel Time Loaded Segment 3 (min/m)	Travel Time Empty Segment 1 (min/m)	Travel Time Empty Segment 2 (min/m)	Tra So
Haul cover soil	NOBS	SWRDF Top	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00271	0.00199	0.00113	(
Haul cover soil	NOBS	SWRDF Outslopes	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00271	0.00199	0.00113	(
Haul cover soil	NOBS	SWRDF Top	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00272	0.00199	0.00113	(
Haul cover soil	NOBS	Hanover Mountain Deposit	12%	11%	-4%	3.2	3.1	7.8	0.7	1.1	50	0.00110	0.00110	0.00401	0.00226	0.00181	(
Haul cover soil	NOBS	No. 3 Stockpile Top	4%	6%	5%	1.4	1.5	7.8	0.7	1.1	50	0.00110	0.00110	0.00110	0.00114	0.00117	(
Haul cover soil	NOBS	No. 3 Stockpile Outslope	4%	6%	5%	1.4	1.5	7.8	0.7	1.1	50	0.00110	0.00110	0.00110	0.00114	0.00117	(
Haul cover soil	NOBS	Pearson-Barnes Mine Area	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00271	0.00199	0.00113	(
Haul cover soil	NOBS	Low Grade WRF	3%	11%	5%	4.0	4.3	7.8	0.7	1.1	50	0.00135	0.00110	0.00110	0.00113	0.00199	(
Haul cover soil	NOBS	MTI Reclaim Pond	11%	1%	-1%	4.0	3.0	7.8	0.7	1.1	50	0.00110	0.00175	0.00249	0.00199	0.00111	(
Haul cover soil	NOBS	MTI Top	11%	1%	-1%	4.0	3.0	7.8	0.7	1.1	50	0.00110	0.00175	0.00249	0.00199	0.00111	(
Haul cover soil	NOBS	MTI Outslope	11%	1%	-1%	4.0	3.0	7.8	0.7	1.1	50	0.00110	0.00175	0.00249	0.00199	0.00111	(
Haul cover soil	Reclaim Pond Outlet Channel	MTI Top	2%	0%	0%	0.6	0.4	7.8	0.7	1.1	50	0.00155	0.00110	0.00110	0.00112	0.00110	(
Haul cover soil	NOBS	Tailing Pipeline Corridor	11%	1%	-1%	4.0	3.0	7.8	0.7	1.1	50	0.00110	0.00175	0.00249	0.00199	0.00111	(
Haul cover soil	NOBS	Grape Gulch Pond #3	11%	10%	0%	1.3	2.2	7.8	0.7	1.1	50	0.00110	0.00110	0.00110	0.00199	0.00173	(
Haul cover soil	NOBS	Magnetite Seepage Pond	11%	1%	7%	2.6	2.9	7.8	0.7	1.1	50	0.00110	0.00175	0.00110	0.00199	0.00111	(
Haul cover soil	NOBS	SWRF Dam 1	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00271	0.00199	0.00113	(
Haul cover soil	NOBS	SWRF Dam 2	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00271	0.00199	0.00113	(
Haul cover soil	NOBS	SWRF Dam 3	11%	3%	-2%	5.9	4.9	7.8	0.7	1.1	50	0.00110	0.00119	0.00271	0.00199	0.00113	(
Haul cover soil	NOBS	North Tailings Decant Pond	11%	4%	0%	1.4	2.0	7.8	0.7	1.1	50	0.00110	0.00117	0.00110	0.00199	0.00114	(
Haul cover soil	NOBS	East WRF Containment	11%	4%	0%	1.4	2.0	7.8	0.7	1.1	50	0.00110	0.00117	0.00110	0.00199	0.00114	(
Haul cover soil	NOBS	Blackman's Seep (Pond #2)	11%	10%	0%	1.3	2.2	7.8	0.7	1.1	50	0.00110	0.00110	0.00110	0.00199	0.00173	(
Haul cover soil	NOBS	Decant Pond #4	11%	4%	0%	1.4	2.0	7.8	0.7	1.1	50	0.00110	0.00117	0.00110	0.00199	0.00114	(
Haul cover soil	NOBS	Upper Creek Containment Pond 1	11%	10%	0%	1.3	2.2	7.8	0.7	1.1	50	0.00110	0.00110	0.00110	0.00199	0.00173	(
Haul cover soil	NOBS	Contingency Disturbance Area	10%	5%	0%	3.6	3.3	7.8	0.7	1.1	50	0.00110	0.00110	0.00204	0.00167	0.00114	(
*Cover meterial	supplied from North Overburden St	advaile for each facility. Suitable cover m															

*Cover material supplied from North Overburden Stockpile for each facility. Suitable cover m MTI as cover with balance from North Overburden Stockpile.

Cobre Stockpile Worksheet #9 05/17/18

> Travel Time Empty Segment 3 (min/m) 0.00110 0.00110 0.00110 0.00110 0.00114 0.00114 0.00110 0.00114 0.00110 0.00110 0.00110 0.00110 0.00110 0.00110 0.00120 0.00110 0.00110 0.00110 0.00110 0.00110 0.00110 0.00110 0.00110

0.00110

Productivity for Front End Loader

									Ρ
					Net Bucket	Loader Cycle		Task	
Task Description	Location 1	Location 2	Equipment	Volume	Capacity	Time	Productivity	Time	
				(cy)	(cy)	(min)	(cy/hr)	(hours)	
Load cover soil	NOBS	SWRDF Top	992K	412,368	14	0.65	1,077	383	
Load cover soil	NOBS	SWRDF Outslopes	992K	1,237,104	14	0.65	1,077	1,149	
Load cover soil	NOBS	SWRDF Top	992K	119,548	14	0.65	1,077	111	
Load cover soil	NOBS	Hanover Mountain Deposit	992K	451,572	14	0.65	1,077	419	
Load cover soil	NOBS	No. 3 Stockpile Top	992K	6,292	14	0.65	1,077	6	
Load cover soil	NOBS	No. 3 Stockpile Outslope	992K	21,296	14	0.65	1,077	20	
Load cover soil	NOBS	Pearson-Barnes Mine Area	992K	57,596	14	0.65	1,077	53	
Load cover soil	NOBS	Low Grade WRF	992K	134,697	14	0.65	1,077	125	
Load cover soil	NOBS	MTI Reclaim Pond	992K	159,720	14	0.65	1,077	148	
Load cover soil	NOBS	MTI Top	992K	261,844	14	0.65	1,077	243	
Load cover soil	NOBS	MTI Outslope	992K	175,837	14	0.65	1,077	163	
Load cover soil	Reclaim Pond Outlet Channel	MTI Top	992K	71,560	14	0.65	1,077	66	
Load cover soil	NOBS	Tailing Pipeline Corridor	992K	6,999	14	0.65	1,077	6	
Load cover soil	NOBS	Grape Gulch Pond #3	992K	1,839	14	0.65	1,077	2	
Load cover soil	NOBS	Magnetite Seepage Pond	992K	968	14	0.65	1,077	1	
Load cover soil	NOBS	SWRF Dam 1	992K	2,517	14	0.65	1,077	2	
Load cover soil	NOBS	SWRF Dam 2	992K	1,646	14	0.65	1,077	2	
Load cover soil	NOBS	SWRF Dam 3	992K	4,066	14	0.65	1,077	4	
Load cover soil	NOBS	North Tailings Decant Pond	992K	2,226	14	0.65	1,077	2	
Load cover soil	NOBS	East WRF Containment	992K	2,420	14	0.65	1,077	2	
Load cover soil	NOBS	Blackman's Seep (Pond #2)	992K	48	14	0.65	1,077	0.0	
Load cover soil	NOBS	Decant Pond #4	992K	3,001	14	0.65	1,077	2.8	
Load cover soil	NOBS	Upper Creek Containment Pond 1	992K	7,405	14	0.65	1,077	6.9	
Load cover soil	NOBS	Contingency Disturbance Area	992K	242,000	14	0.65	1,077	224.7	

Cobre Stockpile Worksheet #10 5/17/2018

PERFORMANCE FACTORS

-		
Rated	Bucket	
Bucket	Fill	Work
Capacity	Factor	Hour
(cy)		(min/hr)
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50
16	0.875	50

Cobre Stockpile Worksheet #11 05/17/18

Productivity and Hours Required for Scraper Use

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Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 11 Page 13 of 23

Cobre Stockpile Worksheet #12 5/17/2018

Productivity and Hours Required for Motor grader Use---Grading

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Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 12 Page 14 of 23

Equipment Type	Task	Location 1	Location 2	Owning and Operating Cost (\$/hr)	Labor Cost (\$/hr)	Number of Units Equipment	Time Req'd (hrs)	Direct Cost (\$)	Total Production	Prod. Unit	Unit Cost (\$/unit)
Dozers-Earthmoving				(ψ/11)	(ψ/11)	Equipment	(1113)	(Ψ)			(want)
Cat D11T	Regrade Top	SWRDF	Тор	\$414.50	\$26.2		1,338	\$589,604.44	666,680	су	0.88
Cat D11T	Regrade Outslope	SWRDF	Outslope	\$414.50	\$26.2		2,060	\$908,019.72	4,438,079	су	0.20
Cat D11T	Regrade Top	MTI	Тор	\$414.50	\$26.2		38	\$16,836.97	50,795	су	0.33
Cat D11T	Regrade Outslope	MTI Reclaim Pond	Top and Outslope	\$414.50	\$26.2		35	\$15,635.00	67,765	•	0.23
Cat D11T	Regrade Outslope	MTI No. 2 Stocknika Tan	Outslope	\$414.50	\$26.2		95	\$41,856.10	170,294	су	0.25
Cat D11T	Regrade Top	No. 3 Stockpile Top	Top	\$414.50 \$414.50	\$26.2 \$26.2		3	\$1,102.53 \$1,007.83	9,438	су	0.12
Cat D11T Cat D11T	Regrade Outslope Dozer Assist	No. 3 Stockpile Outslope NOBS	Outslope SWRDF Top	\$414.50 \$414.50	\$26.2 \$26.2		5 383	\$1,997.82 \$168,784.28	14,489 381,822	су	0.14 0.44
Cat D11T	Dozer Assist	NOBS	SWRDF Top SWRDF Outslopes	\$414.50 \$414.50	\$26.2 \$26.2		303 1,149	\$100,704.20 \$506,352.85	1,145,467	cy	0.44
Cat D11T	Dozer Assist	NOBS	SWRDF Top	\$414.50	\$26.2 \$26.2		111	\$48,931.59	110,693	cy cy	0.44
Cat D11T	Dozer Assist	NOBS	Hanover Mountain Deposit	\$414.50	\$26.2 \$26.2		419	\$184,830.68	418,122	су	0.44
Cat D11T	Dozer Assist	NOBS	No. 3 Stockpile Top	\$414.50	\$26.2		6	\$2,575.35	5,826		0.44
Cat D11T	Dozer Assist	NOBS	No. 3 Stockpile Outslope	\$414.50	\$26.2		20	\$8,716.56	19,719	•	0.44
Cat D11T	Dozer Assist	NOBS	Pearson-Barnes Mine Area	\$414.50	\$26.2		53	\$23,574.33	53,330	су	0.44
Cat D11T	Dozer Assist	NOBS	Low Grade WRF	\$414.50	\$26.2		125	\$55,132.24	124,720	cy	0.44
Cat D11T	Dozer Assist	NOBS	MTI Reclaim Pond	\$414.50	\$26.2		148	\$65,374.19	147,889	•	0.44
Cat D11T	Dozer Assist	NOBS	МТІ Тор	\$414.50	\$26.2		243	\$107,174.06	242,448	cy	0.44
Cat D11T	Dozer Assist	NOBS	MTI Outslope	\$414.50	\$26.2	9 1	163	\$71,971.05	162,812	су	0.44
Cat D11T	Dozer Assist	Reclaim Pond Outlet Channel	MTI Top	\$414.50	\$26.2	9 1	66	\$29,289.82	62,226	•	0.47
Cat D11T	Dozer Assist	NOBS	Tailing Pipeline Corridor	\$414.50	\$26.2	9 1	6	\$2,864.58	6,480	су	0.44
Cat D11T	Dozer Assist	NOBS	Grape Gulch Pond #3	\$414.50	\$26.2	9 1	2	\$752.79	1,703	су	0.44
Cat D11T	Dozer Assist	NOBS	Magnetite Seepage Pond	\$414.50	\$26.2	9 1	1	\$396.21	896	су	0.44
Cat D11T	Dozer Assist	NOBS	SWRF Dam 1	\$414.50	\$26.2	9 1	2	\$1,030.14	2,330	су	0.44
Cat D11T	Dozer Assist	NOBS	SWRF Dam 2	\$414.50	\$26.2	9 1	2	\$673.55	1,524	су	0.44
Cat D11T	Dozer Assist	NOBS	SWRF Dam 3	\$414.50	\$26.2	9 1	4	\$1,664.07	3,764	су	0.44
Cat D11T	Dozer Assist	NOBS	North Tailings Decant Pond	\$414.50	\$26.2	9 1	2	\$911.28	2,061	су	0.44
Cat D11T	Dozer Assist	NOBS	East WRF Containment	\$414.50	\$26.2	9 1	2	\$990.52	2,241	су	0.44
Cat D11T	Dozer Assist	NOBS	Blackman's Seep (Pond #2)	\$414.50	\$26.2	9 1	0	\$19.81	45	су	0.44
Cat D11T	Dozer Assist	NOBS	Decant Pond #4	\$414.50	\$26.2	9 1	3	\$1,228.24	2,779	су	0.44
Cat D11T	Dozer Assist	NOBS	Upper Creek Containment Pond 1	\$414.50	\$26.2		7	\$3,030.99	6,857	су	0.44
Cat D11T	Dozer Assist	NOBS	Contingency Disturbance Area	\$414.50	\$26.2	9 1	225	\$99,051.81	224,074	су	0.44
Dozers-Grading	.			•	• • • •			•			
Cat 16M	Grade surface	Haul Roads	-	\$133.94	\$26.2		17.4	\$2,789.17	45.0	ac	61.98
Cat 16M	Grade surface	Exploration Roads	-	\$133.94	\$26.2		14.3	\$2,293.32	37.0	ac	61.98
Cat 16M	Grade surface	Low Grade WRF	-	\$133.94	\$26.2		10.8	\$1,724.95	27.8	ac	61.98
Cat 16M	Grade surface	Grape Gulch Pond #3	-	\$133.94	\$26.2		0.1	\$23.55	0.4	ac	61.98
Cat 16M	Grade surface	Magnetite Seepage Pond	-	\$133.94	\$26.2		0.1	\$12.40	0.2	ac	61.98
Cat 16M	Grade surface	SWRF Dam 1	-	\$133.94	\$26.2		0.2	\$32.23	0.5	ac	61.98
Cat 16M	Grade surface	SWRF Dam 2	-	\$133.94	\$26.2		0.1	\$21.07	0.3	ac	61.98
Cat 16M	Grade surface	SWRF Dam 3	-	\$133.94	\$26.2		0.3	\$52.06	0.8	ac	61.98
Cat 16M	Grade surface	North Tailings Decant Pond	-	\$133.94	\$26.2		0.2	\$28.51	0.5	ac	61.98
Cat 16M	Grade surface	East WRF Containment	-	\$133.94	\$26.2		0.2	\$30.99	0.5	ac	61.98
Cat 16M	Grade surface	Blackman's Seep (Pond #2)	-	\$133.94	\$26.2		0.0	\$0.62	0.0	ac	61.98
Cat 16M	Grade surface	Decant Pond #4	-	\$133.94	\$26.2		0.2	\$38.43	0.6	ac	61.98
Cat 16M	Grade surface	Upper Creek Containment Pond 1	-	\$133.94	\$26.2		0.6	\$94.83	1.5	ac	61.98
Cat 16M	Grade surface	Contingency Disturbance Area	-	\$133.94	\$26.2 \$26.2		19.3	\$3,099.08	50.0	ac	61.98
Cat D11T	Grade cover soil	SWRDF Top	-	\$414.50 \$414.50	\$26.2 \$26.2		214.7	\$94,625.91 \$170,848,00	412,368.0	су	0.23
Cat D11T Cat D11T	Grade cover soil Grade cover soil	SWRDF Outslopes	-	\$414.50 \$414.50	\$26.2 \$26.2		408.0 62.2	\$179,848.00 \$27,432.63	1,237,104.0	су	0.15 0.23
Cat D11T	Grade cover soil	SWRDF Top Hanover Mountain Deposit	-	\$414.50 \$414.50	\$26.2 \$26.2		235.1	\$27,432.03 \$103,622.03	119,548.0 451,572.0		0.23
Cat D11T	Grade cover soil	No. 3 Stockpile Top		\$414.50 \$414.50	\$20.2 \$26.2		1.8	\$787.54	6,292.0	cy cy	0.23
Cat D11T	Grade cover soil	No. 3 Stockpile Outslope	_	\$414.50	\$26.2 \$26.2		2.6	\$1,126.02	21,296.0	•	0.05
Cat D11T	Grade cover soil	Pearson-Barnes Mine Area	_	\$414.50	\$26.2		46.3	\$20,425.55	57,596.0	су	0.35
Cat D11T	Grade cover soil	Low Grade WRF	-	\$414.50	\$26.2		43.1	\$18,992.22	134,697.2	•	0.14
Cat D11T	Grade cover soil	MTI Reclaim Pond	-	\$414.50	\$26.2		51.1	\$22,520.42	159,720.0	cy	0.14
Cat D11T	Grade cover soil	MTI Top	-	\$414.50	\$26.2		136.9	\$60,357.43	261,844.0	•	0.23
Cat D11T	Grade cover soil	MTI Outslope	-	\$414.50	\$26.2		56.2	\$24,792.94	175,837.2	cy	0.14
Cat D11T	Grade cover soil	MTI Top	-	\$414.50	\$26.2		37.4	\$16,495.21	71,559.9	су	0.23
Cat D11T	Grade cover soil	Tailing Pipeline Corridor	-	\$414.50	\$26.2		3.6	\$1,605.97	6,998.6	•	0.23
Cat D11T	Grade cover soil	Grape Gulch Pond #3	-	\$414.50	\$26.2		1.0	\$422.04	1,839.2	cy	0.23
Cat D11T	Grade cover soil	Magnetite Seepage Pond	-	\$414.50	\$26.2	9 1	0.5	\$222.13	968.0	су	0.23
Cat D11T	Grade cover soil	SWRF Dam 1	-	\$414.50	\$26.2		1.3	\$577.53	2,516.8	cy	0.23
Cat D11T	Grade cover soil	SWRF Dam 2	-	\$414.50	\$26.2		0.9	\$377.62	1,645.6	cy	0.23
Cat D11T	Grade cover soil	SWRF Dam 3	-	\$414.50	\$26.2	9 1	2.1	\$932.93	4,065.6	су	0.23
Cat D11T	Grade cover soil	North Tailings Decant Pond	-	\$414.50	\$26.2	9 1	1.2	\$510.89	2,226.4	су	0.23
Cat D11T	Grade cover soil	East WRF Containment	-	\$414.50	\$26.2	9 1	1.3	\$555.32	2,420.0	су	0.23
Cat D11T	Grade cover soil	Blackman's Seep (Pond #2)	-	\$414.50	\$26.2	9 1	0.0	\$11.11	48.4	су	0.23
Cat D11T	Grade cover soil	Decant Pond #4	-	\$414.50	\$26.2	9 1	1.6	\$688.59	3,000.8	су	0.23
Cat D11T	Grade cover soil	Upper Creek Containment Pond 1	-	\$414.50	\$26.2		3.9	\$1,699.27	7,405.2	су	0.23
Cat D11T	Grade cover soil	Contingency Disturbance Area	-	\$414.50	\$26.2	9 2	126.0	\$111,063.27	242,000.0	cy	0.46
Loaders											
992K	Load cover soil	NOBS	SWRDF Top	\$294.35	\$26.5		500	\$160,469.95	412,368	•	0.39
992K	Load cover soil	NOBS	SWRDF Outslopes Cobre_Stockpiles_Tails_Other_201 Stockpile She		\$26.5) 9.xlsx	6 1	1,500	\$481,409.84	1,237,104	су	0.39

Cobre Stockpile Worksheet #13 05/17/18

Stockpile Sheet 13 Page 15 of 23

Equipment		
Туре	Task	Location 1
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	Reclaim Pond Outlet Channel
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS
992K	Load cover soil	NOBS

Cobre Stockpile Worksheet #13 05/17/18

Location 2	Owning and Operating Cost	Labor Cost	Number of Units	Time Req'd	Direct Cost	Total Production	Prod. Unit	Unit Cost
	(\$/hr)	(\$/hr)	Equipment	(hrs)	(\$)			(\$/unit)
SWRDF Top	\$294.35	\$26.5		145	\$46,521.46	119,548	су	0.39
Hanover Mountain Deposit	\$294.35	\$26.5	5 1	427	\$137,076.03	451,572	cy	0.30
No. 3 Stockpile Top	\$294.35	\$26.5	5 1	6	\$1,874.94	6,292	cy	0.30
No. 3 Stockpile Outslope	\$294.35	\$26.5	5 1	20	\$6,345.95	21,296	cy	0.30
Pearson-Barnes Mine Area	\$294.35	\$26.5	5 1	70	\$22,413.06	57,596	cy	0.39
Low Grade WRF	\$294.35	\$26.5	6 1	143	\$45,914.08	134,697	cy	0.34
MTI Reclaim Pond	\$294.35	\$26.5	6 1	159	\$50,901.09	159,720	су	0.32
MTI Top	\$294.35	\$26.5	6 1	260	\$83,446.95	261,844	су	0.32
MTI Outslope	\$294.35	\$26.5	6 1	175	\$56,037.48	175,837	су	0.32
MTI Top	\$294.35	\$26.5	6 1	66	\$21,323.98	71,560	су	0.30
Tailing Pipeline Corridor	\$294.35	\$26.5	6 1	7.0	\$2,230.39	6,999	су	0.32
Grape Gulch Pond #3	\$294.35	\$26.5	6 1	1.7	\$548.06	1,839	су	0.30
Magnetite Seepage Pond	\$294.35	\$26.5	6 1	0.9	\$288.45	968	су	0.30
SWRF Dam 1	\$294.35	\$26.5	5 1	3.1	\$979.39	2,517	су	0.39
SWRF Dam 2	\$294.35	\$26.5	6 1	2.0	\$640.37	1,646	су	0.39
SWRF Dam 3	\$294.35	\$26.5	5 1	4.9	\$1,582.10	4,066	су	0.39
North Tailings Decant Pond	\$294.35	\$26.5	6 1	2.1	\$663.44	2,226	cy	0.30
East WRF Containment	\$294.35	\$26.5	5 1	2.2	\$721.13	2,420	су	0.30
Blackman's Seep (Pond #2)	\$294.35	\$26.5	5 1	0.0	\$14.42	48	cy	0.30
Decant Pond #4	\$294.35	\$26.50	5 1	2.8	\$894.20	3,001	cy	0.30
Upper Creek Containment Pond 1	\$294.35	\$26.5	5 1	6.9	\$2,206.66	7,405	cy	0.30
Contingency Disturbance Area	\$294.35	\$26.5	6 1	237.3	\$76,136.01	242,000	су	0.31

Summary Calculation of E	arthmoving Costs										05/17/18
Equipment				Owning and	Labor	Number		Direct	Total	Prod.	Ur
Туре	Task	Location 1	Location 2	Operating Cost (\$/hr)	Cost (\$/hr)	Units Equipme	•	Cost (\$)	Production	Unit	Co: (\$/uni
Trucks				(\$711)	(ψ/11)	Equipino		(Ψ)			(ψ/ un
Cat 793 truck	Haul cover soil	NOBS	SWRDF Top	\$478.45	\$23.8	84 2	500	\$502,331.79	412,368	су	1.2
Cat 793 truck	Haul cover soil	NOBS	SWRDF Outslopes	\$478.45	\$23.8	34 2	1,500	\$1,506,995.38	1,237,104	•	1.2
Cat 793 truck	Haul cover soil	NOBS	SWRDF Top	\$478.45	\$23.8		145	\$145,629.83	119,548		1.2
Cat 793 truck	Haul cover soil	NOBS	Hanover Mountain Deposit	\$478.45	\$23.8		427	\$429,099.97	451,572	•	0.9
Cat 793 truck	Haul cover soil	NOBS	No. 3 Stockpile Top	\$478.45	\$23.8		6	\$5,869.27	6,292	•	0.9
Cat 793 truck	Haul cover soil	NOBS	No. 3 Stockpile Outslope	\$478.45	\$23.8		20	\$19,865.23	21,296	•	0.9
Cat 793 truck	Haul cover soil	NOBS	Pearson-Barnes Mine Area	\$478.45	\$23.8		70	\$70,161.37	57,596	-	1.2
Cat 793 truck	Haul cover soil	NOBS	Low Grade WRF	\$478.45	\$23.8		143	\$143,728.47	134,697	cy	1.0
Cat 793 truck	Haul cover soil	NOBS	MTI Reclaim Pond	\$478.45	\$23.8		159	\$159,339.73	159,720	-	1.0
Cat 793 truck	Haul cover soil	NOBS	МТІ Тор	\$478.45	\$23.8		260	\$261,220.58	261,844	•	1.0
Cat 793 truck	Haul cover soil	NOBS	MTI Outslope	\$478.45	\$23.8		175	\$175,418.56	175,837		1.0
Cat 793 truck	Haul cover soil	Reclaim Pond Outlet Channel	MTI Top	\$478.45	\$23.8		66	\$66,752.15	71,560	-	0.9
Cat 793 truck	Haul cover soil	NOBS	Tailing Pipeline Corridor	\$478.45	\$23.8		7.0	\$6,981.98	6,999	•	1.(
Cat 793 truck	Haul cover soil	NOBS	Grape Gulch Pond #3	\$478.45	\$23.8		1.7	\$1,715.63	1,839	-	0.9
Cat 793 truck	Haul cover soil	NOBS	Magnetite Seepage Pond	\$478.45	\$23.8		0.9	\$902.96	968	-	0.9
Cat 793 truck	Haul cover soil	NOBS	SWRF Dam 1	\$478.45	\$23.8		3.1	\$3,065.87	2,517	•	1.2
Cat 793 truck	Haul cover soil	NOBS	SWRF Dam 2	\$478.45	\$23.8		2.0	\$2,004.61	1,646	•	1.2
Cat 793 truck	Haul cover soil	NOBS	SWRF Dam 3	\$478.45	\$23.8		4.9	\$4,952.57	4,066		1.2
Cat 793 truck	Haul cover soil	NOBS	North Tailings Decant Pond	\$478.45	\$23.8		2.1	\$2,076.82	2,226		0.9
Cat 793 truck	Haul cover soil	NOBS	East WRF Containment	\$478.45 \$478.45	۶23.0 \$23.8		2.1	\$2,070.82 \$2,257.41	2,220	•	0.9
Cat 793 truck	Haul cover soil	NOBS					0.0				0.9
			Blackman's Seep (Pond #2) Decant Pond #4	\$478.45 \$478.45	\$23.8 \$23.8			\$45.15 \$2 700 10	48	cy cv	
Cat 793 truck	Haul cover soil	NOBS		\$478.45 \$478.45	\$23.8 \$23.8		2.8	\$2,799.19 \$6,007,68	3,001	су	0.9
Cat 793 truck	Haul cover soil	NOBS	Upper Creek Containment Pond 1	\$478.45 \$478.45	\$23.8		6.9	\$6,907.68 \$228.224.50	7,405	•	0.
Cat 793 truck	Haul cover soil	NOBS	Contingency Disturbance Area	\$478.45	\$23.8	34 2	237.3	\$238,334.59	242,000	су	0.
ippers											
D11T w/ ripper	Rip liners	East WRF Containment	-	\$448.89	\$26.2		0.3	\$139.36	1,210	су	0.
D11T w/ ripper	Rip liners	Decant Pond #4	-	\$448.89	\$26.2	29 1	0.4	\$172.80	1,500	су	0.
D11T w/ ripper	Rip liners	Blackman's Seep (Pond #2)	-	\$448.89	\$26.2	29 1	0.0	\$2.79	24	су	0.
D11T w/ ripper	Rip liners	Grape Gulch Pond #3	-	\$448.89	\$26.2	29 1	0.2	\$105.91	920	су	0.
D11T w/ ripper	Rip liners	Magnetite Seepage Pond	-	\$448.89	\$26.2		0.1	\$55.74	484	су	0.
D11T w/ ripper	Rip surface	Reclaim Pond Outlet Channel	-	\$448.89	\$26.2		1.0	\$473.81	4,114	•	0.
D11T w/ ripper	Rip liners	Upper Creek Containment Pond 1	-	\$448.89	\$26.2		0.9	\$426.43	3,703		0.
Cat 16M	Grade surface	Haul Roads	-	\$448.89	\$26.2		0.0	\$0.00	0	•	
Vater Truck and Grader											
Off-Hwy Water Tanker											
Truck 6,000 gal	SWRDF			\$86.99	\$23.8	34 1	2,145	\$237,747.38			
Off-Hwy Water Tanker											
Truck 6,000 gal	Hanover Mountain [Deposit		\$86.99	\$23.8	34 1	427	\$47,340.80			
Off-Hwy Water Tanker		•		•				. ,			
Truck 6,000 gal	No. 3 Stockpile Top			\$86.99	\$23.8	34 1	6	\$647.53			
Off-Hwy Water Tanker				¢00100	<i>\</i> \\\\\\\\\\\\\		C C	<i>Q Q Q Q Q Q Q Q Q Q</i>			
Truck 6,000 gal	Pearson-Barnes Mir	ne Area		\$86.99	\$23.8	34 1	70	\$7,740.61			
Off-Hwy Water Tanker											
Truck 6,000 gal	Low Grade WRF			\$86.99	\$23.8	34 1	143	\$15,856.96			
Off-Hwy Water Tanker											
Truck 6,000 gal	MTI			\$86.99	\$23.8	34 1	667	\$15,856.96			
Off-Hwy Water Tanker				-	-						
Truck 6,000 gal	Surface Impoundme	ents		\$86.99	\$23.8	34 1	27	\$2,948.78			
Off-Hwy Water Tanker	-										
Truck 6,000 gal	Contingency Disturb	bance Areas		\$86.99	\$23.8	34 1	262	\$29,053.96			
Motor Grader 14M	SWRDF			\$99.13	\$26.2		2,145	\$269,045.17			
Motor Grader 14M	Hanover Mountain [Deposit		\$99.13	\$26.2		427	\$53,572.89			
Motor Grader 14M	No. 3 Stockpile Top	•		\$99.13	\$26.2		6	\$732.78			
Motor Grader 14M	Pearson-Barnes Mir			\$99.13	\$26.2		70	\$8,759.61			
Motor Grader 14M	Low Grade WRF			\$99.13	\$26.2		143	\$17,944.42			
Motor Grader 14M	MTI			\$99.13	\$26.2		667	\$83,613.29			
Motor Grader 14M	Surface Impoundme	ents		\$99.13	\$20.2 \$26.2		27	\$3,336.96			
Motor Grader 14M	Contingency Disturb			\$99.13	\$20.2 \$26.2		262	\$32,878.71			
				499.13	ψ20.2		202	\$9,447,857.22			
							SWRDF	\$5,873,750.23	\$7,536,022		
						니~	nover Mountain Deposit	\$955,542.41	. , ,		
						па	•				
							No. 3 Stockpile	\$51,641.51			
						Pea	arson-Barnes Mine Area	\$153,074.51			
							Low Grade WRF	\$299,293.33			
							MTI	\$1,460,370.69			
						Hau	I and Exploration Roads	\$5,082.49			
							Surface Impoundments	\$59,484.61			
							gency Disturbance Area	\$589,617.42			
							Earthwork Direct Cos	· · · · ·			
							I ALLIWULK DILECT LOS	JJJ.44/.00////			

Cobre Stockpile Worksheet #13 05/17/18

Fuel-

Equipment Туре

Task

Location 1

EQUIPMENT

Equipment Description Cat D11T CD Bulldozer Cat D11T Bulldozer w/ multi shank ripper Cat 793 truck Cat 992K Loader (Costing for Komatsu HD 1500) Cat 16M Cat 14M Off-Hwy Water Tanker Truck,6,000-gal. FUEL Oil Broker Quote

LABOR

Labor Description Cat D11T Bulldozer Cat D11T Bulldozer w/ multi shank ripper Cat 793 truck Cat 992K Loader Cat 16M Cat 14M Off-Hwy Water Tanker Truck,6,000-gal.

References

1. Equipment unit rates from EquipmentWatch Custom Cost Evaluator March 2018 (http://www.equipmentwatch.com). See attachments for rate development.

2. Griffin Propane March 12, 2018; Cobre receives an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Cobre Mine (per MMD's requirements). The indirect cost is removed from the all-inclusive fuel

3. https://www.electricitylocal.com/states/new-mexico/silver-city/

4. Labor rates based on NM Department of Labor Type H (Heavy Engineering) 2018 labor rates.

Cobre Stockpile Worksheet #13 05/17/18

Location 2	Owning and Operating Cost	Labor Cost	Number of Units	Time Req'd	Direct Cost	Total Production	Prod. Unit	Unit Cost
	(\$/hr)	(\$/hr)	Equipment	(hrs)	(\$)			(\$/unit)
		Owning and	Adjusted					
Fuel	Fuel	Operating Cos	t Own/Op					
Consumption	Cost	(w/out fuel)	Cost					
(gal/hr)	(\$/hr)	(\$/hr)	(\$/hr)	Reference				
29.8	\$63.77	\$350.73	\$414.50	1				
29.8	\$63.77	\$385.12	\$448.89	1				
47.8	\$102.37	\$376.08	\$478.45	1				
25.6	\$54.94	\$239.41	\$294.35	1				
9.5	\$20.37	\$113.57	\$133.94	1				
8.3	\$17.76	\$81.37	\$99.13	1				
11.3	\$24.12	\$62.87	\$86.99	1				
		• • • • •						
		\$ 2.14		2				
			Nominal					
			Total					
NMDOL Type A	NMDOL Type A		Rate					
Operator Group	Operator Classi		(\$/hr)					
Equipment Operator IV	Bulldozer (mult.		\$26.29	4				
Equipment Operator IV	Bulldozer (mult.	Units)	\$26.29	4				
Truck Driver III	Haul Truck		\$23.84	4				
Equipment Operator VI	Loader (over 10	cy)	\$26.56	4				
Equipment Operator IV	Motor Grader		\$26.29	4				
Equipment Operator IV	Motor Grader		\$26.29	4				
Truck Driver III	N/A		\$23.84	4				

Revegetation Costs

Cobre Stockpile Worksheet #14 05/17/18

Description:

Chiseling or ripping, scarifying, disking, rangeland drill seeding, mulching, crimping, mobilization.

		Unit	Direct
		Cost	Cost
Unit or Disturbance	(acres)	(\$/acre)	(\$)
SWRDF Top	85	\$856	\$72,948
SWRDF Outslopes	256	\$856	\$218,844
SWRDF Top	25	\$856	\$21,148
Hanover Mountain Deposit	93	\$856	\$79,883
No. 3 Stockpile Top	1	\$856	\$1,113
No. 3 Stockpile Outslope	4	\$856	\$3,767
Pearson-Barnes Mine Area	12	\$856	\$10,189
Low Grade WRF	28	\$856	\$23,828
MTI Reclaim Pond	33	\$856	\$28,254
MTI Outslope	36	\$856	\$31,106
MTI Top	108	\$856	\$92,640
Tailing Pipeline Corridor	1.4	\$856	\$1,238
Haul Roads	45	\$856	\$38,529
Exploration Roads	37	\$856	\$31,679
Continental Pit berm and fence disturbance	18	\$856	\$15,069
Disturbed Area Adjacent and North of the SWRDF	21	\$856	\$17,895
Disturbed Area Aujacent and North of the SWICD	21	φοσο	ψ17,095
Surface Impoundments			
Grape Gulch Pond #3	0.4	\$856	\$325
Magnetite Seepage Pond	0.2	\$856	\$171
SWRF Dam 1	0.5	\$856	\$445
SWRF Dam 2	0.3	\$856	\$291
SWRF Dam 3	0.8	\$856	\$719
North Tailings Decant Pond	0.5	\$856	\$394
East WRF Containment	0.5	\$856	\$428
Blackman's Seep (Pond #2)	0.01	\$856	\$9
Decant Pond #4	0.6	\$856	\$531
Upper Creek Containment Pond 1	1.5	\$856	\$1,310
Borrow Areas			
Top Soil Stockpile	0.2	\$856	\$193
NOBS (proposed)	17	\$856	\$14,869
South OB Stockpile (proposed)	18	\$856	\$15,668
Reclaim Pond Outlet Channel	1.7	\$856	\$1,456
OB Stockpile-1	4.6	\$856	\$3,958
OB Stockpile-2	0.9	\$856	\$779
OB Stockpile-3	5.0	\$856	\$4,312
OB Stockpile-4	4.3	\$856	\$3,651
OB Stockpile-5	3.3	\$856	\$2,865
OB Stockpile-5	5.5	φοσο	ψ2,005
Contingency Disturbance Areas			
Contingency Disturbance Areas	50.0	\$856	\$42,810
		SWRDF	\$330,834
		Hanover Mountain Deposit	\$79,883
		No. 3 Stockpile	\$4,880
		Paarson-Barnes Mine Area	\$10 18Q

Pearson-Barnes Mine Area	\$10,189
Low Grade WRF	\$23,828
MTI	\$153,239
Haul and Exploration Roads	\$70,208
Surface Impoundments	\$4,623
Continental Pit	\$15,069
Contingency Disturbance Areas	\$42,810
Borrow Areas	\$47,750

Revegetation Direct Cost \$783,314

Cobre_Stockpiles_Tails_Other_2018_NOBS_20180519.xlsx Stockpile Sheet 14 Page 19 of 23

Other Reclamation Activity Costs

ltere	A otivity	Quantitu	(lm:4	Unit Cost	Direct Cost	Deference	Line Hom	Daga	Description
Item Surface Impoundments	Activity	Quantity	Unit	(\$/unit)	(\$)	Reference	Line Item	Page	e Description
Surface Impoundments Reinforced Concrete Wall Demolition	SWRF Dam 1	54	hr	\$194.70	\$10,514	Means	Crew B-12C	541	1 Equip. Oper (crane), 1 laborer, 1 Hyd. Excavator, 2 C.Y. Approximately 40 hrs to demo a 200' reinforced concrete dam.
Reinforced Concrete Wall Demolition	SWRF Dam 2	30.6	hr	\$194.70	\$5,958	Means	Crew B-12C	541	1 Equip. Oper (crane), 1 laborer, 1 Hyd. Excavator, 2 C.Y. Approximately 40 hrs to demo a 200' reinforced concrete dam.
Reinforced Concrete Wall Demolition	SWRF Dam 3	47	hr	\$194.70	\$9,151	Means	Crew B-12C	541	
Reinforced Concrete Wall Demolition	East WRF Containment	40	hr	\$194.70	\$7,788	Means	Crew B-12C	541	1 Equip. Oper (crane), 1 laborer, 1 Hyd. Excavator, 2 C.Y. Approximately 40 hrs to demo a 200' reinforced concrete dam.
Wells									
Plug & Abandon Well	close after 100-years	700	ft	\$10.60	\$7,421	MMD, 2013	approximately \$14.0	0 to \$25	rect costs then added inflation from 2013 to 2018. "Estimated costs for abandoning boreholes using bentonite cement grout rang 5.00 per foot. For the purposes of estimating a simplified cost of abandoning boreholes the MMD cost is \$14.00/ft. The FA cost e te specific characteristics".
Channels and Benches									
SWRDF	Downdrain Length	8,595	ft	\$5.57	\$47,874	Appendix B.2.8	Downdrain: Excavate	e and wa	vaste 7.6 cy/lf material on slopes with D11T, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6T
MTI	Downdrain Length	1,353	ft	\$5.57	\$7,536	Appendix B.2.8			vaste 7.6 cy/lf material on slopes with D11T, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6T
SWRDF	3:1 slope Bench Grading	14,126	ft	\$1.99	\$28,111	Appendix B.2.8		-	//If on slopes with D11T, 87-foot push. Finish grade with D9T 3 passes 1 mph.
MTI	3:1 slope Bench Grading	3,894	ft	\$1.75 \$1.75	\$6,815 \$42,542	Appendix B.2.8			//If on slopes with D11T, 87-foot push. Finish grade with D9T 3 passes 1 mph.
SWRDF SWRDF	2.5:1 slope Bench Grading Outslope Channels	25,463 39,589	π feet	\$1.71 \$0.45	\$43,542 \$17,815	Appendix B.2.8 Appendix B.2.8		-	//If on slopes with D11T, 78-foot push. Finish grade with D9T 3 passes 1 mph.
MTI	Outslope Channels	3,894	feet	\$0.45 \$0.45	\$1,752	Appendix B.2.8		-	//If with D11T, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6T XL SU 1 pass 1 mph. //If with D11T, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6T XL SU 1 pass 1 mph.
SWRDF	Type 1 Top Channels	3,964	feet	\$3.10	\$12,288	Appendix B.2.8		-	nd waste 2.4 cy/lf with D11T, 175-foot excavation, 200-foot lateral waste push. Finish grade with D9T 3 passes 1 mph.
MTI	Type 2 Top Channels	2,141	feet	\$8.91	\$19,076	Appendix B.2.8			and waste 2.4 cy/lf with D11T, 175-foot excavation, 200-foot lateral waste push. Finish grade with D9T 3 passes 1 mph.
Riprap & Gravel									
SWRDF	Downdrain Gravel, Haul	9,025	су	\$1.86	\$16,787	Appendix B.2.8	Load & Haul Rock. C	at 992	Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Downdrain Gravel, Backfill	9,025	cy	\$1.43	\$12,906		Gravel Backfill, 9800		
SWRDF	Downdrain Riprap, Haul	36,959	•	\$1.86	\$68,744	Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Downdrain Riprap, Backfill	36,959	су	\$1.43	\$52,851	Appendix B.2.8	-		
MTI	Downdrain Gravel, Haul	1,421	су	\$1.86	\$2,643	Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
MTI	Downdrain Gravel, Backfill	1,421	су	\$1.43	\$2,032	Appendix B.2.8			
MTI MTI	Downdrain Riprap, Haul Downdrain Riprap, Backfill	5,818 5,818	cy cy	\$1.86 \$1.43	\$10,821 \$8,320	Appendix B.2.8 Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Outslope Channel Riprap, Haul	17,023		\$1.86	\$31,663	Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Outslope Channel Riprap, Backfill	17,023	•	\$1.43	\$24,343	Appendix B.2.8	,		
SWRDF	Top Channel Riprap, Haul	3,817	су	\$1.86	\$7,100	Appendix B.2.8	Load & Haul Rock, C	at 992	Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Top Channel Riprap, Backfill	3,817	су	\$1.43	\$5,458	Appendix B.2.8	-		
MTI	Outslope Channel Riprap, Haul	1,647	су	\$1.86	\$3,063	Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
MTI	Top Channel Riprap, Haul	9,206	су	\$1.43 \$1.86	\$13,165 \$20,187	Appendix B.2.8	Gravel Backfill, 9800		
MTI SWRDF	Riprap, Backfill Top Channel Gravel, Haul	10,853 2,202	cy cv	\$1.86 \$1.43	\$20,187 \$3,149	Appendix B.2.8 Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Top Channel Gravel, Hadi	2,202	cy cy	\$1.43 \$1.86	\$3,149 \$4,096	Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
MTI	Top Channel Gravel, Haul	2,248	су	\$1.43	\$3,215	Appendix B.2.8			
MTI	Top Channel Gravel, Backfill	2,248	cy	\$1.86	\$4,181	Appendix B.2.8			Loader, 2-Cat 793 trucks, 3-mile RT
SWRDF	Riprap	57,799	су	\$39.46	\$2,280,819	Direct purchase	See reference note o	n "0 Un	nit Cost" tab for calculations
MTI	Riprap	16,671	су	\$35.47	\$591,350	Direct purchase			hit Cost" tab for calculations
SWRDF MTI	Gravel Gravel	11,227 3,669	cy cy	\$1.43 \$1.43	\$16,055 \$5,247	Appendix B.2.8 Appendix B.2.8	•		
		3,000	<i></i> ,	ΨΠΟ	¥0, 2 71				·, · · · ·
Continental Pit		6 605	fact	¢0 50	¢17 405	Appandix D0		th DOT	XL SU, 100-foot push. Finish grade 1.2 cy/lf with D6T XL SU 50 ft push.
Safety berm, Pits perimeter Chain link fence, Pits perimeter		6,635 2,453	feet feet	\$2.59 \$21.19	\$17,185 \$51,969	Appendix B8 Means	323113.20-0800		Fence, chain link industrial, schedule 40, including concrete, 6 ga. wire, 6' high, but omit barbed wire, galv. Steel
Hanover Mountain Mine		2,400	ieet	ΨΖ1.13	ψ31,909	INICALIS	525115.20-0800	510	Tence, chain link industrial, schedule 40, including concrete, 0 ga. wire, 0 high, but offit barbed wire, galv. Steel
Berm		6,670	feet	\$2.59	\$17,275	Appendix B8	Excavate 3.7 cv/lf wi	th D6T	XL SU, 100-foot push. Finish grade 1.2 cy/lf with D6T XL SU 50 ft push.
Chain link fence		3,286	feet	\$21.19	\$69,617	Means	323113.20-0800		Fence, chain link industrial, schedule 40, including concrete, 6 ga. wire, 6' high, but omit barbed wire, galv. Steel
		Hanove	r Mount	SWRDF ain Deposit	\$2,673,599 \$86,892				
			ount	Wells	\$7,42°				
		_		MTI	\$699,402	2			
		Surfa		oundments	\$33,410				
				ntinental Pit Direct Cost	\$69,154 \$3 569 87				
References					\$3,569,878	J			
See Appendix B.2.8 for Channel. Benc	h and Downdrain unit rate developmen	nt.							

See Appendix B.2.8 for Channel, Bench, and Downdrain unit rate development. RS Means Heavy Construction Cost Data (32nd Annual Edition 2018) Location factor for New Mexico Las Cruces 85.6%

ranges from

Cobre Stockpile Worksheet #15 05/17/18

ost estimate could be

D6T XL SU 3 passes 1 mph. D6T XL SU 3 passes 1 mph.

Reclamation Summary

Cobre Mining Company

Stockpiles, Tailings, F Based on Projected E	Reservoirs, Haul Roads and Distrubed Area	Reclamation	Current Value
DIRECT COSTS	Facility and Structure Removal		-
	Earthmoving		\$9,447,857
	Revegetation		\$783,314
	Other		\$3,569,878
	Subtotal, Direct Costs		\$13,801,049
INDIRECT COSTS ¹	Mobilization and Demobilization	3.8%	\$524,439.87
	Contingencies	4.0%	\$552,042
	Engineering Redesign Fee	2.5%	\$345,026
	Contractor Profit and Overhead	15.0%	\$2,070,157
	Project Management Fee	3.0%	\$414,031
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	28.3%	
	Subtotal, Indirect Costs		\$3,905,697

TOTAL COST

\$17,706,746

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).

Reclamation Summary

DIRECT COSTS			SWRDF(a)	Hanover Mountain Deposit(b)	No. 3 Stockpile(b)	Pearson- Barnes Mine Area	Low Grade WRF	MTI (d)	Haul and Exploration Roads	Surface Impoundments	Wells	Continental Pit	Contingency Disturbance Areas	Borrow Areas	Totals
	Earthmoving		\$5,873,750	\$955,542	\$51,642	\$153,075	\$299,293	\$1,460,371	\$5,082	\$59,485	\$0	\$0	\$589,617		\$9,447,857
	Revegetation		\$330,834	\$79,883	\$4,880	\$10,189	\$23,828	\$153,239	\$70,208	\$4,623	\$0	\$15,069	\$42,810	\$47,750	\$735,563
	Other ^(c)		\$2,673,599	\$86,892	\$0	\$0	\$0	\$699,402	\$0	\$33,410	\$7,421	\$69,154	\$0	\$0	\$3,569,878
	Subtotal, Direct Costs		\$8,878,184	\$1,122,318	\$56,522	\$163,263	\$323,121	\$2,313,012	\$75,291	\$97,518	\$7,421	\$84,223	\$632,427	\$47,750	\$13,753,299
INDIRECT COSTS	Mobilization and Demobilization	3.8%	\$337,371	\$42,648	\$2,148	\$6,204	\$12,279	\$87,894	\$2,861	\$3,706	\$282	\$3,200	\$24,032	\$1,815	\$498,593
	Contingencies	4.0%	\$355,127	\$44,893	\$2,261	\$6,531	\$12,925	\$92,520	\$3,012	\$3,901	\$297	\$3,369	\$25,297	\$1,910	\$524,835
	Engineering Redesign Fee	2.5%	\$221,955	\$28,058	\$1,413	\$4,082	\$8,078	\$57,825	\$1,882	\$2,438	\$186	\$2,106	\$15,811	\$1,194	\$328,022
	Contractor Profit and Overhead	15.0%	\$1,331,728	\$168,348	\$8,478	\$24,489	\$48,468	\$346,952	\$11,294	\$14,628	\$1,113	\$12,633	\$94,864	\$7,163	\$1,968,131
	Project Management Fee	3.0%	\$266,346	\$33,670	\$1,696	\$4,898	\$9,694	\$69,390	\$2,259	\$2,926	\$223	\$2,527	\$18,973	\$1,433	\$393,626
	State Procurement Cost Indirect Percentage Sum =	0.0% 28.3%	\$0	\$0	\$0	\$0	\$0	\$0	\$0		\$0	\$0	\$0	\$0	\$0
	Subtotal, Indirect Costs		\$2,512,526	\$317,616	\$15,996	\$46,204	\$91,443	\$654,582	\$21,307	\$27,598	\$2,100	\$23,835	\$178,977	\$13,513	\$3,892,184
TOTAL COST PER S	TOCKPILE		\$11,390,709 \$17 645 483		\$72,518	\$209,467	\$414,565	\$2,967,594	\$96,598	\$125,116	\$9,521	\$108,058	\$811,404	\$61,263	\$17,706,746

TOTAL COST

\$17,645,483

(a) Includes disturbed area adjacent and north of the SWRDF

(b) Includes berm and fence disturbed area

(c) Other includes benches, channels, downdrains, plug and abandon wells, fence, berms, and reinforced concrete wall demolition.

(d) Cost includes reclaiming south buttress area and burying tailing pipelines in place.

Cobre Stockpile Worksheet #17 5/17/2018

Facility Characteristics

	SWRDF(a)	Hanover Mountain Deposit(b)	No. 3 Stockpile(b)	Pearson-Barnes Mine Area	Low Grade WRF	MTI (d)	Haul and Exploration Roads	Surface Impoundments	Wells	Continental Pit(c)	Contingency Disturbance Areas	Borrow Areas
Facility							Noaus				Aleas	
Reclaimed Acres	386.4	93.3	5.7	11.9	27.8	179.0	82.0	5.4	-	17.6	50.0	55.8
ltem	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost
Cover Material (Load, haul, spread)	\$5,614,570	\$1,225,961	\$62,278	\$196,395	\$381,780	\$1,778,293	\$0	\$75,889	\$0	\$0	\$625,420	\$0
Regrade	\$1,921,452	\$0	\$3,978	\$0	\$2,213	\$95,363	\$6,521	\$429	\$0	\$0	\$131,060	\$0
Seed & Mulch	\$424,460	\$102,490	\$6,261	\$13,072	\$30,571	\$196,605	\$90,077	\$5,932	\$0	\$19,334	\$54,925	\$61,263
Other ^(c)	\$3,430,228	\$111,483	\$0	\$0	\$0	\$897,333	\$0	\$42,865	\$9,521	\$88,724	\$0	\$0
Capital Cost Totals	\$11,390,709	\$1,439,934	\$72,518	\$209,467	\$414,565	\$2,967,594	\$96,598	\$125,116	\$9,521	\$108,058	\$811,404	\$61,263
Capital Cost/Acre	\$29,479	\$15,433	\$12,722	\$17,602	\$14,912	\$16,579	\$1,178	\$23,170	-	\$6,140	\$16,228	\$1,099
Capital Cost/Acre Cover	\$14,530	\$13,140	\$10,926	\$16,504	\$13,733	\$9,935	\$0	\$14,054	-	\$0	\$12,508	\$0
Capital Cost/Acre Top/Outslope Ad	\$4,973	\$0	\$698	\$0	\$80	\$533	\$80	\$80	-	\$0	\$2,621	\$0
Capital Cost/Acre Earthwork Tota	\$19,503	\$13,140	\$11,624	\$16,504	\$13,813	\$10,467	\$80	\$14,133	-	\$0	\$15,130	\$217,350
Capital Cost/Acre Reveg	\$1,099	\$1,099	\$1,099	\$1,099	\$1,100	\$1,098	\$1,099	\$1,099	-	\$1,099	\$1,099	\$16,922
Capital Cost/Acre Other	\$8,877	\$1,195	\$0	\$0	\$0	\$5,013	\$0	\$7,938	-	\$5,041	\$0	\$82,126

(a) Includes disturbed area adjacent and north of the SWRDF

(b) Includes berm and fence disturbed area

(c) Other includes benches, channels, downdrains, plug and abandon wells, fence, berms, and reinforced concrete wall demolition.

(d) Cost includes reclaiming south buttress area and burying tailing pipelines in place.

Cobre Stockpile Worksheet #18 5/17/2018

Magnetite Tailings Impoundment Reclamation Cost Estimate

EOY 2023

Cobre Magnetite Tailings Worksheet #1 5/17/2018

General Information

Applicant	Cobre Mining Company Hanover, New Mexico 88041	
Disturbed Surface Area (acres)	62	
Type of Operation	Existing/Surface/Copper	
Current value before escalation and discounting	\$1,077,972	
Based on Projected EOY 2019 M	ine Plan	Magnetite Tailings

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Magnetite Tailings Worksheet #2

Demolition

Demo cost are addressed elsewhere.

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Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 2 Page 2 of 20 Cobre orksheet #2 5/17/2018

Material Handling Plan Summary Sheet

Cobre Magnetite Tailings Worksheet #3 5/17/2018

			Total Haul/Push		
Item Description	Location 1	Location 2	Distance	Grade	Equipment
			(ft)	(%)	
1100 Regrade Outslopes	Magnetite Tailings	-	250	see dozer	Cat D11T
1101 Regrade Top	Magnetite Tailings	-	300	see dozer	Cat D11T
1102 Dozer Assist	Magnetite Tailings Top	-	-	see dozer	Cat D11T
1103 Dozer Assist	Magnetite Tailings Outslopes	-	-	see dozer	Cat D11T
1200 Load cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top			992K
1201 Load cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes			992K
1202 Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top	6,480	sse trucks	Cat 793 truck
1203 Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes	6,480	sse trucks	Cat 793 truck
1300 Grade cover soil	Magnetite Tailings Top	-			Cat D11T
1301 Grade cover soil	Magnetite Tailings Outslopes	-			Cat D11T
1400 Off-Hwy Water Tanker Truc	k				6,000 gal
1401 Motor Grader					14M

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Cobre Magnetite Tailings Worksheet #4 05/17/18

Earthwork Quantity Worksheet

Item	Description	Location 1	Location 2	Area (ac)	Cover Depth (in)	Bank/stockpile Volume (bcy)	Swell Factor (%)	Loose/stockpile Volume (lcy)
110	0 Regrade Outslopes	Magnetite Tailings	Outslopes			69,996	8%	75,596
110	1 Regrade Top	Magnetite Tailings	Тор			73,482	8%	79,360
110	2 Dozer Assist	Magnetite Tailings Top	Тор			256,126	8%	276,616
110	3 Dozer Assist	Magnetite Tailings Outslopes	Outslopes			23,833	8%	25,739
120	0 Load cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top	57.2	36	256,126	8%	276,616
120	1 Load cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes	5.3	36	23,833	8%	25,739
120	2 Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top			276,616	0%	276,616
120	3 Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes			25,739	0%	25,739
130	0 Grade cover soil	Magnetite Tailings Top	-	57.2		276,616	0%	276,616
130	1 Grade cover soil	Magnetite Tailings Outslopes	-	5.3		25,739	0%	25,739
	1 Off-Hwy Water Tanker Truck 2 Motor Grader							

Productivity and Hours Required for Dozer Use---Earthmoving

	PERFORMANCE FACTORS																	
						Total				Production	Maximum						Direct	
				Loose		Task	Material	Grade	Soil	Method/	Push	Normal	Operator	Work	Visibility	Elevation	Drive	Grade
Task Description	Location 1	Location 2	Equipment	Volume	Productivity	Time	Factor	Factor	Weight	Blade	Distance	Production	Factor	Hour	Factor	Factor	Trans.	
				(cy)	(cy/hr)	(hours)			(lb/cy)		(feet)	(cy/hr)		(min/hr)			Factor	(%)
Regrade Outslopes	Magnetite Tailings	Outslopes	Cat D11T	75,596	1,247	61	1.0	1.67	4,185	1.20	250	1362	1.00	50	1	1	1	-33.3
Regrade Top	Magnetite Tailings	Тор	Cat D11T	79,360	685	116	1.0	1.07	4,185	1.20	300	1164	1.00	50	1	1	1	-3.5
Dozer Assist	Magnetite Tailings Top	Тор	Cat D11T	N/A	N/A	257	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Magnetite Tailings Outslopes	Outslopes	Cat D11T	N/A	N/A	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cobre Magnetite Tailings Worksheet #5 05/17/18

Productivity and Hours Required for Dozer Use---Grading

PERFORMANCE FACTORS

	T ERI ORMANGE I AGTORG																					
												Production	Effective					Direct			Maximum	
								Task			Soil	Method/	Blade		Work			Drive			Push	Normal
Task Description	Location 1	Location 2	Equipment	Volume	Area	Productivity	Productivity	Time	Material	Grade	Weight	Blade	Width	Speed	Hour	Visibility	Elevation	Trans.	Grade	Operator	Distance	Production
				(cy)	(acres)	(acres/hr)	(cy/hr)	(hours)	Factor	Factor	(lb/cy)	Factor	(feet)	(miles/hr)	(min/hr)	Factor	Factor	Factor	(%)	Factor	(feet)	(cy/hr)
Grade cover soil	Magnetite Tailings Top	-	Cat D11T	276,616		-	2,017	137.2	1.2	1.1	3,300	1.20	-	-	50	1.00	1.00	1.00	-3.5	0.75	100	3002
Grade cover soil	Magnetite Tailings Outslopes	-	Cat D11T	25,739		-	3,126	8.2	1.2	1.7	3,300	1.20	-	-	50	1.00	1.00	1.00	-33.0	0.75	100	3002

Cobre Magnetite Tailings Worksheet #6 05/17/18

Magnetite Tailings Worksheet #7 05/17/18

Productivity and Hours Required for Ripper-Equipped Dozer Use

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Cobre

Cobre Magnetite Tailings Worksheet #8 05/17/18

Productivity and Hours Required for Hydraulic Excavator

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Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 8 Page 8 of 20 <u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

-		PERFORMANCE FACTORS																	
					Truck	Optimum					Loader	Total	Haul	Haul	Haul	Haul	Haul	Haul	
					Cycle	No. of		Task	Struck	Heaped	Cycles	Haul	Distance	Distance	Distance	Grade	Grade	Grade	Rolling
Task Description	Location 1	Location 2	Equipment	Volume	Time	Trucks	Productivity	Time	Capacity	/ Capacity	per Truck	Distance	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3	Resistance
				(cy)	(min)		(cy/hr)	(hrs)	(cy)	(cy)		(feet)	(feet)	(feet)	(feet)	(%)	(%)	(%)	(%)
Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top	Cat 793 truck	276,616	7.2	2	2,324	257	126	169	12	6,480	2,310	1,940	2,230	-8.9%	1.5%	-4.0%	2.5%
Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes	Cat 793 truck	25,739	15.0	2	1,118	24	126	169	12	6,480	2,310	1,940	2,230	-8.9%	1.5%	-4.0%	2.5%
*Cover material is	assumed to be obtained from the North	Overburden Stockpile for each fac	ility, except for the	e suitable	cover m	aterial to	be sourced du	uring ex	cavation	of the Rec	aim Pond	spillway,	which will be	e applied to t	he MTI.				

Productivity and Hours Required for Truck Use

<u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

•						Haul	Haul	Haul	Return	Return	Return	
			Haul	Haul	Haul	Effective	Effective	Effective	Effective	Effective	Effective	
			Distance	Distance	Distance	Grade	Grade	Grade	Grade	Grade	Grade	Haul
Task Description	Location 1	Location 2	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3	Time
			(meters)	(meters)	(meters)	(%)	(%)	(%)	(%)	(%)	(%)	(min)
Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top	704.1	591.3	679.7	-6%	4%	-2%	11%	1%	7%	2.5
Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes	704.1	591.3	679.7	-6%	4%	-2%	11%	1%	7%	2.5
*Cover material is	assumed to be obtained from the North	Overburden Stockpile for each fa	C									

Productivity and Hours Required for Truck Use

<u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

					Load/	Dump/		Travel Time					
			Return	Loading	Maneuver	Maneuver	Work	Loaded	Loaded	Loaded	Empty	Empty	Empty
Task Description	Location 1	Location 2	Time	Time	Time	Time	Hour	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3
			(min)	(min)	(min)	(min)	(min/hr)	(min/m)	(min/m)	(min/m)	(min/m)	(min/m)	(min/m)
Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top	2.9	0.0	0.7	1.1	50	0.00110	0.00175	0.00110	0.00199	0.00111	0.00120
Haul cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes	2.9	7.8	0.7	1.1	50	0.00110	0.00175	0.00110	0.00199	0.00111	0.00120
*Cover material is a	assumed to be obtained from the North	Overburden Stockpile for each fa	IC										

Cobre Magnetite Tailings Worksheet #9 05/17/18

Productivity for Front End Loader

					Net	Loader			Rated	Bucket	
					Bucket	Cycle		Task	Bucket	Fill	Work
Task Description	Location 1	Location 2	Equipment	Volume	Capacity	Time	Productivity	Time	Capacity	Factor	Hour
				(cy)	(cy)	(min)	(cy/hr)	(hours)	(cy)		(min/hr)
Load cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Top	992K	276,616	14	0.65	1,077	257	16	0.875	50
Load cover soil	North OB Stockpile, OB-5 Stockpile	Magnetite Tailings Outslopes	992K	25,739	14	0.65	1,077	24	16	0.875	50

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Cobre Magnetite Tailings Worksheet #10 5/17/2018

PERFORMANCE FACTORS

Cobre Magnetite Tailings Worksheet #11 05/17/18

Productivity and Hours Required for Scraper Use

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Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 11 Page 13 of 20

Cobre Magnetite Tailings Worksheet #12 5/17/2018

Productivity and Hours Required for Motor grader Use---Grading

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Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 12 Page 14 of 20

Equipment Type	Task	Location 1	Location 2	Owning and Operating Cost (\$/hr)	Labor Cost (\$/hr)	Number of Units (Equipment)	Time Req'd (hrs)	Direct Cost (\$)	Total Prod. Production Unit	Unit Cost (\$/unit)
Dozers-Earthmoving										
Cat D11T	Regrade Outslopes	s Magnetite Tailings	Outslopes	\$414.50	\$26.29	1	61	\$26,717	69,996 cy	\$0.38
Cat D11T	Regrade Top	Magnetite Tailings	Тор	\$414.50	\$26.29	1	116	\$51,068	73,482 cy	\$0.69
Cat D11T	Dozer Assist	Magnetite Tailings Top	Тор	\$414.50	\$26.29	1	257	\$113,220	256,126 cy	\$0.44
Cat D11T	Dozer Assist	Magnetite Tailings Outslopes	s Outslopes	\$414.50	\$26.29	1	24	\$10,535	23,833 cy	\$0.44
Dozers-Grading										
Cat D11T	Grade cover soil	Magnetite Tailings Top	-	\$414.50	\$26.29	1	137.2	\$60,464	276,615.7 cy	\$0.22
Cat D11T	Grade cover soil	Magnetite Tailings Outslopes	S -	\$414.50	\$26.29	1	8.2	\$3,629	25,739.1 cy	\$0.14
Loaders										
992K	Load cover soil	North OB Stockpile, OB-5 St	c Magnetite Tailings Top	\$294.35	\$26.56	1	257	\$82,428	276,616 cy	\$0.30
992K	Load cover soil	• •	c Magnetite Tailings Outslope	\$294.35	\$26.56	1	24	\$7,670	25,739 cy	\$0.30
Trucks										
Cat 793 truck	Haul cover soil	North OB Stockpile, OB-5 St	c Magnetite Tailings Top	\$478.45	\$23.84	2	257	\$258,031	276,616 cy	\$0.93
Cat 793 truck	Haul cover soil	•	c Magnetite Tailings Outslope		\$23.84	2	24	\$24,010	25,739 cy	\$0.93
Water Truck and Grader										
Off-Hwy Water Tanker Truck	Magnetite Tailings			\$86.99	\$23.84	1	281	\$31,116		
Motor Grader	Magnetite Tailings			\$99.13	\$26.29	1	281	\$35,213		
						Magneti	te Tailings	\$704,102		
						Earthwork D	0	\$704,102		
								÷·•·,·•=		

EQUIPMENT	Fuel	Fuel	Owning and Operating Cost
	Consumption	Cost	(w/out fuel)
Equipment Description	(gal/hr)	(\$/hr)	(\$/hr)
Cat D11T	\$29.75	\$63.77	\$350.73
Cat D11T Bulldozer w/ multi shank ripper	\$29.75	\$63.77	\$385.12
Cat 793 truck	\$47.76	\$102.37	\$376.08
Cat 992K Loader	\$25.63	\$54.94	\$239.41
Cat 16M	\$9.50	\$20.37	\$113.57
Cat 14M	\$8.29	\$17.76	\$81.37
Off-Hwy Water Tanker Truck,6,000-gal.	\$11.25	\$24.12	\$62.87

FUEL

Oil Broker Quote

LABOR

	NMDOL Type A	NMDOL Type A
Labor Description	Operator Group	Operator Classification
Cat D11T Bulldozer	Equipment Operator IV	Bulldozer (mult. Units)
Cat 793 truck	Truck Driver III	Haul Truck
Cat 992K Loader	Equipment Operator VI	Loader (over 10 cy)
Cat 16M	Equipment Operator IV	Motor Grader
Cat 14M	Equipment Operator IV	Motor Grader
Off-Hwy Water Tanker Truck,6,000-gal.	Truck Driver III	N/A

References

0.00

References

1. Equipment unit rates from EquipmentWatch Custom Cost Evaluator March 2018 (http://www.equipmentwatch.com). See attachments for rate development.

2. Griffin Propane March 12, 2018; Cobre receives an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Cobre Mine (per MMD's requirements). The indirect cost is removed from the all-inclusive

\$

Cobre Magnetite Tailings Worksheet #13 05/17/18

g and	Fuel-Adjusted	
ng Cost	Own/Op	
fuel)	Cost	
nr)	(\$/hr)	Reference
.73	\$414.50	1
.12	\$448.89	1
.08	\$478.45	1
.41	\$294.35	1
.57	\$133.94	1
37	\$99.13	1
87	\$86.99	1
2.14	per gallon	2
	Nominal	
	Total	
	Rate	
	(\$/hr)	<u> </u>
	\$26.29	4 4
	\$23.84	
	\$26.56	4
	\$26.29	4
	\$26.29	4
	\$23.84	4

Cobre Magnetite Tailings Worksheet #14 05/17/18

Revegetation Costs

Description:

Plow; apply fertilizer, seed mix, mulch, and crimp mulch

		Unit	Direct
	Area*	Cost**	Cost
Unit or Disturbance	(acres)	(\$/acre)	(\$)
Magnetite Tailings Top	57	\$856	\$48,933
Magnetite Tailings Outslopes	5	\$856	\$4,553

Revegetation Direct Cost \$53,487

*Borrow Area reclamation included in Cobre_Stockpiles_Tails_Other_2014.xlsx Rocky Mountain Reclamation Quote April, 2018 (before taxes)

> Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 14 Page 16 of 20

Other Reclamation Activity Costs

Stockpiles Area	Activity	Quantity	Unit	Unit Cost (\$/unit)	Direct Cost (\$)	Reference
Magnetite Tailings	Downdrain Length	420	ft	\$5.57	\$2,339	Appendix B.2.8
Magnetite Tailings	Downdrain Gravel, Haul	441	су	\$1.86	\$820	Appendix B.2.8
Magnetite Tailings	Downdrain Gravel, Backfill	441	су	\$1.43	\$631	Appendix B.2.8
Magnetite Tailings	Downdrain Riprap, Haul	1,806	су	\$1.86	\$3,359	Appendix B.2.8
Magnetite Tailings	Downdrain Riprap, Backfill	1,806	су	\$1.43	\$2,583	Appendix B.2.8
Magnetite Tailings	Riprap	1,806	су	\$40.00	\$72,246	TG McCauley Inc March 2018, D50=
Magnetite Tailings	Gravel	441	су	\$1.43	\$631	Appendix B.2.8
			Other	Direct Cost:	\$82,608	

References

See Appendix B.2.8 for Channel, Bench, and Downdrain unit rate development.

Description

Excavate and waste 7.6 cy/lf material on slopes with D11T CD, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6T XL SU 3 passes 1 mph.

Load & Haul Rock, Cat 992 Loader, 2-Cat 793 trucks, 3-mile RT Gravel Backfill, 980G loader, 150' haul Load & Haul Rock, Cat 992 Loader, 2-Cat 793 trucks, 3-mile RT Gravel Backfill, 980G loader, 150' haul 50=15", see notes on "0 Unit Costs" tab

Gravel Backfill, 980G loader, 150' haul

Cobre Mining Company

Magnetite Tailings R	eclamation		
Based on Projected	Current Value		
DIRECT COSTS	Facility and Structure Removal		\$0
	Earthmoving		\$704,102
	Revegetation		\$53,487
	Other		\$82,608
	Subtotal, Direct Costs		\$840,196
INDIRECT COSTS'	Mobilization and Demobilization	3.8%	\$31,927.46
	Contingencies	4.0%	\$33,608
	Engineering Redesign Fee	2.5%	\$21,005
	Contractor Profit and Overhead	15.0%	\$126,029
	Project Management Fee	3.0%	\$25,206
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	28.3%	
	Subtotal, Indirect Costs		\$237,776

TOTAL COST

\$1,077,972

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).

Cobre Magnetite Tailings Worksheet #17 5/17/2018

Reclamation Summary

DIRECT COSTS		Ma	gnetite Tailings
	Facility and Structure Removal		\$0
	Earthmoving		\$704,102
	Revegetation		\$53,487
	Other ¹		\$82,608
	Subtotal, Direct Costs		\$840,196
INDIRECT COSTS	Mobilization and Demobilization	3.8%	\$31,927
	Contingencies	4.0%	\$33,608
	Engineering Redesign Fee	2.5%	\$21,005
	Contractor Profit and Overhead	15.0%	\$126,029
	Project Management Fee	3.0%	\$25,206
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	28.3%	
	Subtotal, Indirect Costs		\$237,776
GROSS RECEIPTS TAX	Grant County (unincorporated areas)	0.0%	\$0
	(applied to sum of indirect and direct costs)		
TOTAL COST PER FAC	ILITY		\$1,077,972

¹Other includes: channels and downdrains

Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 17 Page 19 of 20

Facility Characteristics

Facility

Magnetite Tailings

Reclaimed Acres	62.5
ltem	Capital Cost
Cover Material (Load, haul, spread)	\$803,564
Regrade	\$99,798
Seed & Mulch	\$68,623
Other ¹	\$105,986
Capital Cost Totals	\$1,077,972
Capital Cost/Acre	\$17,248

Capital Cost/Acre Cover	\$12,857
Capital Cost/Acre Top/Outslope Adjustment	\$1,597
Capital Cost/Acre Earthwork Total	\$14,454
Capital Cost/Acre Reveg	\$1,098
Capital Cost/Acre Other	\$1,696

¹Other includes channels and downdrains

Cobre_Mag_Tails_2018_NOBS_20180519.xlsx Mag Tails Sheet 18 Page 20 of 20

Demolition Reclamation Cost Estimate EOY 2023

Demolition

		Buildin	ng Information			Building Demolition				
						Unit	Direct			
Description		Dim	ensions (ft)			Cost	Cost			
					Quantity					
	Length	Width	Height	Diameter	(cft)	(\$/unit)	(\$)			
Mill Building #2	197	140	70	-	1930600	\$0.25	\$479,252			
Thickener MCC	18.0	18	12	-	3888	\$0.25	\$965			
Thickener MCC	12.0	22	15	-	3960	\$0.25	\$983			
No. 2 Mill Stacker	820	20	15	-	246000	\$0.25	\$61,067			
Stacker Hoist	28	23	18	-	11592	\$0.25	\$2,878			
No. 2 Mill Secondary Crusher Building	36	38	50	-	68400	\$0.25	\$16,980			
Concentrate Storage Tank	-	-	50	30	35343	\$0.25	\$8,774			
Mill Building #1 and Concentrator	160	140	70		1568000	\$0.25	\$389,240			
Ore Bin (large)	-	-	90	30	63617	\$0.25	\$15,792			
Ore Bin (large)	-	-	90	30	63617	\$0.25	\$15,792			
Ore Bin (small)	-	-	70	30	49480	\$0.25	\$12,283			
Primary Crusher	70	50	60		210000	\$0.25	\$52,130			
Scale House (Guard Shack)	10	10	10		1000	\$0.25	\$248			
Small Truck Shop	102	40	20		81600	\$0.25	\$20,256			
Substation No. 2	66	50	30		99000	\$0.25	\$24,576			
Thickener Tank (100-ft diam.)	-	-	14	100	109956	\$0.25	\$27,295			
Thickener Tank (60-ft diam.)	-	-	20	60	56549	\$0.25	\$14,038			
Water Tank (on Hanover Mountain)	-	-	30	25	14726	\$0.25	\$3,656			
Water Tank (on Hanover Mountain)	-	-	50	35	48106	\$0.25	\$11,942			
Magnetic Separator	15	20	14	-	4200	\$0.25	\$1,043			
Pump House and Shed for Thickener	10	10	14	-	1400	\$0.25	\$348			

Demo Total Direct Cost \$1,159,537

Data Sources:

ltem	Base Unit Cost \$/unit	Units	Location Adjustment New Mexico Las Cruces	Adjusted Unit Cost \$/unit	Means Line Item	Means Page	Description
Structure Demolition 1	\$0.29	cft	85.6%	\$0.248	024116.13 0100	37	Structure Demolition Bui demolition large urban p inclues 20 mi. haul no foundation or dump fees mixture of types

Quantities from: Telesto Solutions Inc, Closure/Closeout Plan Earthwork Update Summary Report Revision II, Prepared for: Cobre Mining Company, January 2 R.S. Means Heavy Construction Cost Data, 32nd Annual Edition, 2018

> Cobre_Demolition_2018_NOBS_20180519.xlsx Demolition Sheet 1 Page 1 of 5





Building n projects

es

Amount					Solid Pickup ¹ (per Ton)					ion ² (Per Mi	e Per Load)	Location		
СҮ	Drums	Tons	Loads	Origin	Disposal Site	Miles	Min cost	Max cost	Ave cost	Min cost	Max cost	Ave cost	Adjustment ³	Total Cost
750	2400	540	30	Fierro, NM	Phoenix, AZ	337	\$190.00	\$595.00	\$392.50	\$3.95	\$7.25	\$5.60	85.6%	\$229,892

Means Line Item Means Page Description

1. 028120.10 1120 and 1130 44 Solid Pickup

2. 028120.10 1260 and 1270 44 Transportation to disposal site, truckload = 80 drums or 25 cu yd or 18 tons

3. 85.6% Location RS Means Heavy Construction Cost Data (32nd Annual Edition, 2018) Las Cruces, NM

Cobre Demolition Worksheet 2 5/17/2018

3

		Building Info	rmation				
						Unit	Direct
Description		Dimensior	ns (ft)			Cost	Cost
					Quantity		
	Length	Width	Height	Diameter	(cy)	(\$/unit)	(\$)
Mill Building #2	197	140	70	-	3064	\$1.76	\$5,392
Thickener MCC	18	18	12	-	36	\$1.76	\$63
Thickener MCC	12	22	15	-	29	\$1.76	\$52
No. 2 Mill Stacker	820	20	15	-	1822	\$1.76	\$3,206
Stacker Hoist	28	23	18	-	72	\$1.76	\$126
No. 2 Mill Secondary Crusher Building	36	38	50	-	152	\$1.76	\$267
Concentrate Storage Tank	-	-	50	30	3927	\$1.76	\$6,910
Mill Building #1 and Concentrator	160	140	70	0	2489	\$1.76	\$4,379
Ore Bin (large)	-	-	90	30	7069	\$1.76	\$12,437
Ore Bin (large)	-	-	90	30	7069	\$1.76	\$12,437
Ore Bin (small)	-	-	70	30	5498	\$1.76	\$9,673
Primary Crusher	70	50	60	0	389	\$1.76	\$684
Scale House (Guard Shack)	10	10	10	0	11	\$1.76	\$20
Small Truck Shop	102	40	20	0	453	\$1.76	\$798
Substation No. 2	66	50	30	0	367	\$1.76	\$645
Thickener Tank (100-ft diam.)	-	-	14	100	12217	\$1.76	\$21,496
Thickener Tank (60-ft diam.)	-	-	20	60	6283	\$1.76	\$11,055
Water Tank (on Hanover Mountain)	-	-	30	25	1636	\$1.76	\$2,879
Water Tank (on Hanover Mountain)	-	-	50	35	5345	\$1.76	\$9,405
Magnetic Separator	15	20	14	-	33	\$1.76	\$59
Pump House and Shed for Thickener	10	10	14	-	11	\$1.76	\$20

Soil Cover Depth ft:

\$102,002

Demolition Cover Direct Cost:

Data Sources:				
Item		Means	Means	Description
	Unit Cost \$/unit	Line Item	Page	
Load and Haul cover material	\$1.76	Assume same u	unit cost to ha	and spread cover as for No. 3 Stockpile

Cobre_Demolition_2018_NOBS_20180519.xlsx Demolition Sheet 2 Page 3 of 5

Demolition

	Building Information								
Description		Dimens	sions (ft)		Area				
	Length	Width	Height	Diameter	(acres)				
Mill Building #2	140	140	70	-	0.450				
Thickener MCC	18	18	12	-	0.007				
Thickener MCC	22	22	15	-	0.011				
No. 2 Mill Stacker	20	20	15	-	0.009				
Stacker Hoist	23	23	18	-	0.012				
No. 2 Mill Secondary Crusher Building	38	38	50	-	0.033				
Concentrate Storage Tank	-	-	50	30	0.005				
Mill Building #1 and Concentrator	140	140	70	0	0.450				
Ore Bin (large)	-	-	90	30	0.005				
Ore Bin (large)	-	-	90	30	0.005				
Ore Bin (small)	-	-	70	30	0.005				
Primary Crusher	50	50	60	0	0.057				
Scale House (Guard Shack)	10	10	10	0	0.002				
Small Truck Shop	40	40	20	0	0.037				
Substation No. 2	50	50	30	0	0.057				
Thickener Tank (100-ft diam.)	-	-	14	100	0.057				
Thickener Tank (60-ft diam.)	-	-	20	60	0.021				
Water Tank (on Hanover Mountain)	-	-	30	25	0.004				
Water Tank (on Hanover Mountain)	-	-	50	35	0.007				
Magnetic Separator	20	20	14	-	0.009				
Pump House and Shed for Thickener	10	10	14	-	0.002				

Revegetation Area:

\$856 \$/acre Revegetation unit cost: Demolition Reveg Direct Cost: \$1,068

Data Sources: Rocky Mountain Reclamation Quote April, 2018 (before taxes)

Cobre Demolition Worksheet 3 5/17/2018



1.248 acres

	Cobre
Reclamation Summary	Demolition Worksheet 4 5/17/2018

Cobre Mining Company

Building Demolition			Current
Based on Projected	EOY 2019 Mine Plan		Value
DIRECT COSTS	Facility and Structure Removal		\$1,389,430
	Ripping & Revegetation Cover		\$1,068 \$102,002
	Subtotal, Direct Costs		\$1,492,500
INDIRECT COSTS'	Mobilization and Demobilization Contingencies Engineering Redesign Fee	3.8% 4.0% 2.5%	\$56,715 \$59,700 \$37,313
	Contractor Profit and Overhead Project Management Fee State Procurement Cost Indirect Percentage Sum = Subtotal, Indirect Costs	15.0% 3.0% 0.0% 28.3%	\$223,875 \$44,775 \$0 \$422,378

TOTAL COST

\$1,914,878

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).

Cobre_Demolition_2018_NOBS_20180519.xlsx Demolition Sheet 4 Page 5 of 5

R0241 Demolition

R024119-10 Demolition Defined

Whole Building Demolition - Demolition of the whole building with no concern for any particular building element, component, or material type being demolished. This type of demolition is accomplished with large pieces of construction equipment that break up the structure, load it into trucks and haul it to a disposal site, but disposal or dump fees are not included. Demolition of below-grade foundation elements, such as footings, foundation walls, grade beams, slabs on grade, etc., is not included. Certain mechanical equipment containing flammable liquids or ozone-depleting refrigerants, electric lighting elements may contain hazardous waste, and must be removed, either selectively or carefully, as hazardous waste before the building can be demolished.

Foundation Demolition - Demolition of below-grade foundation footings, foundation walls, grade beams, and slabs on grade. This type of demolition is accomplished by hand or pneumatic hand tools, and does not include saw cutting, or handling, loading, hauling, or disposal of the debris.

Gutting - Removal of building interior finishes and electrical/mechanical systems down to the load-bearing and sub-floor elements of the rough building frame, with no concern for any particular building element, component, or material type being demolished. This type of demolition is accomplished by hand or pneumatic hand tools, and includes loading into trucks, but not hauling, disposal or dump fees, scaffolding, or shoring. Certain mechanical equipment containing flammable liquids or ozone-depleting refrigerants, electric lighting elements, communication equipment components, and other building elements may contain hazardous waste, and must be removed, either selectively or carefully, as hazardous waste, before the building is gutted.

Selective Demolition - Demolition of a selected building element, component, or finish, with some concern for surrounding or adjacent elements, components, or finishes (see the first Subdivision (s) at the beginning of appropriate Divisions). This type of demolition is accomplished by hand or pneumatic hand tools, and does not include handling, loading, storing, hauling, or disposal of the debris, scaffolding, or shoring. "Gutting" methods may be used in order to save time, but damage that is caused to surrounding or adjacent elements, components, or finishes may have to be repaired at a later time.

Careful Removal - Removal of a piece of service equipment, building element or component, or material type, with great concern for both the removed item and surrounding or adjacent elements, components or finishes. The purpose of careful removal may be to protect the removed item for later re-use, preserve a higher salvage value of the removed item, or replace an item while taking care to protect surrounding or adjacent elements, components, connections, or finishes from cosmetic and/or structural amage. An approximation of the time required to perform this type of removal is 1/3 to 1/2 the time it would take to install a new item of like kind. This type of removal is accomplished by hand or pneumatic hand tools, and does not include loading, hauling, or storing the removed item, scaffolding, shoring, or lifting equipment.

Cutout Demolition - Demolition of a small quantity of floor, wall, roof, or other assembly, with concern for the appearance and structural integrity of the surrounding materials. This type of demolition is accomplished by hand or pneumatic hand tools, and does not include saw cutting, handling, loading, hauling, or disposal of debris, scaffolding, or shoring.

Rubbish Handling - Work activities that involve handling, loading or hauling of debris. Generally, the cost of rubbish handling must be added to the cost of all types of demolition, with the exception of whole building demolition.

Minor Site Demolition - Demolition of site elements outside the footprint of a building. This type of demolition is accomplished by hand or pneumatic hand tools, or with larger pieces of construction equipment, and may include loading a removed item onto a truck (check the Crew for equipment used). It does not include saw cutting, hauling or disposal of debris, and, sometimes, handling or loading.

R024119-20 Dumpsters

Dumpster rental costs on construction sites are presented in two ways.

The cost per week rental includes the delivery of the dumpster; its pulling or emptying once per week, and its final removal. The assumption is made that the dumpster contractor could choose to empty a dumpster by simply bringing in an empty unit and removing the full one. These costs also include the disposal of the materials in the dumpster.

R024119-30 Rubbish Handling Chutes

To correctly estimate the cost of rubbish handling chute systems, the individual components must be priced separately. First choose the size of the system; a 30-inch diameter chute is quite common, but the sizes range from 18 to 36 inches in diameter. The 30-inch chute comes in a standard weight and two thinner weights. The thinner weight chutes are sometimes chosen for cost savings, but they are more easily damaged.

There are several types of major chute pieces that make up the chute system. The first component to consider is the top chute section (top intake hopper) where the material is dropped into the chute at the highest point. After determining the top chute, the intermediate chute pieces called the regular chute sections are priced. Next, the number of chute control door sections (intermediate intake hoppers) must be determined. In the more complex systems, a chute control door section is provided at each floor level. The last major component to consider is bolt down frames; these are usually provided at every other floor level.

There are a number of accessories to consider for safe operation and control. There are covers for the top chute and the chute door sections. The top The Alternate Pricing can be used when actual planned conditions are not approximated by the weekly numbers. For example, these lines can be used when a dumpster is needed for 4 weeks and will need to be emptied 2 or 3 times per week. Conversely the Alternate Pricing lines can be used when a dumpster will be rented for several weeks or months but needs to be emptied only a few times over this period.

chute can have a trough that allows for better loading of the chute. For the safest operation, a chute warning light system can be added that will warn the other chute intake locations not to load while another is being used. There are dust control devices that spray a water mist to keep down the dust as the debris is loaded into a Dumpster. There are special breakaway cords that are used to prevent damage to the chute if the Dumpster is removed without disconnecting from the chute. There are chute liners that can be installed to protect the chute structure from physical damage from rough abrasive materials. Warning signs can be posted at each floor level that is provided with a chute control door section.

In summary, a complete rubbish handling chute system will include one top section, several intermediate regular sections, several intermediate control door (intake hopper) sections and bolt down frames at every other floor level starting with the top floor. If so desired, the system can also include covers and a light warning system for a safer operation. The bottom of the chute should always be above the Dumpster and should be tied off with a breakaway cord to the Dumpster.

Operations & Maintenance Reclamation Cost Estimate

Vegetation Maintenance Costs

	Total		Veg	# yrs	Percent			Unit	ltem	
Location	Area	Reclamation	Maintenance	veg	loss	Quantity	Unit	Cost*	Cost	
	(acres)	Complete	Complete	Maint.	per year			(\$/unit)	(\$)	Description
Stockpiles and Tailings	971	0	11	12	2%	19.4	acres	\$891	\$207,672	2% of veg fails every year for 12 years.
Building Demolition	1.25	0	11	12	2%	0.02	acres	\$891	\$267	2% of veg fails every year for 12 years.

Notes:

Reclamation Start Date: Dec-19

Vegetation Maintenance Total Direct

Vegetation Maintenance Total Cost (with indi

Rocky Mountain Reclamation Quote April, 2018 (before taxes) 891 \$/acre

> Cobre_O&M_2018_NOBS_20180519.xlsx Reveg Maint Sheet #19 Page 1 of 5

Cobre O&M Worksheet #19 5/17/2018

t Cost:	\$207,939
irects):	\$256,388

Cobre O&M Worksheet #20 5/17/18

Operations & Maintenance Overall Site

New Name Database Variable Strate Variable Strate Strate <th>EROSION CONTROL AND MONITOR</th> <th></th> <th>Years 13-39</th> <th>Years 40-99</th> <th>ROAD MAINTENA</th> <th>NCE [2]</th> <th>Years 0-19</th> <th>Years 20-39</th> <th>Years 40-99</th> <th></th> <th></th>	EROSION CONTROL AND MONITOR		Years 13-39	Years 40-99	ROAD MAINTENA	NCE [2]	Years 0-19	Years 20-39	Years 40-99		
		\$3,860.57	\$3,860.57	\$3,860.57 \$/day			\$7,421.08	\$7,421.08	\$7,421.08 \$/month		
Linet Linet Via Test T	Annual:	\$46,326.87	\$15,442.29		Annual:		\$29,684.33	\$14,842.16			
Norm Norm Norm Norm Norm Norm Norm 1											
Construction Construction<											Percent
Yape 15 Yape 100 <td></td>											
1B) Negree basis of we beginned and a set of the formal and a set of the fore	Year					Year				(acres)	
237.74Notes taxed or while started and water at any started an	0 1		-			0 1					
453.131Weighten based on their defined area668085.28085.28085.28085.280.280.285.280.2 <t< td=""><td></td><td>\$7,721</td><td>Weighted based</td><td>d on total reclaimed area</td><td></td><td></td><td>\$4,947 V</td><td>Weighted based or</td><td>total reclaimed area</td><td></td><td>17%</td></t<>		\$7,721	Weighted based	d on total reclaimed area			\$4,947 V	Weighted based or	total reclaimed area		17%
081.003 <td>4</td> <td>\$23,163</td> <td>Weighted based</td> <td>d on total reclaimed area</td> <td></td> <td>4</td> <td>\$14,842 V</td> <td>Neighted based or</td> <td>total reclaimed area</td> <td>486</td> <td>50%</td>	4	\$23,163	Weighted based	d on total reclaimed area		4	\$14,842 V	Neighted based or	total reclaimed area	486	50%
a3.5.22bb5.5.635.5.6	6	\$38,606	Weighted based	d on total reclaimed area			\$24,737 V	Veighted based or	total reclaimed area	810	83%
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	80	\$3,861				80	\$7,421				

Cobre_O&M_2018_NOBS_20180519.xlsx O&M Sheet 20 Page 2 of 5

Cobre O&M Worksheet #20 5/17/18

Operations & Maintenance Overall Site

EROSION CONTROL AND MONITORING[1] Years 0 Base: \$3,860 Time: Annual: \$46,326 Ann Curr	12 4 1 day/yr 87 \$15,442.29 \$3,860.57 \$/yr ıal	Base: Time:	Years 0-19 Years 20-39 \$7,421.08 \$7,421.08 4 2 \$29,684.33 \$14,842.16 Annual Current	Years 40-99 \$7,421.08 \$/month 1 months/yr \$7,421.08 \$/yr	Total Reclaimed Area per	Percent Reclaimed
	ost		Cost		Year (acres)	
Year	(\$)	Year	(\$)			
83 \$3,8		83	\$7,421			
84 \$3,8		84	\$7,421			
85 \$3,8		85	\$7,421			
86 \$3,8		86	\$7,421			
87 \$3,8		87	\$7,421			
88 \$3,8		88	\$7,421			
89 \$3,8		89	\$7,421			
90 \$3,8		90	\$7,421			
91 \$3,8		91	\$7,421			
92 \$3,5		92	\$7,421			
93 \$3,5		93	\$7,421			
94 \$3,5		94	\$7,421			
95 \$3,		95	\$7,421			
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97 \$3,9 98 \$3,9		97	\$7,421 \$7,421			
		98 99	\$7,421 \$7,421			
99 \$3, SubTotal Costs (with indirects): \$1,042,3			\$7,421 \$1,202,215			

O&M Total Costs (with indirects): \$2,244,570

[1] Erosion Control

Modified Crew B-13A (1 Labor Foreman, 2 laborers, 2 equip. operators (med.), 2 truck drivers (heavy), 1 crawler loader (4 cy), 2 dump trucks (8 cy, 220 HP) RS Means Heavy Construction Cost Data (28th Annual Edition, 2014)

	#	\$/hour	\$/day
Labor Foreman (outside)	1	\$23.48	\$187.84
Laborers	2	\$22.73	\$363.68
Equipment Operators Imed.I	1	\$26.56	\$212.48
Truck Drivers (heavy)	2	\$23.84	\$381.44
		\$/hour	\$/day
Loader,980G	1	\$81.48	\$651.84
Dump Trucks, Cat730	2	\$83.36	\$1,333.76

[2] Road Maintenance Crew Equipment - Equipment Watch Version 6.14.0B Labor - NM Department of Labor Type H (Heavy Engineering) labor rates. See Attachments for rate development.

	Operating	Labor	Subtotal
	Cost	Rate	24 hrs/month
	(\$/hr)	(\$/hr)	(\$/month)
Cat 14M Motor Grader	\$107.79	\$26.29	\$3,217.92
6,000-gal Water Truck	\$92.86	\$23.84	\$2,800.80

Total Direct Cost	\$6,019 \$/month
Indirect Cost Percentage	23.30%
Total Cost	\$7,421 \$/month

Total Direct Cost Indirect Cost Percentage 23.30%

Subtotal

\$3,131 \$/day

\$3,131 \$/day

\$3,861 \$/day Total Cost

> Cobre_O&M_2018_NOBS_20180519.xlsx O&M Sheet 20 Page 3 of 5

Operations and Maintenance Summary

Cobre Mining Cor	mpany		
Operations and Mainte	enance		Current Value
Based on Projected E	OY 2019 Mine Plan		
DIRECT COSTS	Facility and Structure Removal		\$0
	Earthmoving		\$0
	Revegetation		\$207,939
	Other		\$1,820,413
	Subtotal, Direct Costs		\$2,028,352
INDIRECT COSTS ¹	Mobilization and Demobilization	3.8%	\$77,077
	Contingencies	4.0%	\$81,134
	Engineering Redesign Fee	2.5%	\$50,709
	Contractor Profit and Overhead	10.0%	\$202,835
	Project Management Fee	3.0%	\$60,851
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	23.3%	
	Subtotal, Indirect Costs		\$472,606

TOTAL COST

\$2,500,958

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).

r													
	Earthwork O&M Cost Summary												
Period	Erosion	Road	Revegetation	Total									
(years)	Control	Maintenance	Maintenance	(Current Year \$)									
Overall Sit	Overall Site												
0 to 19	\$501,874	\$460,107	\$256,388	\$1,218,370									
20 to 39	\$308,846	\$296,843	\$0	\$605,689									
40 to 99	\$231,634	\$445,265	\$0	\$676,899									
Totals	\$1,042,355	\$1,202,215	\$256,388	\$2,500,958									
CHR*													
0 to 11	\$65,630	-	\$26,364	\$91,994									
Totals	\$1,107,985	\$1,202,215	\$282,752	\$2,592,952									

*From Cobre_CHR_RCE_03102016_NOBS_20180519.xlsx

Tot	Total Earthwork O&M Cost: Direct/Indirect by time period											
		Direct	Indirect	Total								
Overall Sit	e											
0 to 19		\$988,134	\$230,235	\$1,218,370								
20 to 39		\$491,232	\$114,457	\$605,689								
40 to 99		\$548,986	\$127,914	\$676,899								
Totals		\$2,028,352	\$472,606	\$2,500,958								
CHR ²												
0 to 11		\$74,610	\$17,384	\$91,994								
Totals		\$2,102,962	\$489,990	\$2,592,952								

Water Management Unit Rates and Reclamation Cost Estimate

Water Treatment Unit Costs

Unit Cost \$/unit	Units	Las Cruces 85.6% ²	T	ъ	
			Line Item	Page	Reference
\$214.50	ea	\$183.61	02 41 13.80 0100	36	Professional Judgment 15 to 30 gpm - includes pump control, control panel, install
\$93.00	ea	\$79.61	02 41 13.80 0300	36	Professional Judgment 50 gpm - includes pump control, control panel, installation,
\$696.5	ea	\$596	33 71 16.33 6020	399	Professional Judgment 100 to 700 gpm - includes pump control, control panel, inst
\$1,259	ea	\$1,078	33 71 16.23 6010	398	Professional Judgment 800 to 2000 gpm - includes pump control, control panel, in
\$1.95	ea	\$1.67	33 71 16.33 9000	399	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 3/4"-4" diamete
\$335.00	ea	\$287	33 71 16.33 7600	399	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 6"-8" diameter
\$579.00	wire mi	\$496	33 71 39.13 0110	402	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 10"-18" diameter
\$15,295.00	wire mi	\$13,093	33 71 39.13 0150	402	Selective Demo, utility poles, wood, 20'-30' high
\$309.00	wire mi	\$265	33 71 39.13 0810	403	Selective Demo, cross arms, wood, 4'-6' long
\$5,261.00	ea	\$4,503	33 71 26.26 4100	402	Steel Pipe Schedule 40, black 24" diameter (221113.48 1210) without coupling an
\$1.95	lf	\$1.67	02 41 13.38-1600	29	Membrane lining, 2X60 mil thick
					Assume similar to 10' high 33 degree slope concrete retaining wall, cast concrete r
\$2.73	lf	\$2.34	02 41 13.38-1700	29	excavation, backfill & reinforced.
\$4.53	lf	\$3.88	02 41 13.38-1800	29	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
	cy		G1030 120 1600	498	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$2.74	sf	\$2.34544	31 05 19.53 1200	218	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$92,125	ea	\$78,859	32 32 13.10 3100	323	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$295,500	ea	\$252,948	33 16 23.13 1000	358	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$10,000	ea	\$10,298.21	-	-	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$15,000	ea	\$15,447.32	-	-	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$25,000	ea	\$25,745.53	-	-	250,000 gallon steel tank, not including foundation., height/diameter Less than 1
\$30,000	ea	\$30,894.63	-	-	Digging holes in rock
\$8.81	lf	\$7.54	33 14 13.35 0100	352	Wood, class 1 type C, CCA/ACA-treated, 30' high, excludes excavation, backfill a
\$12.29	lf	\$10.52	33 14 13.35 0200	352	Cross arms 4' long, includes hardware and insulators
\$16.74	lf	\$14.33	33 14 13.35 0300	352	Disposal of pole and hardware surplus material, assumes 100 feet of wire per pole
\$19.93	lf	\$17.06	33 14 13.35 0400	352	13 to 26 kV
\$22.73	lf	\$19.46	33 14 13.35 0500	352	Material handling and spotting-conductors, primary circuits
\$33.55	lf	\$28.72	33 14 13.35 0600	352	Conductors, per wire, 210-636 kcmil
		\$35.22	33 14 13.35 0700		Disposal of surplus material, high voltage conductors
					3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mi round trip. This value removes Means Crews O&P markup)
\$0.0502	kWh	0.0502	-	-	Industrial rate date looked up 3/01/2018 (http://www.electricitylocal.com/states/n indirect costs
\$5.000	ea	\$5.149.11	_	_	Engineering Judgment
			_	_	Engineering Judgment
			_	_	Griffin Propane verbal Quote, Silver City, NM (March, 2018) less indirect cost of
					Engineering Judgment
			-	-	Engineering Judgment
			-		23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab
\$239 \$59.83	cooler	\$239.32 \$59.83	-	-	23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab Overnight FedEx \$70 for a 10 lb. package 30"x18"x18" Silver City, NM to Caspe
	\$696.5 \$1,259 \$1.95 \$335.00 \$579.00 \$15,295.00 \$309.00 \$5,261.00 \$1.95 \$2.73 \$4.53 \$8.28 \$2.74 \$92,125 \$295,500 \$10,000 \$15,000 \$15,000 \$15,000 \$25,000 \$30,000 \$8.81 \$12.29 \$16.74 \$19.93 \$22.73 \$33.55 \$41.15 \$218.35	\$696.5 ea \$1,259 ea \$1.95 ea \$335.00 ea \$579.00 wire mi \$15,295.00 wire mi \$309.00 wire mi \$57,261.00 ea \$1,95 If \$2,73 If \$4.53 If \$8.28 cy \$2.74 sf \$92,125 ea \$295,500 ea \$10,000 ea \$15,000 ea \$15,000 ea \$25,000 ea \$30,000 ea \$15,000 ea \$25,000 ea \$33,0,000 ea \$33,0,000 ea \$33,0,000 ea \$33,0,000 ea \$33,0,000 ea \$15,000 ea \$33,0,000 ea \$10,000 ea \$22,355 If \$10,000	\$696.5 ea \$596 \$1,259 ea \$1,078 \$1.95 ea \$1.67 \$335.00 ea \$287 \$579.00 wire mi \$496 \$15,295.00 wire mi \$13,093 \$309.00 wire mi \$265 \$5,261.00 ea \$4,503 \$1.95 If \$1.67 \$2.73 If \$2.34 \$4.53 If \$3.88 \$8.28 cy \$7.088 \$2.74 sf \$2.34544 \$92,125 ea \$78,859 \$295,500 ea \$252,948 \$10,000 ea \$10,298.21 \$15,000 ea \$30,894.63 \$8.81 If \$7.54 \$12.29 If \$10.52 \$16.74 If \$14.33 \$19.93 If \$17.06 \$22.73 If \$19.46 \$33.55 If \$28.72 <t< td=""><td>\$696.5 ea \$596 33 71 16.33 6020 \$1,259 ea \$1,078 33 71 16.23 6010 \$1.95 ea \$1.67 33 71 16.33 9000 \$335.00 ea \$287 33 71 16.33 7600 \$579.00 wire mi \$496 33 71 39.13 0110 \$15,295.00 wire mi \$13,093 33 71 39.13 0150 \$309.00 wire mi \$265 33 71 39.13 0150 \$309.00 wire mi \$265 33 71 39.13 0810 \$5,261.00 ea \$4,503 33 71 26.26 4100 \$1.95 If \$1.67 02 41 13.38-1600 \$2,73 If \$2.34 02 41 13.38-1700 \$4.53 If \$3.88 02 41 13.38-1800 \$8.28 cy \$7.088 G1030 120 1600 \$2.74 sf \$2.34544 31 05 19.53 1200 \$92,125 ea \$78,859 32 32 13.10 3100 \$10,000 ea \$10,298.21 - \$15,000 ea \$25,745.53 -</td><td>\$696.5 ea \$596 337116.336020 399 \$1,259 ea \$1,078 337116.236010 398 \$1.95 ea \$1.67 337116.236010 399 \$335.00 ea \$287 337116.339000 399 \$3579.00 wire mi \$496 337139.130110 402 \$\$1,295.00 wire mi \$13,093 337139.130150 402 \$\$309.00 wire mi \$265 337139.130810 403 \$\$5,261.00 ea \$4,503 337139.130810 402 \$\$1,95 If \$1.67 $024113.38-1600$ 29 \$\$4.53 If \$3.88 $024113.38-1600$ 29 \$\$4.53 If \$3.88 $024113.38-1600$ 29 \$\$8.28 cy \$7.088 G10301201600 498 \$\$2.74 \$\$1 \$2.34544 310519.531200 218 \$\$92,125 ea \$15,447.32 - - \$\$10,000</td></t<>	\$696.5 ea \$596 33 71 16.33 6020 \$1,259 ea \$1,078 33 71 16.23 6010 \$1.95 ea \$1.67 33 71 16.33 9000 \$335.00 ea \$287 33 71 16.33 7600 \$579.00 wire mi \$496 33 71 39.13 0110 \$15,295.00 wire mi \$13,093 33 71 39.13 0150 \$309.00 wire mi \$265 33 71 39.13 0150 \$309.00 wire mi \$265 33 71 39.13 0810 \$5,261.00 ea \$4,503 33 71 26.26 4100 \$1.95 If \$1.67 02 41 13.38-1600 \$2,73 If \$2.34 02 41 13.38-1700 \$4.53 If \$3.88 02 41 13.38-1800 \$8.28 cy \$7.088 G1030 120 1600 \$2.74 sf \$2.34544 31 05 19.53 1200 \$92,125 ea \$78,859 32 32 13.10 3100 \$10,000 ea \$10,298.21 - \$15,000 ea \$25,745.53 -	\$696.5 ea \$596 337116.336020 399 \$1,259 ea \$1,078 337116.236010 398 \$1.95 ea \$1.67 337116.236010 399 \$335.00 ea \$287 337116.339000 399 \$3579.00 wire mi \$496 337139.130110 402 \$\$1,295.00 wire mi \$13,093 337139.130150 402 \$\$309.00 wire mi \$265 337139.130810 403 \$\$5,261.00 ea \$4,503 337139.130810 402 \$\$1,95 If \$1.67 $024113.38-1600$ 29 \$\$4.53 If \$3.88 $024113.38-1600$ 29 \$\$4.53 If \$3.88 $024113.38-1600$ 29 \$\$8.28 cy \$7.088 G10301201600 498 \$\$2.74 \$\$1 \$2.34544 310519.531200 218 \$\$92,125 ea \$15,447.32 - - \$\$10,000

38 Description Notes:

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

40 2) City Cost Index Las Cruces-Total 85.6% (weighted average) R.S. Means Heavy Construction Cost Data, 32nd Annual Edition, 2018, pg. 21.

41 3) Griffin's Propane verbal quote March 12, 2018 of \$ 2.75/gal from which the indirect costs are then subtracted.

4) https://edzarenski.com/2016/10/24/construction-inflation-index-tables-2017/ 42

Inflation Adjustment 2014 to 2018 1.0298

allation, and flow meter.

on, and flow meter.

stallation, and flow meter.

installation, and flow meter.

ter

eter

and hanger

reinforced concrete cantilever, including

ill, 4" diameter

ll, 6" diameter

ll, 8" diameter

ll, 10" diameter

ill, 12" diameter

ill, 14" diameter

ll, 16" diameter

and cast-in-place concrete

es the overhead and profit (34% based on RS

es/new-mexico/silver-city/) Subtracting

of 17% .

ab.com).

per, WY Energy Labs

Water Management Cost Estimate	
	Variables

**Removal costs are included in earthwork portion of the cost estimate.

***Surge Tank is Industrial PMLU.

Ponds / Tanks ConstructioCapacityCapacityPond Arean Type(gallons)(cy)(acres) Age Today (yr) Age at Reclamation (yr) Location SWRF Dam 1 (181-2003-Dam 1) concrete dan 1,116,800 5,530 SWRF Dam 2 (181-2003-Dam 2) concrete dan 827,700 4,098 -SWRF Dam 3 (181-2003-Dam 3) concrete dar 2,925,300 14,485 19 Decant Pond #4 HDPE lined 972,500 4,815.310 0.62 Upper Creek Containment Pond #1 HDPE lined 1,879,200 9,304.813 1.29 Grape Gulch Pond #3 HDPE lined 911,600 4,513.765 0.38 Blackman's Seep (Pond #2) Surge Tank*** unlined 25,000 123.787 -29 steel352,5001,745.395-HDPE lined9,60047.5340.20 49 Magnetite Seepage Pond 29 East WRF Containmentconcrete900,0004,456.3280.50*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. -1 5

1

	Descriptio	on			Variable
			2018 R	SMeans NM Discount Rate	0.856
			Steel	Tank Life Expectancy (yr)	50
				Pond Life Expectancy (yr)	30
			Small Concrete	e Dam Life Expectancy (yr)	50
				Pump Life Expectancy (yr)	20
			HDPE Pi	peline Life Expectancy (yr)	100
				Pump / Motor Efficiency	0.70
			Reclaim Pond Pump Fuel	Consumption Rate (gal/hr)	1.0
			Cl	hezy Head Loss Coefficient	150
				Power Pole Spacing (ft)	100
			Annual Pond Ma	aintenance to Capital Factor	1.5%
			1	aintenance to Capital Factor	1.5%
			Annual Pipeline Ma	aintenance to Capital Factor	1.0%
		Annual	Electrical Infrastructure Ma	aintenance to Capital Factor	1.5%
		Estimated average stor	rmwater runoff non-revegeta	ated (CN=85, gal/year/acre)	48,155
Estimated	l average stormwater	r runoff, after 12-year vegetation est	ablishment period (Conditio	n 87 CN=62, gal/year/acre)	2,530
				Spreadsheet Year (2014)	-6
			Rec	clamation Start Year (2020)	0
				Reclamation Finished	5
			Vegetation Established A	Assume stormwater released	12
				First	
ond Area	Age Today (yr)	Age at Reclamation (yr)	Removal Year**	Replacement	Number of
(acres)	150 1000 (j1)	The at Rechandration (J1)	(yr)	Year	Replacemen
	nes)			(vr)	

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 (\$)
12	-	0	\$78,859	\$0	\$1,183	\$15,378	\$15,378
12	-	0	\$78,859	\$0	\$1,183	\$15,378	\$15,378
12	-	0	\$78,859	\$0	\$1,183	\$15,378	\$15,378
12	5	1	\$138,064	\$138,064	\$2,071	\$26,922	\$164,986
12	-	0	\$285,575	\$0	\$4,284	\$55,687	\$55,687
12	0	1	\$88,311	\$88,311	\$1,325	\$17,221	\$105,532
9	0	1	\$292	\$292	\$4.39	\$43.87	\$336
12	0	1	\$252,948	\$252,948	\$3,794	\$49,325	\$302,273
12	0	1	\$40,979	\$40,979	\$615	\$7,991	\$48,970
12	-	0	\$112,696	\$0	\$1,690	\$21,976	\$21,976
		Direct Annual Costs:	-	-	\$17,332	-	-
		Direct Cost Subtotals:	-	\$520,595	-	\$225,298	\$745,893

Cobre_WM_20180519.xlsx Reclamation and O&M Costs Sheet 1 Page 2 of 9

Water Management Cost Estimate

imps											$D_i^{4.865}$						
From	То	Number	Age Today (yr)	Age at Reclamation (yr)	Removal Year (yr)	First Replacement Year (yr)	Number of Ave Replacements	erage Combined Operational Pump Rate (gpm)	ping 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 Co New and Replaceme (\$/replacement
WRF Dam 1 (181-2003-Dam 1)	SWRF Dam 3 (181-2003-Dam 3)	2	15	21	12	0	1	1760	6650	6719	61	130	82	61	120.9	0	\$61,789
WRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	2	15	21	12	0	1	1940	6613	6715	54	156	109	81	48.7	0	\$61,789
WRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	2	15	21	12	0	1	940	6556	6745	11	200	68	51	96.9	0	\$51,491
ecant Pond #4	Booster Pump 2	2	24	30	12	0	1	3000	6688	6700	1	13	14	10	0	18001800	\$51,491
ooster Pump 2	Surge Tank	2	24	30	12	0	1	3000	6700	6925	10	235	254	189	0	0	\$51,491
ecant Pond #4	Reclaim Pond	2	24	30	5	0	1	1760	6688	7000	31	343	218	162	0	0	\$61,789
agnetite Interceptor Trench	Magnetite Tailings Seepage Pond	1	24	30	5	0	1	100	6670	6695	0	25	1	1	0	146643	\$15,447
agnetite Seepage Pond	Decant Pond #4	2	24	30	12	0	1	100	6695	6750	7	62	2	2	13.1	0	\$30,895
strada Seep	Decant Pond #4	2	9	15	5	5	1	45	6575	6688	19	132	2	2	0	762541	\$20,596
nion Hill Adit Seep	Decant Pond #4	2	9	15	5	5	1	30	6575	6688	96	209	2	2	0	169454	\$20,596
pper Creek Containment Pond #1	Surge Tank	2	24	30	12	0	1	1980	6810	6925	358	473	338	252	53.7	0	\$61,789
rape Gulch Pond #3	Surge Tank	2	24	30	12	0	1	1100	6775	6925	14	164	65	49	6.5	0	\$61,789
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	1	24	30	9	0	1	125	6775	6810	0	35	2	1	0	0	\$15,447
urge Tank	Reclaim Pond	2	10	16	9	4	1	3497	6925	7000	26	101	128	95	0	0	\$61,789
eclaim Pond	Surge Tank	1	10	16	5	4	1	1240	7000	7010	46	56	25	19	316.1	0	\$30,895
ast WRF Containment	Decant Pond #4	2	-1	5	12	-	0	2000	6560	6688	70	198	143	106	69.8	423634	\$20,596
uilings pipeline flushing																	
fill No 1	Tailings Impoundment Top	1						4318	6825	7000	13	188	293	219			
lill No 2								1210	10 70	7000	13	63	00	73			
	Tailings Impoundment Top avity fed and thus pumping costs are not i	1 included.	Post Closure	Pre Completed	Reclamation			4318	6950	7000	15	03	98	/3			
Surge tank to bullfrog pipeline is gr	• • •	1 included.		Pre Completec gh Reclamatior					6950 leted Reclamation (Reclama		15	03	98	/3			
	• • •	1 included. Average Pumping Rate (gal/yr)	(Throu Operating	-	Year 5) Direct Annual Operational Cost	Direct Operational Cost (\$)	Average Pumping Rate (gal/yr)		leted Reclamation (Reclama			Direct Pump Cost New and Replacement (\$)		Direct Cost Maintenance (\$)	Direct Cost Removal (\$)	Direct Cost (\$)	Direct Cost Electricity and Fuel (\$)
Surge tank to bullfrog pipeline is gr umps (continued) From	avity fed and thus pumping costs are not i	Average Pumping Rate	(Throu Operating Time	gh Reclamation Annual Electrical Usage	Year 5) Direct Annual Operational	Direct Operational Cost	Pumping Rate	Post Closure Post Compl Operating Time	leted Reclamation (Reclama Annual Electrical	tion Year 6 to 12) Direct Annual Operational Cost	Direct Operational Cost	Direct Pump Cost New and Replacement	Direct Cost Maintenance	Direct Cost	Removal (\$) \$10,298		Electricity and Fuel (\$) \$1,080
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1)	avity fed and thus pumping costs are not i	Average Pumping Rate (gal/yr)	(Throu Operating Time (hr/yr) 55.1 20.1	gh Reclamation Annual Electrical Usage (kWh/yr)	Year 5) Direct Annual Operational Cost (\$/yr) 170 82	Direct Operational Cost (\$)	Pumping Rate (gal/yr)	Post Closure Post Compl Operating Time	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86	ntion Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4	Direct Operational Cost (\$) \$62 \$30	Direct Pump Cost New and Replacement (\$)	Direct Cost Maintenance (\$/yr) \$927 \$927	Direct Cost Maintenance (\$)	Removal (\$) \$10,298 \$10,298	(\$)	Electricity and Fuel (\$) \$1,080 \$523
Surge tank to bullfrog pipeline is gr Imps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2)	To SWRF Dam 3 (181-2003-Dam 3)	Average Pumping Rate (gal/yr) 5,821,936	(Throu Operating Time (hr/yr) 55.1 20.1 227.5	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578	Direct Operational Cost (\$) 1,018 492 3,468	Pumping Rate (gal/yr) 305,888 123,216 8,412,249	Post Closure Post Compl Operating Time (hr/yr) 3 1 149	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552	ution Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379	Direct Operational Cost (\$) \$62 \$30 \$2,652	Direct Pump Cost New and Replacement (\$) \$61,789	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772	Direct Cost Maintenance (\$) \$12,049	Removal (\$) \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830	Electricity and Fuel (\$) \$1,080 \$523 \$6,120
Surge tank to bullfrog pipeline is gr Imps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3)	To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505
Surge tank to bullfrog pipeline is gr mps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2	To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578	Direct Operational Cost (\$) 1,018 492 3,468	Pumping Rate (gal/yr) 305,888 123,216 8,412,249	Post Closure Post Compl Operating Time (hr/yr) 3 1 149	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552	ution Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132
Surge tank to bullfrog pipeline is gr amps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2 ecant Pond #4	To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2 ecant Pond #4 lagnetite Interceptor Trench	To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 0.0 24.4	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17	ttion Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond	To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 1 11	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$5,149 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 ooster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond strada Seep	To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$3 \$0 \$1 \$3 \$0	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$5,149 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82 \$135
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 ooster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond strada Seep nion Hill Adit Seep	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 0 0	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$0 \$0	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$0 \$18 \$0 \$0 \$0 \$0 \$0 \$18	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,51,491 \$51,51,491 \$51,51,491 \$51,51,51,51 \$20,596	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$5,149 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82 \$135 \$48
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$14	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$118	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$20,596	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049	Removal (\$)\$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752
From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2 ecant Pond #4 agnetite Interceptor Trench agnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 0 0	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$0 \$14 \$1	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$1101 \$4	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,51,491 \$51,51,491 \$51,51,491 \$51,51,491 \$51,51,491 \$51,789 \$15,447 \$30,895 \$20,596 \$20,596 \$61,789 \$61,789	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74
Aurge tank to bullfrog pipeline is gr Imps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 poster Pump 2 ecant Pond #4 agnetite Interceptor Trench agnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3 ackman's Seep (Pond #2)	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 0 0	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$10 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$4 \$0	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049 \$12,049 \$12,049 \$12,049 \$2,317	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 ooster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3 lackman's Seep (Pond #2) urge Tank	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 0.0	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 0	tion Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$0 \$14 \$1 \$0 \$0 \$14 \$1 \$0 \$0 \$14 \$15 \$1,241 \$0 \$0 \$15 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$0 \$10 \$18 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$20,596 \$61,789 \$15,447 \$61,789	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268	Removal (\$)\$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,914 \$84,136 \$22,914	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) vecant Pond #4 ooster Pump 2 vecant Pond #4 Iagnetite Interceptor Trench Iagnetite Seepage Pond strada Seep inion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3 Iackman's Seep (Pond #2) urge Tank eclaim Pond	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0 481	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$15 \$1,241 \$0 \$1 \$1,241 \$0 \$0 \$1 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$1,241 \$1,241 \$0 \$0 \$1,241 \$	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$10 \$18 \$0 \$0 \$10 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$15,447 \$30,895 \$15,447 \$61,789 \$15,447 \$61,789 \$30,895	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$32,748 \$84,136 \$84,386	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$0 \$2,885
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) vecant Pond #4 ooster Pump 2 vecant Pond #4 Iagnetite Interceptor Trench Iagnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3 lackman's Seep (Pond #2) urge Tank eclaim Pond ast WRF Containment	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 0.0	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 0	tion Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$0 \$14 \$1 \$0 \$0 \$14 \$1 \$0 \$0 \$14 \$15 \$1,241 \$0 \$0 \$15 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$0 \$1,241 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$0 \$10 \$18 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$20,596 \$61,789 \$15,447 \$61,789	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268	Removal (\$)\$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,745 \$33,824 \$14,315	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) becant Pond #4 ooster Pump 2 becant Pond #4 fagnetite Interceptor Trench fagnetite Seepage Pond strada Seep fnion Hill Adit Seep per Creek Containment Pond #1 brape Gulch Pond #3 lackman's Seep (Pond #2) urge Tank eclaim Pond ast WRF Containment <i>tilings pipeline flushing</i>	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Upper Creek Containment Pond 1 Reclaim Pond Surge Tank Decant Pond #4	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0 481	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$15 \$1,241 \$0 \$1 \$1,241 \$0 \$0 \$1 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$1,241 \$1,241 \$0 \$0 \$1,241 \$	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$10 \$18 \$0 \$0 \$10 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$61,789 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$15,49 \$15,447 \$15,447 \$15,49 \$15,447	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,135 \$0	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066 \$0
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) tecant Pond #4 ooster Pump 2 vecant Pond #4 Iagnetite Interceptor Trench Iagnetite Seepage Pond strada Seep finon Hill Adit Seep poer Creek Containment Pond #1 rape Gulch Pond #3 lackman's Seep (Pond #2) urge Tank eclaim Pond ast WRF Containment <i>tilings pipeline flushing</i> Iill No 1	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank Surge Tank	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851 5,764,479	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5 22.2	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359 4,865	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0 481	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$15 \$1,241 \$0 \$1 \$1,241 \$0 \$0 \$1 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$1,241 \$1,241 \$0 \$0 \$1,241 \$	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$10 \$18 \$0 \$0 \$10 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$15,447 \$30,895 \$20,596 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$30,895 \$20,596 \$20,595 \$20,596 \$20,596 \$20,595 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,595 \$20,596 \$20,595 \$20,596\$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596\$20,5	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,2914 \$81,356 \$38,824 \$14,315 \$0 \$244	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066 \$0 \$0 \$0
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 booster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3 lackman's Seep (Pond #2) urge Tank eclaim Pond ast WRF Containment <i>ilings pipeline flushing</i> fill No 1	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Upper Creek Containment Pond 1 Reclaim Pond Surge Tank Decant Pond #4	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0 481	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$15 \$1,241 \$0 \$1 \$1,241 \$0 \$0 \$1 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$1,241 \$1,241 \$0 \$0 \$1,241 \$	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$10 \$18 \$0 \$0 \$10 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$61,789 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$15,49 \$15,447 \$15,447 \$15,49 \$15,447	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$772 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,135 \$0	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066 \$0
Surge tank to bullfrog pipeline is gr umps (continued) From WRF Dam 1 (181-2003-Dam 1) WRF Dam 2 (181-2003-Dam 2) WRF Dam 3 (181-2003-Dam 3) ecant Pond #4 ooster Pump 2 ecant Pond #4 lagnetite Interceptor Trench lagnetite Seepage Pond strada Seep nion Hill Adit Seep pper Creek Containment Pond #1 rape Gulch Pond #3 lackman's Seep (Pond #2) urge Tank eclaim Pond ast WRF Containment <i>ilings pipeline flushing</i>	To To SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) SWRF Dam 3 (181-2003-Dam 3) Bullfrog pipeline Booster Pump 2 Surge Tank Reclaim Pond Magnetite Tailings Seepage Pond Decant Pond #4 Decant Pond #4 Decant Pond #4 Surge Tank Surge Tank Surge Tank Upper Creek Containment Pond 1 Reclaim Pond Surge Tank Decant Pond #4 Tailings Impoundment Top	Average Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851 5,764,479 6,800,790 :	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5 22.2	gh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359 4,865	Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0 481	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Post Closure Post Compl Operating Time (hr/yr) 3 1 149 31 131 0 24	leted Reclamation (Reclama Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	ation Year 6 to 12) Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$0 \$1 \$3 \$0 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$14 \$1 \$0 \$15 \$1,241 \$0 \$1 \$1,241 \$0 \$0 \$1 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$0 \$0 \$1,241 \$1,241 \$1,241 \$0 \$0 \$1,241 \$	Direct Operational Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$10 \$18 \$0 \$0 \$10 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$0 \$101 \$101	Direct Pump Cost New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$15,447 \$30,895 \$20,596 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$30,895 \$20,596 \$20,595 \$20,596 \$20,596 \$20,595 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,595 \$20,596 \$20,595 \$20,596\$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$20,596\$20,596 \$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596 \$20,596\$20,596\$20,5	Direct Cost Maintenance (\$/yr) \$927 \$927 \$927 \$927 \$772 \$772 \$772 \$772	Direct Cost Maintenance (\$) \$12,049 \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,854 \$1,2,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,2914 \$81,356 \$38,824 \$14,315 \$0 \$244	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066 \$0 \$0 \$0

Pumps										H =	$\frac{4Q^{1.85}}{D_i^{4.865}}$						
From	То	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)	New
SWRF Dam 1 (181-2003-Dam 1)	SWRF Dam 3 (181-2003-Dam 3)	2	15	21	12	0	1	1760	6650	6719	61	130	82	61	120.9	0	\$61,789
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	2	15	21	12	0	1	1940	6613	6715	54	156	109	81	48.7	0	\$61,789
SWRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	2	15	21	12	0	1	940	6556	6745	11	200	68	51	96.9	0	\$51,491
Decant Pond #4	Booster Pump 2	2	24	30	12	0	l	3000	6688	6700	l	13	14	10	0	18001800	\$51,491
Booster Pump 2	Surge Tank	2	24	30 20	12	0	1	3000	6700	6925 7000	10	235	254	189	0	0	\$51,491
Decant Pond #4	Reclaim Pond	2	24	30	5	0	1	1760	6688	7000	31	343	218	162	0	0	\$61,789
Magnetite Interceptor Trench	Magnetite Tailings Seepage Pond	1	24	30	5 10	0	1	100	6670	6695 6750	0 7	25	1	1	0	146643	\$15,447
Magnetite Seepage Pond	Decant Pond #4	2	24	30	12	0	1	100	6695	6750	/	62	2	2	13.1	0	\$30,895
Estrada Seep	Decant Pond #4	2	9	15	5	5	1	45	6575	6688	19	132	2	2	0	762541	\$20,596 \$20,506
Union Hill Adit Seep	Decant Pond #4	2	9	15	5	5	1	30	6575	6688	96 258	209	338	2 252	0	169454	\$20,596 \$61,780
Upper Creek Containment Pond #1	Surge Tank	2	24	30	12	0	1	1980	6810	6925	358	473	538	252	53.7	0	\$61,789 \$61,780
Grape Gulch Pond #3	Surge Tank	2	24	30	12	0	1	1100	6775	6925	14	164	65	49	6.5	0	\$61,789
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	1	24	30	9	0	1	125	6775	6810 7000	0	35	2	1	0	0	\$15,447
Surge Tank	Reclaim Pond	2	10	10	9	4	1	3497	6925 7000	7000	26	101	128 25	95 10	0	0	\$61,789 \$20,805
Reclaim Pond East WRF Containment	Surge Tank	1	10	10	5 12	4	1	1240	7000	7010	46 70	56 198	25 143	19 106	316.1 69.8	423634	\$30,895 \$20,506
	Decant Pond #4	2	-1	5	12	-	0	2000	6560	6688	70	198	143	106	69.8	423034	\$20,596
tailings pipeline flushing		1						1219	(925	7000	13	100	202	210			
Mill No 1 Mill No 2	Tailings Impoundment Top Tailings Impoundment Top	1						4318 4318	6825 6950	7000 7000	13	188 63	293 98	219 73			
Pumps (continued)				e Pre Completed 1gh Reclamation				Post Closure Post Completed	Reclamation (Reclam	nation Year 6 to 12)							
			`	Annual	Direct	Direct						Direct Pump Cost					Direct Cost
From	То	Average Pumping Rate (gal/yr)	Operating Time (hr/yr)	Electrical Usage (kWh/yr)	Annual Operational Cost (\$/yr)	Operational Cost (\$)	Average Pumping Rate (gal/yr)	Operating Time (hr/yr)	Annual Electrical Usage (kWh/yr)	Direct Annual Operational Cost (\$/yr)	Direct Operational Cost (\$)	New and Replacement (\$)	Direct Cost Maintenance (\$/yr)	Direct Cost Maintenance (\$)	Direct Cost Removal (\$)	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	<u>(</u> (<i>q</i> / <i>y</i> 1)) 170	1,018	305,888	3	178	\$9	\$62	\$61,789	\$927	\$12,049	\$10,298	\$84,136	\$1,080
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	2,345,147	20.1	1,636	82	492	123,216	1	86	\$4	\$30	\$61,789	\$927	\$12,049	\$10,298	\$84,136	\$523
SWRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	12,833,300	227.5	11,520	578	3,468	8,412,249	149	7,552	\$379	\$2,652	\$51,491	\$772	\$10,041	\$10,298	\$71,830	\$6,120
Decant Pond #4	Booster Pump 2	23,496,119	130.5	1,317	66	397	5,494,319	31	308	\$15	\$108	\$51,491	\$772	\$10,041	\$10,298	\$71,830	\$505
Booster Pump 2	Surge Tank	23,496,119	130.5	24,734	1,241	7,446	23,496,119	131	24,734	\$1,241	\$8,687	\$51,491	\$772	\$10,041	\$10,298	\$71,830	\$16,132
Decant Pond #4	Reclaim Pond	0	0.0	0	0	0	0	0	0	\$0	\$0	\$61,789	\$927	\$5,561	\$10,298	\$77,649	\$0
Magnetite Interceptor Trench	Magnetite Tailings Seepage Pond	146,643	24.4	17	1	5	146,643	24	17	\$1	\$0	\$15,447	\$232	\$1,390	\$5,149	\$21,987	\$5
Magnetite Seepage Pond	Decant Pond #4	777,473	129.6	216	11	65	179,787	30	50	\$3	\$18	\$30,895	\$463	\$6,024	\$10,298	\$47,217	\$82
Estrada Seep	Decant Pond #4	762,541	282.4	450	23	135	0	0	0	\$0	\$0	\$20,596	\$309	\$1,854	\$10,298	\$32,748	\$135
Union Hill Adit Seep	Decant Pond #4	169,454	94.1	159	8	48	0	0	0	\$0	\$0	\$20,596	\$309	\$1,854	\$10,298	\$32,748	\$48
Upper Creek Containment Pond #1	Surge Tank	2,585,922	21.8	5,485	275	1,651	135,866	1	288	\$14	\$101	\$61,789	\$927	\$12,049	\$10,298	\$84,136	\$1,752
Grape Gulch Pond #3	Surge Tank	313,007	4.7	231	12	69	16,446	0	12	\$1	\$4	\$61,789	\$927	\$12,049	\$10,298	\$84,136	\$74
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	0	0.0	0	0	0	0	0	0	\$0	\$0	\$15,447	\$232	\$2,317	\$5,149	\$22,914	\$0
Surge Tank	Reclaim Pond	0	0.0	0	0	0	0	0	0	\$0	\$0	\$61,789	\$927	\$9,268	\$10,298	\$81,356	\$0
Reclaim Pond	Surge Tank	15,221,786	204.6	-	481	2,885	799,763	11	25	\$1	\$0	\$30,895	\$463	\$2,781	\$5,149	\$38,824	\$2,885
East WRF Containment	Decant Pond #4	3,784,851	31.5	3,359	169	1,011	176,601	1	157	\$8	\$55	\$0	\$309	\$4,016	\$10,298	\$14,315	\$1,066
tailings pipeline flushing																\$0	\$0
Mill No 1	Tailings Impoundment Top	5,764,479	22.2	4,865								\$244				\$244	\$0
Mill No 2	Tailings Impoundment Ton	< 000 700															
	Tailings Impoundment Top	6,800,790	26.2	1,928								\$97				\$97	\$0
	Direct Annual Costs:	6,800,790	- 26.2	1,928	\$3,115	-	-		-	\$1,676	- \$11,717	\$97 -	\$10,195	_	-	\$97 -	\$0 -

1.05

Cobre_WM_20180519.xlsx Reclamation and O&M Costs Sheet 1 Page 3 of 9

Water Management Cost Estimate

From	То	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	15	21	12	-	0	\$17.06	\$3.32	\$76,190	\$0	\$762	\$9,905	\$14,824	\$24,728.71
SWRF Dam 2 (181-2003-Dam 2)	SWRF Dam 3 (181-2003-Dam 3)	HDPE	3,300	10	15	21	12	-	0	\$17.06	\$3.32	\$56,298	\$0	\$563	\$7,319	\$10,954	\$18,272.44
SWRF Dam 3 (181-2003-Dam 3)	Bullfrog pipeline	HDPE	220	6	15	21	12	-	0	\$10.52	\$2.00	\$2,314	\$0	\$23	\$301	\$440	\$740.96
Decant Pond #4	Booster Pump 2	HDPE	100	15	24	30	12	-	0	\$35.22	\$3.32	\$3,522	\$0	\$35	\$458	\$332	\$789.85
Booster Pump 2	Surge Tank	HDPE	1,936	15	24	30	12	-	0	\$35.22	\$3.32	\$68,194	\$0	\$682	\$8,865	\$6,426	\$15,291.43
Decant Pond #4	Reclaim Pond	HDPE	5,502	12	24	30	5	-	0	\$19.46	\$3.32	\$107,052	\$0	\$1,071	\$6,423	\$18,263	\$24,685.86
Magnetite Interceptor Trench	Magnetite Tailings Seepage Pond	HDPE	200	5	24	30	5	-	0	\$10.52	\$2.00	\$2,104	\$0	\$21	\$126	\$400	\$526.32
Magnetite Seepage Pond	Decant Pond #4	HDPE	1,188	4	24	30	12	-	0	\$7.54	\$1.43	\$8,959	\$0	\$90	\$1,165	\$1,697	\$2,862.14
Estrada Seep	Decant Pond #4	HDPE	3,470	3	24	30	5	-	0	\$7.54	\$1.43	\$26,169	\$0	\$262	\$1,570	\$4,958	\$6,528.17
Union Hill Adit Seep	Decant Pond #4	HDPE	5,250	2	24	30	5	-	0	\$7.54	\$1.43	\$39,592	\$0	\$396	\$2,376	\$7,501	\$9,876.91
Upper Creek Containment Pond #1	Surge Tank	HDPE	1,770	6	24	30	12	-	0	\$10.52	\$2.00	\$18,621	\$0	\$186	\$2,421	\$3,541	\$5,961.36
Upper Creek Containment Pond #1	Surge Tank	HDPE	1,770	8	24	30	12	-	0	\$14.33	\$2.00	\$25,363	\$0	\$254	\$3,297	\$3,541	\$6,837.86
Grape Gulch Pond #3	Surge Tank	HDPE	861	8	24	30	12	-	0	\$14.33	\$2.00	\$12,338	\$0	\$123	\$1,604	\$1,722	\$3,326.21
Blackman's Seep (Pond #2)	Upper Creek Containment Pond 1	HDPE	100	5	24	30	9	-	0	\$10.52	\$2.00	\$1,052	\$0	\$11	\$105	\$200	\$305.24
Surge Tank	Bullfrog pipeline *	HDPE	31,850	8	7	13	12	-	0	\$14.33	-	\$456,393	\$0	\$4,564	\$59,331	\$0	\$59,331.05
Surge Tank	Reclaim Pond	HDPE	3,923	15	24	30	9	-	0	\$28.72	\$3.32	\$112,664	\$0	\$1,127	\$11,266	\$13,022	\$24,287.98
Reclaim Pond	Surge Tank	HDPE	3,855	9	24	30	5	-	0	\$14.33	\$3.32	\$55,240	\$0	\$552	\$3,314	\$12,796	\$16,110.28
East WRF Containment	Decant Pond #4	HDPE	4,073	10	3	9	12	-	0	\$17.06	\$3.32	\$69,486	\$0	\$695	\$9,033	\$13,519	\$22,552.63
tailings pipeline flushing			,									. ,					. ,
Mill No 1	Tailings Impoundment Top	HDPE	6,850	21													
Mill No 2	Tailings Impoundment Top	HDPE	6.850	21													
*Bullfrog pipeline has an Industrial PM	MLU	11012	0,050	21								Direct Annual Costs: irect Cost Subtotals:	- \$0	\$11,416	- \$128 879	- \$114.136	- \$243.015
	MLU		0,000	21								Direct Annual Costs: irect Cost Subtotals:	- \$0	\$11,416 -	- \$128,879	- \$114,136	\$243,015
	MLU To	Line (ft)	Number of Poles	21	r Pole and	Direct Cost Wiring Installation (\$)	Number Transformer Stations	Direct Cost Transformer (\$)	Direct Cost Electrical Panel (\$)	Direct Cost New (\$)			- \$0 Direct Cost Removal (\$)	\$11,416 Direct Cost (\$)	- \$128,879	- \$114,136	\$243,015
Electrical Infrastructure From		Line	Number of	21	r Pole and	Wiring	Transformer	Direct Cost Transformer (\$) \$9,007	Electrical Panel		Direct Cost Maintenance	irect Cost Subtotals:	Direct Cost Removal		\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1)	То	Line (ft) 1,166	Number of Poles	f Removal Yea	r Pole and crossarm (\$)	Wiring Installation (\$)	Transformer		Electrical Panel (\$)	(\$)	Direct Cost Maintenance (\$/yr)	irect Cost Subtotals: Direct Cost Maintenance (\$)	Direct Cost Removal (\$)	Direct Cost (\$)	- \$128,879	- \$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2)	To SWRF Dam 2 (181-2003-Dam 2)	Line (ft) 1,166 3,300	Number of Poles	f Removal Yea	r Pole and crossarm (\$) \$25,510.38	Wiring Installation (\$) \$3,059.13	Transformer	\$9,007	Electrical Panel (\$) \$20,596	(\$) \$58,173	Direct Cost Maintenance (\$/yr) \$873	Direct Cost Maintenance (\$) \$11,343.69	Direct Cost Removal (\$) \$3,422	- Direct Cost (\$) \$14,766	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3)	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3)	Line (ft) 1,166	Number of Poles	f Removal Yea 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19	Transformer	\$9,007 \$9,007	Electrical Panel (\$) \$20,596 \$20,596	(\$) \$58,173 \$104,981	Direct Cost Maintenance (\$/yr) \$873 \$1,575	Direct Cost Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22	Direct Cost Removal (\$) \$3,422 \$8,949	Direct Cost (\$) \$14,766 \$29,421	\$128,879	- \$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank	Line (ft) 1,166 3,300 220	Number of Poles 13 34 4	f Removal Yea 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007	Electrical Panel (\$) \$20,596 \$20,596 \$20,596	(\$) \$58,173 \$104,981 \$38,030	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570	Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053	Direct Cost (\$) \$14,766 \$29,421 \$8,469	\$128,879	\$114,136	\$243,015
SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank	Line (ft) 1,166 3,300 220 2,036	Number of Poles 13 34 4	f Removal Yea 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596	(\$) \$58,173 \$104,981 \$38,030 \$78,116	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172	birect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank	Line (ft) 1,166 3,300 220 2,036	Number of Poles 13 34 4	f Removal Yea 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596	(\$) \$58,173 \$104,981 \$38,030 \$78,116	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172	birect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024	\$128,879	- \$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2) Surge Tank	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank s Office Area	Line (ft) 1,166 3,300 220 2,036 582	Number or Poles 13 34 4 22 7	f Removal Yea 12.0 12.0 12.0 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451	birect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2)	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank s Office Area Upper Creek Containment Pond 1	Line (ft) 1,166 3,300 220 2,036 582 1,770	Number or Poles 13 34 4 22 7	f Removal Yea 12.0 12.0 12.0 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$851	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2) Surge Tank Magnetite Tailings Seepage Pond Estrada Seep	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank s Office Area Upper Creek Containment Pond 1 Decant Pond #4	Line (ft) 1,166 3,300 220 2,036 582 1,770 1,188	Number or Poles 13 34 4 22 7	f Removal Yea 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$851 \$651	birect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2) Surge Tank Magnetite Tailings Seepage Pond Estrada Seep Union Hill Adit Seep	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank s Office Area Upper Creek Containment Pond 1 Decant Pond #4 Road	Line (ft) 1,166 3,300 220 2,036 582 1,770 1,188 500	Number or Poles 13 34 4 22 7	f Removal Yea 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80 \$1,907.36	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$851 \$651 \$418	Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$1,843 \$5,001 \$3,422 \$1,579	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2) Surge Tank Magnetite Tailings Seepage Pond	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank s Office Area Upper Creek Containment Pond 1 Decant Pond #4 Road Road	Line (ft) 1,166 3,300 220 2,036 582 1,770 1,188 500 727	Number or Poles 13 34 4 22 7	f Removal Yea 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0 5.0 5.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02 \$17,661.03	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80 \$1,907.36 \$12,021.37	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887 \$34,370	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$451 \$851 \$651 \$418 \$516	birect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87 \$3,093.30	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422 \$1,579 \$2,369	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089 \$5,462	\$128,879	\$114,136	\$243,015
Electrical Infrastructure From SWRF Dam 1 (181-2003-Dam 1) SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Decant Pond #4 Upper Creek Containment Pond #1, Grape Gulch Pond #3, and Blackman's Seep (Pond #2) Surge Tank Magnetite Tailings Seepage Pond Estrada Seep Union Hill Adit Seep East WRF Containment	To SWRF Dam 2 (181-2003-Dam 2) SWRF Dam 3 (181-2003-Dam 3) Road Surge Tank s Office Area Upper Creek Containment Pond 1 Decant Pond #4 Road Road Decant Pond #4	Line (ft) 1,166 3,300 220 2,036 582 1,770 1,188 500 727 4,582	Number or Poles 13 34 4 22 7	f Removal Yea 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0 5.0 5.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02 \$17,661.03 \$92,229.84	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80 \$1,907.36 \$12,021.37	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887 \$34,370 \$119,053	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$451 \$851 \$651 \$418 \$516 \$1,786	birect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87 \$3,093.30 \$23,215.30	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$1,843 \$5,001 \$3,422 \$1,579 \$2,369 \$12,371	Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089 \$5,462 \$35,587	\$128,879	\$114,136	\$243,015

Cobre Mining Company Water Management Worksheet #1 5/17/18

Cobre_WM_20180519.xlsx Reclamation and O&M Costs Sheet 1 Page 4 of 9

Cobre Mining Company Water Management Worksheet #2 5/17/18

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	Reporting (hour/sample)	Rate (\$/hour)	Review Work per Sample (hours)	Review Work Rate (\$/hour)	Reporting Cost (\$/sample)	Total Sample Cost (\$/sample)
0.14	\$ 60	\$ 9	\$ 239	\$ 248	1.0	0.5	\$ 60	0.1	\$ 70	\$ 100	\$ 348

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

Sampling Schedule and Cost

		Tailings			Stockpiles		In	ntercept We	ells		Sampling			Yearly
		Semi-			Semi-			Semi-		Total Well	Events	C	lost	Cost
Year	Quarterly	Annual	Annual	Quarterly	Annual	Annual	Quarterly	Annual	Annual	Locations	Per Year	(\$/sa	ample)	(\$)
0-5	1			4	•	•	2			7	4	\$	348	\$ 9,74
5 - 12		1			4			2		7	2	\$	348	\$ 4,87
12-99			1			4			2	7	1	\$	348	\$ 2,43
											Total Cos	st Year	s 0-99	\$ 297,19

Energy Labs Unit Rates:

23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab.com).

20 Constituents. Energy Eaborate	o, mo.,	Quoto	1110
Alkalinity Total as CaCO3	\$ 10.00		
Anions by Ion Chromatography	\$ 30.00		
Chloride			
Fluoride			
Sulfate			
Total Dissolved Solids	\$ 20.00		
Nitrogen - Nitrate+Nitrite as N	\$ 45.00		
Metals by ICP/ICPMS, total	\$ 160.00		
Aluminum			
Arsenic			
Cadmium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Magnesium			
Manganese			
Nickel			
Potassium			
Selenium			
Sodium			
Zinc			
Sample Prep	\$ 15.00		
	\$ 280	-	

Water Management Cash Flow

	Electricity, F	uel, and Environme		Costs Percentage Costs Percentage	17% 17%											
PONDS & TAN	Capital	O&M	PUMPS	Capital	Removal	Electricity and Fuel	O&M	PIPELINES	Capital	Removal	Maintenance	ELECTRIC	Removal N	TRUCTURE Maintenance	ENVIROMEN	ITAL SAMPLING
	Annual Cost	Annual Cost		Annual Cost	Annual Cost	Annual Cost	Annual Cost		Annual Cost	Annual Cost	Annual Cost		Annual Cost	Annual Cost		Annual Cost
Year	COSI	(\$)	Year	COSI	COSI	(\$)	(\$)	Year	COSI	COSI	(\$)	Year	COSI	(\$)	Year	(\$)
0	\$490,787	\$20,278	0	\$674,280	\$0		\$11,928	0	\$0	\$0		0	\$0	\$11,597	0	\$11,400
1	\$0	\$20,278	1	\$0	\$0		\$11,928	1	\$0	\$0		1	\$0	\$11,597	1	\$11,400
2	\$0	\$20,278	2	\$0	\$0		\$11,928	2	\$0	\$0 \$0		2	\$0	\$11,597	2	\$11,400
3	\$0 \$0	\$20,278 \$20,278	3	\$0 \$118,913	\$0 \$0	. ,	\$11,928 \$11,928	3	\$0 \$0	\$0 \$0		3	\$0 \$0	\$11,597 \$11,597	3	\$11,400 \$11,400
4 5	₄₀ \$177,136	\$20,278 \$20,278	4 5	\$52,850	ەن \$52,850	. ,	\$11,928 \$11,928	4 5	\$0 \$0	ەن \$56,347		4	۵ 0 \$9,456	\$11,597 \$11,597	4 5	\$5,700
6	\$0	\$20,278	6	\$02,000 \$0	¢02,000 \$0		\$9,308	6	\$0	¢00,047 \$0		6	\$0 \$0	\$9,742	6	\$5,700
7	\$0	\$20,278	7	\$0	\$0	\$1,958	\$9,308	7	\$0	\$0	\$10,663	7	\$0	\$9,742	7	\$5,700
8	\$0	\$20,278	8	\$0	\$0	. ,	\$9,308	8	\$0	\$0		8	\$0	\$9,742	8	\$5,700
9	\$0 \$0	\$20,278	9	\$0 \$0	\$19,819		\$9,308 \$7,050	9	\$0	\$16,963		9	\$0	\$9,742	9	\$5,700 \$5,700
10 11	\$0 \$0	\$20,273 \$20,273	10 11	\$0 \$0	\$0 \$0		\$7,952 \$7,952	10 11	\$0 \$0	\$0 \$0		10 11	\$0 \$0	\$9,742 \$9,742	10 11	\$5,700 \$5,700
12	\$0 \$0	\$20,273	12	\$0 \$0	₄₀ \$118,913		\$7,952 \$7,952	12	\$0 \$0	پ و 73,126		12	\$57,749	\$9,742 \$9,742	12	\$2,850
13	\$0	\$0	13	\$0	\$0 \$0		\$0 \$0	13	\$0	\$0		13	\$0 \$0	\$0	13	\$2,850
14	\$0	\$O	14	\$O	\$0		\$0	14	\$0	\$0	\$0	14	\$0	\$0	14	\$2,850
15	\$0	\$0	15	\$0	\$0		\$0	15	\$0	\$0		15	\$0	\$0	15	\$2,850
16	\$0	\$0	16	\$0	\$0		\$O	16	\$0	\$0 \$0		16	\$0	\$0	16	\$2,850
17	\$0 \$0	\$0 \$0	17	\$0 \$0	\$0 \$0		\$0 \$0	17	\$0 \$0	\$0 \$0		17	\$0 \$0	\$0 \$0	17	\$2,850 \$2,850
18 19	\$0 \$0	\$0 \$0	18 19	\$0 \$0	\$0 \$0		\$0 \$0	18 19	\$0 \$0	\$0 \$0		18 19	\$0 \$0	\$0 \$0	18 19	\$2,850 \$2,850
20	\$0 \$0	\$0 \$0	20	\$0 \$0	\$0 \$0		\$0 \$0	20	\$0 \$0	\$0 \$0		20	\$0 \$0	\$0 \$0	20	\$2,850
21	\$0	\$0	21	\$0	\$0		\$0	21	\$0	\$0		21	\$0	\$0	21	\$2,850
22	\$0	\$ 0	22	\$0	\$0	\$0	\$0	22	\$0	\$0	\$0	22	\$0	\$0	22	\$2,850
23	\$0	\$0	23	\$0	\$0		\$0	23	\$0	\$0		23	\$0	\$0	23	\$2,850
24	\$0	\$0	24	\$0	\$0 \$0		\$0	24	\$0	\$0 \$0		24	\$0	\$0	24	\$2,850
25 26	\$0 \$0	\$0 \$0	25 26	\$0 \$0	\$0 \$0		\$0 \$0	25 26	\$0 \$0	\$0 \$0		25 26	\$0 \$0	\$0 \$0	25 26	\$2,850 \$2,850
20	\$0 \$0	\$0 \$0	20	\$0 \$0	\$0 \$0		\$0 \$0	20	\$0 \$0	\$0 \$0		20	\$0 \$0	\$0 \$0	20 27	\$2,850 \$2,850
28	\$0	\$0	28	\$0	\$0	¢O	\$0 \$0	28	\$0	\$0		28	\$0	\$0	28	\$2,850
29	\$0	\$O	29	\$O	\$0		\$0	29	\$0	\$0		29	\$0	\$0	29	\$2,850
30	\$0	\$0	30	\$0	\$0		\$0	30	\$0	\$0		30	\$0	\$0	30	\$2,850
31	\$0	\$0	31	\$0	\$0 \$0		\$0	31	\$0	\$0 \$0		31	\$0	\$0	31	\$2,850
32 33	\$0 \$0	\$0 \$0	32 33	\$0 \$0	\$0 \$0		\$0 \$0	32 33	\$0 \$0	\$0 \$0		32 33	\$0 \$0	\$0 \$0	32 33	\$2,850 \$2,850
33	\$0 \$0	\$0 \$0	33	\$0 \$0	\$0 \$0		\$0 \$0	33	\$0 \$0	\$0 \$0		33	\$0 \$0	\$0 \$0	33	\$2,850 \$2,850
35	\$0	\$0	35	\$0	\$0		\$0 \$0	35	\$0	\$0		35	\$0	\$0	35	\$2,850
36	\$0	\$0	36	\$0	\$0		\$0	36	\$0	\$0		36	\$0	\$0	36	\$2,850
37	\$0	\$0	37	\$0	\$0	-	\$0	37	\$0	\$0		37	\$0	\$0	37	\$2,850
38	\$0	\$0	38	\$0	\$0 \$0		\$0	38	\$0	\$0 \$0		38	\$0	\$0	38	\$2,850
39 40	\$0 \$0	\$0 \$0	39 40	\$0 \$0	\$0 \$0		\$0 \$0	39 40	\$0 \$0	\$0 \$0		39 40	\$0 \$0	\$0 \$0	39 40	\$2,850 \$2,850
40	\$0 \$0	\$0 \$0	40	\$0 \$0	\$0 \$0		\$0 \$0	40	\$0 \$0	\$0 \$0		40	\$0 \$0	\$0 \$0	40	\$2,850 \$2,850
42	\$0	\$0	42	\$0	\$0		\$0	42	\$0	\$0		42	\$0	\$0	42	\$2,850
43	\$0	\$0	43	\$0	\$0	\$0	\$0	43	\$0	\$0	\$0	43	\$0	\$0	43	\$2,850
44	\$0	\$0	44	\$0	\$0		\$0	44	\$0	\$0		44	\$0	\$0	44	\$2,850
45	\$0 \$0	\$0 \$0	45	\$0	\$0 \$0		\$0 \$0	45	\$0	\$0 \$0		45	\$0	\$0	45	\$2,850
46 47	\$0 \$0	\$0 \$0	46 47	\$0 \$0	\$0 \$0		\$0 \$0	46 47	\$0 \$0	\$0 \$0		46 47	\$0 \$0	\$0 \$0	46 47	\$2,850 \$2,850
47	\$0 \$0	\$0 \$0	48	\$0 \$0	\$0 \$0		\$0 \$0	47 48	\$0 \$0	\$0 \$0		47	\$0 \$0	\$0 \$0	47	\$2,850 \$2,850
49	\$0	\$0	49	\$0	\$0		\$0 \$0	49	\$0	\$0		49	\$0	\$0	49	\$2,850
50	\$0	\$0	50	\$0	\$0		\$0	50	\$0	\$0	\$0	50	\$0	\$0	50	\$2,850
51	\$0	\$0	51	\$0	\$0		\$0	51	\$0	\$0	\$0	51	\$0	\$0	51	\$2,850
52	\$0 \$0	\$0 \$0	52	\$0 \$0	\$0 \$0		\$0 \$0	52	\$0 \$0	\$0 \$0		52	\$0 \$0	\$0 \$0	52	\$2,850 \$2,850
53 54	\$0 \$0	\$0 \$0	53	\$0 \$0	\$0 \$0		\$0 \$0	53	\$0 \$0	\$0 \$0		53	\$0 \$0	\$0 \$0	53 54	\$2,850 \$2,850
54 55	\$0 \$0	\$0 \$0	54 55	\$0 \$0	\$0 \$0		\$0 \$0	54 55	\$0 \$0	\$0 \$0		54 55	\$0 \$0	\$0 \$0	54 55	\$2,850 \$2,850
56	\$0 \$0	\$0 \$0	56	\$0 \$0	\$0 \$0		\$0 \$0	56	\$0 \$0	\$0 \$0		56	\$0 \$0	\$0 \$0	56	\$2,850 \$2,850
57	\$0	\$0	57	\$0	\$0		\$0	57	\$0	\$0		57	\$0	\$0	57	\$2,850
58	\$0	\$0	58	\$0	\$0	\$0	\$0	58	\$0	\$0	\$0	58	\$0	\$0	58	\$2,850
59	\$0	\$0	59	\$0	\$0	\$0	\$0	59	\$0	\$0	\$0	59	\$0	\$0	59	\$2,850

28.3%

Capital Indirect Costs Percentage

Cobre_WM_20180519.xlsx

Water Management Cash Flow Sheet 3

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Cobre Mining Company Water Management Worksheet #3 5/17/2018

Total Cash Flow (\$)

\$1,237,272 \$72,205 \$72,205

\$72,205 \$191,118 \$415,144 \$57,650

\$57,650 \$57,650 \$94,432

\$54,959 \$54,959

\$301,897 \$2,850

\$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

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\$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

\$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

Water Management Cash Flow

	Electricity, F	uel, and Environmenta	O&M Indired	t Costs Percentage t Costs Percentage t Costs Percentage	28.3% 17% 17%			
PONDS & TAN	KO		PUMPS					PIPELINES
Year	Capital Annual Cost	O&M Annual Cost (\$)	Year	Capital Annual Cost	Removal Annual Cost	Electricity and Fuel Annual Cost (\$)	O&M Annual Cost (\$)	Year
60	\$0	(\$) \$0	60	\$0	\$0		(\$) \$0	60
61	\$0 \$0	\$0 \$0	61	\$0 \$0	\$0 \$0		\$0 \$0	61
62	\$0	\$0	62	\$0 \$0	\$0	\$0 \$0	\$0 \$0	62
63	\$0	\$0	63	\$0 \$0	\$0	\$0 \$0	\$0	63
64	\$0	\$0	64	\$0 \$0	\$0	\$0 \$0	\$0	64
65	\$0	\$0	65	\$0	\$0	\$0	\$0	65
66	\$0	\$0	66	\$0	\$0	\$0 \$0	\$0	66
67	\$0	\$0	67	\$0	\$0	\$0	\$0	67
68	\$0	\$0	68	\$0	\$0	\$0	\$0	68
69	\$0	\$0	69	\$0	\$0	\$0	\$0	69
70	\$0	\$0	70	\$0	\$0	\$0	\$0	70
71	\$0	\$0	71	\$0	\$0	\$0	\$0	71
72	\$0	\$0	72	\$0	\$0	\$0	\$0	72
73	\$0	\$0	73	\$0	\$0	\$0	\$0	73
74	\$0	\$O	74	\$0	\$0	\$O	\$0	74
75	\$0	\$O	75	\$0	\$0	\$O	\$0	75
76	\$0	\$ 0	76	\$0	\$0	\$0	\$0	76
77	\$0	\$ 0	77	\$0	\$0	\$0	\$0	77
78	\$0	\$0	78	\$0	\$0	\$ 0	\$0	78
79	\$0	\$0	79	\$0	\$0	\$0	\$0	79
80	\$0	\$0	80	\$0	\$0	\$0	\$0	80
81	\$0	\$ 0	81	\$0	\$0	\$0	\$0	81
82	\$0	\$ 0	82	\$0	\$0	\$0	\$0	82
83	\$0	\$ 0	83	\$0	\$0	\$0	\$0	83
84	\$0	\$ 0	84	\$0	\$0	\$0	\$0	84
85	\$0	\$0	85	\$0	\$0	\$0	\$0	85
86	\$0	\$0	86	\$0	\$0	\$0	\$0	86
87	\$0	\$0	87	\$0	\$0	\$0	\$0	87
88	\$0	\$0	88	\$0	\$0	\$ 0	\$0	88
89	\$0	\$0	89	\$0	\$0	\$0	\$0	89
90	\$0	\$0	90	\$0	\$0	\$0	\$0	90
91	\$0	\$0	91	\$0	\$0	\$0	\$0	91
92	\$0	\$0	92	\$0	\$0	\$0	\$0	92
93	\$0	\$0	93	\$0	\$0	\$0	\$0	93
94	\$0	\$0	94	\$0	\$0	\$0	\$0	94
95	\$0	\$0	95	\$0	\$0	\$0	\$0	95
96	\$0	\$0 \$0	96	\$0	\$0 \$0	\$0 \$0	\$0	96
97	\$0 \$0	\$0 \$0	97	\$0	\$0 \$0	\$0 \$0	\$0 \$0	97
98	\$0 \$0	\$0 \$0	98	\$0	\$0	\$0 \$0	\$0 \$0	98
99 Tatal Cast	\$0	\$0 \$000 500	99	\$0	\$0	\$0 \$0	\$0 \$100 050	99
Total Cost	\$667,923	\$263,599		\$846,044	\$191,583	\$35,578	\$132,658	
al Direct Cost	\$520,595	\$225,298		\$659,426	\$149,324	\$30,408	\$113,383	
	Total Cost	\$2.987.307						

Total Cost Total Direct Cost

\$2,987,307 \$2,408,782

> Cobre_WM_20180519.xlsx Water Management Cash Flow Sheet 3 Page 7 of 9

Cobre Mining Company Water Management Worksheet #3 5/17/2018

Total

Cash

Flow (\$)

> \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

> \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

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\$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,987,307

-

			ELECTRIC		STRUCTURE	ENVIROME	NTAL SAMPL	ING
Capital	Removal	Maintenance			Maintenance		A	
Annual Cost	Annual Cost	Annual Cost		Annual Cost	Annual Cost		Annual Cost	
Cost	Cost	(\$)	Year	Cost	(\$)	Year	(\$)	
\$0	0.9			\$0	(\psi) \$0	60	(¥) \$2,850	
\$0 \$0	\$0 \$0		60 61	\$0 \$0	\$0 \$0	61	\$2,850 \$2,850	
\$0 \$0	\$0 \$0		62	\$0 \$0	\$0 \$0	62	\$2,850 \$2,850	
\$0 \$0	\$0 \$0		63	\$0 \$0	\$0 \$0	63	\$2,850 \$2,850	
\$0 \$0	\$0 \$0		64	\$0 \$0	\$0 \$0	64	\$2,850 \$2,850	
\$0 \$0	\$0 \$0		65	\$0 \$0	\$0 \$0	65	\$2,850	
\$0 \$0	\$0 \$0		66	\$0 \$0	\$0 \$0	66	\$2,850	
\$0	\$0 \$0		67	\$0	\$0	67	\$2,850	
\$0	\$0 \$0		68	\$0	\$0	68	\$2,850	
\$0	\$0		69	\$0	\$0	69	\$2,850	
\$0	\$0		70	\$0	\$0	70	\$2,850	
\$0	\$0		71	\$0	\$0	71	\$2,850	
\$0	\$0		72	\$0	\$0	72	\$2,850	
\$0	\$0		73	\$0	\$0	73	\$2,850	
\$0	\$0		74	\$0	\$0	74	\$2,850	
\$0	\$0		75	\$0	\$0	75	\$2,850	
\$0	\$0		76	\$0	\$0	76	\$2,850	
\$0	\$0		77	\$0	\$0	77	\$2,850	
\$0	\$0		78	\$0	\$0	78	\$2,850	
\$0	\$0		79	\$0	\$0	79	\$2,850	
\$0	\$0	\$0	80	\$0	\$0	80	\$2,850	
\$0	\$0	\$0	81	\$0	\$0	81	\$2,850	
\$0	\$0	\$0	82	\$0	\$0	82	\$2,850	
\$0	\$0	\$0	83	\$0	\$0	83	\$2,850	
\$0	\$0		84	\$0	\$0	84	\$2,850	
\$0	\$0		85	\$0	\$0	85	\$2,850	
\$0	\$0		86	\$0	\$0	86	\$2,850	
\$0	\$0		87	\$0	\$0	87	\$2,850	
\$0	\$0		88	\$0	\$0	88	\$2,850	
\$0	\$0		89	\$0	\$0	89	\$2,850	
\$0	\$0		90	\$0	\$0	90	\$2,850	
\$0	\$0		91	\$0	\$0	91	\$2,850	
\$O	\$0		92	\$0	\$O	92	\$2,850	
\$0	\$0		93	\$0	\$0	93	\$2,850	
\$0	\$0 \$0		94	\$0	\$0	94	\$2,850	
\$0	\$0 \$0		95	\$0	\$0	95	\$2,850	
\$0	\$0 \$0		96	\$0	\$0	96	\$2,850	
\$0 \$0	\$0 \$0		97	\$0	\$0	97	\$2,850	
\$0 \$0	\$0 \$0		98	\$0 \$0	\$0 \$0	98	\$2,850 \$2,850	
\$0 \$0	\$0 \$146 427		99	\$0 \$67.205	\$0 \$127 778	99	\$2,850 \$247,715	
\$0 \$0	\$146,437 \$114,136			\$67,205 \$52,281	\$137,778 \$117,750		\$347,715 \$207,102	
\$0	\$114,136	\$128,879		\$52,381	\$117,759		\$297,192	

Water Management Summary

Cobre Mining Company

Based on Projected 201 DIRECT COSTS	9 Mine Plan	Curr	ent Value	
	Capital		\$1,495,862	
	Operations and Maintenance		\$585,319	
Capital				
INDIRECT COSTS ¹	Mobilization and Demobilization	3.8%	\$56,843	
	Contingencies	4.0%	\$59,834	
	Engineering Redesign Fee	2.5%	\$37,397	
	Contractor Profit and Overhead	15.0%	\$224,379	
	Project Management Fee	3.0%	\$44,876	
	State Procurement Cost	0.0%	\$0	
	Indirect Percentage Sum =	28.3%		
	Subtotal, Indirect Costs		\$423,329	
Operations and Mainte	enance			
INDIRECT COSTS ¹	Mobilization and Demobilization	0.0%	\$0	
	Contingencies	4.0%	\$23,413	
	Engineering Redesign Fee	0.0%	\$0	
	Contractor Profit and Overhead	10.0%	\$58,532	
	Project Management Fee	3.0%	\$17,560	
	State Procurement Cost	0.0%	\$0	
	Indirect Percentage Sum =	17.0%		
	Subtotal, Indirect Costs		\$99,504	
ELECTRICITY, FUEL,	AND SAMPLING		\$383,292	
TOTAL COST			\$2,987,307	
New Mexic OSM. 2000. U.S. Depa	Plan Guidelines for Existing Mines, Mining Act Reclam co Energy, Minerals and Natural Resources Departmer artment of the Interior, Office of Surface Mining Reclam for Calculation of Reclamation Bond Amounts. April 5	nt. April 30, 199 nation and Enfo	96.	sion

Notes:

1)

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

Water Management Summary

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost
Capital and Replacement		28.3%	
Ponds and Tanks	\$520,594.94	\$147,328	\$667,923
Pumps	\$659,426.27	\$186,618	\$846,044
Pipelines	\$0.00	\$0	\$0
Electrical	\$0.00	\$0	\$0
Subtotal	\$1,180,021.20	\$333,946	\$1,513,967
Removal ¹		28.3%	
Pumps	\$149,324.06	\$42,259	\$191,583
Pipelines	\$114,136.15	\$32,301	\$146,437
Electrical	\$52,380.78	\$14,824	\$67,205
Subtotal	\$315,840.98	\$89,384	\$405,225
Operations and Maintenance		17%	
Ponds and Tanks	\$225,298.15	\$38,301	\$263,599
Pumps	\$113,383.30	\$19,275	\$132,658
Pipelines	\$128,879.24	\$21,909	\$150,788
Electrical Infrastructure	\$117,758.66	\$20,019	\$137,778
Materials		17%	
Electricity and Fuel	\$30,408.18	\$5,169	\$35,578
Environmental Sampling	\$297,192.00	\$50,523	\$347,715
Subtotal	\$912,919.54	\$155,196	\$1,068,116
Total Estimated Cost	\$2,408,781.72	\$579,000	\$2,987,308

¹Removal costs for ponds and tanks is included in the earthwork portion of the cost estimate.

Cobre Haul Road Reclamation Cost Estimate



Cobre Haul Road Worksheet #1 5/17/2018

General Information

Applicant	Cobre Mining Company Hanover, New Mexico 88401	
Disturbed Surface Area (acres)	100	
Type of Operation	Existing/Surface/Copper	
Current value	\$555,764	Cobre Haul Road

Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #1 Page 1 of 22

Facility and Structure Modification

Item Corrugated Metal Culverts Removal	Activity Culvert north of highway 152 crossing	Quantity 883	Unit ft	Unit Cost (\$/unit) \$10.64	Item Cost (\$) \$9,395	Reference R.S. Means
	Wildlife Friendly Livestock Fence Perimeter Modification	38,700	ft	\$0.24	\$9,351	Engineering Judgment

CHR

Facility and Structure Modification Total Direct Cost: \$18,746

Data Sources: RS Means Heavy Construction Cost Data (32nd Annual Edition 2018)

Location adjustment: New Mexico Las Cruces

85.6%

Cobre Haul Road Worksheet #2 5/17/2018

Means Line Item Description Excludes excavation, CMP steel 48" to 60" 024113.40-0190

-

Replace half staples/clips, add flagging or other markers or other wildlife friendly modifications, and replace or crimp 2 of the 4 to 5 strands of barb wire. This updated estimate relies on quotes available from Alberqurque 2013 Barb wire fence average installation based on ProMatcher cost reports and University of Iowa Study on fencing costs, and no longer calculates separate overhead and profit (estimated at 28.3%), individual labor rate (\$25.34/ hr at 1 hour/100 feet of fence) or materials.

Material Handling Plan Summary Sheet

Item Description	Location 1	Location 2	Total Haul/Push Distance (ft)	Grade (%)	Equipment
1100 Pushdown Outslope	CHR Outslopes Pushdown 2.5:1	-	47	see dozer	D11T
1101 Pushdown Outslope	CHR Outslopes Pushdown 2.5:1 BLM Managed Land	-	47	see dozer	D11T
1102 Dozer Assist	CHR Outslopes Pullback with Excavator to 2.5:1	CHR Road Surface	-	see dozer	D11T
1103 Dozer Assist	CHR Outslopes Pullback to 2.5:1	1 dozer CHR Road Surafce, 1 dozer CHR slope	-	see dozer	D11T
1104 Dozer Assist	CHR Outslopes Pullback to 2:1	1 dozer CHR Road Surafce, 1 dozer CHR slope	-	see dozer	D11T
1105 Dozer Assist	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	1 dozer CHR Road Surafce, 1 dozer CHR slope	-	see dozer	D11T
1106 Dozer Assist	Hanover Creek and Forest Service Road Crossing Spanning Arch	1 dozer CHR Road Surafce, 1 dozer CHR slope	-	see dozer	D11T
1200 Excavate/Pullback Material	CHR Outslopes Pullback with Excavator to 2.5:1	-		Hitachi Z	AXES 200LC-3
1201 Excavate Fill	Hanover Creek and Forest Service Road Crossing Spanning Arch	-		Hitachi Z	AXES 200LC-3
1202 Excavate Concrete	Hanover Creek and Forest Service Road Crossing Spanning Arch	-		Hitachi Z	AXES 200LC-3
1300 Load pullback material	CHR Outslopes Pullback to 2.5:1	-			992K
1301 Load pullback material	CHR Outslopes Pullback to 2:1	-			992K
1302 Load pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	-			992K
1400 Haul excavated soil	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface	5,280	see Trucks	Cat 793 truck
1401 Haul concrete	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface	5,280	see Trucks	Cat 793 truck
1402 Haul pullback material	CHR Outslopes Pullback to 2.5:1	CHR Road Surface	2,640	see Trucks	Cat 793 truck
1403 Haul pullback material	CHR Outslopes Pullback to 2:1	CHR Road Surface	2,640	see Trucks	Cat 793 truck
1404 Haul pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	CHR Road Surface	2,640	see Trucks	Cat 793 truck
1500 Grade surface	CHR footprint	-	,		16M
1501 Grade surface	CHR footprint BLM Managed Land	<u>-</u>			16M
1600 Off-Hwy Water Tanker Truck					6,000 gal

Cobre Haul Road Worksheet #3 5/17/2018

Earthwork Quantity Worksheet

Item	Description	Location 1	Location 2	Area (ac)	Bank/stockpile Volume (bcy)	Swell Factor (%)	Loose/stockpile Volume (Icy)
1100 Pushdov	wn Outslope	CHR Outslopes Pushdown 2.5:1	_		21,419	15%	24,632
1101 Pushdov	wn Outslope	CHR Outslopes Pushdown 2.5:1 BLM Managed Land	-		2,806	15%	3,227
1102 Dozer A	Assist	CHR Outslopes Pullback with Excavator to 2.5:1	CHR Road Surface		28,322	15%	32,571
1103 Dozer A	Assist	CHR Outslopes Pullback to 2.5:1	1 dozer CHR Road Surafce, 1 dozer CHR slope		27,862	15%	32,041
1104 Dozer A	Assist	CHR Outslopes Pullback to 2:1	1 dozer CHR Road Surafce, 1 dozer CHR slope		67,453	15%	77,571
1105 Dozer A	Assist	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	1 dozer CHR Road Surafce, 1 dozer CHR slope		8,125	15%	9,344
1106 Dozer A	Assist	Hanover Creek and Forest Service Road Crossing Spanning Arch	1 dozer CHR Road Surafce, 1 dozer CHR slope		5,731	15%	6,591
1200 Excavat	te/Pullback Material	CHR Outslopes Pullback with Excavator to 2.5:1	-		28,322	15%	32,571
1201 Excavat	te Fill	Hanover Creek and Forest Service Road Crossing Spanning Arch	-		5,731	15%	6,591
1202 Excavat	te Concrete	Hanover Creek and Forest Service Road Crossing Spanning Arch	-		672	60%	1,076
1300 Load pu	ullback material	CHR Outslopes Pullback to 2.5:1	-		27,862	15%	32,041
1301 Load pu	ullback material	CHR Outslopes Pullback to 2:1	-		67,453	15%	77,571
1302 Load pu	ullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	-		8,125	15%	9,344
1400 Haul exc	cavated soil	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface		5,731	15%	6,591
1401 Haul cor	ncrete	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface		672	60%	1,076
1402 Haul pul	Ilback material	CHR Outslopes Pullback to 2.5:1	CHR Road Surface		27,862	15%	32,041
1403 Haul pul	Ilback material	CHR Outslopes Pullback to 2:1	CHR Road Surface		67,453	15%	77,571
1404 Haul pul	Ilback material	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	CHR Road Surface		8,125	15%	9,344
1500 Grade s	surface	CHR footprint	-	91			
1501 Grade s 1600 Off-Hwy	surface / Water Tanker Truck	CHR footprint BLM Managed Land	-	9			

Cobre Haul Road Worksheet #4 05/17/18

Productivity and Hours Required for Dozer Use---Earthmoving

Task Description

Location 1

Location 2

CHR Outslopes Pushdown 2.5:1 Pushdown Outslope CHR Outslopes Pushdown 2.5:1 BLM Managed Land Pushdown Outslope CHR Outslopes Pullback with Excavator to 2.5:1 Dozer Assist CHR Outslopes Pullback to 2.5:1 Dozer Assist CHR Outslopes Pullback to 2:1 Dozer Assist Dozer Assist CHR Outslopes Pullback to 2.5:1 BLM Managed Land Hanover Creek and Forest Service Road Crossing Spanning Arch Dozer Assist

CHR Road Surface

-

-

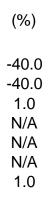
- 1 dozer CHR Road Surafce, 1 dozer CHR slope
- 1 dozer CHR Road Surafce, 1 dozer CHR slope
- 1 dozer CHR Road Surafce, 1 dozer CHR slope
- 1 dozer CHR Road Surafce, 1 dozer CHR slope

PERFORMANCE FACTORS Total Direct Production Maximum Method/ Task Push Drive Loose Soil Normal Work Material Grade Weight Equipment Volume Productivity Time* Blade Distance Production Operator Hour Visibility Elevation Trans. (cy) (cy/hr) (cy/hr) (hours) Factor Factor (lb/cy) Factor (feet) Factor (min/hr) Factor Factor Factor D11T 24,632 7,223 1.0 1.80 3,300 1.20 47 5758 1.00 50 1.00 1.00 1.00 3 D11T 3,227 7,223 1.0 1.80 1.20 47 5758 1.00 50 1.00 0 3,300 1.00 1.00 D11T 16 1.0 100 50 32,571 2,051 0.98 3,300 1.20 3002 1.00 1.00 1.00 1.00 D11T N/A N/A 30 N/A 72 D11T N/A D11T N/A N/A N/A N/A N/A N/A N/A N/A 9 N/A N/A N/A 6,591 3002 1.00 1.00 1.00 D11T 2,051 100 50 3 1.0 0.98 3,300 1.20 1.00

Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #5 Page 5 of 22

Cobre Haul Road Worksheet #5 05/17/18

Grade



Productivity and Hours Required for Dozer Use---Grading

							Task			Soil	Production Method/	Effective Blade		Work			Direct Drive			Maximum Push	Normal
Task Description Location 1	Location 2	Equipment	Volume			Productivity	Time	Material		Weight		Width	Speed	Hour	Visibility	Elevation		Grade	Operator	Distance	Production
			(cy)	(acres)	(acres/hr)	(cy/hr)	(hours)		Factor	(lb/cy)		(feet)	(miles/hr)	(11111/111)				(%)		(feet)	(cy/hr)
Grade surface CHR footprint	-	16M	-	91	2.5		37	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	1.0	0.75	-	
Grade surface CHR footprint BLM Managed Land	-	16M	-	9	2.5		4	1.0	1.0	3,300	1.2	16	2.50	50	1	1	1	1.0	0.75	-	

*Push distances: Assumed 100 feet.

Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #6 Page 6 of 22

PERFORMANCE FACTORS

Cobre Haul Road Worksheet #7 05/17/18

Productivity and Hours Required for Ripper-Equipped Dozer Use

Note: Scarifying/Ripping Covered Areas Currently Included in Revegetation Costs This page intentionally left blank.

> Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #7 Page 7 of 22

Productivity and Hours Required for Hydraulic Excavator

								PERFOR	MANCE F	ACTORS						
Task Description	Location 1	Equipment	Volume	Net Bucket Capacity	Cycle Time*	Productivity	Task Time	Heaped Bucket Capacity	Bucket Fill Factor	Soil Weight	Load Bucket	Swing	•	0	Efficiency Factor	Work Hour
		Equipment	(cy)	(cy)	(min)	(cy/hr)	(hours)		1 40101	(lb/cy)	(min)	(min)	(min)	(min)	1 40101	(min/hr)
Excavate/Pullback Material	CHR Outslopes Pullback with Excavator to 2.5:1	Hitachi ZAXES 200LC-3	32,571	1.00	0.23	196	166	1.18	0.85	3,300	0.09	0.06	0.03	0.05	0.9	50
Excavate Fill Excavate Concrete	Hanover Creek and Forest Service Road Crossing Spanning Arch Hanover Creek and Forest Service Road Crossing Spanning Arch	Hitachi ZAXES 200LC-3 Hitachi ZAXES 200LC-3	6,591 1,076	1.00 1.00	0.23 0.25	196 181	34 6	1.18 1.18	0.85 0.85	3,300 4,050	0.09 0.11	0.06 0.06	0.03 0.03	0.05 0.05	0.9 0.9	50 50

*Sum of Load, Swing, Dump, Swing of Bucket

Cobre Haul Road Worksheet #8 05/17/18

Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #8 Page 8 of 22

Productivity and Hours Required for Truck Use

<u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

								PERFC	ORMANCE F	ACTORS												
					Truck	Optimum	n				Loader or Excavator	r Total	Haul	Haul	Haul	Haul	Haul	Haul		Haul	Haul	Haul
					Cycle	No. of		Task	Struck	Heaped	Cycles	Haul	Distance	Distance	Distance	Grade	Grade	Grade	Rolling	Distance	Distance	Distance
Task Description	Location 1*	Location 2	Equipment	Volume	Time	Trucks	Productivity	Time	Capacity	Capacity	per Truck	Distance	Segment 1	Segment 2	Segment 3	Segment 1	Segment 2	Segment 3	Resistance	Segment 1	Segment 2	Segment
				(cy)	(min)		(cy/hr)	(hrs)	(cy)	(cy)		(feet)	(feet)	(feet)	(feet)	(%)	(%)	(%)	(%)	(meters)	(meters)	(meters)
Haul excavated soil	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface	Cat 793 truck	6,591	48.9	1	172	38	126	169	168	5,280	5,280	-	-	7.0%	-	-	2.5%	1,609	0	0
Haul concrete	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface	Cat 793 truck	1,076	52.2	1	161	7	126	169	168	5,280	5,280	-	-	7.0%	-	-	2.5%	1,609	0	0
Haul pullback material	CHR Outslopes Pullback to 2.5:1	CHR Road Surface	Cat 793 truck	32,041	13.8	2	1,216	30	126	169	12	2,640	2,640	-	-	7.0%	-	-	2.5%	805	0	0
Haul pullback material	CHR Outslopes Pullback to 2:1	CHR Road Surface	Cat 793 truck	77,571	13.8	2	1,216	72	126	169	12	2,640	2,640	-	-	7.0%	-	-	2.5%	805	0	0
Haul pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	CHR Road Surface	Cat 793 truck	9,344	13.8	2	1,216	9	126	169	12	2,640	2,640	-	-	7.0%	-	-	2.5%	805	0	0

Productivity and Hours Required for Truck Use

<u>Truck-Loader Matching</u> Truck Loading Height (empty), Cat 777F - 14'7" Loader Dump Clearance, Cat 992G - 15'3"

Task Description	Location 1*	Location 2	Haul Effective Grade Segment 1 (%)	Haul Effective Grade Segment 2 (%)	Haul Effective Grade Segment 3 (%)	Return Effective Grade Segment 1 (%)	Grade	Grade	Haul Time (min)	Return Time (min)	Loading Time (min)	Load/ Maneuver Time (min)	Dump/ Maneuver Time (min)	r Work Hour (min/hr)	Travel Time Loaded Segment 1 (min/m)	Travel Time Loaded Segment 2 (min/m)	Travel Time Loaded Segment 3 (min/m)	Travel Time Empty Segment 1 (min/m)	Travel Time Empty Segment 2 (min/m)	Travel Time Empty Segment 3 (min/m)
Haul excavated soil	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface	10%	0%	0%	0%	0%	0%	6.7	1.8	38.6	0.7	1.1	50	0.00414	0.00110	0.00110	0.00110	0.00110	0.00110
Haul concrete	Hanover Creek and Forest Service Road Crossing Spanning Arch	CHR Road Surface	10%	0%	0%	0%	0%	0%	6.7	1.8	42.0	0.7	1.1	50	0.00414	0.00110	0.00110	0.00110	0.00110	0.00110
Haul pullback material	CHR Outslopes Pullback to 2.5:1	CHR Road Surface	10%	0%	0%	0%	0%	0%	3.3	0.9	7.8	0.7	1.1	50	0.00414	0.00110	0.00110	0.00110	0.00110	0.00110
Haul pullback material	CHR Outslopes Pullback to 2:1	CHR Road Surface	10%	0%	0%	0%	0%	0%	3.3	0.9	7.8	0.7	1.1	50	0.00414	0.00110	0.00110	0.00110	0.00110	0.00110
Haul pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed Land	CHR Road Surface	10%	0%	0%	0%	0%	0%	3.3	0.9	7.8	0.7	1.1	50	0.00414	0.00110	0.00110	0.00110	0.00110	0.00110

Productivity for Front End Loader

Task Description	Location 1	Location 2	Equipment	Volume (cy)	Net Bucket Capacity (cy)	Loader Cycle Time (min)	Productivity (cy/hr)	Task Time (hours)
Load pullback material	CHR Outslopes Pullback to 2.5:1	-	992K	32,041	14	0.65	1,077	30
Load pullback material	CHR Outslopes Pullback to 2:1		992K	77,571	14	0.65	1,077	72
Load pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed		992K	9,344	14	0.65	1,077	9

Cobre Haul Road Worksheet #10 5/17/2018

PERFORMANCE FACTORS

Rated	Bucket	
Bucket	Fill	Work
Capacity	Factor	Hour
(cy)		(min/hr)
16	0.875	50
16	0.875	50
16	0.875	50

Cobre Haul Road Worksheet #11 05/17/18

Productivity and Hours Required for Scraper Use

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Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #11 Page 12 of 22 Productivity and Hours Required for Motor grader Use---Grading

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Cobre Haul Road Worksheet #12 5/17/2018

Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #12 Page 13 of 22

Summary Calculation of Earthmoving Costs

Equipment Type	Task	Location 1	Location 2	Owning and Operating Cost (\$/hr)	Labor Cost (\$/hr)	Number of Units (Equipment)	Time Req'd (hrs)	Direct Cost (\$)	Total Pro Production Un	
Dozers-Earthmov Cat D11T	Ing Pushdown Outslope	CHR Outslopes Pushdown 2.5:1	-	\$414.50	\$26.29	1	3.4	\$1,503	24,632 cy	0.06
Cat D11T	Pushdown Outslope	CHR Outslopes Pushdown 2.5:1 BLM Managed I	l -	\$414.50	\$26.29		0.4	\$197	3,227 cy	0.06
Cat D11T	Dozer Assist	CHR Outslopes Pullback with Excavator to 2.5:1		\$414.50	\$26.29		15.9	\$7,001	32,571 cy	0.21
Cat D11T	Dozer Assist	CHR Outslopes Pullback to 2.5:1	1 dozer CHR Road Sura		\$26.29		29.8	\$26,229	32,041 cy	0.82
Cat D11T	Dozer Assist	CHR Outslopes Pullback to 2:1	1 dozer CHR Road Sura	•	\$26.29		72.0	\$63,500	77,571 cy	0.82
Cat D11T	Dozer Assist	CHR Outslopes Pullback to 2.5:1 BLM Managed			\$26.29		8.7	\$7,649	9,344 cy	0.82
Cat D11T	Dozer Assist	Hanover Creek and Forest Service Road Crossin			\$26.29		3.2	\$2,833	6,591 cy	0.43
Dozers-Grading					·					
Cat 16M	Grade surface	CHR footprint	-	\$133.94	\$26.29	1	36.6	\$5,871	91.0 ac	64.51
Cat 16M	Grade surface	CHR footprint BLM Managed Land	-	\$133.94	\$26.29		3.6	\$581	9.0 ac	64.51
Excavators										
	-3 Excavate/Pullback Material	CHR Outslopes Pullback with Excavator to 2.5:1	-	\$62.57	\$28.37	1	166	\$15,094	32,571 cy	0.46
Hitachi ZAXES 200LC		Hanover Creek and Forest Service Road Crossin		\$62.57	\$28.37	1	34	\$3,054	6,591 cy	0.46
	-3 Excavate Concrete	Hanover Creek and Forest Service Road Crossin		\$62.57	\$28.37	1	6	\$542	1,076 cy	0.50
				+	<i> </i>	-	-	+ • · -	.,	
Loaders				•	•			• • • • •		
992K	Load pullback material	CHR Outslopes Pullback to 2.5:1	-	\$294.35	\$23.84		30	\$9,467	32,041 cy	0.30
992K	Load pullback material	CHR Outslopes Pullback to 2:1	-	\$294.35	\$23.84		72	\$22,919	77,571 cy	0.30
992K	Load pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed	-	\$294.35	\$23.84	1	9	\$2,761	9,344 cy	0.30
Trucks										
Cat 793 truck	Haul excavated soil	Hanover Creek and Forest Service Road Crossir	CHR Road Surface	\$478.45	\$23.84	1	38	\$19,201	6,591 cy	2.91
Cat 793 truck	Haul concrete	Hanover Creek and Forest Service Road Crossir	CHR Road Surface	\$478.45	\$23.84	1	7	\$3,349	1,076 cy	3.11
Cat 793 truck	Haul pullback material	CHR Outslopes Pullback to 2.5:1	CHR Road Surface	\$478.45	\$23.84	2	30	\$29,888	32,041 cy	0.93
Cat 793 truck	Haul pullback material	CHR Outslopes Pullback to 2:1	CHR Road Surface	\$478.45	\$23.84		72	\$72,359	77,571 cy	0.93
Cat 793 truck	Haul pullback material	CHR Outslopes Pullback to 2.5:1 BLM Managed	CHR Road Surface	\$478.45	\$23.84		9	\$8,716	9,344 cy	0.93
Water Truck and	Grader									
	Tanker Truck,6,000-gal.			\$86.99	\$23.84	1	102	\$11,281		
Cat 14M	Tanker Truck,0,000-gai.			\$99.13	\$26.29		102	\$12,766		
	Tanker Truck,6,000-gal.			\$86.99	\$23.84		9	\$962		
Cat 14M	Tariker Truck,0,000 gai.			\$99.13	\$26.29		9	\$1,088		
	is a water truck running 1 hour	twice a day when the dozers are running over an 8	3 hour work dav.	\$00.10	φ 20 .20	·	Ũ	ψ1,000		
	j i	,	-	Forest Service Roa	d Crossing S	panning Arch	Demolition	\$28,980		
						Regrade	Outslopes	\$247,961		
				Re	egrade Outslo	opes BLM Man	aged Land	\$19,322		
					5	•	rface CHR	\$5,871		
				Gr	ade Surface (CHR BLM Man		\$581		
							uck/grader	\$24,046		
				۱۸/	ator Truck/or	ader BLM Man	•	\$2,050		
				٧V	ater muchyl		-			
						Earthwork D		\$328,810		

Cobre Haul Road Worksheet #13 05/17/18

					Fuel	
			Ownir	ig and	Adjusted	
EQUIPMENT	Fuel	Fuel	Operati	ng Cost	t Own/Op	
	Consumption	Cost	(w/ou	t fuel)	Cost	
Equipment Description	(gal/hr)	(\$/hr)	(\$/	hr)	(\$/hr)	Reference
Cat D11T	29.8	\$63.77	\$35).73	\$414.50	1
Cat D11T Bulldozer w/ multi shank ripper	29.8	\$63.77	\$38	5.12	\$448.89	1
Hitachi ZAXES 200LC-3	6.7	\$14.31	\$48	.26	\$62.57	1
Cat 793 truck	47.8	\$102.37	\$37	6.08	\$478.45	1
Cat 992K Loader	25.6	\$54.94	\$23	9.41	\$294.35	1
Cat 16M Motor Grader	9.5	20.37	113	.57	\$133.94	1
Cat 14M	8.3	\$17.76	\$81	.37	\$99.13	1
Off-Hwy Water Tanker Truck,6,000-gal.	11.3	\$24.12	\$62	.87	\$86.99	1
FUEL						
Oil Broker Quote			\$	2 14	per gallon	2
			Ψ	_	Nominal	-
LABOR					Total	
	NMDOL Type A	NMDOL Type A			Rate	
Labor Description	Operator Group	Operator Classif	ication		(\$/hr)	
Cat D11T CD Bulldozer	Equipment Operator IV	/ Bulldozer (mult.	Units)		\$26.29) 4
Cat D11T Bulldozer w/ multi shank ripper	Equipment Operator I	•	•		\$26.29) 4
Hitachi ZAXES 200LC-3	Equipment Operator V	•	,		\$28.37	′ 4
Cat 793 truck	Truck Driver III	Haul Truck	,		\$23.84	4
Cat 992K Loader	Equipment Operator V	I Loader (over 10	cy)		\$26.29) 4
Cat 16M	Equipment Operator I		- /		\$26.29) 4
Cat 14M	Equipment Operator I				\$23.84	4
Off-Hwy Water Tanker Truck,6,000-gal.	Truck Driver III	N/A			·	

References

1. Equipment unit rates from EquipmentWatch Custom Cost Evaluator March 2018 (http://www.equipmentwatch.com). See attachments for rate development.

2. Griffin Propane March 12, 2018; Cobre receives an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Cobre Mine (per MMD's requirements). The indirect cost is removed from the all-inclusion

3. https://www.electricitylocal.com/states/new-mexico/silver-city/

4. Labor rates based on NM Department of Labor Type H (Heavy Engineering) 2018 labor rates.

rate development. MMD's requirements). The indirect cost is removed from the all-inclusi

Revegetation Costs

Description:

Chiseling or ripping, scarifying, disking, rangeland drill seeding, mulching, crimping, mobilization.

		Unit Cost
Unit or Disturbance	(acres)	(\$/acre)
CHR footprint	91	\$856
CHR footprint BLM Managed Land	9	\$856
•		

Revegetation Direct Cost

Rocky Mountain Reclamation Quote April, 2018 (before taxes)

Cobre Haul Road Worksheet #14 05/17/18

> Direct Cost (\$) \$77,914 \$7,706

\$85,620

Other Reclamation Activity Costs

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Cobre Haul Road Worksheet #15 05/17/18

\$555,764

Reclamation Summary

Cobre Mining Company

Cobre Haul Road

			Current Value
DIRECT COSTS	Facility and Structure Modification		\$18,746
	Earthmoving		\$328,810
	Revegetation		\$85,620
	Other		\$0
	Subtotal, Direct Costs		\$433,176
INDIRECT COSTS ¹	Mobilization and Demobilization	3.8%	\$16,461
	Contingencies	4.0%	\$17,327 \$10,820
	Engineering Redesign Fee	2.5%	\$10,829
	Contractor Profit and Overhead	15.0%	\$64,976
	Project Management Fee	3.0%	\$12,995
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	28.3%	
	Subtotal, Indirect Costs		\$122,589

TOTAL COST

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).

Vegetation Maintenance Costs

Cobre Haul Road O&M Worksheet #17 5/17/2018

Activity	Total Area (acres)	# yrs veg Maint.	% loss per year	Quantity	Unit	Unit Cost* (\$/unit)	Item Cost (\$)
CHR footprint	91	12	2%	1.8	acres	\$891	\$19,458
CHR footprint BLM Managed Land	9.0	12	2%	0.2	acres	\$891	\$1,924

Veg Maintenance Total Direct Cost: \$21,382

Veg Maintenance Total with Indirect Cost: \$26,364

*Rocky Mountain Reclamation Quote April, 2018 (before taxes), \$1099/acre minus 23.3% indirect costs. 1098.5 Quote includes cost for scarifying (ripping) surface. \$891 (\$/acre)

> Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #17 Page 19 of 22

Operations & Maintenance

EROSION CONTROL [1]

	Year 1	Years 2-11	
Base:	\$3,861	\$3,861 \$	5/day
Time:	6	1 d	lay/yr
Annual:	\$23,163	\$3,861 \$	
	. ,	.,	,
	Annual Current		
	Cost		
Year	(\$)		
0	\$23,163		
1	\$3,861		
2	\$3,861		
3	\$3,861		
4	\$3,861		
5	\$3,861		
6	\$3,861		
7	\$3,861		
8	\$3,861		
9	\$3,861		
10	\$3,861		
11	\$3,861		
Total	\$65,629.73		
	<i>400,0</i> _0110		

[1] Erosion Control

Modified Crew B-13A (1 Labor Foreman, 2 laborers, 1 equip. operators (med.), 2 truck drivers (heavy), 1 crawler loader (4 cy), 2 dump trucks (8 cy, 220 HP) RS Means Heavy Construction Cost Data (28th Annual Edition, 2014)

	#	\$/hour			\$/day		
Labor Foreman (outside)	1	\$	23.48	\$	187.84		
Laborers	2	\$	22.73	\$	363.68		
Equipment Operators med.	1	\$	26.56	\$	212.48		
Truck Drivers (heavy)	2	\$	23.84	\$	381.44		
		\$/h	our	\$/0	day		
Loader,980G	1	\$	81.48	\$	651.84		
Dump Trucks, Cat730	2	\$	83.36	\$	1,333.76		

Subtotal \$3,131 \$/day

Total Direct Cost	\$3,131	\$/day
Indirect Cost Percentage	23.30%	
Total Cost	\$3,861	\$/day

Operations and Maintenance Summary

Cobre Mining Co	mpany		Current
Cobre Haul Road			Value
DIRECT COSTS	Facility and Structure Removal		\$0
	Earthmoving		\$0
	Vegetation Other		\$0 \$74,610
	Subtotal, Direct Costs		\$74,610
INDIRECT COSTS ¹	Mobilization and Demobilization Contingencies Engineering Redesign Fee	3.8% 4.0% 2.5%	\$2,835 \$2,984 \$1,865
	Contractor Profit and Overhead Project Management Fee State Procurement Cost Indirect Percentage Sum = Subtotal, Indirect Costs	10.0% 3.0% 0.0% 23.3%	\$7,461 \$2,238 \$0 \$17,384
TOTAL COST			\$91,994

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).

Cobre_CHR_RCE_03102016_NOBS_20180517d.xlsx Worksheet #19 Page 21 of 22

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs 28.3%	Total Cost					
(Capital							
Hanover Creek and Forest Service Road Crossing Spanning Arch Demolition	\$28,980	\$8,201	\$37,181					
Regrade Outslopes	\$247,961	\$70,173	\$318,134					
Regrade Outslopes BLM Managed Land	\$19,322	\$5,468	\$24,791					
Grade Surface CHR	\$5,871	\$1,661	\$7,532					
Grade Surface CHR BLM Managed Land	\$581	\$164	\$745					
Water Truck/grader	\$24,046	\$6,805	\$30,851					
Water Truck/grader BLM Managed Land	\$2,050	\$580	\$2,630					
Revegetation CHR	\$77,914	\$22,050	\$99,964					
Revegetation BLM Managed Land	\$7,706	\$2,181	\$9,887					
CMP Culvert Removal	\$9,395	\$2,659	\$12,054					
Wildlife Friendly Fence Perimeter Modification ²	\$9,351	\$2,646	\$11,997					
Total Capital Cost	\$433,176	\$122,589	\$555,764					
Operations	and Maintenance	e						
		23.3%						
Veg Maintenance CHR	\$19,458	\$4,534	\$23,991					
Veg Maintenance CHR BLM Land	\$1,924	\$448	\$2,373					
Erosion Control CHR ¹	\$48,437	\$11,286	\$59,723					
Erosion Control BLM Land ¹	\$4,790	\$1,116	\$5,907					
Total Operations and Maintenance	\$74,610	\$17,384	\$91,994					

Facility Characteristics

	EOY 2023
EOY 2023	100
Reclaimed Area	
Item	Capital Cost
Cover Material (Load,	\$41,758
Regrade	\$342,924
Seed & Mulch	\$109,850
Other	\$61,232
Capital Cost Totals	\$555,764
Capital Cost/Acre	\$5,558

CHR	\$471,412	\$130,015	\$601,427			
CHR BLM Land ³	\$36,373	\$9,958	\$46,331			
Total Current Dollar Cost	\$507,785	\$139,973	\$647,758			
broken out based on percentage of BLM Land. Note that the total on Sheet #19						

includes indirect costs and is equal to the total erosion control cost listed in this table.

 2 \$0.30/foot 38,700 feet of fence; Replace half staples/clips, add flagging or other markers or other wildlife friendly modifications, and replace or crimp 2 of the 4 to 5 strands of barb wire. Labor rate of \$25.34/ hr at 1 hour/100 feet of fence; remaining cost is materials.

³ The estimated reclamation cost for BLM managed lands is broken out for no other purpose except to show the relative costs between private and public land. Financial assurance posted by Cobre will be based upon regulation and terms negotiated with MMD and BLM.

APPENDIX B.2 SUPPORTING DOCUMENTATION

Appendix B.2.1

Production and Misc. Calculation Documentation

EQUATIONS USED IN CAPITAL COST SPREADSHEET

Sheet #4 Earthwork:

 $Bank Volume (bcy) = Area (acre) * Cover Depth (in) * \frac{43560(ft^2 / acre)}{12(in / ft) * 27(ft^3 / cy)}$

Loose or Stockpile Volume (lcy) = Bank or stockpile Volume (cy)[1+Swell Factor]*

Sheet #5 Dozer:

Normal Production (cy/hr) = 159372.008958 * Maximum Push Distance $(ft)^{-0.862481}$ (Caterpillar Performance Handbook Edition 42 D11T CD page1-53)

Productivity (cy/hr) = Normal Production $(cy/hr) * Operator * Material * \frac{Work Hour (min/hr)}{60 (min/hr)}$

* Grade Factor * $\frac{2300(lbs/cy)}{Soil Weight (lbs/cy)}$ * Prod. Method * Visibility * Elev. * Drive Trans.

 $Total Task Time (hr) = \frac{Loose \ or Stockpile Volume (cy)}{Productivity (cy / hr)}$

Grade (Dozing Factor) = -0.02 * Grade (%) + 1(Curve Fit Cat Handbook Ed 44 19-55)

Sheet #6 Grading:

Grade Surface:

Grade (Dozing Factor) = -0.02*Grade (%)+1 (Curve Fit Cat Handbook Ed 44 19-55)

Productivity $(acre / hr) = Speed (mi / hr) * \frac{5280 (ft / mi) * Effective Blade Width (ft)}{43560 (ft^2 / acre)} * \frac{Work Hour (min / hr)}{60 (min / hr)}$ * Operator * Material * Grade Factor * $\frac{2300(lbs / cy)}{Soil Weight (lbs / cy)}$ * Prod. Method * Visibility * Elev. * Drive Trans.

Task Time $(hr) = \frac{Area (acres)}{Productivity (acres / hr)}$

Freeport-McMoRan Chino Mines Co. 20180404_productivity_calc_documentation.doc

Grade Cover:

D11T CD Normal Production (cy / hr) = 159372.008958 * Maximum Push Distance $(ft)^{-0.862481}$ (*Curve Fit Cat Handbook Ed* 42 1–53)

Grade (Dozing Factor) = -0.02*Grade (%)+1 (Curve Fit Cat Handbook Ed 44 19-55)

Productivity $(cy / hr) = Normal \operatorname{Production} (cy / hr) * \frac{Work Hour (min/hr)}{60 (min/hr)} * Operator * Material * Grade Factor 2300 (lbs / cy)$

* $\frac{2300 (lbs / cy)}{Soil Weight (lbs / cy)}$ * Production Method *Visibility * Elevation * DriveTrans

 $Task \ Time(hr) = \frac{\text{Area or Volume}}{\text{Productivity}}$

Sheet #7 Ripper:

$$Ripper Width (ft) = \frac{Pocket Spacing (in)}{12 (in / ft)}$$

1000 ft Passes / Acre = $\frac{43560 (ft^2 / acre)}{Ripper Length (ft) * Ripper Width (ft)}$

 $Volume (cy) = Area (acres) * 43560 (ft^{2} / acre) * \frac{Ripper Penetration (in)}{12 (in / ft) * 27 (ft^{3} / cy)}$

$$Productivity (acres / hr) = \frac{Work Hour (min/hr)}{\left[\left(\frac{Ripper Lenth (ft)}{5280 (ft / mi)^* \frac{Speed (mi / hr)}{60 (min/hr)}} \right) + Turn Time (min/ pass) \right]^* 1000 ft Passes / acre}$$

Task Time $(hr) = \frac{Area (acres)}{Productivity (acres / hr)}$

Sheet #8 Excavator NOT USED:

Sheet #9 Trucks:

Calculations refer to 777F haul truck. It was determined that speeds are not significantly different from the 793 haul truck so no changes have been made to formulas in Sheet #9.

Total Haul Distance $(ft) = \sum$ Segment Haul Distance (ft)Haul Distance Segment (m) = Haul Distance (ft)*0.3048 (m / ft)Haul Effective Grade (%) = (Haul Grade (%) + Rolling Resistance (%))(unless < 0 then 0)Return Effective Grade (%) = (Rolling Resistance (%) - Haul Grade (%))(unless < 0 then 0)

777*F* Segment Travel Time Loaded $(\min/m) =$

-1.6825* Haul Effective Grade Segment (%) $^{3}+0.4592*$ Haul Effective Grade Segment (%) 2

+0.0079* Haul Effective Grade Segment (%)+0.0009

777*F* Segment Travel Time Empty $(\min/m) =$

-6.2135*Return Effective Grade Segment (%) ⁴+1.0448*Return Effective Grade Segment (%) ³+0.1016*Return Effe

-0.0035*Return *Effective Grade Segement* (%)+0.0009

(Curve Fit Cat Handbook Ed 41 9-42)

$$Loader (cycles / truck) = Maximum \left[\frac{Struck Capacity (cy)}{Loader Net Bucket Capacity (cy)}, \frac{Heaped Capacity (cy)}{Loader Net Bucket Capacity (cy)} \right]$$

 $Haul Time (min) = \sum (Segment Travel Time Loaded (min/m) * Segment Haul Dist (m))$ Return Time (min) = $\sum (Segment Travel Time Empty (min/m) * Segment Haul Dist (m))$ Loading Time (min) = Loader Cycle Time (min) * Loader (cycles / truck)

Task Time (hr) = Maximum $\left[\frac{Volume(cy)}{Productivity(cy/hr)}, Loader Task Time(hr)\right]$

Truck Cycle Time (min) =

Haul Time (min) + Return *Time* (min) + *Loading Time* (min) + *Load / Maneuver Time* (min) + *Dump Maneuver Time* (min)

Productivity (cy / hr) =

Work Hour (\min/hr) *Loader (cycles/truck)*Loader Net Bucket Cap (cy)* $\frac{Optimum Number of Trucks}{Truck Cycle Time (min)}$

Sheet #10 Loader:

992K Truck Loader

Net Bucket Capcity (*cy*) = *Rated Bucket Capacity* (*cy*)* *Bucket Fill Factor*

 $Productivity (cy/hr) = \frac{Net \ Bucket \ Capcity \ (cy) * Work \ Hour \ (min/hr)}{Loader \ Cycle \ Time \ (min)}$

Task Time (hr) = $\frac{Volume(cy)}{Productivity(cy/hr)}$

Sheet #11 Scraper NOT USED

Sheet #13 Earth Sum:

Direct Cost (\$) = [Owning & Operating Cost (\$/hr) + Labor Cost (\$/hr)] * TimeRequired (hr)* Number of Units of Equipment

 $Unit \ Cost \ (\$/unit) = \frac{Direct \ Cost \ (\$)}{Total \ Production \ (unit)}$

Earthwork Total Direct Cost (\$) = $\sum Total Cost$ (\$)

Sheet #14 Reveg:

Direct Cost (\$) = Area (acres) *Unit Cost (\$/ acre)

Reveg Total Direct Cost (\$) = \sum Direct Costs (\$)

Sheet #15 Other:

 $Unit Cost (\$/unit) = Unadjusted Cost (\$/unit) * \frac{Location Adjustment (\%)}{100}$

Direct Cost (\$) = Quantity (units) * Unit Cost (\$/unit)

Other Total Direct Cost (\$) = $\sum Current Item Cost$ (\$)

Sheet #16 & 17 Sum:

Subtotal Direct Cost (\$) = Earthwork Total Direct Cost (\$) + Reveg Total Direct Cost(\$) + Other Total DirectCost (\$)

Subtotal Indirect Costs(\$) = SubTotal Direct Cost (\$) * $\frac{Various Indirect Costs (\%)}{100}$

Total Cost (\$) = Subtotal Direct Cost (\$) + Subtotal Indirect Cost (\$)

OPTIMIZATION EQUATIONS:

Each Equation for number of trucks (n) from 2 to 25.

Productivity Sheet:

Productivity (cy / hr) =

Work Hour (\min/hr) *Loader (cycle / truck)*Loader Net Buckter Cap (cy)* $\frac{Number of Trucks[n]}{Truck Cycle Time (min)}$

Time Sheet:

$$Time (hr) = Maximum \left(\frac{Volume (cy)}{Productivity (cy/hr)}, Laoder Task Time (hr) \right)$$

Truck Cost Sheet:

 $Truck \ Cost \ (\$) = \\Time \ (hr) * \ Number \ of \ Trucks[n] * (Owning \ \& \ Operating \ Cost \ (\$/hr) + Labor \ Cost \ (\$/hr))$

Loader Cost Sheet:

Loader Cost for Number of Trucks[n] (\$) = Time (hr) * (Owning & Operating Cost (\$/hr) + Labor Cost (\$/hr))

Total Cost Sheet:

Total Cost Number of Trucks[n](\$) = Truck Cost(\$) + Loader Cost(\$)

Minimum Cost = *Minimum (Total Cost for Number of Trucks*[*n*](\$))

Optimum Number of Trucks:

Number of Trucks[n] = when (Minimum Cost (\$) >= Total Cost for Number of Trucks[n]) then Number of Trucks[n] else 0

Optimum Number of Trucks = $\sum_{n=2}^{25}$ *Number of Trucks*[*n*]

WATER TRUCK AND GRADER DATA FROM TYRONE:

Water Truck		
Row Labels	Average of Duration Min	Average of Duration Hr
4/18/2017 0:00	695.28	11.59
4/19/2017 0:00	518.39	8.64
4/20/2017 0:00	291.41	4.86
4/21/2017 0:00	233.89	3.90
4/22/2017 0:00	330.05	5.50
4/23/2017 0:00	200.71	3.34
4/24/2017 0:00	382.43	6.37
4/25/2017 0:00 4/26/2017 0:00	202.24 268.24	3.37 4.47
4/27/2017 0:00	514.92	8.58
4/28/2017 0:00	325.58	5.43
4/29/2017 0:00	331.60	5.53
4/30/2017 0:00	659.40	10.99
5/1/2017 0:00	705.98	11.77
5/2/2017 0:00	230.81	3.85
5/3/2017 0:00	461.68	7.69
5/4/2017 0:00	467.07	7.78
5/5/2017 0:00	470.86	7.85
5/6/2017 0:00	706.67	11.78
5/7/2017 0:00	443.10	7.39
5/8/2017 0:00	698.03	11.63
5/9/2017 0:00 5/10/2017 0:00	349.35	5.82
5/10/2017 0:00	462.81 696.73	11.61
5/12/2017 0:00	353.59	5.89
5/13/2017 0:00	698.33	11.64
5/14/2017 0:00	696.75	11.61
5/15/2017 0:00	652.90	10.88
5/16/2017 0:00	346.92	5.78
5/17/2017 0:00	342.36	5.71
5/18/2017 0:00	1.81	0.03
5/19/2017 0:00	207.18	3.45
5/21/2017 0:00	404.37	6.74
5/22/2017 0:00	292.39	4.87
5/23/2017 0:00	527.75	8.80
5/24/2017 0:00 5/25/2017 0:00	651.89 691.07	10.87 11.52
5/26/2017 0:00	477.33	7.96
5/27/2017 0:00	357.94	5.97
5/28/2017 0:00	354.56	5.91
5/29/2017 0:00	260.51	4.34
5/30/2017 0:00	337.40	5.62
5/31/2017 0:00	677.89	11.30
6/1/2017 0:00	699.70	11.66
6/2/2017 0:00	649.56	10.83
6/3/2017 0:00	335.03	5.58
6/4/2017 0:00	446.52	7.44
6/5/2017 0:00	447.30	7.45
6/6/2017 0:00 6/7/2017 0:00	185.96 101.75	3.10
6/8/2017 0:00	398.88	6.65
6/9/2017 0:00	313.80	5.23
6/10/2017 0:00	314.52	5.24
6/11/2017 0:00	254.88	4.25
6/12/2017 0:00	287.91	4.80
6/13/2017 0:00	402.94	6.72
6/14/2017 0:00	469.57	7.83
6/15/2017 0:00	672.43	11.21
6/16/2017 0:00	390.23	6.50
6/17/2017 0:00	103.78	1.73
6/18/2017 0:00	570.19	9.50
6/19/2017 0:00	696.47	11.61
6/20/2017 0:00	312.88	5.22
6/21/2017 0:00	514.83	8.58
6/22/2017 0:00	204.73	3.41
6/23/2017 0:00 6/24/2017 0:00	443.86 329.19	7.40 5.49
6/24/2017 0:00	295.48	5.49 4.92
6/26/2017 0:00	459.31	7.66
6/27/2017 0:00	342.37	5.71
	072.01	0.7 1

Water Truck Totals				
Period	Minutes	Hours		
Q2 2017	372.19	6.20		
Q3 2017	361.84	6.03		
Q4 2017 314.77 5.25				
Q1 2018	282.18	4.70		
Totals	332.78	5.55		

6/28/2017 0:00 418.72 6.98 6/29/2017 0:00 352.45 5.87 7/1/2017 0:00 352.45 5.87 7/1/2017 0:00 429.44 7.02 7/3/2017 0:00 693.90 11.57 7/4/2017 0:00 677.71 11.30 7/6/2017 0:00 420.15 4.34 7/7/2017 0:00 350.45 5.84 7/8/2017 0:00 227.39 3.79 7/10/2017 0:00 422.85 10.74 7/11/2017 0:00 433.20 7.22 7/14/2017 0:00 238.64 3.98 7/16/2017 0:00 238.64 3.98 7/16/2017 0:00 235.00 5.92 7/18/2017 0:00 33.18 5.89 7/18/2017 0:00 347.45 5.79 7/28/2017 0:00 353.18 5.89 7/18/2017 0:00 347.45 5.79 7/28/2017 0:00 353.18 5.89 7/28/2017 0:00 245.97 4.50 8/2/2017 0:00 248.167 8.03			
6/30/2017 0:00 352.45 5.87 7/1/2017 0:00 420.944 7.02 7/3/2017 0:00 693.90 11.57 7/4/2017 0:00 474.37 7.91 7/5/2017 0:00 379.77 1 1.30 7/6/2017 0:00 379.97 6.33 7/7/2017 0:00 380.45 7/8/2017 0:00 360.45 5.84 7/9/2017 0:00 443.25 10.74 7/11/2017 0:00 447.36 5.80 7/13/2017 0:00 433.20 7.22 7/11/2017 0:00 472.76 7.88 7/14/2017 0:00 472.76 7.88 7/14/2017 0:00 472.76 7.88 7/14/2017 0:00 35.00 5.92 7/26/2017 0:00 35.18 5.89 7/31/2017 0:00 35.18 5.89 7/31/2017 0:00 35.18 5.89 7/31/2017 0:00 35.18 5.89 7/26/2017 0:00 28.97 4.50 36/2 36/2/2017 7/31/2017 0:00 181.80 3.03 30/2/2017 7/31/2017 0:00 271.78 3	6/28/2017 0:00	418.72	6.98
7/1/2017 0:00 353.69 5.89 7/1/2017 0:00 420.94 7.02 7/3/2017 0:00 677.71 11.30 7/6/2017 0:00 260.15 4.34 7/7/2017 0:00 379.97 6.33 7/8/2017 0:00 360.45 5.84 7/9/2017 0:00 27.39 3.79 7/10/2017 0:00 644.25 10.74 7/11/2017 0:00 644.25 10.74 7/11/2017 0:00 433.20 7.22 7/11/2017 0:00 433.20 7.22 7/11/2017 0:00 433.20 7.22 7/11/2017 0:00 472.76 7.88 7/11/2017 0:00 355.00 5.92 7/12/2017 0:00 355.00 5.92 7/12/2017 0:00 353.18 5.89 7/12/2017 0:00 353.18 5.89 7/12/2017 0:00 353.18 5.89 7/3/2017 0:00 214.87 8.03 8/5/2017 0:00 289.97 4.50 8/2/2017 0:00 249.97 4.50 8/2/2017 0:00 217.28 3.62 8/2/2017 0:00 217.28 3.62 8/2/2017 0:00 248.51 1.74 8/2/2017 0:00 248.55 4.91 8/1/2017 0:00 <td>6/29/2017 0:00</td> <td>335.00</td> <td>5.58</td>	6/29/2017 0:00	335.00	5.58
7/2/2017 0:00 420.94 7.02 7/3/2017 0:00 693.90 11.57 7/4/2017 0:00 677.71 11.30 7/6/2017 0:00 260.15 4.34 7/7/2017 0:00 350.45 5.84 7/9/2017 0:00 227.39 3.79 7/10/2017 0:00 644.25 10.74 7/11/2017 0:00 433.20 7.22 7/13/2017 0:00 432.20 7.22 7/14/2017 0:00 433.20 7.22 7/15/2017 0:00 275.83 4.60 7/14/2017 0:00 472.76 7.88 7/14/2017 0:00 350.00 5.92 7/26/2017 0:00 353.18 5.89 7/13/2017 0:00 351.8 5.89 7/31/2017 0:00 353.18 5.89 7/26/2017 0:00 350.39 5.84 8/3/2017 0:00 481.67 8.03 8/2/2017 0:00 49.71 7.66 8/7/2017 0:00 49.72 5.82 8/2/2017 0:00 44.67 3.58 <	6/30/2017 0:00	352.45	5.87
7/3/2017 0:00 693.90 11.57 7/4/2017 0:00 474.37 7.91 7/5/2017 0:00 260.15 4.34 7/7/2017 0:00 379.97 6.33 7/8/2017 0:00 227.39 3.79 7/10/2017 0:00 644.25 10.74 7/11/2017 0:00 672.83 11.21 7/14/2017 0:00 433.20 7.22 7/15/2017 0:00 275.83 4.60 7/11/2017 0:00 275.83 4.60 7/11/2017 0:00 232.99 3.88 7/11/2017 0:00 355.00 5.92 7/16/2017 0:00 232.99 3.88 7/21/2017 0:00 347.45 5.79 7/26/2017 0:00 353.18 5.89 7/31/2017 0:00 363.38 5.84 8/2/2017 0:00 360.39 5.84 8/2/2017 0:00 450 3.03 8/2/2017 0:00 450 3.62 8/2/2017 0:00 217.28 3.62 8/2/2017 0:00 24.87 3.58 8/1/2017 0:00 214.87 3.58 8/1/2017 0:00 214.87 3.58 8/1/2017 0:00 214.87 3.58 8/1/2017 0:00 214.87 3.58 8/1/2017 0:00	7/1/2017 0:00	353.69	5.89
7/4/2017 0:00 474.37 7.91 7/5/2017 0:00 677.71 11.30 7/6/2017 0:00 379.97 6.33 7/8/2017 0:00 320.45 5.84 7/9/2017 0:00 644.25 10.74 7/1/1/2017 0:00 644.25 10.74 7/1/1/2017 0:00 672.83 11.21 7/1/1/2017 0:00 473.20 7.22 7/1/1/2017 0:00 275.83 4.60 7/1/1/2017 0:00 176.7 3.29 7/1/1/2017 0:00 176.7 3.29 7/1/1/2017 0:00 176.7 3.29 7/1/1/2017 0:00 176.7 3.29 7/1/2/2017 0:00 355.00 5.92 7/2/2/2017 0:00 355.18 5.89 7/2/2/2017 0:00 353.18 5.84 8/3/2017 0:00 353.18 5.84 8/3/2017 0:00 259.97 4.50 8/6/2017 0:00 217.28 3.62 8/3/2017 0:00 217.28 3.62 8/3/2017 0:00 170.58 11.72 8/3/2017 0:00 170.84 3.58 8/1/2017 0:00 172.85 2.95 8/1/2017 0:00 174.87 3.58 8/1/2017 0:00 174.87 3.58 8/1/20	7/2/2017 0:00	420.94	7.02
7/5/2017 0:00 260.15 4.34 7/7/2017 0:00 360.45 5.84 7/7/2017 0:00 360.45 5.84 7/9/2017 0:00 227.39 3.79 7/10/2017 0:00 644.25 10.74 7/11/2017 0:00 672.83 11.21 7/14/2017 0:00 275.83 4.60 7/11/2017 0:00 275.83 4.60 7/11/2017 0:00 275.83 4.60 7/11/2017 0:00 272.76 7.88 7/13/2017 0:00 32.2 1.56 7/12/2017 0:00 32.299 3.88 7/12/2017 0:00 347.45 5.79 7/28/2017 0:00 35.318 5.89 7/31/2017 0:00 181.80 3.03 8/2/2017 0:00 268.97 4.50 8/2/2017 0:00 268.97 4.50 8/2/2017 0:00 27.28 5.82 8/4/2017 0:00 27.37 1.123 8/4/2017 0:00 24.87 3.58 8/11/2017 0:00 27.379 11.23	7/3/2017 0:00	693.90	11.57
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11/16/2017 0:00299.064.9811/17/2017 0:00195.563.2611/18/2017 0:00418.376.9711/19/2017 0:00147.382.4611/20/2017 0:00168.032.8011/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00450.217.50	11/14/2017 0:00	398.95	6.65
11/16/2017 0:00299.064.9811/17/2017 0:00195.563.2611/18/2017 0:00418.376.9711/19/2017 0:00147.382.4611/20/2017 0:00168.032.8011/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00450.217.50	11/15/2017 0:00	443.29	7.39
11/17/2017 0:00195.563.2611/18/2017 0:00418.376.9711/19/2017 0:00147.382.4611/20/2017 0:00168.032.8011/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00224.263.7411/28/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50		299.06	4.98
11/18/2017 0:00418.376.9711/19/2017 0:00147.382.4611/20/2017 0:00168.032.8011/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00450.217.50			
11/19/2017 0:00147.382.4611/20/2017 0:00168.032.8011/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00450.217.50			
11/20/2017 0:00168.032.8011/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00450.217.50			
11/21/2017 0:00283.334.7211/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50			
11/22/2017 0:00414.046.9011/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50			
11/23/2017 0:00327.855.4611/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/21/2017 0:00	283.33	4.72
11/24/2017 0:00261.674.3611/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50			6 90
11/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50		414.04	0.00
11/25/2017 0:00224.263.7411/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50			
11/26/2017 0:00408.296.8111/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00	327.85	5.46
11/27/2017 0:00520.868.6811/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00	327.85 261.67	5.46 4.36
11/28/2017 0:00284.504.7411/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00	327.85 261.67 224.26	5.46 4.36 3.74
11/29/2017 0:0085.991.4311/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00	327.85 261.67 224.26 408.29	5.46 4.36 3.74 6.81
11/30/2017 0:00459.047.6512/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00	327.85 261.67 224.26 408.29 520.86	5.46 4.36 3.74 6.81 8.68
12/1/2017 0:00689.7511.5012/2/2017 0:00346.245.7712/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50	5.46 4.36 3.74 6.81 8.68 4.74
12/2/2017 0:00 346.24 5.77 12/3/2017 0:00 286.34 4.77 12/4/2017 0:00 450.51 7.51 12/5/2017 0:00 440.94 7.35 12/6/2017 0:00 450.21 7.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99	5.46 4.36 3.74 6.81 8.68 4.74 1.43
12/3/2017 0:00286.344.7712/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65
12/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65
12/4/2017 0:00450.517.5112/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00 12/1/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04 689.75	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65 11.50
12/5/2017 0:00440.947.3512/6/2017 0:00450.217.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00 12/1/2017 0:00 12/2/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04 689.75 346.24	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65 11.50 5.77
12/6/2017 0:00 450.21 7.50	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00 12/1/2017 0:00 12/2/2017 0:00 12/3/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04 689.75 346.24 286.34	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65 11.50 5.77 4.77
	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00 12/1/2017 0:00 12/3/2017 0:00 12/3/2017 0:00 12/4/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04 689.75 346.24 286.34 450.51	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65 11.50 5.77 4.77 7.51
12///2017 0:00 274.15 4.57	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/30/2017 0:00 12/1/2017 0:00 12/2/2017 0:00 12/3/2017 0:00 12/4/2017 0:00 12/5/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04 689.75 346.24 286.34 450.51 440.94	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65 11.50 5.77 4.77 7.51 7.35
• I I	11/23/2017 0:00 11/24/2017 0:00 11/25/2017 0:00 11/26/2017 0:00 11/27/2017 0:00 11/28/2017 0:00 11/29/2017 0:00 11/2017 0:00 12/2/2017 0:00 12/3/2017 0:00 12/3/2017 0:00 12/4/2017 0:00 12/5/2017 0:00 12/5/2017 0:00	327.85 261.67 224.26 408.29 520.86 284.50 85.99 459.04 689.75 346.24 286.34 450.51 440.94 450.21	5.46 4.36 3.74 6.81 8.68 4.74 1.43 7.65 11.50 5.77 4.77 7.51 7.35 7.50

12/9/2017 0:00	123.70	2.06
12/10/2017 0:00	385.08	6.42
12/11/2017 0:00	291.06	4.85
12/12/2017 0:00	368.36	6.14
12/13/2017 0:00	252.65	4.21
12/14/2017 0:00	347.16	5.79
12/15/2017 0:00	696.60	11.61
12/16/2017 0:00	690.07	11.50
12/22/2017 0:00	625.00	10.42
12/23/2017 0:00	328.09	5.47
12/25/2017 0:00	322.08	5.37
	_	
12/26/2017 0:00	98.73	1.65
12/27/2017 0:00	458.77	7.65
12/28/2017 0:00	704.22	11.74
12/29/2017 0:00	653.10	10.89
12/31/2017 0:00	98.62	1.64
1/1/2018 0:00	182.06	3.03
1/2/2018 0:00	336.94	5.62
1/3/2018 0:00	136.03	2.27
1/4/2018 0:00	225.08	3.75
1/5/2018 0:00	327.98	5.47
1/6/2018 0:00	220.19	3.67
1/7/2018 0:00	287.72	4.80
1/8/2018 0:00	463.07	7.72
1/9/2018 0:00	191.91	3.20
1/14/2018 0:00	76.47	1.27
1/15/2018 0:00	347.21	5.79
1/17/2018 0:00	95.20	1.59
1/19/2018 0:00	198.00	3.30
1/20/2018 0:00	353.77	5.90
1/24/2018 0:00	478.19	7.97
1/25/2018 0:00	381.99	6.37
1/26/2018 0:00	353.07	5.88
1/29/2018 0:00	517.88	8.63
1/30/2018 0:00	436.56	7.28
1/31/2018 0:00		4.30
	257.83	
2/1/2018 0:00	664.70	11.08
2/2/2018 0:00	181.82	3.03
2/3/2018 0:00	249.61	4.16
2/4/2018 0:00	226.63	3.78
2/5/2018 0:00	240.72	4.01
2/6/2018 0:00	463.14	7.72
		4.37
2/7/2018 0:00	261.94	11.03
2/9/2018 0:00	661.57	11.00
		0.88
2/9/2018 0:00	661.57	
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00	661.57 52.63 217.64	0.88 3.63
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00	661.57 52.63 217.64 335.14	0.88 3.63 5.59
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00	661.57 52.63 217.64 335.14 660.33	0.88 3.63 5.59 11.01
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59	0.88 3.63 5.59 11.01 3.26
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75	0.88 3.63 5.59 11.01 3.26 0.28
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59	0.88 3.63 5.59 11.01 3.26 0.28 5.69
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75	0.88 3.63 5.59 11.01 3.26 0.28
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24	0.88 3.63 5.59 11.01 3.26 0.28 5.69
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/25/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/22/2018 0:00 2/25/2018 0:00 2/26/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/25/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/22/2018 0:00 2/25/2018 0:00 2/26/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/25/2018 0:00 2/27/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.68 3.02 5.52 0.24
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/3/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/3/2018 0:00 3/5/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.68 3.02 5.52 0.24 1.51 11.21
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/4/2018 0:00 3/5/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/4/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/7/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.68 3.02 5.52 0.24 1.51 11.21
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/3/2018 0:00 3/5/2018 0:00 3/6/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/4/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/7/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/3/2018 0:00 3/5/2018 0:00 3/6/2018 0:00 3/7/2018 0:00 3/7/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/25/2018 0:00 3/2/2018 0:00 3/2/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/6/2018 0:00 3/8/2018 0:00 3/8/2018 0:00 3/9/2018 0:00 3/9/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/3/2018 0:00 3/4/2018 0:00 3/5/2018 0:00 3/6/2018 0:00 3/7/2018 0:00 3/8/2018 0:00 3/9/2018 0:00 3/9/2018 0:00 3/9/2018 0:00 3/9/2018 0:00 3/10/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/26/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/4/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/6/2018 0:00 3/7/2018 0:00 3/9/2018 0:00 3/9/2018 0:00 3/10/2018 0:00 3/10/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52 230.05	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68 3.83
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/3/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/7/2018 0:00 3/7/2018 0:00 3/8/2018 0:00 3/9/2018 0:00 3/10/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/13/2018 0:00 3/13/2018 0:00 3/13/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52 230.05 445.72	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68 3.83 7.43
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/26/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/4/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/6/2018 0:00 3/7/2018 0:00 3/9/2018 0:00 3/9/2018 0:00 3/10/2018 0:00 3/10/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52 230.05	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68 3.83
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/17/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/3/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/7/2018 0:00 3/7/2018 0:00 3/8/2018 0:00 3/9/2018 0:00 3/10/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/13/2018 0:00 3/13/2018 0:00 3/13/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52 230.05 445.72	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68 3.83 7.43
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/25/2018 0:00 2/27/2018 0:00 3/1/2018 0:00 3/3/2018 0:00 3/4/2018 0:00 3/6/2018 0:00 3/6/2018 0:00 3/7/2018 0:00 3/8/2018 0:00 3/9/2018 0:00 3/10/2018 0:00 3/11/2018 0:00 3/11/2018 0:00 3/13/2018 0:00 3/13/2018 0:00 3/13/2018 0:00 3/13/2018 0:00 3/14/2018 0:00 3/14/2018 0:00 3/14/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52 230.05 445.72 459.96	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68 3.83 7.43 7.67
2/9/2018 0:00 2/10/2018 0:00 2/11/2018 0:00 2/12/2018 0:00 2/13/2018 0:00 2/13/2018 0:00 2/14/2018 0:00 2/21/2018 0:00 2/22/2018 0:00 2/23/2018 0:00 2/24/2018 0:00 2/25/2018 0:00 3/1/2018 0:00 3/2/2018 0:00 3/4/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/5/2018 0:00 3/7/2018 0:00 3/7/2018 0:00 3/9/2018 0:00 3/10/2018 0:00 3/11/2018 0:00 3/13/2018 0:00	661.57 52.63 217.64 335.14 660.33 195.59 16.75 341.24 531.03 29.08 349.65 702.17 302.20 340.67 181.37 331.31 14.35 90.84 672.77 286.80 322.93 285.48 226.22 712.35 700.52 230.05 445.72 459.96 346.69	0.88 3.63 5.59 11.01 3.26 0.28 5.69 8.85 0.49 5.83 11.70 5.04 5.68 3.02 5.52 0.24 1.51 11.21 4.78 5.38 4.76 3.77 11.87 11.68 3.83 7.43 7.67 5.78

4/17/2018 0:00 Average	189.73 332.78	3.16 5.55
4/16/2018 0:00	328.04	5.47
4/15/2018 0:00	172.19	2.87
4/14/2018 0:00	430.10	7.17
4/13/2018 0:00	472.28	7.87
4/12/2018 0:00	682.90	11.38
4/11/2018 0:00	298.08	4.97
4/10/2018 0:00	323.72	5.40
4/9/2018 0:00	193.67	3.23
4/8/2018 0:00	347.54	5.79
4/7/2018 0:00	703.34	11.72
4/6/2018 0:00	398.56	6.64
4/5/2018 0:00	463.73	7.73
4/4/2018 0:00	661.90	11.03
4/3/2018 0:00	277.54	4.63
4/2/2018 0:00	224.16	3.74
4/1/2018 0:00	351.31	5.86
3/31/2018 0:00	252.44	4.21
3/30/2018 0:00	271.06	4.52
3/29/2018 0:00	133.14	2.22
3/28/2018 0:00	78.53	1.31
3/27/2018 0:00	560.18	9.34
3/26/2018 0:00	687.70	11.46
3/25/2018 0:00	579.73	9.66
3/24/2018 0:00	695.07	11.58
3/23/2018 0:00	192.05	3.20
3/22/2018 0:00	284.36	4.74
3/21/2018 0:00	236.63	3.94
3/19/2018 0:00 3/20/2018 0:00	355.92 695.80	5.93 11.60

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Grader

Row Labels	Average of Duration (min)	Average of Duration (Hrs)
4/18/2017 0:00	350.35	5.84
4/19/2017 0:00	227.57	3.79
4/20/2017 0:00	291.54	4.86
4/21/2017 0:00	251.04	4.18
4/22/2017 0:00	300.15	5.00
4/23/2017 0:00	361.30	6.02
4/24/2017 0:00	431.76	7.20
4/25/2017 0:00	425.46	7.09
4/26/2017 0:00	275.94	4.60
4/27/2017 0:00	188.86	3.15
4/29/2017 0:00	693.25	11.55
4/30/2017 0:00	332.96	5.55
5/1/2017 0:00		4.56
	273.69	
5/3/2017 0:00	301.43	5.02
5/4/2017 0:00	586.87	9.78
5/5/2017 0:00	414.94	6.92
5/6/2017 0:00	659.18	10.99
5/7/2017 0:00	310.45	5.17
5/8/2017 0:00	324.24	5.40
5/9/2017 0:00	202.61	3.38
5/10/2017 0:00	101.71	1.70
5/11/2017 0:00	553.88	9.23
5/12/2017 0:00	462.37	7.71
5/13/2017 0:00	512.54	8.54
5/14/2017 0:00	696.17	11.60
5/15/2017 0:00	570.67	9.51
5/17/2017 0:00	130.54	2.18
5/19/2017 0:00	214.80	3.58
5/20/2017 0:00	401.52	6.69
5/21/2017 0:00	347.98	5.80
5/22/2017 0:00	375.32	6.26
5/23/2017 0:00	540.68	9.01
5/24/2017 0:00	341.28	5.69
5/25/2017 0:00	369.06	6.15
5/26/2017 0:00	355.10	5.92
5/27/2017 0:00	178.75	2.98
5/28/2017 0:00	360.83	6.01
5/29/2017 0:00		
	588.19	9.80
5/30/2017 0:00	660.06	11.00
5/31/2017 0:00	450.99	7.52
6/1/2017 0:00	684.04	11.40
6/3/2017 0:00	349.24	5.82
6/4/2017 0:00	586.05	9.77
6/6/2017 0:00	264.95	4.42
6/7/2017 0:00	274.56	4.58
6/8/2017 0:00	404.04	6.73
6/9/2017 0:00	124.39	2.07
6/10/2017 0:00	150.12	2.50
6/11/2017 0:00	252.62	4.21
6/12/2017 0:00	655.75	10.93
6/13/2017 0:00	103.07	1.72
6/14/2017 0:00	321.56	5.36
6/16/2017 0:00	408.32	6.81
6/17/2017 0:00	700.58	11.68
6/18/2017 0:00	691.30	11.52
6/19/2017 0:00	397.74	6.63
6/20/2017 0:00	433.63	7.23
6/21/2017 0:00	354.43	5.91
6/22/2017 0:00	240.44	4.01
6/23/2017 0:00	169.96	2.83
6/24/2017 0:00	438.21	7.30
6/25/2017 0:00	424.26	7.07
6/26/2017 0:00	373.16	6.22
6/27/2017 0:00	469.45	7.82
6/28/2017 0:00		
0/20/2017 0.00	108.42	1.81

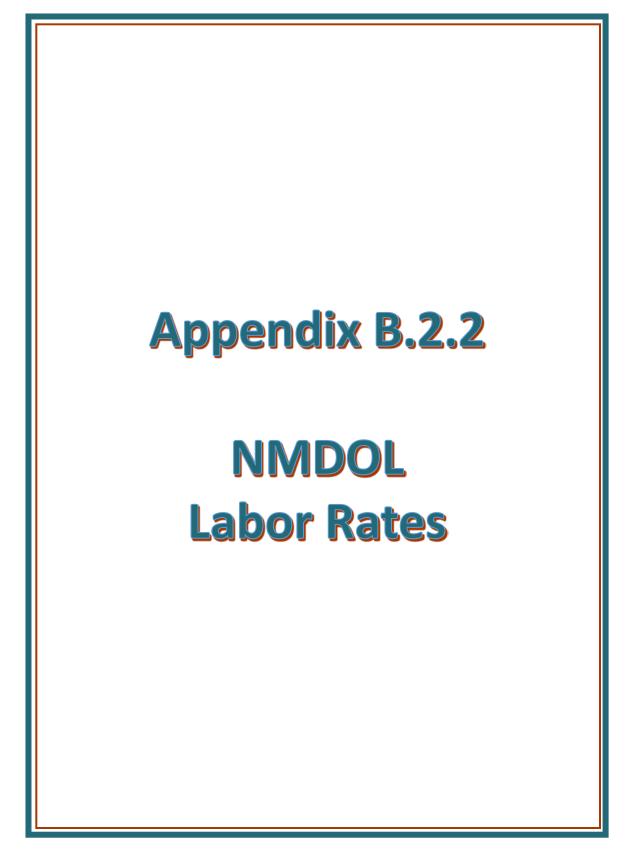
Motor Grader (Blade)				
Period	Minutes	Hours		
Q2 2017	335.90	5.60		
Q3 2017	314.34	5.24		
Q4 2017 298.65 4.98				
Q1 2018	286.16	4.77		
Total	306.71	5.11		

6/29/2017 0:00	202.28	3.37
6/30/2017 0:00	202.28 705.72	11.76
7/2/2017 0:00	477.75	7.96
7/3/2017 0:00	462.43	7.71
7/4/2017 0:00	446.18	7.44
7/5/2017 0:00	335.46	5.59
7/6/2017 0:00	269.60	4.49
7/7/2017 0:00	435.92	7.27
7/9/2017 0:00	678.13	11.30
7/11/2017 0:00	687.18	11.45
7/12/2017 0:00	381.88	6.36
7/13/2017 0:00	673.52	11.23
7/14/2017 0:00	199.04	3.32
7/15/2017 0:00	153.88	2.56
7/16/2017 0:00	698.20	11.64
7/17/2017 0:00	248.35	4.14
7/18/2017 0:00	228.04	3.80
7/19/2017 0:00	388.48	6.47
7/20/2017 0:00	459.86	7.66
7/21/2017 0:00	392.37	6.54
7/22/2017 0:00	310.20	5.17
7/23/2017 0:00	228.29	3.81
7/24/2017 0:00	220.10	3.67
7/25/2017 0:00	344.31	5.74
7/26/2017 0:00	332.07	5.53
7/27/2017 0:00	514.27	8.57
7/28/2017 0:00	305.01	5.08
7/29/2017 0:00	290.83	4.85
7/30/2017 0:00	432.10	7.20
7/31/2017 0:00	270.33	4.51
8/1/2017 0:00	155.75	2.60
8/2/2017 0:00	447.63	7.46
8/3/2017 0:00	709.18	11.82
8/4/2017 0:00	184.49	3.07
8/5/2017 0:00	220.80	3.68
8/6/2017 0:00	303.05	5.05
8/7/2017 0:00	339.12	5.65
8/9/2017 0:00	699.58	11.66
8/10/2017 0:00	361.20	6.02
8/11/2017 0:00	260.21	4.34
8/12/2017 0:00	361.72	6.03
8/13/2017 0:00	340.41	5.67
8/14/2017 0:00	398.42	6.64
8/15/2017 0:00	512.00	8.53
8/16/2017 0:00	127.77	2.13
8/17/2017 0:00	286.08	4.77
8/18/2017 0:00	352.38	5.87
8/19/2017 0:00	241.85	4.03
8/20/2017 0:00	406.61	6.78
8/21/2017 0:00	118.86	1.98
8/22/2017 0:00	190.70	3.18
8/23/2017 0:00	220.18	3.67
8/24/2017 0:00	222.21	3.70
8/25/2017 0:00	265.04	4.42
8/26/2017 0:00	507.68	8.46
8/27/2017 0:00	396.60	6.61
8/28/2017 0:00	252.64	4.21
8/20/2017 0.00	354.06	5.90
8/29/2017 0:00	354.06	5.90
8/30/2017 0:00	360.31	6.01
8/30/2017 0:00 8/31/2017 0:00	360.31 609.73	6.01 10.16
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00	360.31 609.73 492.57	6.01 10.16 8.21
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00	360.31 609.73 492.57 310.52	6.01 10.16 8.21 5.18
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00 9/3/2017 0:00	360.31 609.73 492.57 310.52 489.42	6.01 10.16 8.21 5.18 8.16
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00 9/3/2017 0:00 9/4/2017 0:00	360.31 609.73 492.57 310.52 489.42 186.51	6.01 10.16 8.21 5.18 8.16 3.11
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00 9/3/2017 0:00 9/4/2017 0:00 9/5/2017 0:00	360.31 609.73 492.57 310.52 489.42 186.51 469.16	6.01 10.16 8.21 5.18 8.16 3.11 7.82
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00 9/3/2017 0:00 9/4/2017 0:00 9/5/2017 0:00 9/6/2017 0:00	360.31 609.73 492.57 310.52 489.42 186.51 469.16 567.83	6.01 10.16 8.21 5.18 8.16 3.11 7.82 9.46
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00 9/3/2017 0:00 9/4/2017 0:00 9/5/2017 0:00 9/6/2017 0:00	360.31 609.73 492.57 310.52 489.42 186.51 469.16 567.83 203.52	6.01 10.16 8.21 5.18 8.16 3.11 7.82 9.46 3.39
8/30/2017 0:00 8/31/2017 0:00 9/1/2017 0:00 9/2/2017 0:00 9/3/2017 0:00 9/4/2017 0:00 9/5/2017 0:00 9/6/2017 0:00	360.31 609.73 492.57 310.52 489.42 186.51 469.16 567.83	6.01 10.16 8.21 5.18 8.16 3.11 7.82 9.46

0		
9/10/2017 0:00	336.72	5.61
9/11/2017 0:00	272.27	4.54
9/12/2017 0:00	232.15	3.87
9/13/2017 0:00	218.47	3.64
9/14/2017 0:00	349.35	5.82
9/15/2017 0:00	300.25 149.56	5.00 2.49
9/17/2017 0:00	149.30	1.96
9/18/2017 0:00	218.81	3.65
9/19/2017 0:00	223.18	3.72
9/20/2017 0:00	409.21	6.82
9/21/2017 0:00	210.94	3.52
9/22/2017 0:00	331.22	5.52
9/23/2017 0:00	251.19	4.19
9/24/2017 0:00	229.84	3.83
9/25/2017 0:00	457.93	7.63
9/26/2017 0:00	420.38	7.01
9/27/2017 0:00	387.62	6.46
9/28/2017 0:00	659.09	10.98
9/29/2017 0:00	371.04	6.18
9/30/2017 0:00	208.48	3.47
10/1/2017 0:00	291.95	4.87
10/2/2017 0:00	389.50	6.49
10/3/2017 0:00	184.27	3.07
10/4/2017 0:00	445.00	7.42
10/5/2017 0:00	568.80	9.48
10/6/2017 0:00	51.37	0.86
10/7/2017 0:00	268.80	4.48
10/8/2017 0:00	222.88	3.72
10/9/2017 0:00	661.62	11.03
10/10/2017 0:00	271.94	4.53
10/11/2017 0:00	324.12	5.40
10/12/2017 0:00	284.70	4.74
10/13/2017 0:00 10/15/2017 0:00	167.90	2.80 11.38
10/15/2017 0:00	682.88	6.15
10/17/2017 0:00	369.13 351.72	5.86
10/18/2017 0:00	251.28	4.19
10/19/2017 0:00	278.52	4.64
10/20/2017 0:00	244.78	4.08
10/21/2017 0:00	244.71	4.08
10/22/2017 0:00	687.33	11.46
10/23/2017 0:00	349.80	5.83
10/24/2017 0:00	347.98	5.80
10/25/2017 0:00	466.46	7.77
10/26/2017 0:00	480.69	8.01
10/27/2017 0:00	234.82	3.91
10/28/2017 0:00	310.43	5.17
10/29/2017 0:00	618.53	10.31
10/30/2017 0:00	282.06	4.70
10/31/2017 0:00	256.06	4.27
11/1/2017 0:00	143.64	2.39
11/2/2017 0:00	332.36	5.54
11/3/2017 0:00	231.17	3.85
11/6/2017 0:00	390.78	6.51
		4.00
11/7/2017 0:00	275.94	4.60
11/7/2017 0:00 11/8/2017 0:00	275.94 663.58	11.06
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00	275.94 663.58 334.41	11.06 5.57
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00	275.94 663.58 334.41 343.10	11.06 5.57 5.72
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00	275.94 663.58 334.41 343.10 200.07	11.06 5.57 5.72 3.33
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39	11.06 5.57 5.72 3.33 2.76
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/14/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75	11.06 5.57 5.72 3.33 2.76 4.08
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/14/2017 0:00 11/15/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75 454.31	11.06 5.57 5.72 3.33 2.76 4.08 7.57
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/14/2017 0:00 11/15/2017 0:00 11/16/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75 454.31 506.30	11.06 5.57 5.72 3.33 2.76 4.08 7.57 8.44
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/14/2017 0:00 11/15/2017 0:00 11/16/2017 0:00 11/17/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75 454.31 506.30 160.14	11.06 5.57 5.72 3.33 2.76 4.08 7.57 8.44 2.67
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/15/2017 0:00 11/16/2017 0:00 11/17/2017 0:00 11/18/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75 454.31 506.30 160.14 186.10	11.06 5.57 5.72 3.33 2.76 4.08 7.57 8.44 2.67 3.10
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/14/2017 0:00 11/15/2017 0:00 11/17/2017 0:00 11/18/2017 0:00 11/19/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75 454.31 506.30 160.14 186.10 249.98	11.06 5.57 5.72 3.33 2.76 4.08 7.57 8.44 2.67 3.10 4.17
11/7/2017 0:00 11/8/2017 0:00 11/9/2017 0:00 11/10/2017 0:00 11/12/2017 0:00 11/13/2017 0:00 11/15/2017 0:00 11/16/2017 0:00 11/17/2017 0:00 11/18/2017 0:00	275.94 663.58 334.41 343.10 200.07 165.39 244.75 454.31 506.30 160.14 186.10	11.06 5.57 5.72 3.33 2.76 4.08 7.57 8.44 2.67 3.10

11/24/2017 0:00 224.39 3.74 11/25/2017 0:00 461.58 7.52 11/28/2017 0:00 371.87 6.20 11/28/2017 0:00 371.87 6.20 11/28/2017 0:00 365.35 7.52 11/28/2017 0:00 326.83 5.45 11/30/2017 0:00 481.56 7.69 12/1/2017 0:00 689.57 11.49 12/2/2017 0:00 689.47 10.99 12/5/2017 0:00 682.99 11.55 12/6/2017 0:00 682.99 1.43 12/1/2017 0:00 682.29 1.04 12/1/2017 0:00 692.83 7.55 12/1/2017 0:00 695.18 11.59 12/16/2017 0:00 452.83 7.55 12/17/2017 0:00 452.83 7.55 12/17/2017 0:00 452.83 7.55 12/17/2017 0:00 452.83 7.55 12/17/2017 0:00 453.57 10.60 12/22/2017 0:00 577.83 9.63 12/22/2017 0:00 53.77 10.60 <th></th> <th></th> <th></th>			
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11/26/2017 0:00 167.47 2.79 11/28/2017 0:00 351.35 7.52 11/28/2017 0:00 328.83 5.45 11/30/2017 0:00 288.35 5.45 11/30/2017 0:00 689.57 11.49 12/2/2017 0:00 689.57 11.49 12/2/2017 0:00 659.47 10.99 12/5/2017 0:00 658.47 10.99 12/7/2017 0:00 686.04 11.43 12/10/2017 0:00 686.04 11.43 12/10/2017 0:00 109.67 1.83 12/13/2017 0:00 695.18 11.59 12/13/2017 0:00 695.18 11.59 12/13/2017 0:00 685.18 11.59 12/13/2017 0:00 452.83 7.55 12/13/2017 0:00 454.66 2.42 12/20/2017 0:00 445.46 2.42 12/22/2017 0:00 445.47 1.43 12/22/2017 0:00 54.67 4.64 12/22/2017 0:00 278.67 4.64 12/22/2017 0:00 278.67 4.			
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12/30/2017 0:0034.760.5812/31/2017 0:0025.490.431/1/2018 0:00201.843.361/2/2018 0:00341.875.701/4/2018 0:00353.755.901/5/2018 0:00399.976.671/6/2018 0:00100.671.681/7/2018 0:00125.462.091/8/2018 0:0050.480.841/9/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00309.975.161/20/2018 0:00309.335.161/20/2018 0:00309.335.161/21/2018 0:00309.335.161/22/2018 0:00236.263.941/23/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00287.964.801/28/2018 0:00287.964.801/26/2018 0:00287.964.801/26/2018 0:00287.964.801/26/2018 0:00287.964.801/26/2018 0:00239.163.991/28/2018 0:00232.843.88	4.64	278.67	12/28/2017 0:00
12/31/2017 0:0025.490.431/1/2018 0:00201.843.361/2/2018 0:00341.875.701/4/2018 0:00353.755.901/5/2018 0:00399.976.671/6/2018 0:00100.671.681/7/2018 0:00125.462.091/8/2018 0:0050.480.841/9/2018 0:00416.726.951/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00309.335.161/20/2018 0:00309.335.161/21/2018 0:00309.335.161/22/2018 0:00236.263.941/23/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00287.964.801/26/2018 0:00270.904.521/28/2018 0:00239.163.991/24/2018 0:00238.43.88	4.81	288.73	12/29/2017 0:00
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1/5/2018 0:00399.976.671/6/2018 0:00100.671.681/7/2018 0:00125.462.091/8/2018 0:0050.480.841/9/2018 0:00416.726.951/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00309.975.171/16/2018 0:00309.975.171/18/2018 0:00309.975.161/20/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:00309.335.161/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00287.964.801/26/2018 0:00239.163.991/28/2018 0:00239.163.991/28/2018 0:00239.163.991/28/2018 0:00232.843.88	5.70	341.87	1/2/2018 0:00
1/6/2018 0:00100.671.681/7/2018 0:00125.462.091/8/2018 0:0050.480.841/9/2018 0:00416.726.951/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00270.904.521/28/2018 0:00239.163.991/28/2018 0:00239.163.991/29/2018 0:00232.843.88	5.90	353.75	1/4/2018 0:00
1/7/2018 0:00125.462.091/8/2018 0:0050.480.841/9/2018 0:00416.726.951/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:00309.335.161/22/2018 0:00236.263.941/23/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00239.163.991/28/2018 0:00239.163.991/29/2018 0:00232.843.88	6.67	399.97	1/5/2018 0:00
1/8/2018 0:0050.480.841/9/2018 0:00416.726.951/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00179.522.991/24/2018 0:00185.723.101/25/2018 0:00287.964.801/26/2018 0:00270.904.521/28/2018 0:00239.163.991/28/2018 0:00232.843.88	1.68	100.67	1/6/2018 0:00
1/9/2018 0:00416.726.951/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00185.723.101/26/2018 0:00287.964.801/26/2018 0:00239.163.991/28/2018 0:00239.163.991/29/2018 0:00232.843.88	2.09	125.46	1/7/2018 0:00
1/10/2018 0:00284.104.741/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:00309.335.161/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00185.723.101/26/2018 0:00239.163.991/27/2018 0:00239.163.991/29/2018 0:00232.843.88	0.84	50.48	1/8/2018 0:00
1/12/2018 0:00616.6810.281/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	6.95	416.72	1/9/2018 0:00
1/13/2018 0:00138.152.301/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	4.74	284.10	1/10/2018 0:00
1/15/2018 0:00446.407.441/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 10.28	616.68	
1/16/2018 0:00309.975.171/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 2.30	138.15	1/13/2018 0:00
1/18/2018 0:00318.575.311/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 7.44	446.40	1/15/2018 0:00
1/19/2018 0:00165.142.751/20/2018 0:00309.335.161/21/2018 0:0087.151.451/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88		309.97	1/16/2018 0:00
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1/22/2018 0:00236.263.941/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 5.16	309.33	
1/23/2018 0:00179.522.991/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 1.45	87.15	1/21/2018 0:00
1/24/2018 0:00190.983.181/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 3.94	236.26	1/22/2018 0:00
1/25/2018 0:00287.964.801/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 2.99	179.52	1/23/2018 0:00
1/26/2018 0:00185.723.101/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 3.18	190.98	1/24/2018 0:00
1/27/2018 0:00270.904.521/28/2018 0:00239.163.991/29/2018 0:00232.843.88	 4.80	287.96	1/25/2018 0:00
1/28/2018 0:00 239.16 3.99 1/29/2018 0:00 232.84 3.88	 3.10	185.72	1/26/2018 0:00
1/29/2018 0:00 232.84 3.88	4.52	270.90	1/27/2018 0:00
	 3.99	239.16	1/28/2018 0:00
	 3.88	232.84	1/29/2018 0:00
1/31/2018 0:00 237.39 3.96	 3.96	237.39	1/31/2018 0:00
2/1/2018 0:00 386.03 6.43	 6.43	386.03	2/1/2018 0:00
2/3/2018 0:00 148.08 2.47	 2.47	148.08	2/3/2018 0:00
2/4/2018 0:00 510.88 8.52	 8.52	510.88	2/4/2018 0:00
2/6/2018 0:00 164.39 2.74	 2.74	164.39	2/6/2018 0:00
2/7/2018 0:00 302.85 5.05	 5.05	302.85	2/7/2018 0:00
2/8/2018 0:00 310.77 5.18	 5.18	310.77	2/8/2018 0:00
2/9/2018 0:00 371.90 6.20	 6.20	371.90	2/9/2018 0:00

2/10/2018 0:00	225.20	3.75
2/11/2018 0:00	681.38	11.36
2/12/2018 0:00	198.20	3.30
2/13/2018 0:00	275.00	4.58
2/14/2018 0:00	295.72	4.93
2/15/2018 0:00	289.19	4.82
2/16/2018 0:00	158.71	2.65
2/17/2018 0:00	421.55	7.03
2/18/2018 0:00	402.58	6.71
2/19/2018 0:00	291.18	4.85
2/20/2018 0:00	309.00	5.15
2/21/2018 0:00	240.90	4.02
2/22/2018 0:00	158.56	2.64
2/23/2018 0:00	286.76	4.78
2/25/2018 0:00	299.08	4.99
2/26/2018 0:00	572.80	9.55
2/27/2018 0:00	232.73	3.88
2/28/2018 0:00	331.59	5.53
3/1/2018 0:00	167.85	2.80
3/2/2018 0:00	447.53	7.46
3/3/2018 0:00	327.52	5.46
3/4/2018 0:00	342.51	5.71
3/5/2018 0:00	447.90	7.47
3/6/2018 0:00	344.52	5.74
3/7/2018 0:00	632.50	10.54
3/8/2018 0:00	309.26	5.15
3/9/2018 0:00	287.65	4.79
3/10/2018 0:00	696.72	11.61
3/11/2018 0:00	521.74	8.70
3/12/2018 0:00	658.90	10.98
3/13/2018 0:00	412.33	6.87
3/14/2018 0:00	364.83	6.08
3/15/2018 0:00	233.28	3.89
3/16/2018 0:00	151.90	2.53
3/17/2018 0:00	494.33	8.24
3/18/2018 0:00	573.96	9.57
3/19/2018 0:00	710.80	11.85
3/20/2018 0:00	698.68	11.65
3/21/2018 0:00	239.17	3.99
3/22/2018 0:00	298.30	4.97
3/23/2018 0:00	319.31	5.32
3/24/2018 0:00	236.02	3.93
3/25/2018 0:00	238.47	3.97
3/26/2018 0:00	339.06	5.65
3/27/2018 0:00	6.28	0.11
3/28/2018 0:00	493.82	8.23
3/29/2018 0:00	193.19	3.22
3/30/2018 0:00	530.86	8.85
3/31/2018 0:00	199.61	3.33
4/2/2018 0:00	271.65	4.53
4/3/2018 0:00	251.00	4.18
4/4/2018 0:00	500.85	8.35
4/5/2018 0:00	172.77	2.88
4/6/2018 0:00	705.53	11.76
4/8/2018 0:00	157.95	2.63
4/9/2018 0:00	164.08	2.74
4/10/2018 0:00	38.93	0.65
4/12/2018 0:00	211.84	3.53
4/13/2018 0:00	353.91	5.90
4/14/2018 0:00	363.11	6.05
4/15/2018 0:00	236.92	3.95
4/16/2018 0:00	244.62	4.08
4/17/2018 0:00	269.91	4.50
	1	
Average	306.71	5.11

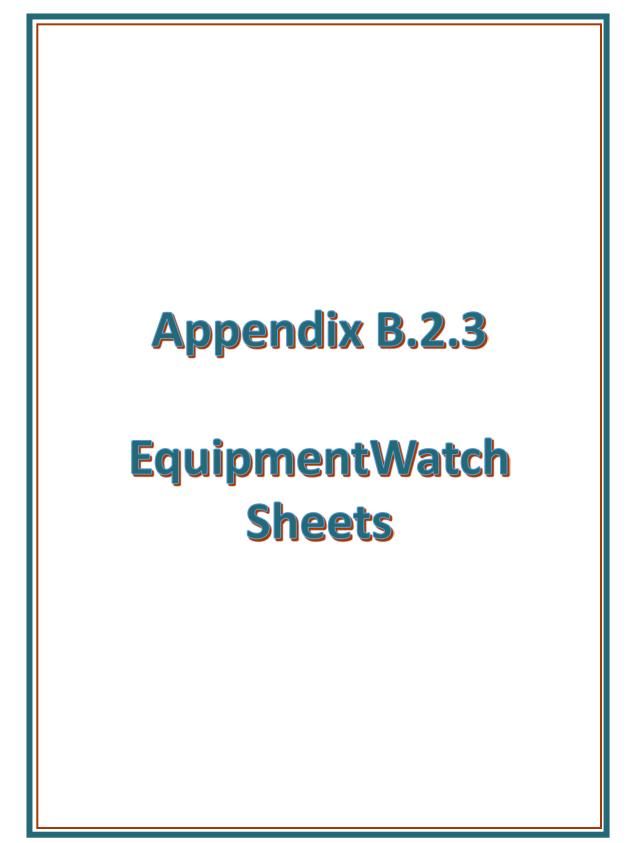


			LADOR RATE			
Labor	Equipment	Group	Base rate ¹	Fringes ¹	Apprentice Rate ¹	Subtotal
Power Equipment Operator	Front End Loaders	VI	\$20.15	\$5.74	\$0.67	\$26.56
Power Equipment Operator	Dozer	IV	\$19.88	\$5.74	\$0.67	\$26.29
Power Equipment Operator	Motor Grader (Rough)	IV	\$19.88	\$5.74	\$0.67	\$26.29
Power Equipment Operator	Mechanic	V	\$19.98	\$5.74	\$0.67	\$26.39
Truck Drivers	Haul Trucks	III	\$16.00	\$7.17	\$0.67	\$23.84
Laborers	Forman	II	\$17.51	\$5.30	\$0.67	\$23.48
Laborers	Laborer		¢16.76	¢5 20	¢0.67	¢00.70
	Laborer	I	\$16.76	\$5.30	\$0.67	\$22.73

LABOR RATES

1. Base Rate, Fringes, Apprentice Rate

https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Prevailing_Wage_Poster_H_2018.pdf





All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar D11T Standard Crawler Dozers Size Class: 520 HP & Over Weight: 208,885 Ibs.			
Configuration for D11T			
Operator Protection Net Horsepower	EROPS 850 hp	Dozer Type Power Mode	U Blade Diesel
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$116.51/hr	\$109.64/hr	-5.9%
Cost of Facilities Capital (CFC)	\$23.92/hr	\$20.17/hr	-15.7%
Overhead	\$59.40/hr	\$0.00/hr	-100%
Overhaul Labor	\$17.07/hr	\$6.44/hr	-62.3%
Overhaul Parts	\$102.61/hr	\$85.56/hr	-16.6%
Total Hourly Ownership Cost: User Defined Adjustments: Annu	\$319.51/hr ual Overhead (\$83,160.00 -> \$1.00).	\$221.81/hr Annual Use Hours (1,400hrs -> 1,6	-30.6% 679hrs) Sales Tax (5.1% -> 0%)
Hourly Operating Costs		~	
	Standard Value	User Adjusted Value	Variance
Field Labor	\$19.99/hr	\$7.54/hr	-62.3%
Field Parts	\$99.94/hr	\$83.34/hr	-16.6%
Ground Engaging Component (GEC)	\$16.66/hr	\$13.89/hr	-16.6%
Tire	\$0.00/hr	-	-
Electrical/Fuel	\$76.46/hr	\$63.77/hr	-16.6%
Lube	\$24.15/hr	-	-
Total Operating Ownership Cost: User Defined Adjustments: Diese	\$237.20/hr el Cost (2.57 -> 2.1434) Mechanics W	\$192.69/hr /age (\$58.29 -> \$26.39)	-18.8%
Total	0		
	Standard Value	User Adjusted Value	Variance

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$319.51/hr	\$221.81/hr	-30.6%
Hourly Operating Costs	\$237.20/hr	\$192.69/hr	-18.8%
Total Hourly Cost	\$556.71	\$414.50/hr	-25.5%

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Crawler Tractor Multi-Shank Rippers			
Size Class: 6 60 HP & Over Veight:			
N/A			Model Image
Configuration for MSR-700+	нар		
-	700 & Over	Number of Shanks 3	
Engine Horsepower Ripper Type	Adj. Parallelogram	Number of Shanks 3	
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$17.49/hr	\$16.60/hr	-5.1%
Depresidion		\$1.31/hr	-18.1%
Cost of Facilities Capital (CEC)	\$1.60/nr		10.170
	\$1.60/hr \$4.06/hr		-100%
Overhead	\$4.06/hr	\$0.00/hr	-100% -64%
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost:	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr		-64% -20.9% -25.9%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr	-64% -20.9% -25.9%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr	-64% -20.9% -25.9%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr	\$0.00/hr \$0.98/hr <u>\$4.50/hr</u> \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs)	-64% -20.9% - 25.9% Sales Tax (5.1% -> 0%)
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr	\$0.00/hr \$0.98/hr <u>\$4.50/hr</u> \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9%
Field Labor Field Parts Ground Engaging Component (GEC)	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr	\$0.00/hr \$0.98/hr <u>\$4.50/hr</u> \$23.39/hr 1) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire	\$4.06/hr \$2.72/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr	\$0.00/hr \$0.98/hr <u>\$4.50/hr</u> \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9%
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr	\$0.00/hr \$0.98/hr <u>\$4.50/hr</u> \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9%
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube	\$4.06/hr \$2.72/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.90/hr	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr \$3.78/hr - - -	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9% -20.8% - -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.90/hr \$16.39/hr	\$0.00/hr \$0.98/hr <u>\$4.50/hr</u> \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.90/hr \$16.39/hr	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr \$3.78/hr - - -	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9% -20.8% - -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Mec	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.90/hr \$16.39/hr	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr \$3.78/hr - - -	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9% -20.8% - -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Mec Fotal	\$4.06/hr \$2.72/hr \$5.69/hr \$31.56/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.00/hr \$0.00/hr \$0.90/hr \$16.39/hr hanics Wage (\$58.29 -> \$26.39)	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr 0) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr \$3.78/hr - - - \$11.00/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9% -20.8% - - - - - - - - - - - - - - - - - - -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Mec Fotal Hourly Ownership Costs	\$4.06/hr \$2.72/hr \$5.69/hr val Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.00/hr \$0.90/hr \$16.39/hr hanics Wage (\$58.29 -> \$26.39)	\$0.00/hr \$0.98/hr \$23.39/hr • \$23.39/hr • \$23.39/hr • \$1,623hrs • \$1,79/hr \$4.53/hr \$3.78/hr - - - \$11.00/hr User Adjusted Value	-64% -20.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9% -20.8% - - - - - - - - - - - - - - - - - - -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Mec	\$4.06/hr \$2.72/hr \$5.69/hr ual Overhead (\$5,214.74 -> \$1.00 Standard Value \$4.99/hr \$5.73/hr \$4.77/hr \$0.00/hr \$0.00/hr \$0.00/hr \$0.00/hr \$0.00/hr \$0.00/hr \$26.39) Standard Value \$31.56/hr	\$0.00/hr \$0.98/hr \$4.50/hr \$23.39/hr)) Annual Use Hours (1,285hrs -> 1,623hrs) User Adjusted Value \$1.79/hr \$4.53/hr \$3.78/hr - - \$11.00/hr User Adjusted Value \$23.39/hr	-64% -20.9% -25.9% Sales Tax (5.1% -> 0%) Variance -64.1% -20.9% -20.8% - - - - - - - - - - - - - - - - - - -



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar D9T Standard Crawler Dozers Size Class: 360 - 519 HP Weight: 105,600 Ibs.			
Configuration for D9T			
Dozer Type Net Horsepower	Semi-U 410 hp	Power Mode Operator Protection	Diesel ROPS/FOPS
Hourly Ownership Costs			<u> </u>
	Standard Value	User Adjusted Value	Variance
Depreciation	\$45.49/hr	\$42.80/hr	-5.9%
Cost of Facilities Capital (CFC)	\$9.46/hr	\$7.98/hr	-15.6%
Overhead	\$41.28/hr	\$0.00/hr	-100%
Overhaul Labor	\$17.07/hr	\$6.44/hr	-62.3%
Overhaul Parts	\$40.59/hr	\$33.84/hr	-16.6%
Total Hourly Ownership Cost: User Defined Adjustments: Annu	\$153.89/hr ual Overhead (\$57,796.85 -> \$1.00	\$91.06/hr) Annual Use Hours (1,400hrs -> 1,6	-40.8% 679hrs) Sales Tax (5.1% -> 0%)
Hourly Operating Costs			
	Standard Value	User Adjusted Value	Variance
Field Labor	\$19.99/hr	\$7.54/hr	-62.3%
Field Parts	\$39.53/hr	\$32.96/hr	-16.6%
Ground Engaging Component (GEC)	\$6.59/hr	\$5.49/hr	-16.7%
Tire	\$0.00/hr	-	-
Electrical/Fuel	\$36.88/hr	\$30.76/hr	-16.6%
Lube	\$10.21/hr	-	-
Total Operating Ownership Cost: User Defined Adjustments: Diese	\$113.20/hr el Cost (2.57 -> 2.1434) Mechanics	\$86.96/hr Wage (\$58.29 -> \$26.39)	-23.2%
Total			
	Standard Value	User Adjusted Value	Variance

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$153.89/hr	\$91.06/hr	-40.8%
Hourly Operating Costs	\$113.20/hr	\$86.96/hr	-23.2%
Total Hourly Cost	\$267.09	\$178.02/hr	-33.3%

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar D6T XL Standard Crawler Dozers Size Class: 190 - 259 HP Weight: 44,420 Ibs.			
Configuration for D6T XL			
Dozer Type Net Horsepower	Semi-U 200 hp	Power Mode Operator Protection	Diesel EROPS
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$26.11/hr	\$24.43/hr	-6.4%
Cost of Facilities Capital (CFC)	\$5.38/hr	\$4.39/hr	-18.4%
Overhead	\$15.32/hr	\$0.00/hr	-100%
Overhaul Labor	\$9.75/hr	\$3.55/hr	-63.6%
Overhaul Parts	\$17.88/hr	\$14.39/hr	-19.5%
Total Hourly Ownership Cost: User Defined Adjustments: Annu	\$74.44/hr al Overhead (\$19,692.47 -> \$1.0	\$46.76/hr 00) Annual Use Hours (1,285hrs -> 1,5	-37.2% 97hrs) Sales Tax (5.1% -> 0%)
Hourly Operating Costs		No.	
	Standard Value	User Adjusted Value	Variance
Field Labor	\$12.02/hr	\$4.38/hr	-63.6%
Field Parts	\$17.33/hr	\$13.94/hr	-19.6%
Ground Engaging Component (GEC)	\$2.89/hr	\$2.32/hr	-19.7%
Tire	\$0.00/hr	-	-
Electrical/Fuel	\$20.05/hr	\$16.72/hr	-16.6%
Lube	\$4.74/hr	-	-
Total Operating Ownership Cost: User Defined Adjustments: Diese	\$57.03/hr el Cost (2.57 -> 2.1434) Mechanic	\$42.10/hr s Wage (\$58.29 -> \$26.39)	-26.2%
Total	0		
	Standard Value	User Adjusted Value	Variance

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$74.44/hr	\$46.76/hr	-37.2%
Hourly Operating Costs	\$57.03/hr	\$42.10/hr	-26.2%
Total Hourly Cost	\$131.47	\$88.86/hr	-32.4%

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar 992K 4-Wd Articulated Wheel Loaders			
Size Class:			
500 - 999 HP Weight:			
214,948 lbs.			The second second
			/ \%(0)990(0)-
			2 - 20 Human Human
Configuration for 992K			
Power Mode	Diesel	Net Horsepower	801 hp
Operator Protection	EROPS	Bucket Capacity - Heaped	14 cu yd
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$111.16/hr	\$103.81/hr	-6.6%
	*•••••••••••••	\$18.90/hr	-16.3%
Cost of Facilities Capital (CFC)	\$22.59/hr	\$10.50/III	
	\$22.59/hr \$59.32/hr	\$0.00/hr	-100%
Overhead			-100% -62.6%
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost:	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr	\$0.00/hr	-62.6% -17.5% -35.1%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Anr	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr	-62.6% -17.5% - 35.1%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Anr	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr	-62.6% -17.5% - 35.1%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Anr Hourly Operating Costs	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr nual Overhead (\$85,710.31 -> \$1.0	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 10) Annual Use Hours (1,445hrs -> 1,7	-62.6% -17.5% - 35.1% 751hrs) Sales Tax (5.1% -> 0%)
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> wal Overhead (\$85,710.31 -> \$1.0 Standard Value	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 10) Annual Use Hours (1,445hrs -> 1, User Adjusted Value	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 10) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC)	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr	\$0.00/hr \$3.77/hr <u>\$24.92/hr</u> \$ 151.40/hr 0) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5%
Overhead Overhaul Labor <u>Overhaul Parts</u> Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$4.54/hr	\$0.00/hr \$3.77/hr <u>\$24.92/hr</u> \$ 151.40/hr 0) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5%
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$4.54/hr \$32.69/hr	\$0.00/hr \$3.77/hr <u>\$24.92/hr</u> \$ 151.40/hr 10) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr \$3.74/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5% -17.6% -
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	\$59.32/hr \$10.08/hr \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$4.54/hr \$32.69/hr \$65.87/hr \$19.49/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 0) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr \$3.74/hr - \$54.94/hr - \$54.94/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5% -17.6% -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Dies	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$4.54/hr \$32.69/hr \$65.87/hr \$19.49/hr \$168.20/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 0) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr \$3.74/hr - \$54.94/hr - \$54.94/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5% -17.6% - - -16.6% -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	\$59.32/hr \$10.08/hr <u>\$30.19/hr</u> \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$4.54/hr \$32.69/hr \$65.87/hr \$19.49/hr \$168.20/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 10) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr \$3.74/hr - \$54.94/hr - \$142.95/hr s Wage (\$58.29 -> \$26.39)	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5% -17.6% - - -16.6% -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies	\$59.32/hr \$10.08/hr \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$33.31/hr \$4.54/hr \$32.69/hr \$65.87/hr \$19.49/hr \$168.20/hr \$cost (2.57 -> 2.1434) Mechanic	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 0) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr \$3.74/hr - \$54.94/hr - \$54.94/hr	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5% -17.6% - - -16.6% - -
Overhead Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Ann Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Dies	\$59.32/hr \$10.08/hr \$30.19/hr \$233.34/hr hual Overhead (\$85,710.31 -> \$1.0 Standard Value \$12.30/hr \$33.31/hr \$33.31/hr \$4.54/hr \$32.69/hr \$65.87/hr \$19.49/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr \$168.20/hr	\$0.00/hr \$3.77/hr \$24.92/hr \$151.40/hr 0) Annual Use Hours (1,445hrs -> 1, User Adjusted Value \$4.60/hr \$27.49/hr \$3.74/hr - \$54.94/hr - \$142.95/hr s Wage (\$58.29 -> \$26.39) User Adjusted Value	-62.6% -17.5% -35.1% 751hrs) Sales Tax (5.1% -> 0%) Variance -62.6% -17.5% -17.6% - - -16.6% - - -15% Variance



All prices shown in US\$

Custom Cost Evaluator

May 14, 2018

4-Wd Articulated Wheel Loaders			
Size Class:			fi i
275 - 349 HP			
Weight:			
65,078 lbs.			
Configuration for 980G			
Power Mode	Diesel	Net Horsepower	300 hp
Operator Protection	EROPS	Bucket Capacity - Heaped	7.5 cu yd
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$21.61/hr	\$20.15/hr	-6.8%
Cost of Facilities Capital (CFC)	\$4.70/hr	\$3.97/hr	-15.5%
Overhead	\$2.80/hr	\$0.00/hr	-100%
Overhaul Labor	\$10.08/hr	\$3.80/hr	-62.3%
Overhaul Parts	\$6.28/hr	\$5.24/hr	-16.6%
Total Hourly Ownership Cost:	\$45.47/hr	\$33.16/hr	-27.1%
User Defined Adjustments: Annu	uai Ovemead (\$4,050.81 -> \$1.00) Annual Use Hours (1,445hrs -> 1,73	541115) Sales Tax (5.1% -> 0%)
-	uai Overnead (\$4,050.81 -> \$1.00) Annual Use Hours (1,445hrs -> 1,73	941115) Sales Tax (5.1 % - 7 0 %)
	Standard Value	User Adjusted Value	Variance
Hourly Operating Costs		0	
Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Hourly Operating Costs Field Labor Field Parts	Standard Value \$12.30/hr	User Adjusted Value \$4.64/hr	Variance -62.3%
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC)	Standard Value \$12.30/hr \$6.93/hr	User Adjusted Value \$4.64/hr \$5.78/hr	Variance -62.3% -16.6%
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr	User Adjusted Value \$4.64/hr \$5.78/hr	Variance -62.3% -16.6%
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr -	Variance -62.3% -16.6% -16% -
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr \$24.67/hr \$5.15/hr \$55.77/hr	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr - \$20.58/hr - \$42.72/hr	Variance -62.3% -16.6% -16% -
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr \$24.67/hr \$5.15/hr \$55.77/hr	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr - \$20.58/hr - \$42.72/hr	Variance -62.3% -16.6% -16% - - -16.6% -
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr \$24.67/hr \$5.15/hr \$55.77/hr el Cost (2.57 -> 2.1434) Mechanic	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr - \$20.58/hr - \$42.72/hr cs Wage (\$58.29 -> \$26.39)	Variance -62.3% -16.6% - 16.6% - - - 23.4%
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr \$24.67/hr \$5.15/hr \$55.77/hr el Cost (2.57 -> 2.1434) Mechanic Standard Value	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr - \$20.58/hr - \$42.72/hr as Wage (\$58.29 -> \$26.39) User Adjusted Value	Variance -62.3% -16.6% - 16.6% - - - 23.4% Variance
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese Total Hourly Ownership Costs	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr \$24.67/hr \$5.15/hr \$55.77/hr el Cost (2.57 -> 2.1434) Mechanic Standard Value \$45.47/hr	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr - \$20.58/hr - \$20.58/hr - \$42.72/hr as Wage (\$58.29 -> \$26.39) User Adjusted Value \$33.16/hr	Variance -62.3% -16.6% - -16.6% - - -23.4% Variance -27.1%
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese	Standard Value \$12.30/hr \$6.93/hr \$0.94/hr \$5.78/hr \$24.67/hr \$5.15/hr \$55.77/hr el Cost (2.57 -> 2.1434) Mechanic Standard Value	User Adjusted Value \$4.64/hr \$5.78/hr \$0.79/hr - \$20.58/hr - \$42.72/hr as Wage (\$58.29 -> \$26.39) User Adjusted Value	Variance -62.3% -16.6% - 16.6% - - - 23.4% Variance



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Komatsu HD1500-5 (disc. 200	8)		
Mechanical Drive Rear Dumps			
Size Class:			
05 - 139 MTons			Parente Trans
Weight: 221,481 Ibs.			
221,401 103.			F-EQJEEQJ
			Kunny Kunny
Configuration for HD1500-5	(disc. 2008)		
Body Capacity (StruckHeaped)	71 cu yd - 102 cu yd	Power Mode	Diesel
Net Horsepower	1406 hp	Rated Payload	136 mt
lourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$53.84/hr	\$50.71/hr	-5.8%
Cost of Facilities Capital (CFC)	\$10.53/hr	\$9.60/hr	-8.8%
Dverhead	\$24.81/hr	\$0.00/hr	-100%
Overhaul Labor	\$35.45/hr	011 FOU	
Jvernaul Labor	\$33.43/III	\$14.52/hr	-59%
Overhaul Parts	\$35.45/m \$26.74/hr	\$14.52/hr \$24.20/hr	-59% -9.5%
Overhaul Parts			
Dverhaul Parts Fotal Hourly Ownership Cost:	\$26.74/hr \$151.37/hr	\$24.20/hr	-9.5% - 34.6%
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu	\$26.74/hr \$151.37/hr	\$24.20/hr \$99.03/hr	-9.5% - 34.6%
Overhaul Parts Fotal Hourly Ownership Cost: Jser Defined Adjustments: Annu	\$26.74/hr \$151.37/hr	\$24.20/hr \$99.03/hr	-9.5% - 34.6%
Overhaul Parts Fotal Hourly Ownership Cost: Iser Defined Adjustments: Annu	\$26.74/hr \$151.37/hr	\$24.20/hr \$99.03/hr	-9.5% - 34.6%
Overhaul Parts Fotal Hourly Ownership Cost: Iser Defined Adjustments: Ann Hourly Operating Costs	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0	\$24.20/hr \$99.03/hr 00) Annual Use Hours (1,850hrs -> 2,0	-9.5% - 34.6% 44hrs) Sales Tax (5.1% -> 0%)
Overhaul Parts Fotal Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value	-9.5% - 34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance
Dverhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu- Hourly Operating Costs Field Labor Field Parts	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59%
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC)	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59%
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59%
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu- Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr \$24.53/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr \$10.26/hr - -	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59% -9.5% - -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr \$24.53/hr \$72.27/hr \$17.93/hr \$146.55/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr \$10.26/hr - - \$60.27/hr - \$121.38/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59% -9.5% - -
Dverhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu- Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Total Operating Ownership Cost:	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr \$24.53/hr \$72.27/hr \$17.93/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr \$10.26/hr - - \$60.27/hr - \$121.38/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59% -9.5% - - - - - -16.6% -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr \$24.53/hr \$72.27/hr \$17.93/hr \$146.55/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr \$10.26/hr - - \$60.27/hr - \$121.38/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59% -9.5% - - - - - -16.6% -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr \$24.53/hr \$72.27/hr \$17.93/hr \$146.55/hr	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr \$10.26/hr - - \$60.27/hr - \$121.38/hr	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59% -9.5% - - - - - -16.6% -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu- Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies	\$26.74/hr \$151.37/hr ual Overhead (\$45,902.04 -> \$1.0 Standard Value \$20.48/hr \$11.34/hr \$0.00/hr \$24.53/hr \$72.27/hr \$17.93/hr \$146.55/hr el Cost (2.57 -> 2.1434) Mechanic	\$24.20/hr \$99.03/hr 10) Annual Use Hours (1,850hrs -> 2,0 User Adjusted Value \$8.39/hr \$10.26/hr - - \$60.27/hr - \$121.38/hr s Wage (\$58.29 -> \$26.39)	-9.5% -34.6% 44hrs) Sales Tax (5.1% -> 0%) Variance -59% -9.5% - - - - -16.6% - - - 17.2%

Total Hourly Cost

Revised Date: 1st Half 2018

The equipment represented in this report has been exclusively prepared for MANDY LILLA (mlilla@fmi.com)

\$297.92

\$220.41/hr

-26%



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar 797B (disc. 2009) Mechanical Drive Rear Dumps			0
Size Class: 200 MTons & Over			
Weight:			A THINK AS ANTING
575,660 lbs.			LEQILEO1
			Europe Europe
Configuration for 797B (disc	. 2009)		
Net Horsepower	3370 hp	Power Mode	Diesel
Rated Payload	380 mt		
Iourly Ownership Costs			Q
	Standard Value	User Adjusted Value	Variance
Depreciation	\$231.35/hr	\$217.88/hr	-5.8%
Cost of Facilities Capital (CFC)	\$45.22/hr	\$41.88/hr	-7.4%
Overhead	\$106.61/hr	\$0.00/hr	-100%
Overhaul Labor	\$35.45/hr	\$14.77/hr	-58.3%
Overhaul Parts	\$108.72/hr	\$100.06/hr	-8%
Total Hourly Ownership Cost: Jser Defined Adjustments: Annu	\$527.35/hr al Overhead (\$197,225.00 -> \$1.0	\$374.59/hr 0) Annual Use Hours (1,850hrs -> 2	-29% ,010hrs) Sales Tax (5.1% -> 0%)
Hourly Operating Costs		0	
	Standard Value	User Adjusted Value	Variance
Field Labor	\$20.48/hr	\$8.53/hr	-58.3%
Field Parts	\$49.79/hr	\$45.82/hr	-8%
Ground Engaging Component (GEC)	\$0.00/hr	-	-
Гire	\$99.75/hr	-	-
Electrical/Fuel	\$173.22/hr	\$144.47/hr	-16.6%
Lube	\$63.32/hr	-	
Total Operating Ownership Cost: Jser Defined Adjustments: Diese	\$406.56/hr el Cost (2.57 -> 2.1434) Mechanics	\$361.89/hr Wage (\$58.29 -> \$26.39)	-11%
Total			
	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$527.35/hr	\$374.59/hr	-29%

Total Hourly Cost	\$933.91	\$736.48/hr	-21.1%	
Hourly Operating Costs	\$406.56/hr	\$361.89/hr	-11%	
Hourly Ownership Costs	\$527.35/hr	\$374.59/hr	-29%	

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

off-Highway Water Tanker Trucks			
Size Class: 00 - 399 HP			
Veight: 54,400 Ibs.			Model Image
Configuration for 6000 330			-0-
Power Mode Fank Capacity	Diesel 6000 gal	Horsepower	330
lourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$22.90/hr	\$21.43/hr	-6.4%
Cost of Facilities Capital (CFC)	\$4.03/hr	\$3.50/hr	-13.2%
Overhead	\$7.31/hr	\$0.00/hr	-100%
	\$8.94/hr	\$3.47/hr	-61.2%
Overhaul Labor	+		
Overhaul Parts Total Hourly Ownership Cost:	\$5.85/hr \$49.03/hr	\$5.01/hr \$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751)	-14.4% - 31.9% hrs) Sales Tax (5.1% -> 0%)
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu	\$5.85/hr \$49.03/hr aal Overhead (\$10,969.00 -> \$1.0	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751)	-31.9% hrs) Sales Tax (5.1% -> 0%)
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs	\$5.85/hr \$49.03/hr tal Overhead (\$10,969.00 -> \$1.0 Standard Value	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance
Dverhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs	\$5.85/hr \$49.03/hr tal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2%
Dverhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts	\$5.85/hr \$49.03/hr Ial Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC)	\$5.85/hr \$49.03/hr Ial Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2%
Dverhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire	\$5.85/hr \$49.03/hr Ial Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - -	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr	\$33.41/hr 0) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2%
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube	\$5.85/hr \$49.03/hr tal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr -	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - - - - -16.6% -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr - \$53.58/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - -
Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr - \$53.58/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - - - - -16.6% -
Dverhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Fotal Operating Ownership Cost: User Defined Adjustments: Diese	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr - \$53.58/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - - - -16.6% -
Diverhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Diese Fotal	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr \$10.00 +> \$1.0 \$21.96/hr \$10.69/hr \$10.	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr - \$53.58/hr s Wage (\$58.29 -> \$26.39)	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - - -16.6% - - - - 27%
Overhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Diese Fotal Hourly Ownership Costs	\$5.85/hr \$49.03/hr tal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.1434) Mechanic Standard Value	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr - \$53.58/hr s Wage (\$58.29 -> \$26.39) User Adjusted Value	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - - -16.6% - - - -27% Variance
Overhaul Parts Total Hourly Ownership Cost: User Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Diese Fotal Hourly Ownership Costs Hourly Operating Costs	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.1434) Mechanic Standard Value \$49.03/hr	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - \$24.12/hr - \$53.58/hr s Wage (\$58.29 -> \$26.39) User Adjusted Value \$33.41/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - -16.6% - - -27% Variance -31.9%
Overhaul Labor Overhaul Parts Total Hourly Ownership Cost: Jser Defined Adjustments: Annu- Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Diese Fotal Hourly Ownership Costs Hourly Operating Costs Hourly Operating Costs Revised Date: 1st Half 2018	\$5.85/hr \$49.03/hr hal Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.1434) Mechanic Standard Value \$49.03/hr \$73.35/hr	\$33.41/hr 10) Annual Use Hours (1,500hrs -> 1,751) User Adjusted Value \$8.52/hr \$9.16/hr - - \$24.12/hr - \$53.58/hr s Wage (\$58.29 -> \$26.39) User Adjusted Value \$33.41/hr \$53.58/hr	-31.9% hrs) Sales Tax (5.1% -> 0%) Variance -61.2% -14.3% - - -16.6% - - -27% Variance -31.9% -27%



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar 14M Articulated Frame Graders			
Size Class: 250 HP & Over Weight: 46,796 lbs.			
Configuration for 14M			
Power Mode Operator Protection	Diesel EROPS	Net Horsepower Moldboard Size	259 hp 14 ft
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$30.16/hr	\$28.25/hr	-6.3%
Cost of Facilities Capital (CFC)	\$6.77/hr	\$5.70/hr	-15.8%
Overhead	\$19.15/hr	\$0.00/hr	-100%
Overhaul Labor	\$7.49/hr	\$2.83/hr	-62.2%
Overhaul Parts	\$17.11/hr	\$14.26/hr	-16.7%
Total Hourly Ownership Cost: User Defined Adjustments: Annu Hourly Operating Costs	\$80.68/hr ual Overhead (\$26,805.07 -> \$1.0	\$51.04/hr 0) Annual Use Hours (1,400hrs -> 1,6	-36.7% 580hrs) Sales Tax (5.1% -> 0%)
<i>.</i>	Standard Value	User Adjusted Value	Variance
Field Labor	\$6.25/hr	\$2.36/hr	-62.2%
Field Parts	\$16.59/hr	\$13.83/hr	-16.6%
Ground Engaging Component (GEC)	\$1.38/hr	\$1.15/hr	-16.7%
Tire	\$7.00/hr	-	-
Electrical/Fuel	\$21.30/hr	\$17.76/hr	-16.6%

 Lube
 \$5.99/hr

 Total Operating Ownership Cost:
 \$58.51/hr
 \$48.09/hr
 -17.8%

 User Defined Adjustments:
 Diesel Cost (2.57 -> 2.1434) Mechanics Wage (\$58.29 -> \$26.39)
 -17.8%

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$80.68/hr	\$51.04/hr	-36.7%
Hourly Operating Costs	\$58.51/hr	\$48.09/hr	-17.8%
Total Hourly Cost	\$139.19	\$99.13/hr	-28.8%

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar 16M Articulated Frame Graders			
Size Class: 250 HP & Over Weight: 59,435 lbs .			
Configuration for 16M			
Power Mode Operator Protection	Diesel EROPS	Net Horsepower Moldboard Size	297 hp 16 ft
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$43.66/hr	\$40.89/hr	-6.3%
Cost of Facilities Capital (CFC)	\$9.80/hr	\$8.08/hr	-17.6%
Overhead	\$21.14/hr	\$0.00/hr	-100%
Overhaul Labor	\$7.49/hr	\$2.76/hr	-63.2%
Overhaul Parts	\$24.76/hr	\$20.18/hr	-18.5%
Total Hourly Ownership Cost: User Defined Adjustments: Annu Hourly Operating Costs	\$106.85/hr Jal Overhead (\$29,594.62 -> \$1.0	\$71.91/hr 00) Annual Use Hours (1,400hrs -> 1,7	-32.7% 18hrs) Sales Tax (5.1% -> 0%)
	Standard Value	User Adjusted Value	Variance
Field Labor	\$6.25/hr	\$2.30/hr	-63.2%
Field Parts	\$24.01/hr	\$19.57/hr	-18.5%
Ground Engaging Component (GEC)	\$2.00/hr	\$1.63/hr	-18.5%
Tire	\$10.13/hr	-	-

Electrical/Fuel	\$24.43/hr	\$20.37/hr	-16.6%
Lube	\$8.03/hr	-	-
Total Operating Ownership Cost: User Defined Adjustments: Diesel Cost	\$74.85/hr (2.57 -> 2.1434) Mechanics Wa	\$62.03/hr ge (\$58.29 -> \$26.39)	-17.1%

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$106.85/hr	\$71.91/hr	-32.7%
Hourly Operating Costs	\$74.85/hr	\$62.03/hr	-17.1%
Total Hourly Cost	\$181.70	\$133.94/hr	-26.3%

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Hitachi ZAXIS 200LC-3			
Crawler Mounted Hydraulic Excava	ators		
Size Class:			and a second sec
21.1 - 24.0 MTons			Anna anna anna
Weight: 47,015 lbs.			
Configuration for ZAXIS 20	00LC-3		
Bucket Capacity - Heaped	1.19 cu yd	Power Mode	Diesel
Net Horsepower	159 hp	Operating Weight	21.3 mt
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$19.06/hr	\$17.85/hr	-6.3%
Cost of Facilities Capital (CFC)	\$3.19/hr	\$2.63/hr	-17.6%
Overhead	\$6.63/hr	\$0.00/hr	-100%
Overhaul Labor	\$11.70/hr	\$4.29/hr	-63.3%
Overhaul Parts	\$8.21/hr	\$6.65/hr	-19%
Total Hourly Ownership Cost:	\$48.79/hr	\$31,42/hr	-35.6%

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	\$14.18/hr	\$5.20/hr	-63.3%
Field Parts	\$8.39/hr	\$6.79/hr	-19.1%
Ground Engaging Component (GEC)	\$1.34/hr	\$1.09/hr	-18.7%
Tire	\$0.00/hr	-	-
Electrical/Fuel	\$17.16/hr	\$14.31/hr	-16.6%
Lube	\$3.76/hr	-	-
Total Operating Ownership Cost:	\$44.83/hr	\$31.15/hr	-30.5%

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$48.79/hr	\$31.42/hr	-35.6%
Hourly Operating Costs	\$44.83/hr	\$31.15/hr	-30.5%
Total Hourly Cost	\$93.62	\$62.57/hr	-33.2%

Revised Date: 1st Half 2018



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar 980G 4-Wd Articulated Wheel Loaders			
Size Class:			
275 - 349 HP			
Weight: 65,078 lbs.			A contraction of the contraction
55,010 153.			/\{(@)\ 2 E(@)
Configuration for 980G			
Power Mode	Diesel	Net Horsepower	300 hp
Operator Protection	EROPS	Bucket Capacity - Heaped	7.5 cu yd
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$21.61/hr	\$20.15/hr	-6.8%
Cost of Facilities Capital (CFC)	\$4.70/hr		-
Overhead	\$2.80/hr	\$0.00/hr	-100%
Overhaul Labor	\$10.08/hr	\$4.57/hr	-54.7%
Overhaul Parts	\$6.28/hr		-
Total Hourly Ownership Cost:	\$45.47/hr	\$35.70/hr	-21.5%
Jser Defined Adjustments: Annu	al Overhead (\$4,050.81 -> \$1.00	0) Sales Tax (5.1% -> 0%)	
Hourly Operating Costs		.0	
	Standard Value	User Adjusted Value	Variance
Field Labor	\$12.30/hr	\$5.57/hr	-54.7%
Field Parts	\$6.93/hr	-	-
Ground Engaging Component (GEC)	\$0.94/hr	-	-
Гire	\$5.78/hr	-	-
Electrical/Fuel	\$24.67/hr	\$21.41/hr	-13.2%
Lube	\$5.15/hr	-	-
Total Operating Ownership Cost: Jser Defined Adjustments: Diese	\$55.77/hr	\$45.78/hr	-17.9%
	$= \cos(2.37 - 2.23) \text{ we change }$	waye (400.20 -> 420.00)	
Fotal			
	Standard Value	User Adjusted Value	Variance
	\$45.47/hr	\$35.70/hr	-21.5%
Hourly Ownership Costs			1
Hourly Ownership Costs Hourly Operating Costs Total Hourly Cost	\$55.77/hr	\$45.78/hr	-17.9%



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Caterpillar 730 Articulated Rear Dumps			
Size Class: 26 - 29 MTons Weight: 50,376 lbs.			
Configuration for 730			
Rated Payload	28.1 mt	Net Horsepower	317 hp
Power Mode	Diesel	Body Capacity (StruckHeaped)	16.9 cu yd - 22.1 cu yd
Axle Configuration	6 X 6		
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$25.62/hr	\$24.13/hr	-5.8%
Cost of Facilities Capital (CFC)	\$4.25/hr		<u> </u>
Overhead	\$9.51/hr	\$0.00/hr	-100%
Overhaul Labor	\$15.75/hr	\$7.13/hr	-54.7%
Overhaul Parts	\$9.08/hr		-
Total Hourly Ownership Cost:	\$64.21/hr	\$44.59/hr	-30.6%
User Defined Adjustments: Annu Hourly Operating Costs			
	Standard Value	User Adjusted Value	Variance
Field Labor	\$12.45/hr	\$5.63/hr	-54.8%
Field Parts	\$5.61/hr	-	-
Ground Engaging Component (GEC)	\$0.00/hr	<u> </u>	-
Tire			-
I Ire	\$7.49/hr	-	
	\$7.49/hr \$16.29/hr	- \$14.14/hr	-13.2%
Electrical/Fuel		- \$14.14/hr -	-13.2% -
Electrical/Fuel Lube Total Operating Ownership Cost:	\$16.29/hr \$5.90/hr \$47.74/hr	\$38.77/hr	-13.2% - - 18.8%
	\$16.29/hr \$5.90/hr \$47.74/hr	\$38.77/hr	-
Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Dies	\$16.29/hr \$5.90/hr \$47.74/hr	\$38.77/hr	-
Electrical/Fuel Lube Total Operating Ownership Cost: User Defined Adjustments: Dies	\$16.29/hr \$5.90/hr \$47.74/hr el Cost (2.57 -> 2.23) Mechanics	\$38.77/hr Wage (\$58.29 -> \$26.39)	-18.8%

Total Hourly Cost

Revised Date: 1st Half 2018

The equipment represented in this report has been exclusively prepared for MANDY LILLA (mlilla@fmi.com)

\$111.95

\$83.36/hr

-25.5%



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Off-Highway Water Tanker Trucks			
Size Class: 300 - 399 HP			
Weight: 54,400 lbs.			Model Image
Configuration for 6000 330			
Power Mode	Diesel	Horsepower	330
Fank Capacity	6000 gal		
Hourly Ownership Costs			
	Standard Value	User Adjusted Value	Variance
Depreciation	\$22.90/hr	\$21.43/hr	-6.4%
Cost of Facilities Capital (CFC)	\$4.03/hr		-
Dverhead	\$7.31/hr	\$0.00/hr	-100%
Overhaul Labor	\$8.94/hr	\$4.05/hr	-54.7%
Overhaul Parts	\$5.85/hr	-	-
	\$49.03/hr	35.36/hr	-27.9%
Jser Defined Adjustments: Annu	\$49.03/hr ual Overhead (\$10,969.00 -> \$1.0		-27.9%
Jser Defined Adjustments: Annu	• • • • • •		-27.9% Variance
Iser Defined Adjustments: Anni Iourly Operating Costs	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr	0) Sales Tax (5.1% -> 0%)	
ser Defined Adjustments: Annu Iourly Operating Costs	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value	Variance
Iser Defined Adjustments: Annu Iourly Operating Costs Field Labor Field Parts	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value	Variance
Iser Defined Adjustments: Annu Iourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - -	Variance -54.7% - - - -
Ser Defined Adjustments: Annu Iourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value	Variance
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - - \$25.09/hr -	Variance -54.7% - - - - 13.2% -
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr	Variance -54.7% - - - -
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr	Variance -54.7% - - - - 13.2% -
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr	Variance -54.7% - - - - 13.2% -
Iser Defined Adjustments: Annu Iourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Total Operating Ownership Cost: Iser Defined Adjustments: Dies Total	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28,92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.23) Mechanics M	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - \$25.09/hr - \$57.50/hr Vage (\$58.29 -> \$26.39)	Variance -54.7% - - - - 13.2% - - -13.2% - -
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Fire Electrical/Fuel Lube Fotal Operating Ownership Cost: Jser Defined Adjustments: Dies Fotal Hourly Ownership Costs	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.23) Mechanics V Standard Value	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr Vage (\$58.29 -> \$26.39) User Adjusted Value	Variance -54.7% - - - -13.2% - - 21.6% Variance
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies Fotal Hourly Ownership Costs Hourly Operating Costs	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.23) Mechanics \v Standard Value \$49.03/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr Vage (\$58.29 -> \$26.39) User Adjusted Value \$35.36/hr	Variance -54.7% - - - -13.2% - -21.6% Variance -27.9%
Jser Defined Adjustments: Annu Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost: Jser Defined Adjustments: Dies Fotal Hourly Ownership Costs Hourly Operating Costs Total Hourly Cost	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.23) Mechanics V Standard Value \$49.03/hr \$73.35/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr Vage (\$58.29 -> \$26.39) User Adjusted Value \$35.36/hr \$57.50/hr	Variance -54.7% - - - -13.2% - -21.6% Variance -27.9% -21.6%
Hourly Operating Costs Field Labor Field Parts Ground Engaging Component (GEC) Tire Electrical/Fuel Lube Total Operating Ownership Cost:	ual Overhead (\$10,969.00 -> \$1.0 Standard Value \$21.96/hr \$10.69/hr \$0.00/hr \$6.42/hr \$28.92/hr \$5.36/hr \$73.35/hr el Cost (2.57 -> 2.23) Mechanics V Standard Value \$49.03/hr \$73.35/hr	0) Sales Tax (5.1% -> 0%) User Adjusted Value \$9.94/hr - - \$25.09/hr - \$57.50/hr Vage (\$58.29 -> \$26.39) User Adjusted Value \$35.36/hr \$57.50/hr	Variance -54.7% - - - -13.2% - -21.6% Variance -27.9% -21.6%



All prices shown in US\$

Custom Cost Evaluator

May 4, 2018

Custom Cost Evaluato	ſ		Way 4, 20
Caterpillar 14M Articulated Frame Graders			
Size Class:			
250 HP & Over			
Weight: 46,796 lbs.			
-			
Configuration for 14M			
Power Mode	Diesel	Net Horsepower	259 hp
Operator Protection	EROPS	Moldboard Size	14 ft
Hourly Ownership Costs			<u> </u>
	Standard Value	User Adjusted Value	Variance
Depreciation	\$30.16/hr	\$28.25/hr	-6.3%
Cost of Facilities Capital (CFC)	\$6.77/hr	-	<u> </u>
Overhead	\$19.15/hr	\$0.00/hr	-100%
Overhaul Labor	\$7.49/hr	\$3.39/hr	-54.7%
Overhaul Parts	\$17.11/hr		-
Hourly Operating Costs			
	Standard Value	User Adjusted Value	Variance
Field Labor	\$6.25/hr	\$2.83/hr	-54.7%
Field Parts	\$16.59/hr	-	-
Ground Engaging Component (GEC)	\$1.38/hr	- -	-
Tire	\$7.00/hr	-	-
Electrical/Fuel	\$21.30/hr	\$18.48/hr	-13.2%
Lube	\$5.99/hr	-	-
-	\$58.51/hr el Cost (2.57 -> 2.23) Mechanics Wag	\$52.27/hr ge (\$58.29 -> \$26.39)	-10.7%
Total			
	Standard Value	User Adjusted Value	Variance
Hourly Ownership Costs	\$80.68/hr	\$55.52/hr	-31.2%
Hourly Operating Costs	\$58.51/hr	\$52.27/hr	-10.7%
Total Hourly Cost	\$139.19	\$107.79/hr	-22.6%

Revised Date: 1st Half 2018

Appendix B.2.4 RSMeans Sheets

G&RDIAN®

2018 32nd annual edition

Heavy Construction Costs with RSMeans data

	1 13 – Selective Site Demolition			Labor-	11:1	Material	2018 Bare Labor E	Costs quipment	Total	Total Incl 0&P
	13.33 Railtrack Removal	Crew B-14	Output	Hours 48	Unit Ea.	Material	2,025	310	2,335	3,425
800	Turnouts using new bolts and spikes	D-14		40	Lu.		2,020		,	
	13.34 Selective Demolition, Utility Materials						1 Sandalla			
010	SELECTIVE DEMOLITION, UTILITY MATERIALS R024119-10									
015	Excludes excavation									
020	See other utility items in Section 02 41 13.33	0.00	14	1 714	L.		76.50	Stand a	76.50	117
100	Fire hydrant extensions	B-20	14	1.714	Ea.		1,225	295	1,520	2,175
200	Precast utility boxes up to 8' x 14' x 7'	B-13	2	28 12			525	156	681	965
300	Handholes and meter pits	B-6	2				268	150	268	410
400	Utility valves 4"-12"	B-20	4	6 14			650	65	715	1,050
500	14"-24"	B-21	L	14			0.00	05	110	
2 41	13.36 Selective Demolition, Utility Valves and Accesso	ories		Provide de la		-		S. P. S. S. S. S. S.		
010	SELECTIVE DEMOLITION, UTILITY VALVES & ACCESSORIES									
015	Excludes excavation						0/0		268	410
100	Utility valves 4"-12" diam.	B-20	4	6	Ea.		268	15	715	1,050
200	14"-24" diam.	B-21	2	14			650	65	134	205
0300	Crosses 4"-12" diam.	B-20	8	3		1	134	32.50	357.50	530
)400	14"-24" diam.	B-21	4	7			325	32.30	53.50	82
0500	Utility cut-in valves 4"-12" diam.	B-20	20	1.200			53.50		53.50	82
0600	Curb boxes	"	20	1.200	V		53.50		53.50	02
02 41	13.38 Selective Demo., Water & Sewer Piping & Fitting	gs						A DOWNSON OF THE		
0010	SELECTIVE DEMOLITION, WATER & SEWER PIPING AND FITTINGS									
0015	Excludes excavation									
0020	See other utility items in Section 02 41 13.23									
0090	Concrete pipe 4"-10" diameter	B-6	250	.096	L.F.		4.19	1.25	5.44	7.70
0100	42"-48" diameter	B-138	3 96	.583			25.50	10.35	35.85	50
0200	60"-84" diameter	"	80	.700			30.50	12.45	42.95	60
0300	96" diameter	B-13	C 80	.700			30.50	23.50	54	72
0400	108"-144" diameter	"	64	.875	-		38.50	29.50	68	90
0450	Concrete fittings 12" diameter	B-6	24	1	Ea.		43.50	13	56.50	81
0480	Concrete end pieces 12" diameter		200	.120	L.F.		5.25	1.56	6.81	9.6
0485	15" diameter		150	.160			7	2.08	9.08	12.9
0490	18" diameter		150	.160			7	2.08	9.08	12.9
0500	24"-36" diameter		100	.240			10.50	3.12	13.62	19.3
0600	Concrete fittings 24"-36" diameter		12	2	Ea.		87.50	26	113.50	162
0700	48"-84" diameter	B-13	IB 12	4.667	7		204	83	287	400
0800	96" diameter	"	8	7			305	124	429	600
0900	108"-144" diameter	B-13		14	V		610	470	1,080	1,450
1000	Ductile iron pipe 4" diameter	B-21	IB 20			· .	8.70		11.18	15.9
1100			17				9.95		12.78	
1200			12				14.50		18.63	
1300	Ductile iron fittings 4"-12" diameter		24				72.50	(and a second s	93	133
1400			18	51 Jan 2008			96.50	1	124	178
1500	18"-24" diameter						145	41.50	186.50	1
1600	Plastic pipe 3/4"-4" diameter	B-					1.50		1.95	
1700			50				2.10		2.73	
1800			30				3.49		4.53	
1900			20				5.25		6.81	
191(18				5.80		7.54	
1920			16			7	6.55		8.50	
2000			7			1.	13.95	10 C	18.12	
210	i idane ininge i e		5				21	6.25	27.25	
220			2	0 1.20	00		52.50) 15.60	68.10	96

02.4	1 13 - Selective Site Demolition					S. Salar				
VA		1	Daily	Labor-	An all's		2018 Ba	re Costs		Tota
02 41	13.78 Selective Demolition, Radio Towers	Crew	Output		Unit	Material	Labor	Equipment	Total	Incl O8
0800	120'	K-2	.80	30	Ea.		1,550	298	1,848	2,825
0900	190'		.40	60	+		3,125	595	3,720	5,625
02 41	13.80 Selective Demo., Utility Poles and Cross Arms									
	SELECTIVE DEMOLITION, UTILITY POLES & CROSS ARMS			10.00						
0100	Utility poles, wood, 20'- 30' high	R-3	6	3.333	Ea.		193	21.50	214.50	315
0200	35'-45' high	"	5	4	Lu.		232	26	258	375
	Cross arms, wood, 4'-6' long	1 Elec	5	1.600			93	20	93	139
			J	1.000			/5		/0	107
	13.82 Selective Removal, Pavement Lines and Markin	gs		11200			NU VERSION			
	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		.016	C.L.F.		.82	1.71	2.53	3
0200	Temporary traffic line tape	- Charles and a second	1500	.011	L.F.		.43		.43	1
0300	Thermoplastic traffic lines and markings	B-79A	500	.024	C.L.F.		1.23	2.62	3.85	
0400	Painted pavement markings	B-78B	500	.036	S.F.		1.48	.70	2.18	
02 41	13.84 Selective Demolition, Walks, Steps and Pavers									
0010	SELECTIVE DEMOLITION, WALKS, STEPS AND PAVERS									
0100	Splash blocks	1 Clab	300	.027	S.F.		1.06		1.06	
0200	Tree grates		50	.160	Ea.		6.40		6.40	
0300	Walks, limestone pavers	2 Clab	150	.107	S.F.		4.25		4.25	
0400	Redwood sections		600	.027	1		1.06		1.06	
0500	Redwood planks		480	.033			1.33		1.33	
0600	Shale paver		300	.053		1.00	2.13		2.13	
0700	Tile thinset paver		675	.024			.94		.94	
0800	Wood round	B-1	350	.069	Ea.		2.78		2.78	
0900	Asphalt block	2 Clab	450	.036	S.F.		1.42		1.42	
1000	Bluestone		450	.036			1.42		1.42	
1100	Slate, 1" or thinner		675	.024			.94		.94	
1200	Granite blocks		300	.053			2.13		2.13	
1300	Precast patio blocks		450	.036			1.42		1.42	
1400	Planter blocks		600	.027			1.06		1.06	1
1500	Brick paving, dry set		300	.053			2.13		2.13	3
1600	Mortar set		180	.089			3.54		3.54	
1700	Dry set on edge		240	.067			2.66		2.66	
1800	Steps, brick		200	.080	L.F.		3.19		3.19	
1900	Railroad tie		150	.107			4.25	the second	4.25	
2000	Bluestone		180	.089			3.54		3.54	and the second
2100	Wood/steel edging for steps		1000			1	.64		.64	1
2200	Timber or railroad tie edging for steps		400	.040			1.59		1.59	4
-	1 13.86 Selective Demolition, Athletic Surfaces		100	.010	V	1	1.37		1.57	
PERSONAL PROPERTY.			13475-49		1-1-1-1-1-1	1.2	100000000000000000000000000000000000000			1.52.54
0010	SELECTIVE DEMOLITION, ATHLETIC SURFACES	0.011	0000	000			00		0.0	
0100	Synthetic grass	2 Clab			S.F.		.32		.32	
0200	Surface coat latex rubber		2000	.008	5		.32	10.55	.32	
0300	Tennis court posts	B-11C	16		Ea.	The second	47	19.55	66.55	1
	1 13.88 Selective Demolition, Lawn Sprinkler Systems		- N.							
0010	SELECTIVE DEMOLITION, LAWN SPRINKLER SYSTEMS									
0100	Golf course sprinkler system, 9 hole	4 Clab	.10	320	Ea.		12,800		12,800	19,4
0200	Sprinkler system, 24' diam. @ 15' OC, per head	B-20	110	.218	Head		9.75		9.75	
0300	60' diam. @ 24' OC, per head	"	52	.462	"		20.50		20.50	
0400	Sprinkler heads, plastic	2 Clab	150	.107	Ea.		4.25		4.25	
0500	Impact circle pattern, 28'-76' diam.		75	.213			8.50		8.50	1

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02 81 Transportation and Disposal of Hazardous Materials 02 81 20 – Hazardous Waste Handling

			Daily	Labor-		10.5 × 1		Bare Costs	T . 1	Total
	20.10 Hazardous Waste Cleanup/Pickup/Disposal	Crew	Output	Hours	Unit	Material	Labor	Equipment	Total	Incl O&P
0010	HAZARDOUS WASTE CLEANUP/PICKUP/DISPOSAL									
0100	For contractor rental equipment, i.e., dozer,									
0110	Front end loader, dump truck, etc., see 01 54 33 Reference Section									
1000	Solid pickup									
1100	55 gal. drums				Ea.				240	265
1120	Bulk material, minimum				Ton				190	210
1130	Maximum				"				595	655
1200	Transportation to disposal site									
1220	Truckload = 80 drums or 25 C.Y. or 18 tons									
1260	Minimum				Mile				3.95	4.45
1270	Maximum				"				7.25	7.35
3000	Liquid pickup, vacuum truck, stainless steel tank									
3100	Minimum charge, 4 hours									
3110	1 compartment, 2200 gallon				Hr.				140	155
3120	2 compartment, 5000 gallon				"				200	225
3400	Transportation in 6900 gallon bulk truck				Mile				7.95	8.75
3410	In teflon lined truck				"				10.20	11.25
5000	Heavy sludge or dry vacuumable material				Hr.				140	160
6000	Dumpsite disposal charge, minimum				Ton				140	155
6020	Maximum				"				415	455

	1 13 – Selective Site Demolition	1	Daily	Labor-			2018 Bc	una Casta		Total
02 41	13.88 Selective Demolition, Lawn Sprinkler Systems	Crew	Output		Unit	Material	Labor	Equipment	Total	Incl 0&P
0600	Pop-up, 42'-76' diam.	2 Clab		.320	Ea.		12.75		12.75	19.4
0700	39′-99′ diam.		50	.320			12.75	1.1	12.75	19.4
0800	Sprinkler valves		40	.400			15.95		15.95	24.5
0900	Valve boxes		40	.400			15.95		15.95	24.5
1000	Controls		2	8			320		320	485
1100	Backflow preventer		4	4			159		159	243
1200	Vacuum breaker	V	4	4	4		159		159	243
02 41	13.90 Selective Demolition, Retaining Walls									
0010 5	SELECTIVE DEMOLITION, RETAINING WALLS									
0020	See other retaining wall items in Section 32 32					Mainter al				
0100	Concrete retaining wall, 6' high, no reinforcing	B-13K	200	.080	L.F.		4.49	8.30	12.79	15.9
0200	8' high		150	.107			6	11.10	17.10	21
0300	10' high		150	.107			6	11.10	17.10	21
0400	With reinforcing, 6' high		200	.080			4.49	8.30	12.79	15.9
0500	8' high		150	.107			6	11.10	17.10	21
0600	10' high		120	.133			7.50	13.85	21.35	26.5
0700	20' high		60	.267	-		14.95	27.50	42.45	53
0800	Concrete cribbing, 12' high, open/closed face		150	.107	S.F.		6	11.10	17.10	21
0900	Interlocking segmental retaining wall	B-62	800	.030			1.31	.22	1.53	2.2
1000	Wall caps	<i>n</i>	600	.040			1.75	.29	2.04	2.9
1100	Metal bin retaining wall, 10' wide, 4'-12' high	B-13	1200	.047			2.04	.49	2.53	3.6
1200	10' wide, 16'-28' high		1000	.056			2.45	.59	3.04	4.3
1300	Stone filled gabions, 6' x 3' x 1'		170	.329	Ea.		14.40	3.48	17.88	26
1400	6' x 3' x 1'-6"		75	.747			32.50	7.90	40.40	58
1500	6' x 3' x 3'	30.23	25	2.240			98	23.50	121.50	175
1600	9' x 3' x 1'		75	.747			32.50	7.90	40.40	58
1700	9′ x 3′ x 1′-6″		33	1.697			74	17.90	91.90	133
1800	9′ x 3′ x 3′		12	4.667			204	49	253	365
1900	12' x 3' x 1'		42	1.333			58.50	14.05	72.55	104
2000	12' x 3' x 1'-6"		20	2.800			122	29.50	151.50	219
2100	12' x 3' x 3'		6	9.333			410	98.50	508.50	730
02 41	13.92 Selective Demolition, Parking Appurtenances	1 Y	1		V.					
	SELECTIVE DEMOLITION, PARKING APPURTENANCES									
0100	Bumper rails, garage, 6" wide	B-6	300	.080	L.F.		3.49	1.04	4.53	6.4
0200	12" channel rail	00	300	.080	2.1.		3.49	1.04	4.53	6.4
0300	Parking bumper, timber		1000	.000	1		1.05	.31	1.36	1.9
0400	Folding, with locks	B-1	1000	.240	Ea.		9.70	.01	9.70	14.8
0500	Flexible fixed garage stanchion	B-6	150	.160			7.70	2.08	9.08	12.9
0600	Wheel stops, precast concrete		120	.200			8.75	2.60	11.35	16.1
0700	Thermoplastic		120	.200			8.75	2.60	11.35	16.1
0800	Pipe bollards, 6"-12" diam.		80	.300			13.10	3.91	17.01	24
And a state of the		Y	00	.000	V		10.10	0.71	17.01	24
	1 16 – Structure Demolition			a second	A CONTRACT				attend to	
12 F 1	16.13 Building Demolition									
	BUILDING DEMOLITION Large urban projects, incl. 20 mi. haul R024119-10	0								
0011	No foundation or dump fees, C.F. is vol. of building standing									
0020	Steel	B-8	21500		C.F.		.14	.13	.27	
0050	Concrete		15300	.004			.19	.19	.38	
0800	Masonry		20100	.003			.15	.14	.29	
0100	Mixture of types		20100	.003			.15	.14	.29	
a		0.0	14000	.003			14	.15	.29	
0500	Small bldgs, or single bldgs, no salvage included, steel	B-3	14800	.005			.14	.15	.27	
0500 0600 0650	Small bldgs, or single bldgs, no salvage included, steel Concrete	D-0	11300				.14	.20	.29	

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44 1 1	1 13 – Facility Water Distribution Piping				14.913					
99 11 ⁻	13.48 Pipe, Fittings and Valves, Steel, Grooved-Joint	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	re Costs Equipment	Total	Total Incl O8
		1								
	PIPE, FITTINGS AND VALVES, STEEL, GROOVED-JOINT									
0012	Fittings are ductile iron. Steel fittings noted.									
0020	Pipe includes coupling & clevis type hanger assemblies, 10' OC									
1000	Schedule 40, black	1 Plum	71	.113	L.F.	6.05	7		13.05	1
1040	3/4" diameter		63	.113	L.I.	5.85	7.90		13.75	1
1050	1" diameter		58	.127		6.95	8.55		15.50	1 2
1060	1-1/4" diameter		51	.157		7.55	9.75		17.30	2
1070	1-1/2" diameter		40	.200		8.75	12.45		21.20	1
1080	2" diameter	Q-1	40 57	.200		11.45	15.70		27.15	1
1090	2-1/2" diameter	Q-1	50	.201		13.85	17.90		31.75	
1100	3" diameter					24	19.90		43.90	4
1110	4" diameter		45	.356			24		67.50	1
1120	5" diameter	*	37	.432		43.50	24 33		82	8
1130	6" diameter	Q-2	42	.571		49			118.50]
1140	8" diameter		37	.649		81	37.50		110.50].
1150	10" diameter		31	.774		108	45]
1160	12" diameter		27	.889		121	51.50		172.50	2
1170	14" diameter		20	1.200		128	69.50		197.50	2
1180	16" diameter		17	1.412		189	82		271	3
1190	18" diameter		14	1.714		194	99.50		293.50	3
1200	20" diameter		12	2		230	116		346	4
1210	24" diameter	V	10	2.400		258	139		397	4
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	ı 71	.113	L.F.	6.25	7		13.25	
1850	1" diameter		63	.127		6.50	7.90		14.40	
1860	1-1/4" diameter		58	.138		7.80	8.55		16.35	
1870	1-1/2" diameter		51	.157		8.65	9.75		18.40	
1880	2" diameter	V	40	.200		10	12.45		22.45	
1890	2-1/2" diameter	Q-1	57	.281		12.95	15.70		28.65	
1900	3" diameter		50	.320		15.75	17.90		33.65	
1910	4" diameter		45	.356		26.50	19.90		46.40	
1920	5″ diameter		37	.432		31	24		55	
1930	6" diameter	Q-2	42	.571		33	33		66	
1940	8" diameter		37	.649		50.50	37.50	0	88	-
1950	10" diameter		31	.774		103	45		148	
1960	12" diameter		27	.889	1	124	51.50		175.50	
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%			
2560	6" diam. to 12" diam.					14%	13%			
						1170	10.0			
4690	Tee, painted	1 Plur	n 38	.211	Ea.	77	13.10)	90.10	
4700	3/4" diameter		33	.242		59.50	15.05		74.55	
4740	1" diameter		27	.242		59.50	18.40		77.90	
4750	1-1/4" diameter		27	.296		59.50	22.50		82	
4760	1-1/2" diameter		17	.364 .471		59.50	22.50		89	
4770	2" diameter 2-1/2" diameter	Q-1	27	.4/1		59.50	33	,	92.50	

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31 05 Common Work Results for Earthwork

31 05	5 19.53 Reservoir Liners HDPE	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	re Costs Equipment	Total	Total Incl O&P
0010	RESERVOIR LINERS HDPE		ee.pe.		•	materia				
0011	Membrane lining									
1100	30 mil thick	3 Skwk	1850	.013	S.F.	.41	.68		1.09	1.4
1200	60 mil thick		1600	.015		.58	.79		1.37	1.8
1300	120 mil thick		1440	.017	*	.67	.87		1.54	2.0
31 (05 23 - Cement and Concrete for	Earthwork								
31 05	5 23.30 Plant Mixed Bituminous Concrete									
0010	PLANT MIXED BITUMINOUS CONCRETE									
0020	Asphaltic concrete plant mix (145 lb./C.F.)				Ton	65			65	71.5
0040	Asphaltic concrete less than 300 tons add trucking costs									
0050	See Section 31 23 23.20 for hauling costs									
0200	All weather patching mix, hot				Ton	65.50			65.50	72
0250	Cold patch					73.50			73.50	80.5
0300	Berm mix					64			64	70
0400	Base mix					65			65	71.5
0500	Binder mix					65			65	71.5
0600	Sand or sheet mix	- Alexandrian (Construction)			T	65			65	71.5
31 0!	5 23.40 Recycled Plant Mixed Bituminous Co	oncrete								
0010	RECYCLED PLANT MIXED BITUMINOUS CONCRETE									
0200	Reclaimed pavement in stockpile	G			Ton	22			22	24
0400	Recycled pavement, at plant, ratio old:new, 70:30	G				35			35	38.5
0600	Ratio old:new, 30:70	G			¥	52.50			52.50	57.5

31 06 Schedules for Earthwork

31 06 60 - Schedules for Special Foundations and Load Bearing Elements

010	PILING SPECIAL COSTS								
011	Piling special costs, pile caps, see Section 03 30 53.40								
500	Cutoffs, concrete piles, plain	1 Pile	5.50	1.455	Ea.	74.50		74.50	118
600	With steel thin shell, add		38	.211		10.80		10.80	17.
700	Steel pile or "H" piles		19	.421		21.50		21.50	34
800	Wood piles		38	.211	W.	10.80		10.80	17.
900	Pre-augering up to 30' deep, average soil, 24" diameter	B-43	180	.267	L.F.	11.85	13.60	25.45	33
920	36″ diameter		115	.417		18.50	21.50	40	51.
960	48″ diameter		70	.686		30.50	35	65.50	84.
980	60" diameter		50	.960	*	42.50	49	91.50	119
000	Testing, any type piles, test load is twice the design load								
050	50 ton design load, 100 ton test				Ea.			14,000	15,500
100	100 ton design load, 200 ton test							20,000	22,000
150	150 ton design load, 300 ton test							26,000	28,500
200	200 ton design load, 400 ton test							28,000	31,000
250	400 ton design load, 800 ton test				W.			32,000	35,000
500	Wet conditions, soft damp ground								
600	Requiring mats for crane, add							40%	40
700	Barge mounted driving rig, add							30%	30
1 06	6 60.15 Mobilization								
010	MOBILIZATION								
020	Set up & remove, air compressor, 600 CFM	A-5	3.30	5.455	Ea.	220	14.30	234.30	35(
100	1,200 CFM	"	2.20	8.182		330	21.50	351.50	52
200	Crane, with pile leads and pile hammer, 75 ton	B-19	.60	107		5,600	3,225	8,825	12,20

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32 11 Base Courses

32 11 23 - Aggregate Base Courses

32 1 [.]	1 23.23 Base Course Drainage Layers	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Bare Labor E	Costs quipment	Total	To
010	BASE COURSE DRAINAGE LAYERS	CIGN	Carbon	10013	Jill	marorial	LUDOI L	ווישייקירי		Ind
011	For roadways and large areas									
)50	Crushed 3/4" stone base, compacted, 3" deep	B-36C	5200	.008	S.Y.	2.71	.38	.74	3.83	
00	6" deep	0000	5000	.008		5.40	.40	.77	6.57	
00	9″ deep		4600	.009		8.15	.43	.84	9.42	
00	12" deep		4200	.010		10.85	.47	.92	12.24	
100	Crushed 1-1/2" stone base, compacted to 4" deep	B-36B	6000	.010		4.52	.51	.75	5.78	
301 302	6" deep	0-000	5400	.012		6.80	.57	.83	8.20	
102	8" deep		4500	.012		9.05	.68	1	10.73	144
	12" deep		3800	.014		13.55	.81	1.19	15.55	
04			3000	.017	*	10.00	.01	1.17	13.33	
50	Bank run gravel, spread and compacted	000	/000	005	сv	2 /0	.27	.36	1 22	
70	6" deep	B-32	6000	.005	S.Y.	3.60			4.23	
90	9″ deep		4900	.007		5.40	.33	.44	6.17	
00	12" deep	\$	4200	.008	W	7.20	.38	.51	8.09	
00	Cold laid asphalt pavement, see Section 32 12 16.19									
00	Alternate method to figure base course	2015	105	000	FOV	00	4.50	0.00	41.40	
510	Crushed stone, 3/4", compacted, 3" deep	B-36C		.092	E.C.Y.	28	4.58	8.90	41.48	
11	6″ deep	B-36B		.077		28	3.67	5.40	37.07	
12	9″ deep		1150	.056		28	2.66	3.92	34.58	
13	12" deep		1400	.046		28	2.19	3.22	33.41	
520	Crushed stone, 1-1/2", compacted, 4" deep		665	.096		28	4.60	6.80	39.40	
21	6" deep		900	.071		28	3.40	5	36.40	
22	8" deep		1000	.064		28	3.06	4.51	35.57	
523	12" deep	, w	1265	.051		28	2.42	3.56	33.98	
30	Gravel, bank run, compacted, 6" deep	B-36C		.048		18.50	2.39	4.63	25.52	
31	9" deep		1150	.035		18.50	1.73	3.36	23.59	
532	12" deep		1400	.029	*	18.50	1.42	2.76	22.68	
010	Crushed stone, 3/4" maximum size, 3" deep	B-36	540	.074	Ton	18.05	3.39	2.85	24.29	
)11	6" deep		1625	.025		18.05	1.13	.95	20.13	
)12	9" deep		1785	.022		18.05	1.03	.86	19.94	
013	12" deep		1950	.021		18.05	.94	.79	19.78	
020	Crushed stone, 1-1/2" maximum size, 4" deep		720	.056		18.05	2.55	2.14	22.74	
021	6" deep		815	.049		18.05	2.25	1.89	22.19	
)22	8″ deep		835	.048		18.05	2.19	1.85	22.09	
023	12" deep	4	975	.041		18.05	1.88	1.58	21.51	
)30	Bank run gravel, 6" deep	B-32A	875	.027		12.45	1.35	1.49	15.29	
)31	9″ deep		970	.025		12.45	1.22	1.34	15.01	[
)32	12" deep		1060	.023		12.45	1.11	1.23	14.79	
000	Stabilization fabric, polypropylene, 6 oz./S.Y.	B-6	10000	.002	S.Y.	.73	.10	.03	.86	
900	For small and irregular areas, add						50%	50%		
000	Prepare and roll sub-base, small areas to 2,500 S.Y.	B-32A	1500	.016	S.Y.		.79	.87	1.66	
000	Large areas over 2,500 S.Y.	"	3500	.007	1		.34	.37	.71	
050	For roadways	B-32	4000	.008	1		.40	.54	.94	
	11 26 – Asphaltic Base Courses									120
	1 26.13 Plant Mix Asphaltic Base Courses									0.95
)10	PLANT MIX ASPHALTIC BASE COURSES									1
011	Roadways and large paved areas									
500	Bituminous concrete, 4" thick	B-25	4545	.019	S.Y.	14.60	.85	.59	16.04	
550	6" thick	025	3700	.024	5.1.	21.50	1.04	.73	23.27	
560	8" thick		3000	.024		28.50	1.29	.90	30.69	
570	10" thick		2545	.027		35.50	1.52	1.06	38.08	
1400	Macadam base, crushed steps or slag, druhound	R-34D		.035	ECV	47.50	1.52	2.00	50.00	

1600

Macadam base, crushed stone or slag, dry-bound

For customer support on your Heavy Construction Costs with RSMeans data, call 800.448.8182.

B-36D 1400 .023 E.C.Y.

47.50

1.16

2.24

56.50

50.90

32 18 Athletic and Recreational Surfacing

32 18 23 – Athletic Surfacing

20.40	00.00 Burning Trools Carefording	(Daily	Labor-	11-5	M I		ire Costs	Tel	Total
	3 23.33 Running Track Surfacing	Crew	Output	Hours	Unit	Material	Labor	Equipment	Total	Incl O&
0010	RUNNING TRACK SURFACING									
0020	Running track, asphalt concrete pavement, 2-1/2"	B-37	300	.160	S.Y.	14.90	6.75	.50	22.15	27
0102	Surface, latex rubber system, 1/2" thick, black	B-20	115	.209		47.50	9.30		56.80	66.
0152	Colors		115	.209		58	9.30		67.30	78
0302	Urethane rubber system, $1/2''$ thick, black		110	.218		35.50	9.75		45.25	54
0402	Color coating		110	.218	V	43.50	9.75		53.25	63

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32 31 Fences and Gates

32 31 11 - Gate Operators

0010	GATE OPERATORS							1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
7810	Motor operators for gates (no elec wiring), 3' wide swing	2 Skwk	.50	32	Ea.	1,175	1,675	2,850	3,850
7815	Up to 20' wide swing		.50	32		1,525	1,675	3,200	4,250
7820	Up to 45' sliding		.50	32	+	2,750	1,675	4,425	5,600
7825	Overhead gate, 6' to 18' wide, sliding/cantilever		45	.356	L.F.	320	18.60	338.60	380
7830	Gate operators, digital receiver		7	2.286	Ea.	74.50	120	194.50	265
7835	Two button transmitter		24	.667		23	35	58	79
7840	3 button station		14	1.143		39.50	60	99.50	135
7845	Master slave system		4	4	4	173	209	382	510

32 31 13.20 Fence, Chain Link Industrial

0010	FENCE, CHAIN LINK INDUSTRIAL									
0011	Schedule 40, including concrete									
0020	3 strands barb wire, 2" post @ 10' OC, set in concrete, 6' H									
0200	9 ga. wire, galv. steel, in concrete	B-80C	240	.100	L.F.	19.80	4.14	.82	24.76	29
0248	Fence, add for vinyl coated fabric				S.F.	.68			.68	.7
0300	Aluminized steel	B-80C	240	.100	L.F.	22	4.14	.82	26.96	31
0301	Fence, wrought iron		240	.100		30	4.14	.82	34.96	40
0500	6 ga. wire, galv. steel		240	.100		25	4.14	.82	29.96	34.5
0600	Aluminized steel		240	.100		30.50	4.14	.82	35.46	40.50
0800	6 ga. wire, 6' high but omit barbed wire, galv. steel		250	.096		20	3.97	.78	24.75	29
0900	Aluminized steel, in concrete		250	.096		24	3.97	.78	28.75	33.5
0920	8' H, 6 ga. wire, 2-1/2" line post, galv. steel, in concrete		180	.133		32	5.50	1.09	38.59	44.5
0940	Aluminized steel, in concrete		180	.133	\$	39	5.50	1.09	45.59	52.5
1400	Gate for 6' high fence, 1-5/8" frame, 3' wide, galv. steel		10	2.400	Ea.	208	99.50	19.60	327.10	400
1500	Aluminized steel, in concrete		10	2.400	"	209	99.50	19.60	328.10	405
2000	5'-0" high fence, 9 ga., no barbed wire, 2" line post, in concrete									
2010	10' OC, 1-5/8" top rail, in concrete									
2100	Galvanized steel, in concrete	B-80C	300	.080	L.F.	21	3.31	.65	24.96	28.5
2200	Aluminized steel, in concrete		300	.080	"	19.05	3.31	.65	23.01	26.5
2400	Gate, 4' wide, 5' high, 2" frame, galv. steel, in concrete		10	2.400	Ea.	219	99.50	19.60	338.10	415
2500	Aluminized steel, in concrete		10	2.400	"	197	99.50	19.60	316.10	390
3100	Overhead slide gate, chain link, 6' high, to 18' wide, in concrete	W	38	.632	L.F.	97	26	5.15	128.15	152
3105	8' high, in concrete	B-80	30	1.067		100	47.50	20.50	168	204
3108	10' high, in concrete		24	1.333		169	59	25.50	253.50	305
3110	Cantilever type, in concrete		48	.667		142	29.50	12.75	184.25	215
3120	8' high, in concrete		24	1.333		168	59	25.50	252.50	300
3130	10' high, in concrete	*	18	1.778	+	206	79	34	319	385
5000	Double swing gates, incl. posts & hardware, in concrete									1
5010	5' high, 12' opening, in concrete	B-80C	3.40	7.059	Opng.	540	292	57.50	889.50	1,100

2 31 29 - Wood Fences		Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	re Costs Equipment	Total	Total Incl O&P
31 29.10 Fence, Wood No. 2 cedar, treated wood rails, 6	hiah	B-80C	160	.150	L.F.	13.45	6.20	1.22	20.87	25.5
	ingn		8	3	Ea.	89.50	124	24.50	238	315
			160	.150	L.F.	13.95	6.20	1.22	21.37	26
and a second			150	.160	"	19.80	6.60	1.31	27.71	33.5
0 8' high 10 Gate, 3'-6" wide			9	2.667	Ea.	100	110	22	232	300
31 29.20 Fence, Wood Rail										
0 FENCE, WOOD RAIL									14.00	10.1
2 Picket, No. 2 cedar, Gothic, 2 rail, 3'	iigh	B-1	160	.150	L.F.	8.10	6.10		14.20	18.1
Gate, 3'-6" wide		B-80C	9	2.667	Ea.	78	110	22	210	277
) 3 rail, 4' high			150	.160	L.F.	9.10	6.60	1.31	17.01	21.5
Gate, 3'-6" wide			9	2.667	Ea.	95	110	22	227	295
0 Fence rail, redwood, 2″ x 4″, merch.	grade, 8'	B-1	2400	.010	L.F.	2.53	.41		2.94	3.4
0 Fence post, select redwood, earth pac	ked & treated, 4" x 4" x 6'		96	.250	Ea.	14	10.15		24.15	31
0 4″ x 4″ x 8′			96	.250		19.25	10.15		29.40	36.5
0 Set in concrete, 4" x 4" x 6'			50	.480		22	19.45		41.45	53.
30 4″ x 4″ x 8′			50	.480		23	19.45		42.45	55
10 Wood post, 4' high, set in concrete, i	ncl. concrete		50	.480		14.20	19.45		33.65	45
50 Earth packed			96	.250		17.20	10.15		27.35	34.
60 6' high, set in concrete, incl. cor	crete		50	.480		17.70	19.45		37.15	49
)70 Earth packed			96	.250		12.10	10.15		22.25	29

32 32 Retaining Walls

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- Aller

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2 32	13.10 Retaining Walls, Cast Concrete									
	RETAINING WALLS, CAST CONCRETE									
800	Concrete gravity wall with vertical face including excavation & backfill									
850	No reinforcing									
900	6' high, level embankment	C-17C	36	2.306	L.F.	89	122	15.80	226.80	300
000	33° slope embankment		32	2.594		103	137	17.80	257.80	345
200	8' high, no surcharge		27	3.074		110	163	21	294	395
300	33° slope embankment		24	3.458		133	183	23.50	339.50	450
2500	10' high, level embankment		19	4.368		157	231	30	418	560
2600	33° slope embankment		18	4.611	-	217	244	31.50	492.50	650
2800	Reinforced concrete cantilever, incl. excavation, backfill & reinf.									
2900	6' high, 33° slope embankment	C-17C	35	2.371	L.F.	80.50	125	16.25	221.75	298
3000	8' high, 33° slope embankment		29	2.862		93	151	19.65	263.65	355
3100	10' high, 33° slope embankment		20	4.150		121	219	28.50	368.50	500
3200	20' high, 500 lb./L.F. surcharge		7.50	11.067	4	360	585	76	1,021	1,375
3500	Concrete cribbing, incl. excavation and backfill	v								
3700	12' high, open face	B-13	210	.267	S.F.	40.50	11.65	2.81	54.96	65.5
3900	Closed face	"	210	.267	"	38	11.65	2.81	52.46	62.5
4100	Concrete filled slurry trench, see Section 31 56 23.20						1.1			
32 3	2 23 – Segmental Retaining Walls			843-Q						
32 32	23.13 Segmental Conc. Unit Masonry Retaining Wall	5								
0010	SEGMENTAL CONC. UNIT MASONRY RETAINING WALLS	-								
7100	Segmental retaining wall system, incl. pins and void fill									
7120	base and backfill not included									
7140	Large unit, 8" high x 18" wide x 20" deep, 3 plane split	B-62	300	.080	S.F.	12.75	3.49	.58	16.82	20
7150	Straight split		300	.080	1	12.85	3.49	.58	16.92	20
							2.62	.44	9.36	11.3

33 14 Water Utility Transmission and Distribution 33 14 13 – Public Water Utility Distribution Piping

3 1/	13.25 Water Supply, Polyvinyl Chloride Pipe	Crew		Labor- Hours	Unit	Material	2018 Bare Labor	e Costs Equipment	Total	Total Incl O&P
785	20" diameter			3.501	Ea.	465	169		634	770
790	24" diameter	4		4.250	*	540	206		746	905
	13.35 Water Supply, HDPE									
	WATER SUPPLY, HDPE									
011	Butt fusion joints, SDR 21 40' lengths not including excavation or backfill									
100	4" diameter	B-22A	400	.100	L.F.	2.50	4.60	1.71	8.81	11.6
200	6" diameter		380	.105		5.65	4.84	1.80	12.29	15.6
300	8" diameter		320	.125		8.85	5.75	2.14	16.74	21
400	10" diameter		300	.133		11.50	6.15	2.28	19.93	24.5
500	12" diameter		260	.154		13	7.10	2.63	22.73	28
600	14" diameter	B-22B	220	.182		15.35	8.35	9.85	33.55	40.5
700	16" diameter		180	.222		18.90	10.20	12.05	41.15	50
800	18" diameter		140	.286		28	13.15	15.50	56.65	68
900	24" diameter	-	100	.400		49.50	18.40	21.50	89.40	107
000	Fittings			1223						
100	Elbows, 90 degrees	111								
00	4" diameter	B-22A	32	1.250	Ea.	17.25	57.50	21.50	96.25	130
00	6" diameter		28	1.429		44.50	65.50	24.50	134.50	176
100	8" diameter		24	1.667		116	76.50	28.50	221	276
100	10" diameter		18	2.222		252	102	38	392	475
500	12" diameter		12	3.333		297	153	57	507	620
100	12 dameter 14" diameter	B-22B	9	4.444		570	204	241	1,015	1,200
00	14 diameter 16" diameter	0 220	6	6.667		830	305	360	1,495	1,775
00	18" diameter		4	10		955	460	540	1,955	2,350
00	24" diameter		3	13.333	W	1,700	615	720	3,035	3,600
00	Tees	Ŵ	3	. 5.550	V	.,				,
200	4" diameter	B-22A	30	1.333	Ea.	21.50	61.50	23	106	142
300	4" alameter 6" diameter	UZZA	26	1.538		51.50	71	26.50	149	194
100 100	6" alameter 8" diameter		20	1.536		130	83.50	31	244.50	305
	8" diameter 10" diameter		15	2.667		172	123	45.50	340.50	425
500 500	10" diameter 12" diameter		15	2.667 4		360	125	68.50	612.50	750
500 700	12" diameter 14" diameter	B-22B		4		425	230	271	926	1,125
		D-ZZB	6	5 6.667		425 500	305	360	1,165	1,400
800	16" diameter			10		565	460	540	1,565	1,925
200	18" diameter		4	20		565 920	400 920	1,075	2,915	3,600
00	24" diameter		Z	20	Ŵ	720	720	L'07 D	2,/IJ	0,000
00	Caps	0.004	24	1 17/	E~	15	54	20	89	121
10	4" diameter	B-22A		1.176	Ea.		54 61.50	20 23	115	153
20	6" diameter		30	1.333		30.50			148.50	193
30	8" diameter		26	1.538		51	71 02	26.50		35
50	10" diameter		20	2		161	92	34	287	47
160	12" diameter		14	2.857	1	201	131	49	381	4/:
3 14	4 13.40 Water Supply, Black Steel Pipe									10002000
010	WATER SUPPLY, BLACK STEEL PIPE									
)11	Not including excavation or backfill									
000	Pipe, black steel, plain end, welded, 1/4" wall thk, 8" diam.	B-35A			L.F.	31.50	13.10	8.70	53.30	64
010	10" diameter		204			40	13.35	8.85	62.20	74
)20	12" diameter		195			47	14	9.25	70.25	8
030	18" diameter		175	.320		73.50	15.60	10.30	99.40	11
)40	5/16" wall thickness, 12" diameter		195	.287		59.50	14	9.25	82.75	9
)50	18" diameter		175			92	15.60	10.30	117.90	13
060	36" diameter			6 1.934		173	94	62.50	329.50	400
070	3/8" wall thickness, 18" diameter			0 1.296		108	63	42	213	26

			Ea.			202,000	CONSTRUCTION OF
			Ea.			202,000	244,500
						295,500	324,000
						417,000	458,500
						538,000	591,500
						558,000	725,500
						1,043,000	1,148,000
						2,121,000	2,333,000
						3,095,000	3,405,000
						4,068,000	4,475,000
							5,554,500
							, ,
			Γ.			546,500	600,50
			EO.			Lower Contractor Contractor	794,50
							1,167,00
							1,923,00
1							2,559,00
			*				
						1,706,000 2,266,000 2,924,000) 1,877,0) 2,493,0) 3,216,
						3,533,00	Line A Setupped
age Ci	ister	ns				3,533,00	
age Ci	ister	'ns				3,533,00	
			8 F	1. 3.	,650 320	3,533,00	
4	Clab	4	8 E4		,650 320 ,100 955	3,97	5 17
4	Clab Clab	4 2	24	14		3,97 15,05 22,20	5 17 00 25
4 6 8	Clab Clab Clab 1	4 2 .50 42	24 2.667	14 20	,100 955	3,97 15,05 22,20 42,90	55 17, 00 25 00 48
4 6 8	Clab Clab Clab 1 Clab .	4 2 .50 42 .90	24	14 20 39	,100 955 ,500 1,700	3,97 15,05 22,20 42,90 51,9	55 17 00 25 00 48 50 60
4 6 8	Clab Clab Clab 1 Clab .	4 2 .50 42 .90 .50	24 2.667 80	14 20 39 46	,100 955 ,500 1,700 ,700 3,200 ,200 5,750 3,000 7,175	3,97 15,05 22,20 42,90 51,9 90,1	55 17, 00 25, 00 48, 50 60, 75 102,
4 6 8	Clab Clab Clab 1 Clab .	4 2 .50 42 .90 .50 .40	24 2.667 80 144	14 20 39 46 83	,100 955 ,500 1,700 ,700 3,200 ,200 5,750	3,97 15,05 22,20 42,90 51,9	55 17, 00 25, 00 48, 50 60, 75 102,
	te Wa	te Water S	te Water Stor	Eo.	te Water Storage Tanks	te Water Storage Tanks	Ea. 546,500 722,500 1,060,500 1,749,000 2,327,000 te Water Storage Tanks

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Q-3

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55.05

88.50

131.50

2024

2026

2028

2030

5" diameter

6" diameter

8" diameter

10" diameter

33 71 Electrical Utility Transmission and Distribution 33 71 16 – Electrical Utility Poles

3 71	16.23 Steel Electrical Utility Poles	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Bare Labor	e Costs Equipment	Total	Total Incl 0&P
880	85'	R-13	1.40	30	Ea.	7,200	1,700	168	9,068	10,60
900	90'		1.25	33.600		9,425	1,900	188	11,513	13,40
920	95 <i>′</i>			36.522		11,800	2,050	205	14,055	16,30
940	100'		1	42		14,400	2,375	235	17,010	19,7(
	100		.90	46.667		15,900	2,625	261	18,786	21,60
960			.70	10.007		253	2,020		253	21,00
980	Ladder clips	R-15A	9.20	5.217		1,050	266	30.50	1,346.50	
000	Galvanized steel, round, tapered, w/one 6' arm, 20'	N-LOA				1,030	320	37	1,482	1,5
020	25'		7.65	6.275			375	43	1,668	1,7
040	30'			7.328		1,250			1,824	1,9
060	35'		5.75	8.348		1,350	425	49		2,1
080	40'		5.15	9.320		1,425	475	55	1,955	2,3
200	Two 6′ arms, 20′			7.328		1,350	375	43	1,768	2,0
220	25'		5.75	8.348		1,375	425	49	1,849	2,2
240	30'		5.15	9.320		1,425	475	55	1,955	2,3
260	35'		4.60	10.435		1,625	530	61.50	2,216.50	2,
280	40'		4.20	11.429		1,875	585	67.50	2,527.50	3,
400	One 12' truss arm, 25'		7.65	6.275		1,300	320	37	1,657	1,
420	30'			7.328		1,350	375	43	1,768	2,
440	35'		5.75			1,450	425	49	1,924	2,
			5.15	9.320		1,625	475	55	2,155	2,
1460	40'			10.435		1,875	530	61.50	2,466.50	2,
1480	45'					1,525	425	49	1,999	2,
1600	Two 12' truss arms, 25'		5.75					55	2,105	
1620	30'		5.15			1,575	475			2,
1640	35'			10.435		1,700	530	61.50	2,291.50	2,
1660	40'			11.429		1,875	585	67.50	2,527.50	3,
1680	45'			12.468		2,125	635	73.50	2,833.50	3,
3400	Galvanized steel, tapered, 10'		15.50	3.097		425	158	18.25	601.25	
3420	12'		11.50	4.174		500	213	24.50	737.50	
3440	14'		9.20	5.217		370	266	30.50	666.50	
3460	16'		8.45	5.680		385	290	33.50	708.50	
3480	18'		7.65	6.275		395	320	37	752	
3500	20'		7.10			380	345	40	765	
	Digging holes in earth, average	R-5		3.500			178	48	226	
6000				19.512			990	269	1,259	1
6010	In rock, average		4.J1	17.312	V		110	207	1,237	
6020	Formed plate pole structure	D 7	0.40	20	Г.		825	69	894	1
6030	Material handling and spotting	R-7	2.40		Ea.	10 400				15
6040	Erect steel plate pole	R-5		45.128		10,400	2,300	620	13,320	
6050	Guys, anchors and hardware for pole, in earth			12.500		630	635	172	1,437]
6060	In rock		17.90	6 4.900	V.	750	249	67.50	1,066.50	1
6070	Foundations for line poles									
6080	Excavation, in earth	R-5	135.3	8 .650	С.Ү.		33	8.95	41.95	
6090	In rock		20	4.400			224	60.50	284.50	
6110	Concrete foundations		11	8	-	153	405	110	668	
	16.33 Wood Electrical Utility Poles	1 V								
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.	875	360	40.50	1,275.50	
5000	Wood, class 3 yellow pine, penta-treated, 25'	R-15/				278	285	33	596	
	30'			6.234		320	320	36.50	676.50	
5020				8.276		400	420		868.50	
5040	35'			9.057		400	420		988.50	
5060	40'						480 520		1,095	
5080	45'		4./() 10.213	1	515	520	00	1,075	1

33 71 Electrical Utility Transmission and Distribution

	16 - Electrical Utility Poles		Daily	Labor-			2018 Bar			Total
71	16.33 Wood Electrical Utility Poles	Crew	Output	Hours	Unit	Material		Equipment	Total	Incl O&P
0	50'	R-15A			Ea.	635	585	67.50	1,287.50	1,650
0	55'			12.632		745	645	74.50	1,464.50	1,875
0	60'		3.50	13.714		995	700	81	1,776	2,250
0	65'		3.20	15		1,300	765	88.50	2,153.50	2,675
0	70′		3	16		1,825	815	94	2,734	3,325
0	75'		2.80	17.143		2,350	875	101	3,326	4,000
0	Wood, class 1 type C, CCA/ACA-treated, 25'		8.60	5.581		278	285	33	596	770
0	30′	1	7.70	6.234		340	320	36.50	696.50	895
10	35'		5.80	8.276		475	420	48.50	943.50	1,225
0	40'		5.30	9.057		555	460	53.50	1,068.50	1,375
30	45'			10.213		675	520	60	1,255	1,600
00	50'			11.429		740	585	67.50	1,392.50	1,775
20	55'	1		12.632		835	645	74.50	1,554.50	1,975
00	Electric & tel sitework, 20' high, treated wd., see Section 26 56 13.10	R-3	3.10	6.452		189	375	42	606	815
00	25′ high		2.90	6.897		238	400	44.50	682.50	910
00	30′ high		2.60	7.692		340	445	50	835	1,100
00	35' high		2.40	8.333		480	485	54	1,019	1,325
00	40' high		2.30	8.696		640	505	56.50	1,201.50	1,525
00	45' high	-	1.70	11.765	*	870	680	76	1,626	2,075
00	Cross arms with hardware & insulators								0.0.5	
00	4' long	1 Elec	2.50	3.200	Ea.	149	186		335	440
00	5' long		2.40	3.333		165	194		359	470
00	6' long		2.20	3.636	Ŵ	171	212		383	505
6255 F	Disposal of pole & hardware surplus material	R-7	20.87	2.300	Mile		95	7.95	102.95	154
00	Disposal of crossarms & hardware surplus material	"	40	1.200	"		49.50	4.15	53.65	80
100	Disposal of crossarms & hardware surplus material	S. A. Marin	12000		"		49.50	4.15	53.65	80
100 33 7	Disposal of crossarms & hardware surplus material 11 19 – Electrical Underground Ducts an	S. A. Marin	12000		"		49.50	4.15	53.65	80
100 33 7 3 71	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts an 19.15 Underground Ducts and Manholes	S. A. Marin	12000		"		49.50	4.15	53.65	80
100 13 7 3 71 010	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts an 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES	S. A. Marin	12000		"		49.50	4.15	53.65	80
00 3 7 3 7 010 011	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts an 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank	S. A. Marin	12000		"		49.50	4.15	53.65	80
100 37 371 010 011 000	Disposal of crossarms & hardware surplus material 11 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial	d Mant	nole	5		.30	49.50	4.15	53.65	
00 3 7 3 7 010 011 000 010	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter	d Mant	tole	5 .024	" L.F.	.30 .40		4.15		1
00 3 7 3 7 010 011 000 010 020	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter	d Mant	c 340 290	S .024 .028			1.37		1.67	
00 3 7 3 7 3 7 010 011 000 010 020 030	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter	d Mant	c 340 290 260	.024 .028 .031		.40	1.37 1.61		1.67 2.01	
100 13 7 3 71 010 011 000 010 020 030 040	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter	d Mant	c 340 290 260 210	.024 .028 .031 .038		.40 .66	1.37 1.61 1.79		1.67 2.01 2.45	
00 3 7 3 7 010 011 000 010 020 030 040 050	Disposal of crossarms & hardware surplus material 11 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter	d Manh	a 340 290 260 210 180	.024 .028 .031 .038 .044		.40 .66 .97	1.37 1.61 1.79 2.22		1.67 2.01 2.45 3.19	-
00 3 7 3 7 10 010 010 020 030 040 050 060	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter	d Mant	c 340 290 260 210 180 c 240	.024 .028 .031 .038 .044 0 .067		.40 .66 .97 1.26	1.37 1.61 1.79 2.22 2.59		1.67 2.01 2.45 3.19 3.85	
00 3 7 3 7 1 10 11 10 11 10 10 10 10 10 10	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter	d Manh	c 340 290 260 210 180 c 240 160	.024 .028 .031 .038 .044 .067 .100		.40 .66 .97 1.26 2.26 3.09	1.37 1.61 1.79 2.22 2.59 3.88		1.67 2.01 2.45 3.19 3.85 6.14	1
00 3 7 3 71 010 011 000 010 020 030 040 050 060 070 080	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter	d Manh	c 340 290 260 210 180 c 240 160 120	.024 .028 .031 .038 .044 .067 .100 133		.40 .66 .97 1.26 2.26	1.37 1.61 1.79 2.22 2.59 3.88 5.80		1.67 2.01 2.45 3.19 3.85 6.14 8.89	1
100 3 7 3 71 010 011 000 010 020 030 040 050 1060 1070 1080 1090	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 3" diameter 5" diameter 6" diameter	d Manh 1 Elec 2 Ele	c 340 290 260 210 180 c 240 160 120 90	.024 .028 .031 .038 .044 .067 .100 .133 .178		.40 .66 .97 1.26 2.26 3.09 4.61 6.05	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36	1
00 3 7 3 7 3 7 1 00 010 020 030 040 050 060 070 080 090 1110	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter Elbows, 1/2" diameter	d Manh	с 3400 2900 2600 2100 1800 1200 900 900 900 900 900 900	.024 .028 .031 .038 .044) .067) .100) .133 .178 .167	LE	.40 .66 .97 1.26 2.26 3.09 4.61	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40	1 1 1 2 1 1
00 3 7 3 7 3 7 1 0 0 0 0 0 0 0 0	Disposal of crossarms & hardware surplus material 71 19 – Electrical Underground Ducts an 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1" diameter 2" diameter 4" diameter 5" diameter 6" diameter Elbows, 1/2" diameter 3/4" diameter	d Manh 1 Elec 2 Ele	c 340 290 26C 21C 18C 16C 12C 90 90 48 38	.024 .028 .031 .038 .044) .067) .100) .133 .178 .167 .211	LE	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32	1 1 1 2 1 1
00 3 7 3 7 3 7 010 011 000 010 020 030 040 050 040 050 060 070 080 1090 1110 1120 1130	Disposal of crossarms & hardware surplus material 71 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 4" diameter 5" diameter 5" diameter 5" diameter 4" diameter 5" diameter 5" diameter 1/2" diameter 3/4" diameter 3/4" diameter 1" diameter 1" diameter 1" diameter	d Manh 1 Elec 2 Ele	c 340 290 26C 210 180 160 120 90 90 90 90 90 90 90 90 90 90 90 90 90	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250	LE	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03	1 1 1 2 1 1 1 2
00 3 7 3 7 10 00 010 010 020 030 040 050 060 070 080 1090 110 1120 1130 1140	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter 3/4" diameter 1" diameter	d Manh 1 Elec 2 Ele	c 340 290 26C 21C 18C 16C 12C 90 90 cc 48 38 32 21	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381	LE	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85	1 1 1 2 1 1 1 2 3
00 3 71 3 71 010 010 020 030 040 050 040 050 060 070 080 1090 1110 1120 1130 1140 1150	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 4" diameter 5" diameter 6" diameter 5" diameter 1/2" diameter 1.1/2" diameter 1.1/2" diameter 2/4" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter	d Manh 1 Elec 2 Ele	c 340 290 260 210 180 160 160 120 90 90 90 90 90 90 90 90 90 90 90 90 90	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500	LE	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22	1 1 1 2 1 1 1 2 3 3 4
00 3 7 3 71 010 011 000 010 020 030 040 050 060 070 1080 1090 1110 1120 1130 1140 1150 1160	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1" diameter 2" diameter 4" diameter 5" diameter 6" diameter 5" diameter 8/4" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 3/4" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter	d Manh 1 Elec 2 Ele	c 340 290 26C 210 180 120 160 120 90 90 48 38 32 21 16 122 90 90 90 16 121 121 16 121 16 121 16 121 16 16 121 16 16 121 16 16 16 16 16 16 16 16 16 16 16 16 16	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500 .667	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91	
100 3 7 3 7 010 011 000 010 010 010 010 010 020 030 040 050 1060 1070 1100 1110 1120 1130 1140 1150 1170 1170	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1" diameter 2" diameter 4" diameter 5" diameter 5" diameter 6" diameter 1/2" diameter 3/4" diameter 1.1/2" diameter 1.1/2" diameter 2" diameter 1.1/2" diameter 1.1/2" diameter 3/4" diameter 1.1/2" diameter 4" diameter 1.1/2" diameter	d Manh 1 Elec 2 Ele	c 340 290 260 210 180 180 160 120 90 90 48 38 32 211 16 120 90	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91 49.50	
Image: Non-Strain Strain Str	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 4" diameter 5" diameter 5" diameter 1" diameter 1" diameter 1" diameter 3/4" diameter 1" diameter 5" diameter 5" diameter 5" diameter 5" diameter	d Manh 1 Elec 2 Ele	c 340 290 26C 21C 18C 16C 12C 90 90 cc 488 382 322 211 166 122 90 90 90 88 88 88 82 88 88 88 82 88 88 88 88 88	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500 .667 .889 .1	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91 49.50 68.51	
100 3 7 3 7 010 011 000 010 010 010 010 010 010 010 010 010 010 010 010 010 010 010 010 010 0100 0100 0100 0100 1000 1100 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 1110 1120 <th< td=""><td>Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1.1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 5" diameter 1.1/2" diameter 3/4" diameter 3/4" diameter 1.1/2" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 5" diameter 3" diameter 3" diameter 5" diameter 3" diameter 3" diameter 5" diameter 4" diameter 5" diameter 6" diameter</td><td>d Manh 1 Elec 2 Ele</td><td>c 340 2900 2600 2100 1800 1200 1800 1800 1800 1800 18</td><td>.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500 .667 .889 1 1.600</td><td>L.F. Ea.</td><td>.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26 36</td><td>1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58 93</td><td></td><td>1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91 49.50 68.55 84</td><td></td></th<>	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1.1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 5" diameter 1.1/2" diameter 3/4" diameter 3/4" diameter 1.1/2" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 3/4" diameter 5" diameter 3" diameter 3" diameter 5" diameter 3" diameter 3" diameter 5" diameter 4" diameter 5" diameter 6" diameter	d Manh 1 Elec 2 Ele	c 340 2900 2600 2100 1800 1200 1800 1800 1800 1800 18	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500 .667 .889 1 1.600	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26 36	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58 93		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91 49.50 68.55 84	
100 13 7 3 7 10 00 010 011 000 020 030 040 050 1050 1060 1070 1080 1070 1120 1130 1140 1150 1160 1170 1180 1190 1210 1210	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 4" diameter 5" diameter 6" diameter 1-1/2" diameter 1-1/2" diameter 2" diameter 3/4" diameter 1-1/2" diameter 1-1/2" diameter 3/4" diameter 1-1/2" diameter 3/4" diameter 5" diameter 4" diameter 5" diameter	d Manh 1 Elec 2 Ele	c 340 290 260 210 180 160 160 160 160 160 180 90 90 90 90 90 90 90 90 90 90 90 90 90	.024 .028 .031 .038 .044 .067 .100 .133 .178 .167 .211 .250 .381 .500 .667 .889 1 1.600 2154	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26 36 .21	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58 93 8.9		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91 49.50 68.55 84 129	
3 71 010 011 000 010 020 030 1040 1050 1060 1070 1080 1070 1100 1120 1130 1140 1150 1150 1170 1180 1190	Disposal of crossarms & hardware surplus material 119 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes UNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1.1/2" diameter 2" diameter 4" diameter 5" diameter 6" diameter 1.1/2" diameter 3/4" diameter 2" diameter 3/4" diameter 1.1/2" diameter 3/4" diameter 3/4" diameter 5" diameter 1.1/2" diameter 3/4" diameter 4" diameter 3" diameter 4" diameter 3" diameter 4" diameter 4" diameter 4" diameter 4" diameter 4" diameter 5" diameter 4" diameter 4" diameter 3' diameter 4" diameter 4" diameter 4" diameter 4" diameter 4" diameter 4" diameter 5" diameter 4" diameter 4" diameter 5" diameter 4" diameter 5" diameter 4" diameter 5" diameter 4" diameter 5" diameter 4" diameter 5" diameter 5" diameter 4" diameter 5" diame	d Manh 1 Elec 2 Ele	c 340 2900 2600 2100 1800 1200 1800 1800 1800 1800 18	.024 .028 .031 .038 .044 0 .100 .133 .178 .167 .211 .250 .381 .500 .667 .889 1 .602 .154 .186	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26 36	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58 93		1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.91 49.50 68.55 84 129 9.10	2 3 1 1 2 2 3 4 3 4 3 4 5 9 11 1 6 1 7 1 7 1 1 1 1 1 1 1 1 1 1 1 1 1

For customer support on your Heavy Construction Costs with RSMeans data, call 800.448.8182.

	1 23 – Insulators and Fittings		Duth	Lehen			0010 0	<i>c</i> .		Til
33 71	23.16 Post Insulators	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	ire Costs Equipment	Total	Total Incl 0&I
010	POST INSULATORS									
7400	Insulators, pedestal type	R-11	112	.500	Ea.		27.50	5.90	33.40	
7490	See also line 33 71 39.13 1000									
33 7	1 26 – Transmission and Distribution	on Equipmer	nt							
	26.13 Capacitor Banks									1
010	CAPACITOR BANKS									
1300	Station capacitors									
1350	Synchronous, 13 to 26 kV	R-11	3.11	18.006	MVAR	7,375	995	213	8,583	9,8
1360	46 kV		3.33	16.817		9,425	930	199	10,554	12,0
370	69 kV			14.698		9,275	815	174	10,264	11,6
380	161 kV		6.51	8.602		8,650	475	102	9,227	10,4
390	500 kV		10.37			7,525	299	64	7,888	8,8
450	Static, 13 to 26 kV			18.006		6,250	995	213	7,458	8,
460	46 kV			18.605		7,900	1,025	220	9,145	10,
400	40 KV 69 kV			14.698		7,675	815	174	8,664	10, 9,
480	161 kV		6.51	8.602		7,125	475	102	7,702	8,
400	500 kV			5.400		6,500	299	64	6,863	o, 7,
600	Voltage regulators, 13 to 26 kV			74.667	Ea.	280,000	4,125	885	285,010	315,
		▼	./)	/4.00/	LU.	200,000	4,123	000	203,010	515,
	26.23 Current Transformers	· · · · · · · · · · · · · · · · · · ·								
010	CURRENT TRANSFORMERS	D 11	14		F	0.450	001	47.50	0 710 50	
050	Current transformers, 13 to 26 kV	R-11	14	4	Ea.	3,450	221	47.50	3,718.50	4,
060	46 kV		9.33	6.002		10,000	330	71	10,401	11,
4070	69 kV		7	8		10,400	445	94.50	10,939.50	12,
1080	161 kV		1.87	29.947	V I	33,800	1,650	355	35,805	40,
	26.26 Potential Transformers									
010	POTENTIAL TRANSFORMERS									
100	Potential transformers, 13 to 26 kV	R-11	11.20		Ea.	4,925	277	59	5,261	5,
110	46 kV		8	7		10,100	385	82.50	10,567.50	11,
120	69 kV		6.22	9.003		10,700	500	106	11,306	12,
130	161 kV		2.24	25	i i i	23,200	1,375	296	24,871	27,
140	500 kV		1.40	40	W I	69,000	2,225	475	71,700	80,
33 7	71 39 – High-Voltage Wiring									
3 71	1 39.13 Overhead High-Voltage Wiring									
010	OVERHEAD HIGH-VOLTAGE WIRING									
100	Conductors, primary circuits									
110	Material handling and spotting	R-5	9.78	8.998	W.Mile		455	124	579	
120	For river crossing, add		11	8			405	110	515	
150	Conductors, per wire, 210 to 636 kcmil		1.96	44.898		12,400	2,275	620	15,295	17,
160	795 to 954 kcmil			47.059	0 10 10	24,800	2,400	650	27,850	31,
170	1,000 to 1,600 kcmil			59.864	87 E B	42,500	3,050	825	46,375	52
180	Over 1,600 kcmil			65.185	6 8 9	59,500	3,325	900	63,725	71
200	For river crossing, add, 210 to 636 kcmil			70.968		1	3,600	980	4,580	6
220	795 to 954 kcmil		1.09	80.734			4,100	1,125	5,225	7
230	1,000 to 1,600 kcmil		.97	90.722		1	4,600	1,250	5,850	8
240	Over 1,600 kcmil		.87	101			5,150	1,400	6,550	9
300	Joints and dead ends	R-8	.07	8	Ea.	1,650	410	47	2,107	2
400	Sagging	R-5	7.33	12.001		1,000	610	165	775	1
)500	Clipping, per structure, 69 kV	R-10	9.60	5	Ea.		274	62.50	336.50	
)510	161 kV	K-10	5.33		LU.		495	113	608	
JIU	345 to 500 kV		0.00	1.000			T/J	110	000	1

71 Electrical Utility Transmission and Distribution 35

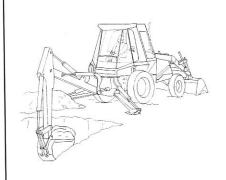
33 71 39 - High-Voltage Wiring Total Daily Labor-2018 Bare Costs Incl O&P Total Labor Equipment 33 71 39.13 Overhead High-Voltage Wiring Unit Materia Crew Output Hours 1,308 1,775 88 770 3.20 15 Ea. 450 Make and install jumpers, per structure, 69 kV R-8 0600 234 3,179 4,350 895 2,050 40 1.20 161 kV 0620 880 14,200 7,725 10,105 1,500 150 .32 345 to 500 kV 0640 166 136.75 .700 89.50 38.50 8.75 68.57 R-10 Spacers 0700 44 10 54 77 " 60 .800 For river crossings, add 0720 3,159 4.350 2,125 194 R-9 1.45 44.138 W.Mile 840 Installing pulling line (500 kV only) 0800 460 309 285 24 6.96 6.897 Mile Disposal of surplus material, high voltage conductors R-7 0810 157.10 234 145 12.10 13.71 3.501 With trailer mounted reel stands 0820 Insulators and hardware, primary circuits 0900 6.75 .35 4.48 4.13 R-7 480 .100 Eq. Material handling and spotting, 69 kV 0920 3.13 4.70 2.89 .24 .070 685.71 161 kV 0930 2.23 3.35 2.06 .17 .050 960 345 to 500 kV 0950 109 5.10 1.38 97.98 91.50 .100 R-5 880 Disk insulators, 69 kV 1000 123 109.81 1.24 .090 104 4.57 977.78 161 kV 1020 1.10 109.17 122 .080 104 4.07 1100 345 to 500 kV 1040 See Section 33 71 23.16 for pin or pedestal insulator 1060 Install disk insulator at river crossing, add 1100 13.75 7.60 2.07 9.67 586.67 .150 R-5 Ea. 69 kV 1110 1.38 6.48 9.15 5.10 .100 880 161 kV 1120 9.15 6.48 1.38 5.10 880 .100 345 to 500 kV 1140 77 3.98 51.48 47.50 41.74 1.150 Mile R-7 Disposal of surplus material, high voltage insulators 1150 Overhead around wire installation 1300 379.50 570 29.50 350 W.Mile R-7 5.65 8.496 Material handling and spotting 1320 6,540 8,200 690 3,300 2,550 1.76 50 R-5 Overhead ground wire 1340 1,025 4,850 6,925 3,825 1.17 75.214 1350 At river crossing, add 136 194 107 29 41.74 2.108 Mile Disposal of surplus material, grounding wire 1360 Installing conductors, underbuilt circuits 1400 570 29.50 379.50 5.65 8.496 W.Mile 350 R-7 1420 Material handling and spotting 17,800 620 15,295 2,275 1.96 44.898 12,400 R-5 Conductors, per wire, 210 to 636 kcmil 1440 27.850 31,600 650 2,400 1.87 47.059 24.800 1450 795 to 954 kcmil 46,375 52,500 3,050 825 1.47 59.864 42,500 1,000 to 1,600 kcmil 1460 63,725 71,500 3,325 900 59,500 1.35 65.185 1470 Over 1,600 kcmil 2,500 47 2,107 410 1,650 R-8 6 8 Ea. 1500 Joints and dead ends 915 138 648 8.80 10 W.Mile 510 R-5 1550 Sagging 336.50 480 274 62.50 5 R-10 9.60 Eq. Clipping, per structure, 69 kV 1600 608 865 113 495 9.006 5.33 1620 161 kV 237 1.287 1.800 1,050 18.972 2.53 1640 345 to 500 kV 918 1,175 48 450 420 5.87 8.177 R-8 1700 Making and installing jumpers, per structure, 69 kV 5,175 293 3,763 895 2,575 .96 50 1720 161 kV 10,105 14,200 880 7,725 .32 150 1.500 1740 345 to 500 kV 123.25 146 27.50 6.25 .500 89.50 R-10 96 1800 Spacers 309 460 285 24 Mile R-7 6.96 6.897 1810 Disposal of surplus material, conductors & hardware 2000 Insulators and hardware for underbuilt circuits 2.68 1.79 .040 1.65 .14 1200 R-7 Ea. 2100 Material handling and spotting .47 96.09 107 4.12 91.50 600 .080 R-8 2150 Disk insulators, 69 kV 108.01 121 .41 3.60 .070 104 2160 686 161 kV 120 3.09 .35 107.44 104 800 .060 2170 345 to 500 kV 51.48 77 47.50 3.98 Mile 2180 R-7 41.74 1.150 Disposal of surplus material, insulators & hardware 32,300 3,550 28,010 23,500 960 1.26 69.841 Ea. 2300 R-5 Sectionalizing switches, 69 kV 1,525 33,725 39,400 5,600 .80 110 26,600 2310 161 kV 9,925 220 8,735 815 2500 5.50 16 7,700 Protective devices 2600 Clearance poles, 8 poles per mile 11,225 13,900 1.050 3.850 1.16 75.862 Mile 6,325 2650 R-5

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In earth, 69 kV

G10 Site Preparation

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. C

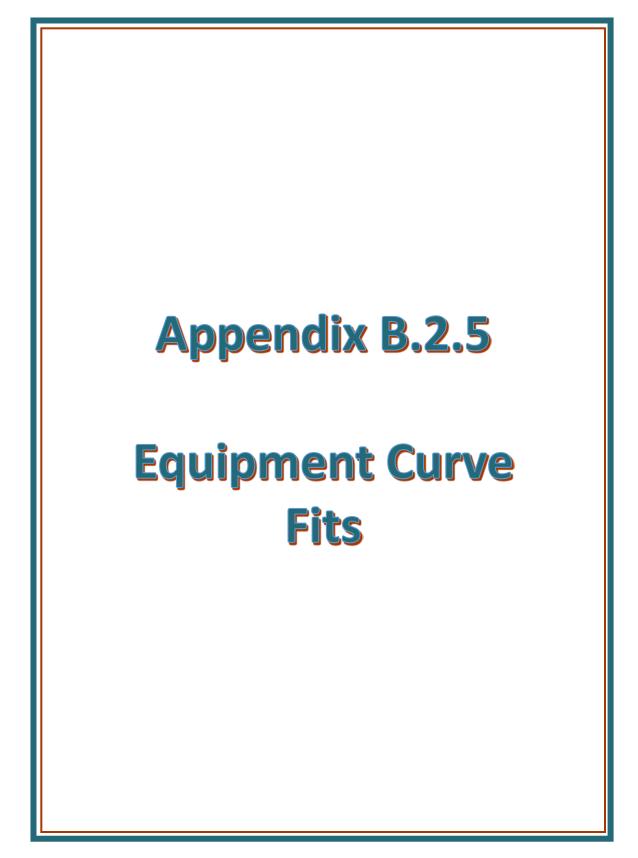
			C	OST PER C.Y.	
System Components	QUANTITY	UNIT	EQUIP.	LABOR	TOTAL
SYSTEM G1030 120 1000 EXCAVATE COMMON EARTH, 1/2 CY BACKHOE, TWO 8 CY DUMP TRUCKS, 1 MRT Excavating, bulk hyd. backhoe wheel mtd., 1/2 C.Y. Hauling, 8 CY truck, cycle 0.5 mile, 20 MPH, 15 min. wait/Ld./Uld. Spotter at earth fill dump or in cut	1.000 1.280 .020	B.C.Y. L.C.Y. Hr.	.95 2.06	2.29 3.06 .97	3.2 5.1 .9
TOTAL			3.01	6.32	9.3

			0	OST PER C.Y.	
G103	80 120	Excavate and Haul Common Earth	EQUIP.	LABOR	TOTAL
1000 Ex	cavate commo	n earth, 1/2 C.Y. backhoe, two 8 C.Y. dump trucks, 1 MRT	3.01	6.30	9.31
1200		Three 8 C.Y. dump trucks, 3 mile round trip	5.95	10.80	16.75
1400		Two 12 C.Y. dump trucks, 4 mile round trip	6.30	8.25	14.55
1600		backhoe, three 8 C.Y. dump trucks, 1 mile round trip	3.03	5.25	8.28
1700		Five 8 C.Y. dump trucks, 3 mile round trip	5.90	10	15.90
1800		Two 12 C.Y. dump trucks, 2 mile round trip	5.35	6.40	11.75
1900		Two 16 C.Y. dump trailers, 3 mile round trip	5.15	5.45	10.60
2000		Two 20 C.Y. dump trailers, 4 mile round trip	4.95	5.35	10.30
2200		Y. backhoe, eight 8 C.Y. dump trucks, 3 mile round trip	5.70	8.95	14.65
2300		Four 12 C.Y. dump trucks, 2 mile round trip	4.94	5.50	10.44
2400		Six 12 C.Y. dump trucks, 4 mile round trip	5.95	6.35	12.30
2500		Three 16 C.Y. dump trailers, 2 mile round trip	4.17	4.07	8.2
2600		Two 20 C.Y. dump trailers, 1 mile round trip	3.33	3.32	6.6
2700		Three 20 C.Y. dump trailers, 3 mile round trip	4.38	4.18	8.5
2800	2.1/2 0	Y. excavator, six 12 C.Y. dump trucks, 1 mile round trip	3.57	3.72	7.2
2900	21/20	Eight 12 C.Y. dump trucks, 3 mile round trip	5.10	5.20	10.3
3000		Four 16 C.Y. dump trailers, 1 mile round trip	3.66	3.37	7.0
3100		Six 16 C.Y. dump trailers, 3 mile round trip	4.91	4.59	9.5
3200		Six 20 C.Y. dump trailers, 4 mile round trip	4.57	4.23	8.8
3400	2,1/2 (.Y. backhoe, six 16 C.Y. dump trailers, 1 mile round trip	3.89	3.23	7.1
3600	51/20	Ten 16 C.Y. dump trailers, 4 mile round trip	5.55	4.60	10.1
3800		Eight 20 C.Y. dump trailers, 3 mile round trip	4.46	3.65	8.1
4000	1/2 ()	/. pwr. shovel, four 8 C.Y. dump trucks, 2 mile round trip	5.30	8.10	13.4
4000	1/2 0.1	Two 12 C.Y. dump trucks, 1 mile round trip	4.32	4.96	9.2
4200		Four 12 C.Y. dump trucks, 4 mile round trip	6.40	6.70	13.1
4300		Two 16 C.Y. dump trailers, 2 mile round trip	4.68	4.85	9.5
4300		Two 20 C.Y. dump trailers, 4 mile round trip	5.40	5.55	10.9
4400	3/4 01	Y. pwr. shovel, six 8 C.Y. dump trucks, 2 mile round trip	5.20	7.85	13.0
4900	5/4 0.	Three 12 C.Y. dump trucks, 1 mile round trip	4.21	4.28	8.4
5000		Five 12 C.Y. dump trucks, 4 mile round trip	6.50	6.45	12.9
5100		Three 16 C.Y. dump trailers, 3 mile round trip	5.60	5.20	10.8
5200		Three 20 C.Y. dump trailers, 4 mile round trip	5.25	4.84	10.
5200	1,1/2 (C.Y. pwr. shovel, six 12 C.Y. dump trucks, 1 mile round trip	3.75	3.71	7.
5400 5500	1-1/2	Ten 12 C.Y. dump trucks, 4 mile round trip	6.05	5.90	11.

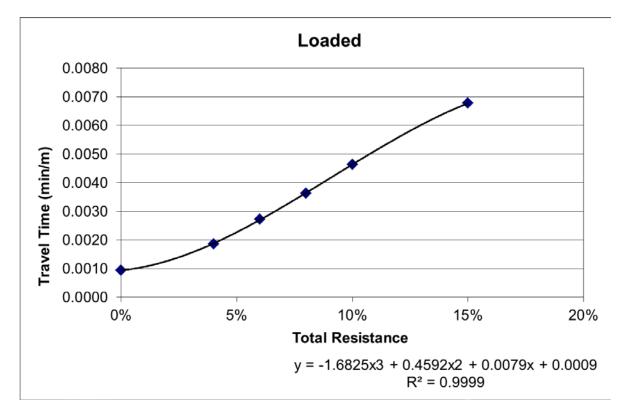
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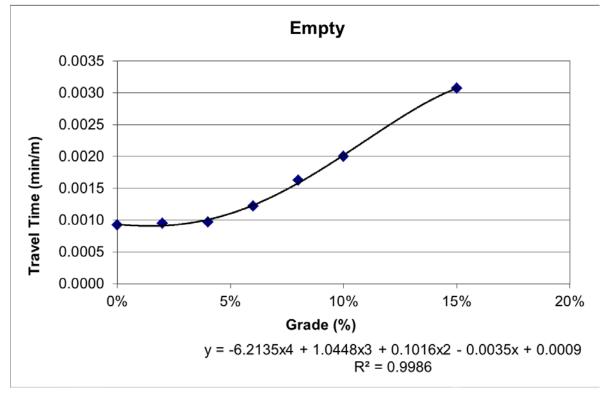
City Cost Indexes

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DIVISION		NEW BRUNSWICK				NEWARK 070 - 071			74 - 075			087					0	85 - 086	_	
		088 - 089 MAT. INST. TOTAL		070 - 071 MAT. INST. TOTAL				TOTAL	MAT.			MAT.	INST.		MAT.	INST.	TOTA			
122	CONTRACTOR EQUIPMENT	.m/1.	95.9	95.9	antal.	98.8	98.8		98.8	98.8		95.9	95.9		98.8			95.9	95	
433		102.2	95.9	95.9 104.9	100.9	106.3	104.7	99.4	106.3	104.2	103.7	105.9	105.3		_		89.0	105.9	100	
, 31 - 34		102.2	106.0	104.9	100.9	146.5	140.7	101.4	146.4	140.2	98.8	145.5					100.5	145.3	139	
)	oonerede i erning erniereren		146.4 150.5	140.6	104.4 99.7	140.5	125.3	101.4	150.5	126.1	76.7			78.1			100.7	119.9	110	
0	Concrete Reinforcing		150.5 141.9	113.9	93.9	136.1	109.9	84.7	136.1	104.2	96.3		114.0	1			94.8	140.6	11	
0	Cast-in-Place Concrete	96.3	141.9	113.6	93.9	142.1	109.9	87.1	142.1	112.2	97.2	143.8		1			91.9	137.6	11	
	CONCRETE	97.5	143.8	118.7	91.6	142.1	125.4	94.0	143.0	124.4	98.0	141.1					101.9	141.1	12	
	MASONRY METALS	109.7 96.6	143.0 120.5	130.4	96.6 102.0	143.0	123.4	95.5	123.7	104.2	96.6	120.3				103.4	102.0	109.1	10	
	METALS	96.6 111.5	120.5 146.1	103.9 130.8	102.0	123.7	125.7	105.0	146.2	127.9	104.1	146.1					93.5	146.1	12	
	WOOD, PLASTICS & COMPOSITES THERMAL & MOISTURE PROTECTION	101.3	146.1 134.8	130.8 115.5	100.0	146.2	123.7	103.0	135.6	120.1	101.3	137.6				120.6	101.7	138.6	11	
		92.0	134.8 144.2	115.5 104.0	109.8	130.4	110.6	107.3	144.2	115.8	93.8	144.2		108.3	144.2	116.5	98.5	136.7	10	
	OPENINGS	92.0	144.2	136.0	100.6	144.2	132.4	110.2	147.0	134.9	108.4	147.0	_	109.1	147.0	134.6	103.4	147.0	13	
20	Plaster & Gypsum Board	91.4	147.0	130.0	98.8	147.0	131.3	97.3	147.0	130.8	91.4	147.0		87.8	147.0	127.7	97.9	147.0	13	
50, 0980	Ceilings & Acoustic Treatment		147.0	128.9	90.0 87.4	191.9	116.3	82.9	191.9	113.1	87.5	168.1				113.3	91.9	187.0	11	
60	Flooring	90.0		118.3 119.6	87.4 85.4	191.9	120.6	84.0	145.9	120.1	83.0	145.9				120.1	86.6	145.9	12	
70, 0990	Wall Finishes & Painting/Coating	83.0	145.9	119.6	85.4 90.7	145.9	125.9	88.0	145.4	120.1	88.2	150.9			10000000	and the second second	92.4	154.2	12	
	FINISHES	89.6	155.3		90.7	131.8	125.9	100.0	131.8	107.1	100.0	116.4					100.0	119.4	10	
VERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	131.7	107.0		131.8	107.1	100.0	137.5	116.1	99.8	136.5	1.				100.2	136.2	11	
, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	99.8	137.5	115.9	100.0	137.5	122.8	99.5	142.9	122.1	93.2	137.2	1000			Conception of the second	101.2	135.9	11	
i, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	93.9	141.2	118.5	103.1	140.9	122.8	99.5	138.2	115.3	96.8	135.8		1.			98.5	133.9	11	
F2016	WEIGHTED AVERAGE	97.4	137.8	115.1	99.1	137.9	110.1	57.4	1.00.2	113.5	-		-	5010					2000	
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15433	CONTRACTOR EQUIPMENT		96.3	96.3		111.0	111.0		111.0	111.0		111.0		00.0			100 E	102.4	1.	
241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	93.9	104.7	101.4	92.3	102.4	99.4	112.0	102.4	105.3	98.8	102.4					108.5	_	10	
310	Concrete Forming & Accessories	96.0	144.0	137.4	99.0	64.1	68.9	97.1	64.1	68.6	97.1	64.0					99.1	64.1		
320	Concrete Reinforcing	75.8	135.4	105.9	97.0	71.0	83.9	109.7	71.0	90.2	110.9	71.0					101.5	71.0	8	
1330	Cast-in-Place Concrete	84.0	140.9	105.6	93.6	70.1	84.7	94.7	70.1	85.3	94.6	70.0					88.9	70.1	8	
1350	CONCRETE	86.3	139.8	110.8	93.3	68.8	82.1	114.3	68.8	93.5	102.6	68.7			-		102.9	68.8		
)4	MASONRY	98.6	141.1	125.0	107.3	60.0	78.0	106.9	60.0	77.8	106.9	60.0					101.6	60.0	1	
)4)5	METALS	96.5	113.9	101.8	109.2	91.0	103.6	105.2	91.0	100.8	104.8	90.8		Constant Comp			105.9	91.0	1	
06	WOOD, PLASTICS & COMPOSITES	101.0	144.6	125.2	94.7	64.6	77.9	92.4	64.6	77.0	92.4	64.6					94.8	64.6		
07	THERMAL & MOISTURE PROTECTION	100.8	137.6	116.4	96.9	70.8	85.8	99.5	70.8	87.3	98.2	70.8					98.2	70.8		
08	OPENINGS	93.3	139.1	103.8	98.5	65.8	91.0	96.6	65.8	89.5	96.7	65.8				_	100.9	65.8		
0920	Plaster & Gypsum Board	106.8	145.4	132.7	100.6	63.4	75.6	77.6	63.4	68.1	77.6	63.4		1.			92.7	63.4		
0950, 0980	Ceilings & Acoustic Treatment	91.4	145.4	127.8	99.3	63.4	75.1	102.3	63.4	76.1	102.3	63.4					97.1	63.4		
0960 0960	Flooring	86.6	168.1	109.2	87.7	69.5	82.7	98.5	69.5	90.4	98.5	69.5					89.3	69.5		
0900	Wall Finishes & Painting/Coating	83.0	145.9	119.6	95.3	52.8	70.5	93.6	52.8	69.8	93.6	52.8				_	89.9	52.8	-	
0970, 0990	FINISHES	87.0	150.0	121.3	89.4	63.6	75.4	93.9	63.6	77.4	92.6	63.6	0.000				89.6	63.6	-	
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	119.4	104.3	100.0	84.0	96.5	100.0	84.0	96.5	100.0	84.0	96.5	0.0x (q000)/27			100.0	84.0		
		99.8	131.9	113.5	100.0	69.2	86.9	98.1	69.2	85.7	98.1	68.8	85.6	100.0			98.1	69.2		
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	99.8	131.9	119.9		88.5	88.3	91.7	88.5	90.0		88.5	88.9	86.2	88.5		85.6	88.5	20	
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	93.2 95.0	134.4	119.9		75.1	88.3	101.1	75.1	89.7		75.0	88.4	99.1	75.1	88.6	98.9	75.1		
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0241, 31 - 34		99.0	80.8	86.3		102.4	101.1	101.0	102.4		_					1020			-	
0310	Concrete Forming & Accessories	93.8	63.0	67.2		64.1	68.9		64.1	68.6	1									
0320	Concrete Reinforcing	106.4	70.9	88.5	157 P		87.0		71.0		1			177.000						
0330	Cast-in-Place Concrete	89.4	62.6	79.2			83.6		70.1					_				65.3	_	
03	CONCRETE	81.3	65.3	74.0			82.6		68.8		_			ALL STORESTAL						
04	MASONRY	102.2	59.6	75.8			75.9	1 10000000	60.0		water and						**************************************			
05	METALS	103.6		97.2					91.0											
06	WOOD, PLASTICS & COMPOSITES	81.4	63.5	71.4	15 B B B B B B B B B B B B B B B B B B B				64.6											
07	THERMAL & MOISTURE PROTECTION	85.7	65.9	77.3	· · · · · · · · · · · · · · · · · · ·			10000	70.8					111111111111111111111111111111111111111			1 - 388X			
08	OPENINGS	92.3		86.1																
0920	Plaster & Gypsum Board	75.9	63.4	67.5							2 1 PARSES									
0950, 0980	Ceilings & Acoustic Treatment	88.0	63.4	71.4	12									3 10 120233						
0960	Flooring	129.6		112.9	9 89.3	69.5		ter in the second						8			Section Section			
0970, 0990	Wall Finishes & Painting/Coating	82.8		65.3	3 89.9									_						
09	FINISHES	102.6		80.9	9 88.2	2 63.6			63.6				_	_						
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44, 22, 22	FIRE SUFFICESSION, FLOWDING & HVAC				원 - 다				88.5	5 89.	6 99.8	8 88.5	93.9	86.0) 88.	5 87.	3 89.0	5 88.	5	
21, 22, 23 26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL	. 91.4	88.5	02	9 01.1		00.1	50.0	, 00.0	000	0 00.0	0010			3 75.		3 96.0	6 71.3	-	

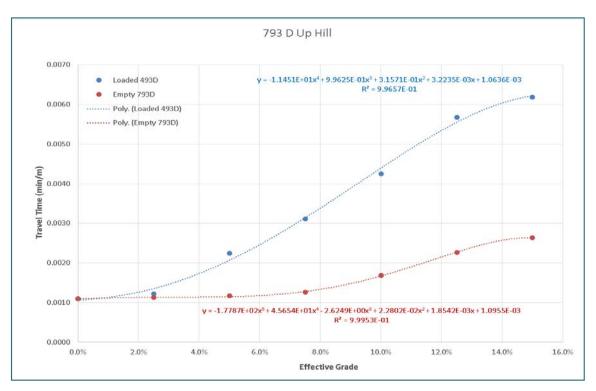


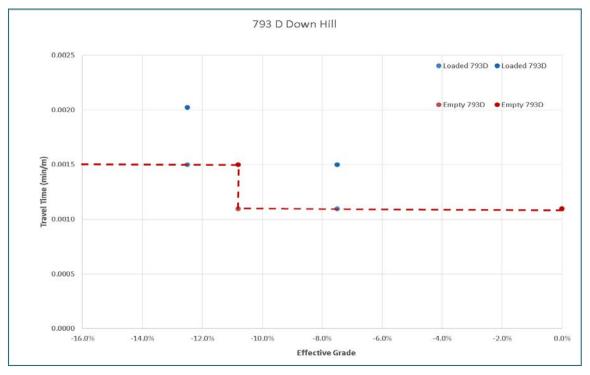
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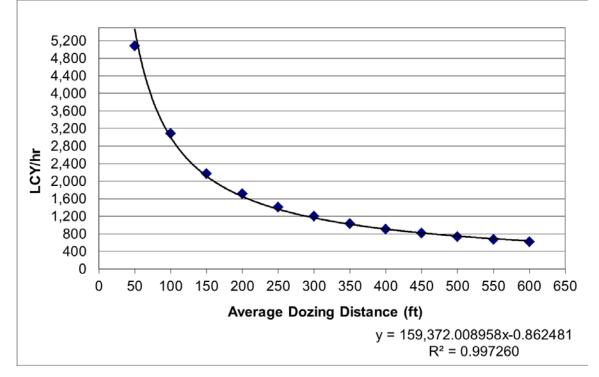


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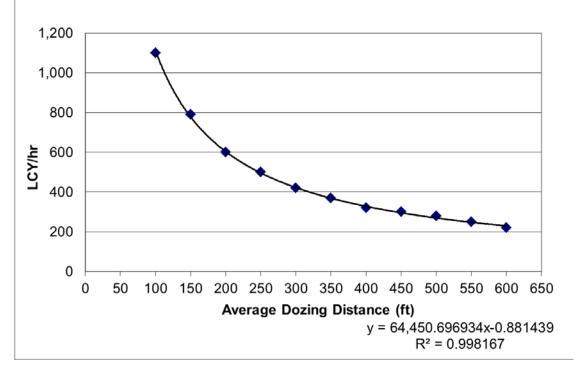




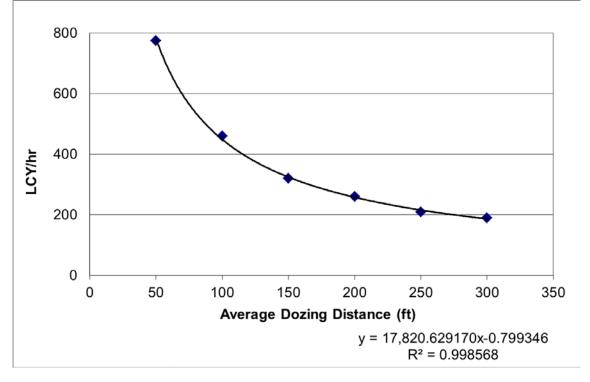
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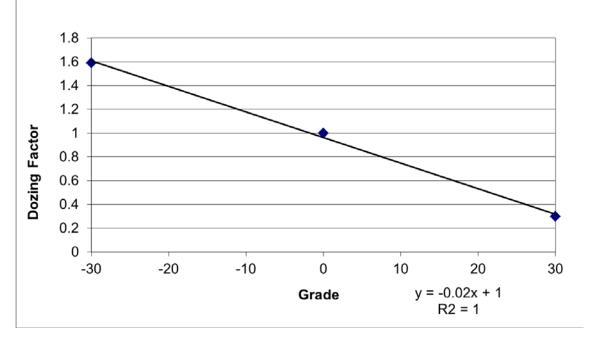




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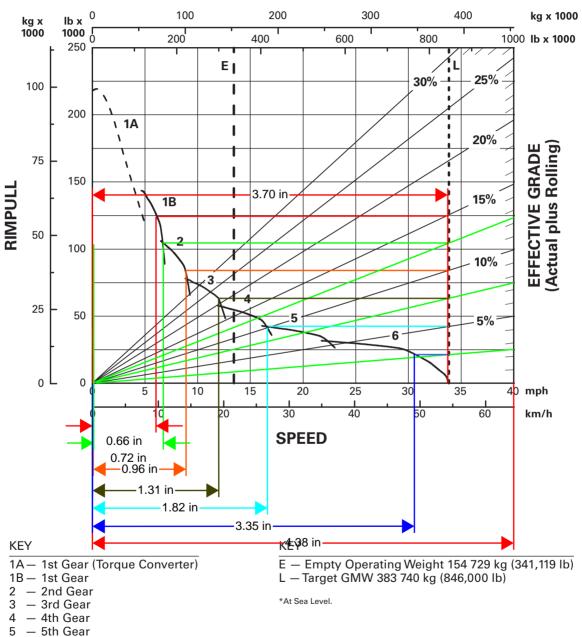
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Mining & Off-Highway Trucks

793D Rimpull-Speed-Gradeability

- Standard Arrangement*
- 40.00R57 Tires
- 1778 mm (5'10") Tire Radius



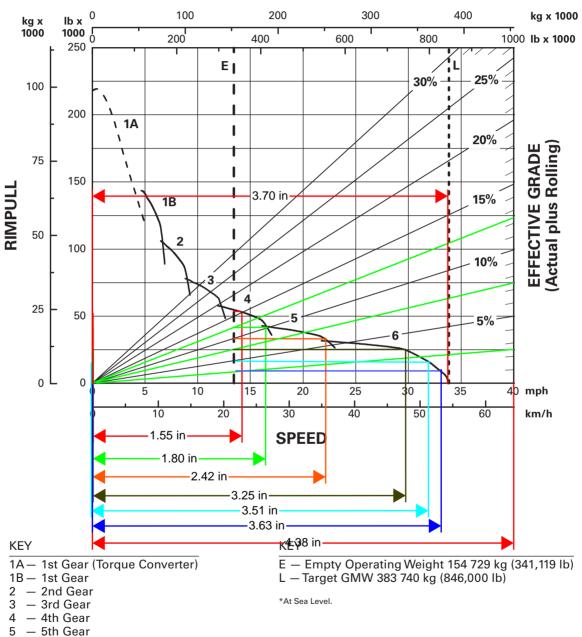
GROSS WEIGHT

6 – 6th Gear

Mining & Off-Highway Trucks

793D Rimpull-Speed-Gradeability

- Standard Arrangement*
- 40.00R57 Tires
- 1778 mm (5'10") Tire Radius



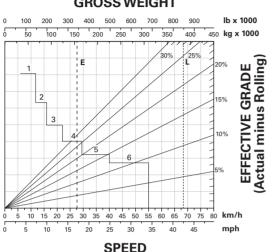
GROSS WEIGHT

6 – 6th Gear

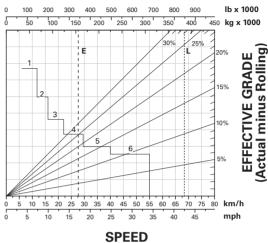
Mining & Off-Highway Trucks

793D Brake Performance

- Standard Arrangement*
- 450 m (1500 ft) 600 m (2000 ft)
- 900 m (3000 ft) 1500 m (5000 ft)

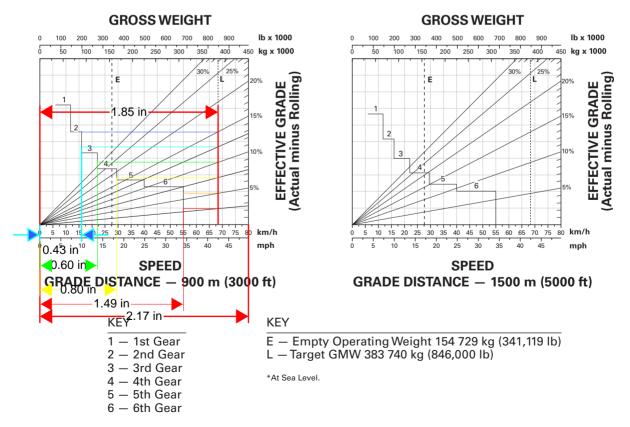


GRADE DISTANCE - 450 m (1500 ft)



GROSS WEIGHT

GRADE DISTANCE - 600 m (2000 ft)

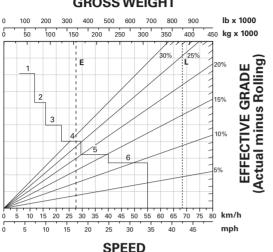


GROSS WEIGHT

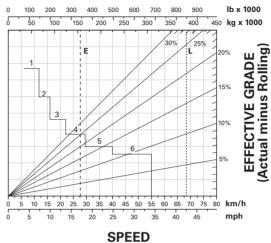
Mining & Off-Highway Trucks

793D Brake Performance

- Standard Arrangement*
- 450 m (1500 ft) 600 m (2000 ft)
- 900 m (3000 ft) 1500 m (5000 ft)

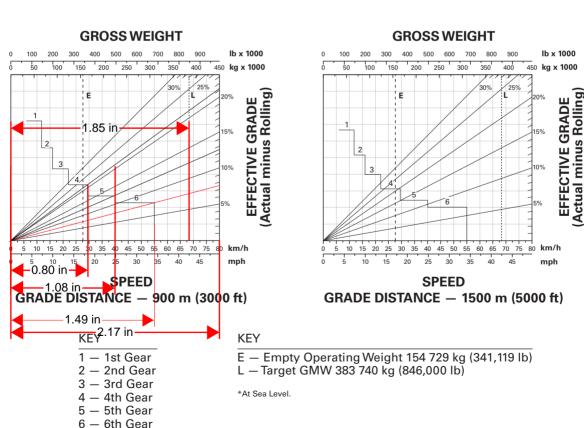


GRADE DISTANCE - 450 m (1500 ft)



GROSS WEIGHT

GRADE DISTANCE - 600 m (2000 ft)

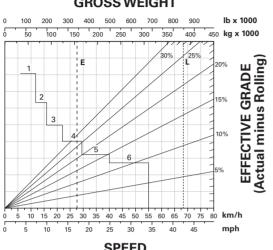


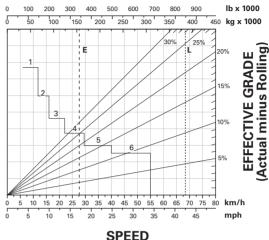
GROSS WEIGHT

Mining & Off-Highway Trucks

793D Brake Performance

- Standard Arrangement*
- 450 m (1500 ft) 600 m (2000 ft)
- 900 m (3000 ft) 1500 m (5000 ft)





GROSS WEIGHT

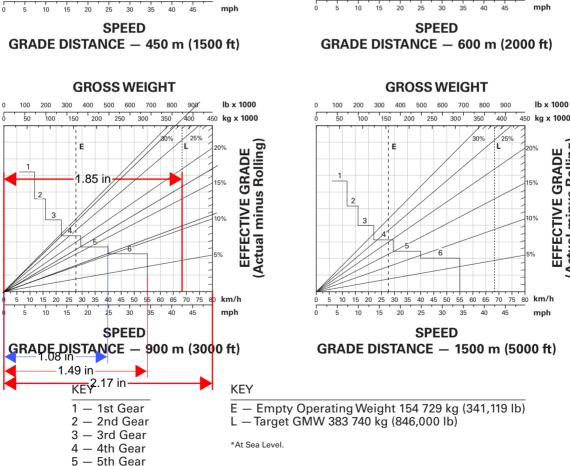
GRADE DISTANCE - 600 m (2000 ft)

lb x 1000

Actual minus Rolling

EFFECTIVE GRADE

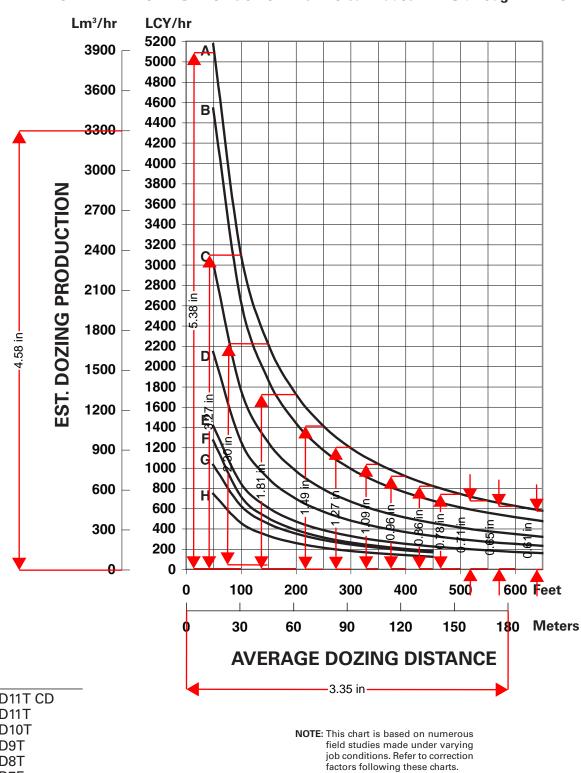
mph



GROSS WEIGHT

6 - 6th Gear

1



ESTIMATED DOZING PRODUCTION Universal Blades D7G through D11T CD

KEY

- A D11T CD B - D11T
- C D10T
- D D9T
- E D8T F D7E
- G D7R Series 2
- H D7G

Appendix B.2.6

Misc. Caterpillar Handbook Sheets

CATERPILLAR PERFORMANCE HANDBOOK

a publication by Caterpillar, Peoria, Illinois, U.S.A.

JANUARY 2017

Performance information in this booklet is intended for estimating purposes only. Because of the many variables peculiar to individual jobs (including material characteristics, operator efficiency, underfoot conditions, altitude, etc.), neither Caterpillar nor its dealers warrant that the machines described will perform as estimated.

NOTE: Always refer to the appropriate Operation and Maintenance Manual for specific product information.

Materials and specifications are subject to change without notice.

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GENERAL

MINING AND EARTHMOVING

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INTRODUCTION

This section explains the earthmoving principles used to determine machine productivity. It shows how to calculate production on-the-job or estimate production off-the-job.

ELEMENTS OF PRODUCTION

Production is the hourly rate at which material is moved. Production can be expressed in various units:

Metric

Bank Cubic Meters	— BCM — bank m ³
Loose Cubic Meters	$-LCM - loose m^3$
Compacted Cubic Meter	s — CCM — compacted m ³
Tonnes	-

English

Bank Cubic Yards	- BCY $-$ bank yd ³
Loose Cubic Yards	$-LCY - loose yd^3$
Compacted Cubic Yards	$-CCY - compacted yd^3$
Tons	

For most earthmoving and material handling applications, production is calculated by multiplying the quantity of material (load) moved per cycle by the number of cycles per hour.

Production = Load/cycle \times cycles/hour

The load can be determined by

- 1) load weighing with scales
- 2) load estimating based on machine rating
- 3) surveyed volume divided by load count
- 4) machine payload measurement system

Generally, earthmoving and overburden removal for coal mines are calculated by volume (bank cubic meters or bank cubic yards). Metal mines and aggregate producers usually work in weight (tons or tonnes).

Mining and Earthmoving

Elements of Production • Volume Measure • Swell Load Factor Material Density

Volume Measure — Material volume is defined according to its state in the earthmoving process. The three measures of volume are:

- BCM (BCY) one cubic meter (vard) of material as it lies in the natural bank state.
- LCM (LCY) one cubic meter (vard) of material which has been disturbed and has swelled as a result of movement.
- CCM (CCY) one cubic meter (vard) of material which has been compacted and has become more dense as a result of compaction.

In order to estimate production, the relationships between bank measure, loose measure, and compacted measure must be known.

Swell — Swell is the percentage of original volume (cubic meters or cubic yards) that a material increases when it is removed from the natural state. When excavated, the material breaks up into different size particles that do not fit together, causing air pockets or voids to reduce the weight per volume. For example to hold the same weight of one cubic unit of bank material it takes 30% more volume (1.3 times) after excavation. (Swell is 30%.)

$$1 + Swell = \frac{Loose cubic volume}{Bank cubic volume for}$$
the same given weight

Bank = $\frac{\text{Loose}}{(1 + \text{Swell})}$ Loose = Bank \times (1 + Swell)

Example Problem:

If a material swells 20%, how many loose cubic meters (loose cubic vards) will it take to move 1000 bank cubic meters (1308 bank cubic yards)?

Loose = Bank \times (1 + Swell) = $1000 \text{ BCM} \times (1 + 0.2) = 1200 \text{ LCM}$ $1308 \text{ BCY} \times (1 + 0.2) = 1570 \text{ LCY}$

How many bank cubic meters (yards) were moved if a total of 1000 loose cubic meters (1308 yards) have been moved? Swell is 25%.

 $Bank = Loose \div (1 + Swell) =$ $1000 \text{ LCM} \div (1 + 0.25) = 800 \text{ BCM}$ $1308 \text{ LCY} \div (1 + 0.25) = 1046 \text{ BCY}$

Load Factor — Assume one bank cubic yard of material weighs 3000 lb. Because of material characteristics, this bank cubic vard swells 30% to 1.3 loose cubic yards when loaded, with no change in weight. If this 1.0 bank cubic yard or 1.3 loose cubic yards is compacted, its volume may be reduced to 0.8 compacted cubic yard, and the weight is still 3000 lb.

Instead of dividing by 1 + Swell to determine bank volume, the loose volume can be multiplied by the load factor.

If the percent of material swell is known, the load factor (L.F.) may be obtained by using the following relationship:

L.F. =
$$\frac{100\%}{100\% + \%}$$
 swel

Load factors for various materials are listed in the Tables Section of this handbook.

To estimate the machine payload in bank cubic vards, the volume in loose cubic vards is multiplied by the load factor:

Load (BCY) = Load (LCY)
$$\times$$
 L.F.

The ratio between compacted measure and bank measure is called shrinkage factor (S.F.):

S.F. =
$$\frac{\text{Compacted cubic yards (CCY)}}{\text{Bank cubic yards (BCY)}}$$

Shrinkage factor is either estimated or obtained from job plans or specifications which show the conversion from compacted measure to bank measure. Shrinkage factor should not be confused with percentage compaction (used for specifying embankment density, such as Modified Proctor or California Bearing Ratio [CBR]).

Material Density — Density is the weight per unit volume of a material. Materials have various densities depending on particle size, moisture content and variations in the material. The denser the material the more weight there is per unit of equal volume. Density estimates are provided in the Tables Section of this handbook.

Density =
$$\frac{\text{Weight}}{\text{Volume}} = \frac{\text{kg (lb)}}{\text{m}^3(\text{yd}^3)}$$

Weight = Volume × Density

Elements of Production • Fill Factor • Soil Density Tests

Mining and Earthmoving

A given material's density changes between bank and loose. One cubic unit of loose material has less weight than one cubic unit of bank material due to air pockets and voids. To correct between bank and loose use the following equations.

$$1 + \text{Swell} = \frac{\text{kg/BCM}}{\text{kg/LCM}} \text{ or } \frac{\text{lb/BCY}}{\text{lb/LCY}}$$
$$1\text{b/LCY} = \frac{\text{lb/BCY}}{(1 + \text{Swell})}$$
$$1\text{b/BCY} = 1\text{b/LCY} \times (1 + \text{Swell})$$

Fill Factor — The percentage of an available volume in a body, bucket, or bowl that is actually used is expressed as the fill factor. A fill factor of 87% for a hauler body means that 13% of the rated volume is not being used to carry material. Buckets often have fill factors over 100%.

Example Problem:

A 14 cubic yard (heaped 2:1) bucket has a 105% fill factor when operating in a shot sandstone (4125 lb/BCY and a 35% swell).

- a) What is the loose density of the material?
- b) What is the usable volume of the bucket?
- c) What is the bucket payload per pass in BCY?
- d) What is the bucket payload per pass in tons?
- a) lb/LCY = lb/BCY ÷ (1 + Swell) = 4125 ÷ (1.35) = 3056 lb/LCY
- b) LCY = rated LCY \times fill factor = 14 \times 1.05 = 14.7 LCY
- c) lb/pass = volume × density lb/LCY = 14.7×3056 = 44,923 lb

BCY/pass = weight \div density lb/BCY = 44,923 \div 4125 = 10.9 BCY

or bucket LCY from part b \div (1 + Swell) = 14.7 \div 1.35 = 10.9 BCY

d) tons/pass = lb ÷ 2000 lb/ton = 44,923 ÷ 2000 = 22.5 tons

Example Problem:

Construct a 10,000 compacted cubic yard (CCY) bridge approach of dry clay with a shrinkage factor (S.F.) of 0.80. Haul unit is rated 14 loose cubic yards struck and 20 loose cubic yards heaped.

- a) How many bank yards are needed?
- b) How many loads are required?

a) BCY =
$$\frac{CCY}{S.F.} = \frac{10,000}{0.80} = 12,500 \text{ BCY}$$

b) Load (BCY) = Capacity (LCY)
× Load factor (L.F.) = 20 × 0.81
= 16.2 BCY/Load
(L.F. of 0.81 from Tables)
Number of
loads required = $\frac{12,500 \text{ BCY}}{16.2 \text{ BCY/Load}} = 772 \text{ Loads}$

Soil Density Tests — There are a number of acceptable methods that can be used to determine soil density. Some that are currently in use are:

> Nuclear density moisture gauge Sand cone method Oil method Balloon method Cylinder method

All these except the nuclear method use the following procedure:

- 1. Remove a soil sample from bank state.
- 2. Determine the volume of the hole.
- 3. Weigh the soil sample.
- 4. Calculate the bank density kg/BCM (lb/BCY).

The nuclear density moisture gauge is one of the most modern instruments for measuring soil density and moisture. A common radiation channel emits either neutrons or gamma rays into the soil. In determining soil density, the number of gamma rays absorbed and back scattered by soil particles is *indirectly* proportional to the soil density. When measuring moisture content, the number of moderated neutrons reflected back to the detector after colliding with hydrogen particles in the soil is *directly* proportional to the soil's moisture content.

All these methods are satisfactory and will provide accurate densities when performed correctly. Several repetitions are necessary to obtain an average.

NOTE: Several newer methods have been successfully applied, along with weigh scales to determine volume and loose density of material moved in hauler bodies. These measurements include photogrammatic and laser scanning technologies.

Mining and Earthmoving

- Figuring Production On-the-Job
- Load Weighing
- Time Studies
- Example (English)

FIGURING PRODUCTION ON-THE-JOB

Load Weighing — The most accurate method of determining the actual load carried is by weighing. This is normally done by weighing the haul unit one wheel or axle at a time with portable scales. Any scales of adequate capacity and accuracy can be used. While weighing, the machine must be level to reduce error caused by weight transfer. Enough loads must be weighed to provide a good average. Machine weight is the sum of the individual wheel or axle weights.

The weight of the load can be determined using the empty and loaded weight of the unit. Weight of

load = gross machine weight - empty weight

To determine the bank cubic measure carried by a machine, the load weight is divided by the bankstate density of the material being hauled.

$$BCY = \frac{\text{Weight of load}}{\text{Bank density}}$$

Times Studies — To estimate production, the number of complete trips a unit makes per hour must be determined. First obtain the unit's cycle time with the help of a stop watch. Time several complete cycles to arrive at an average cycle time. By allowing the watch to run continuously, different segments such as load time, wait time, etc. can be recorded for each cycle. Knowing the individual time segments affords a good opportunity to evaluate the balance of the spread and job efficiency. The following is an example of a scraper load time study form. Numbers in the white columns are stop watch readings; numbers in the shaded columns are calculated:

Total								
Cycle								
Times								
(less	Arrive	Wait	Begin	Load	End	Begin	Delay	End
delays)	Cut	Time	Load	Time	Load	Delay	Time	Delay
	0.00	0.30	0.30	0.60	0.90			
3.50	3.50	0.30	3.80	0.65	4.45			
4.00	7.50	0.35	7.85	0.70	8.55	9.95	1.00	10.95
4.00	12.50	0.42	12.92	0.68	13.60			

NOTE: All numbers are in minutes

This may be easily extended to include other segments of the cycle such as haul time, dump time, etc. Haul roads may be further segmented to more accurately define performance, including measured speed traps. Similar forms can be made for pushers, loaders, dozers, etc. *Wait Time* is the time a unit must wait for another unit so that the two can function together (haul unit waiting for pusher). *Delay Time* is any time, other than wait time, when a machine is not performing in the work cycle (scraper waiting to cross railroad track). To determine trips-per-hour at 100% efficiency, divide 60 minutes by the average cycle time less all wait and delay time. Cycle time may or may not include wait and/or delay time. Therefore, it is possible to figure different kinds of production: measured production, production without wait or delay, maximum production, etc. For example:

Actual Production: includes all wait and delay time.

- Normal Production (without delays): includes wait time that is considered normal, but no delay time.
- Maximum Production: to figure maximum (or optimum) production, both wait time and delay time are eliminated. The cycle time may be further altered by using an optimum load time.

Example (English)

A job study of a Wheel Tractor-Scraper might yield the following information:

iono wing intormation.	
Average wait time	= 0.28 minute
Average load time	= 0.65
Average delay time	= 0.25
Average haul time	= 4.26
Average dump time	= 0.50
Average return time	= 2.09
Average total cycle	$\overline{= 8.03}$ minutes
Less wait & delay time Average cycle 100% eff.	
Weight of haul unit empt Weights of haul unit load	y — 48,650 lb
Weighing unit #1 — 93	3,420 lb
Weighing unit #2 — 89	9,770 lb
Weighing unit #3 — 88	3,760 lb

- 271,950 lb; average = 90,650 lb
- 1. Average load weight = 90,650 lb 48,650 lb = 42,000 lb
- 2. Bank density = 3125 lb/BCY

3. Load =
$$\frac{\text{Weight of load}}{\frac{1}{2}}$$

$$= \frac{42,000 \text{ lb}}{2125 \text{ lb}/\text{DCV}} = 13.4 \text{ BCY}$$

3125 lb/BCY 4. Cycles/hr =

$$\frac{60 \text{ min/hr}}{\text{Cycle time}} = \frac{60 \text{ min/hr}}{7.50 \text{ min/cycle}} = 80 \text{ cycles/hr}$$

5. Production = Load/cycle × cycles/hr (less delays) = 13.4 BCY/cycle × 8.0 cycles/hr = 107.2 BCY/hr

Figuring Production On-the-Job • Example (Metric) Estimating Production Off-the-Job • Rolling Resistance

Mining and Earthmoving

Example (Metric)

A job study of a Wheel Tractor-Scraper might yield the following information:

rono ning internation.	
Average wait time	= 0.28 minute
Average load time	= 0.65
Average delay time	= 0.25
Average haul time	= 4.26
Average dump time	
Average return time	= 2.09
Average total cycle	= 8.03 minutes
Less wait & delay time	$\overline{=0.53}$
Average cycle 100% eff.	
Weight of haul unit empt	
Weights of haul unit load	ed —
Weighing unit #1 — 42	2 375 kg
Weighing unit #2 — 40) 720 kg
Weighing unit #3 — 40) 260 kg
123	3 355 kg;
	werage = $41 \ 120 \ \text{kg}$
1. Average load weight	$x = 41\ 120\ kg - 22\ 070\ kg =$
19 050 kg	
2. Bank density = 1854 k	g/BCM
Weight of loa	d
3. Load = $\frac{\text{Weight of loa}}{\text{Bank density}}$	7
-	
19 050 kg	-10.2 DCM
$= \frac{19\ 050\ \text{kg}}{1854\ \text{kg/BCN}}$	$\frac{-10.3 \text{ BCM}}{1}$
4. Cycles/hr =	
60 min/hr	60 min/hr
$\overline{\text{Cycle time}} =$	$\overline{7.50 \text{ min/cycle}} = 80 \text{ cycles/hr}$
5. Production = Load/c	ycle × cycles/hr

(less delays) = 10.3 BCM/cycle × 8.0 cycles/hr = 82 BCM/hrr

...

ESTIMATING PRODUCTION OFF-THE-JOB

It is often necessary to estimate production of earthmoving machines which will be selected for a job. As a guide, the remainder of the section is devoted to discussions of various factors that may affect production. Some of the figures have been rounded for easier calculation.

Rolling Resistance (RR) is a measure of the force that must be overcome to roll or pull a wheel over the ground. It is affected by ground conditions and load — the deeper a wheel sinks into the ground, the higher the rolling resistance. Internal friction and tire flexing also contribute to rolling resistance. Experience has shown that minimum resistance is 1%-1.5% (see Typical Rolling Resistance Factors in Tables section) of the gross machine weight (on tires). A 2% base resistance is quite often used for estimating. Resistance due to tire penetration is approximately 1.5% of the gross machine weight for each inch of tire penetration (0.6% for each cm of tire penetration). Thus rolling resistance can be calculated using these relationships in the following manner:

RR = 2% of GMW + 0.6% of GMW per cm tire penetration

RR = 2% of GMW + 1.5% of GMW per inch tire penetration

It's *not* necessary for the tires to actually penetrate the road surface for rolling resistance to increase above the minimum. If the road surface flexes under load, the effect is nearly the same — the tire is always running "uphill." Only on very hard, smooth surfaces with a well compacted base will the rolling resistance approach the minimum.

When actual penetration takes place, some variation in rolling resistance can be noted with various inflation pressures and tread patterns.

NOTE: When figuring "pull" requirements for tracktype tractors, rolling resistance applies only to the trailed unit's *weight on wheels*. Since tracktype tractors utilize steel wheels moving on steel "roads," a tractor's rolling resistance is relatively constant and is accounted for in the Drawbar Pull rating. 28

Mining and Earthmoving

- **Estimating Production Off-the-Job**
- Grade Resistance
- Total Resistance
- Traction

Grade Resistance is a measure of the force that must be overcome to move a machine over unfavorable grades (uphill). Grade assistance is a measure of the force that assists machine movement on favorable grades (downhill).

Grades are generally measured in percent slope, which is the ratio between vertical rise or fall and the horizontal distance in which the rise or fall occurs. For example, a 1% grade is equivalent to a 1 m (ft) rise or fall for every 100 m (ft) of horizontal distance; a rise of 4.6 m (15 ft) in 53.3 m (175 ft) equals an 8.6% grade.

 $\frac{4.6 \text{ m (rise)}}{53.3 \text{ m (horizontal distance)}} = 8.6\% \text{ grade}$

 $\frac{15 \text{ ft (rise)}}{175 \text{ ft (horizontal distance)}} = 8.6\% \text{ grade}$

Uphill grades are normally referred to as adverse grades and downhill grades as favorable grades. Grade resistance is usually expressed as a positive (+) percentage and grade assistance is expressed as a negative (-) percentage.

It has been found that for each 1% increment of adverse grade an additional 10 kg (20 lb) of resistance must be overcome for each metric (U.S.) ton of machine weight. This relationship is the basis for determining the Grade Resistance Factor which is expressed in kg/ metric ton (lb/U.S. ton):

Grade Resistance Factor = $10 \text{ kg/m ton } \times \%$ grade = $20 \text{ lb/U.S. ton } \times \%$ grade

Grade resistance (assistance) is then obtained by multiplying the Grade Resistance Factor by the machine weight (GMW) in metric (U.S.) tons.

Grade Resistance = GR Factor × GMW in metric (U.S.) tons

Grade resistance may also be calculated using percentage of gross weight. This method is based on the relationship that grade resistance is approximately equal to 1% of the gross machine weight for 1% of grade.

Grade Resistance = 1% of GMW × % grade

Grade resistance (assistance) affects both wheel and track-type machines.

Total Resistance is the combined effect of rolling resistance (wheel vehicles) and grade resistance. It can be computed by summing the values of rolling resistance and grade resistance to give a resistance in kilogram (pounds) force.

Total Resistance = Rolling Resistance + Grade Resistance Total resistance can also be represented as consisting completely of grade resistance expressed in percent grade. In other words, the rolling resistance component is viewed as a corresponding quantity of additional adverse grade resistance. Using this approach, total resistance can then be considered in terms of percent grade.

This can be done by converting the contribution of rolling resistance into a corresponding percentage of grade resistance. Since 1% of adverse grade offers a resistance of 10 kg (20 lb) for each metric or (U.S.) ton of machine weight, then each 10 kg (20 lb) of resistance per ton of machine weight can be represented as an additional 1% of adverse grade. Rolling resistance in percent grade and grade resistance in percent grade can then be summed to give Total Resistance in percent or Effective Grade. The following formulas are useful in arriving at Effective Grade.

Rolling Resistance (%) = 2% + 0.6% per cm tire penetration = 2% + 1.5% per inch tire penetration Grade Resistance (%) = % grade Effective Grade (%) = RR (%) + GR (%)

Effective grade is a useful concept when working with Rimpull-Speed-Gradeability curves, Retarder curves, Brake Performance curves, and Travel Time curves.

Traction — is the driving force developed by a wheel or track as it acts upon a surface. It is expressed as usable Drawbar Pull or Rimpull. The following factors affect traction: weight on the driving wheel or tracks, gripping action of the wheel or track, and ground conditions. The coefficient of traction (for any roadway) is the ratio of the maximum pull developed by the machine to the total weight on the drivers.

Coeff. of traction =
$$\frac{\text{Pull}}{\text{weight on drivers}}$$

Therefore, to find the usable pull for a given machine: Usable pull = Coeff. of traction \times weight on drivers

Example: Track-Type Tractor

What usable drawbar pull (DBP) can a 26 800 kg (59,100 lb) Track-type Tractor exert while working on firm earth? on loose earth? (See table section for coefficient of traction.)

Answer:
Firm earth — Usable DBP =
$0.90 \times 26800 \text{ kg} = 24120 \text{ kg}$
$(0.90 \times 59,100 \text{ lb} = 53,190 \text{ lb})$
Loose earth — Usable DBP =
$0.60 \times 26800 \text{ kg} = 16080 \text{ kg}$
$(0.60 \times 59,100 \mathrm{lb} = 35,460 \mathrm{lb})$

If a load required 21 800 kg (48,000 lb) pull to move it, this tractor could move the load on firm earth. However, if the earth were loose, the tracks would spin.

NOTE: D8R through D11R Tractors may attain higher coefficients of traction due to their suspended undercarriage.

Example: Wheel Tractor-Scraper

What usable rimpull can a 621F size machine exert while working on firm earth? on loose earth? The total loaded weight distribution of this unit is:

Drive unit	Scraper unit
wheels: 23 600 kg	wheels: 21 800 kg
(52,000 lb)	(48,000 lb)

Remember, use weight on drivers only. Answer:

Firm earth —	$0.55 \times 23600 \text{ kg} = 12980 \text{ kg}$
	$(0.55 \times 52,000 \mathrm{lb} = 28,600 \mathrm{lb})$
Loose earth —	$0.45 \times 23\ 600\ \text{kg} = 10\ 620\ \text{kg}$
	$(0.45 \times 52,000 \text{ lb} = 23,400 \text{ lb})$

On firm earth this unit can exert up to 12 980 kg (28,600 lb) rimpull without excessive slipping. However, on loose earth the drivers would slip if more than 10 620 kg (23,400 lb) rimpull were developed.

$\bullet \bullet \bullet$

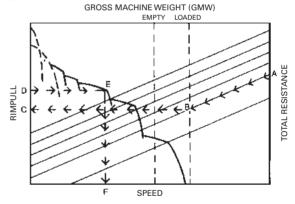
Altitude — Specification sheets show how much pull a machine can produce for a given gear and speed when the engine is operating at rated horsepower. When a standard machine is operated in high altitudes, the engine may require derating to maintain normal engine life. This engine deration will produce less drawbar pull or rimpull.

The Tables Section gives the altitude deration in percent of flywheel horsepower for current machines. It should be noted that some turbocharged engines can operate up to 4570 m (15,000 ft) before they require derating. Most machines are engineered to operate up to 1500-2290 m (5000-7500 ft) before they require deration. The horsepower deration due to altitude must be considered in any job estimating. The amount of power deration will be reflected in the machine's gradeability and in the load, travel, and dump and load times (unless loading is independent of the machine itself). Altitude may also reduce retarding performance. Consult a Cat representative to determine if deration is applicable. Fuel grade (heat content) can have a similar effect of derating engine performance.

The example job problem that follows indicates one method of accounting for altitude deration: by increasing the appropriate components of the total cycle time by a percentage equal to the percent of horsepower deration due to altitude. (i.e., if the travel time of a hauling unit is determined to be 1.00 minute at full HP, the time for the same machine derated to 90% of full HP will be 1.10 min.) This is an approximate method that yields reasonably accurate estimates up to 3000 m (10,000 feet) elevation.

Travel time for hauling units derated more than 10% should be calculated as follows using Rimpull-Speed-Gradeability charts.

1) Determine total resistance (grade plus rolling) in percent.



2) Beginning at point A on the chart follow the total resistance line diagonally to its intersection, B, with the vertical line corresponding to the appropriate gross machine weight. (Rated loaded and empty GMW lines are shown dotted.)

3) Using a straight-edge, establish a horizontal line to the left from point B to point C on the rim-pull scale.

4) Divide the value of point C as read on the rimpull scale by the percent of total horsepower available after altitude deration from the Tables Section. This yields rimpull value D higher than point C.

Mining and Earthmoving

Estimating Production Off-the-Job

Job Efficiency

Example Problem (English)

5) Establish a horizontal line right from point D. The farthest right intersection of this line with a curved speed range line is point E.

6) A vertical line down from point E determines point F on the speed scale.

7) Multiply speed in kmh by 16.7 (mph by 88) to obtain speed in m/min (ft/min). Travel time in minutes for a given distance in feet is determined by the formula:

Distance in m (ft) Time (min) =Speed in m/min (ft/min)

The Travel Time Graphs in sections on Wheel Tractor-Scrapers and Construction & Mining Trucks can be used as an alternative method of calculating haul and/or return times.

The following example provides a method to manually estimate production and cost. Today, computer programs, such as Caterpillar's Fleet Production and Cost Analysis (FPC), provide a much faster and more accurate means to obtain those application results.

Example problem (English)

A contractor is planning to put the following spread on a dam job. What is the estimated production?

Equipment:

- 11 631G Wheel Tractor-Scrapers
- 2 D9T Tractors with C-dozers
- 2 12H Motor Graders
- 1 825G Tamping Foot Compactor

Material:

Description — Sandy clay; damp, natural bed Bank Density - 3000 lb/BCY Load Factor - 0.80 Shrinkage Factor — 0.85 Traction Factor - 0.50 Altitude - 7500 ft

Job Layout — Haul and Return:

Job Efficiency is one of the most complex elements of estimating production since it is influenced by factors such as operator skill, minor repairs and adjustments, personnel delays, and delays caused by job layout. An approximation of efficiency, if no job data is available, is given below.

		Efficiency
Operation	Working Hour	Factor
Day	50 min/hr	0.83
Night	45 min/hr	0.75

These factors do not account for delays due to weather or machine downtime for maintenance and repairs. You must account for such factors based on experience and local conditions.

1. Estimate Payload:

Est. load (LCY) \times L.F. \times Bank Density = payload $31 \text{ LCY} \times 0.80 \times 3000 \text{ lb/BCY} = 74,400 \text{ lb payload}$

2. Establish Machine Weight:

Empty Wt.		102,460 lb or 51.27 tons
Wt. of Load	_	74,400 lb or 37.2 tons
Total (GMW)		176,860 lb or 88.4 tons

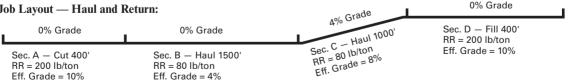
3. Calculate Usable Pull (traction limitation):

Loaded: (weight on driving wheels = 54%) (GMW) Traction Factor \times Wt. on driving wheels = 0.50×176.860 lb $\times 54\% = 47.628$ lb *Empty*: (weight on driving wheels = 69%) (GMW) Traction Factor \times Wt. on driving wheels = 0.50×102.460 lb $\times 69\% = 35.394$ lb

4. Derate for Altitude:

Check power available at 7500 ft from altitude deration table in the Tables Section.

631G — 100%	12H — 83%
D9T — 100%	825G —100%



Total Effective Grade = $RR(\%) \pm GR(\%)$

Sec. A: Total Effective Grade = 10% + 0% = 10%Sec. B: Total Effective Grade = 4% + 0% = 4%Sec. C: Total Effective Grade = 4% + 4% = 8%Sec. D: Total Effective Grade = 10% + 0% = 10%

Then adjust if necessary:

Load Time — controlled by D9T, at 100% power, no change. Travel, Maneuver and Spread time — 631G, no change. 5. Compare Total Resistance to Tractive Effort on haul: Grade Resistance — $GR = lb/ton \times tons \times adverse grade in percent$ Sec. C: = 20 lb/ton \times 88.4 tons \times 4% grade = 7072 lb Rolling Resistance — RR = RR Factor (lb/ton) × GMW (tons) Sec. A: = 200 lb/ton \times 88.4 tons = 17.686 lb Sec. B: = $80 \text{ lb/ton} \times 88.4 \text{ tons} = 7072 \text{ lb}$ Sec. C: = $80 \text{ lb/ton} \times 88.4 \text{ tons} = 7072 \text{ lb}$ Sec. D: = $200 \text{ lb/ton} \times 88.4 \text{ tons} = 17.686 \text{ lb}$ Total Resistance — TR = RR + GRSec. A: = 17.686 lb +0 $= 17.686 \, lb$ Sec. B: = 7072 lb + $= 7072 \, lb$ 0 Sec. C: = 7072 lb + 6496 lb = 14.144 lbSec. D: = 17.686 lb +0 $= 17.686 \, lb$ Check usable pounds pull against maximum pounds pull required to move the 631G. Pull usable ... 47,628 lb loaded Pull required ... 17,686 lb maximum total resistance Estimate travel time for haul from 631G (loaded) travel time curve: read travel time from distance and effective grade. Travel time (from curves): Sec. A: 0.60 min Sec. B: 1.00 Sec. C: 1.20 Sec. D: 0.60 3.40 min

NOTE: This is an estimate only; it *does not account for all the acceleration and deceleration time*, therefore it is not as accurate as the information obtained from a computer program.

6. Compare Total Resistance to Tractive Effort on return: Grade Assistance — GA = 20 lb/ton × tons × negative grade in percent Sec. C: = 20 lb/ton × 51.2 tons × 4% grade = 4096 lb

Rolling Resistance — RR = RR Factor × Empty Wt (tons)

Sec. D: = 200 lb/ton \times 51.2 tons = 10,240 lb Sec. C: = 80 lb/ton \times 51.2 tons = 4091 lb Sec. B: = 80 lb/ton \times 51.2 tons = 4091 lb Sec. A: = 200 lb/ton \times 51.2 tons = 10,240 lb

Total Resistance —

TR = RR - GASec. D: = 10,240 lb - 0 = 10,240 lb Sec. C: = 4096 lb - 4096 lb = 0 Sec. B: = 4096 lb - 0 = 4096 lb Sec. A: = 10,240 lb - 0 = 10,240 lb

Check usable pounds pull against maximum pounds pull required to move the 631G. Pounds pull usable ... 35,349 lb empty Pounds pull required ... 10,240 lb

Estimate travel time for return from 631G empty travel time curve.

Travel time (from curves):

- Sec. A: 0.40 min
- Sec. B: 0.55
- Sec. C: 0.80
- Sec. D: 0.40

2.15 min

7. Estimate Cycle Time:

Total Travel Time (Haul plus Return)	= 5.55 min
Adjusted for altitude: $100\% \times 5.55$ min	= 5.55 min
Load Time	0.7 min
Maneuver and Spread Time	0.7 min
Total Cycle Time	6.95 min

Mining and Earthmoving

Estimating Production Off-the-Job

• Example Problem (English)

• Example Problem (Metric)

8. Check pusher-scraper combinations:

Pusher cycle time consists of load, boost, return and maneuver time. Where actual job data is not available, the following may be used.

Boost time = 0.10 minute Return time = 40% of load time Maneuver time = 0.15 minute Pusher cycle time = 140% of load time + 0.25 minute Pusher cycle time = 140% of 0.7 min + 0.25 minute = 0.98 + 0.25 = 1.23 minute

Scraper cycle time divided by pusher cycle time indicates the number of scrapers which can be handled by each pusher.

$$\frac{6.95 \text{ min}}{1.23 \text{ min}} = 5.65$$

Each push tractor is capable of handling five plus scrapers. Therefore the two pushers can adequately serve the eleven scrapers.

9. Estimate Production:

Cycles/hour	$= 60 \min \div$ Total cycle time
-	$= 60 \text{ min/hr} \div 6.95 \text{ min/cycle}$
	= 8.6 cycles/hr
Estimated load	= Heaped capacity \times L.F.
	$= 31 LCY \times 0.80$
	= 24.8 BCY
Hourly unit	= Est. load \times cycles/hr
production	= $24.8 \text{ BCY} \times 8.6 \text{ cycles/hr}$
-	= 213 BCY/hr
Adjusted	= Efficiency factor \times hourly
production	production
	$= 0.83 (50 \text{ min hour}) \times 213 \text{ BCY}$
	= 177 BCY/hr
Hourly fleet	= Unit production \times No. of units
production	= $177 \text{ BCY/hr} \times 11$
	= 1947 BCY/hr

10. Estimate Compaction:

Compaction requirement	= S.F. × hourly fleet = 0.85 × 1947 BCY = 1655 CCY/hr	
Compacting Average comp	pacting speed, 6 mph ift thickness, 7 in	owing): (W) (S) (L) (P)
825G productio	on =	
$CCY/hr = \frac{W \times H}{H}$	$\frac{\text{(S × L × 16.3)}}{\text{P}}$ (conv	version constant)

$$=\frac{7.4 \times 6 \times 7 \times 16.3}{3}$$
$$= 1688 \text{ CCY/hr}$$

Given the compaction requirement of 1655 CCY/hr, the 825G is an adequate compactor match-up for the rest of the fleet. However, any change to job layout that would increase fleet production would upset this balance.

•••

Example problem (Metric)

A contractor is planning to put the following spread on a dam job. What is the estimated production?

Equipment:

11 — 631G Wheel Tractor-Scrapers

- 2 D9T Tractors with C-dozers
- 2 12H Motor Graders
- 1 825G Tamping Foot Compactor

Material:

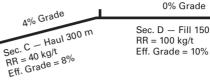
Description — Sandy clay; damp, natural bed Bank Density — 1770 kg/BCM Load Factor — 0.80 Shrinkage Factor — 0.85 Traction Factor — 0.50 Altitude — 2300 meters

Job Lavout — Haul and Return:

L	0% Grade
	Sec. A — Cut 150 m RR = 100 kg/t
	Eff. Grade = 10%

Sec. B – Haul 450 m RR = 40 kg/tEff. Grade = 4%

0% Grade



Sec. D - Fill 150 m

Total Effective Grade = RR (%) \pm GR (%)

Sec. A: Total Effective Grade = 10% + 0% = 10%Sec. B: Total Effective Grade = 4% + 0% = 4%Sec. C: Total Effective Grade = 4% + 4% = 8%Sec. D: Total Effective Grade = 10% + 0% = 10%

1. Estimate Payload:

Est. load (LCM) \times L.F. \times Bank Density = payload $24 \text{ LCM} \times 0.80 \times 1770 \text{ kg/BCM} = 34\,000 \text{ kg payload}$

2. Machine Weight:

Empty Wt. — 46 475 kg or 46.48 metric tons Wt. of Load — 34 000 kg or 34 metric tons Total (GMW) — 80 475 kg or 80.48 metric tons

3. Calculate Usable Pull (traction limitation):

Loaded: (weight on driving wheels = 54%) (GMW) Traction Factor \times Wt. on driving wheels = $0.50 \times 80\,475 \,\mathrm{kg} \times 54\% = 21\,728 \,\mathrm{kg}$ *Empty:* (weight on driving wheels = 69%) (GMW)

Traction Factor \times Wt. on driving wheels = $0.50 \times 46\,475 \,\mathrm{kg} \times 69\% = 16\,034 \,\mathrm{kg}$

4. Derate for Altitude:

Check power available at 2300 m from altitude deration table in the Tables Section.

631G — 100%	12H — 83%
D9T — 100%	825G — 100%

Then adjust if necessary:

Load Time — controlled by D9T, at 100% power, no change.

Travel, Maneuver and Spread time - 631G, no change.

5. Compare Total Resistance to Tractive Effort on haul: Grade Resistance —

- $GR = 10 \text{ kg/metric ton } \times \text{ tons } \times \text{ adverse grade}$ in percent
 - Sec. C: = 10 kg/metric ton \times 80.48 metric tons \times 4% grade = 3219 kg

Rolling Resistance —

- RR = RR Factor (kg/mton) × GMW (metric tons) Sec. A: = 100 kg/metric ton \times 80.48 metric tons = 8048 kg
 - Sec. B: = $40 \text{ kg/metric ton} \times 80.48 \text{ metric tons}$ = 3219 kg
 - Sec. C: = $40 \text{ kg/metric ton} \times 80.48 \text{ metric tons}$ = 3219 kg
 - Sec. D: = 100 kg/metric ton \times 80.48 metric tons = 8048 kg

Total Resistance

TR = RR + GR

- Sec. A: = 8048 kg +0 = 8048 kgSec. B: = 3219 kg +0 = 3219 kgSec. C: = 3219 kg + 3219 kg = 6438 kg
- Sec. D: = 8048 kg += 8048 kg0

Check usable kilogram force against maximum kilogram force required to move the 631G.

Force usable ... 21 728 kg loaded

Force required ... 8048 kg maximum total resistance

Estimate travel time for haul from 631G (loaded) travel time curve: read travel time from distance and effective grade.

Travel time (from curves):

- Sec. A: 0.60 min
- Sec. B: 1.00
- Sec. C: 1.20
- Sec. D: 0.60

3.40 min

NOTE: This is an estimate only; it *does not account for all* the acceleration and deceleration time, therefore it is not as accurate as the information obtained from a computer program.

6. Compare Total Resistance to Tractive Effort on return:

Grade Assistance —

- $GA = 10 \text{ kg/mton} \times \text{metric tons} \times \text{negative grade}$ in percent
 - Sec. C: = $10 \text{ kg/metric ton} \times 46.48 \text{ metric tons}$ \times 4% grade = 1859 kg

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Mining and Earthmoving

Estimating Production Off-the-Job • Example Problem (Metric)

Rolling Resistance — RR = RR Factor × Empty Wt. Sec. D: = $100 \text{ kg/metric ton } \times 46.48 \text{ metric tons}$ = 4648 kg Sec. C: = $40 \text{ kg/metric ton} \times 46.48 \text{ metric tons}$ = 1859 kgSec. B: = $40 \text{ kg/metric ton} \times 46.48 \text{ metric tons}$ = 1859 kgSec. A: = $100 \text{ kg/metric ton } \times 46.48 \text{ metric tons}$ = 4648 kgTotal Resistance -TR = RR - GASec. D: = 4648 kg - 0 = 4648 kgSec. C: = 1859 kg - 1859 kg = 0Sec. B: = 1859 kg - 0= 1859 kgSec. A: = 4648 kg – 0 = 4648 kgCheck usable kilogram force against maximum force required to move the 631G. Kilogram force usable ... 16 034 kg empty Kilogram force required ... 4645 kg Estimate travel time for return from 631G empty

travel time curve.

Travel time (from curves):

Sec. A: 0.40 min

Sec. B: 0.55

- Sec. C: 0.80
- Sec. D: 0.40

2.15 min

7. Estimate Cycle Time:

Total Travel Time (Haul plus Return)	= 5.55 min
Adjusted for altitude: $100\% \times 5.55$ min	= 5.55 min
Load Time	0.7 min
Maneuver and Spread Time	0.7 min
Total Cycle Time	6.95 min

8. Check pusher-scraper combinations:

Pusher cycle time consists of load, boost, return and maneuver time. Where actual job data is not available, the following may be used.

Boost time = 0.10 minute Return time = 40% of load time Maneuver time = 0.15 minute Pusher cycle time = 140% of load time + 0.25 minute Pusher cycle time = 140% of 0.7 min + 0.25 minute = 0.98 + 0.25 = 1.23 minute

Scraper cycle time divided by pusher cycle time indicates the number of scrapers which can be handled by each pusher.

$$\frac{6.95 \text{ min}}{1.23 \text{ min}} = 5.65$$

Each push tractor is capable of handling five plus scrapers. Therefore the two pushers can adequately serve the eleven scrapers.

9. Estimate Production:

9. Estimate I fo	Juuction.		
Cycles/hour	Cycles/hour = $60 \min \div$ Total cycle time		
	= $60 \text{ min/hr} \div 6.95 \text{ min/cycle}$		
	= 8.6 cycles/hr		
Estimated load	= Heaped capacity \times L.F.		
	$= 24 \text{ LCM} \times 0.80$		
	= 19.2 BCM		
Hourly unit	= Est. load \times cycles/hr		
production			
	= 165 BCM		
Adjusted	= Efficiency factor \times hourly		
production	production		
	$= 0.83 (50 \text{ min hour}) \times 165 \text{ BCM}$		
	= 137 BCM/hour		
Hourly fleet	= Unit production \times No. of units		
production			
	= 1507 BCM/hr		
10. Estimate C	ompaction:		
Compaction	= S.F. \times hourly fleet production		
requirement	$= 0.85 \times 1507 \text{ BCM/hr}$		
	= 1280 CCM/hr		
Compaction ca	pability (given the following):		
	width, 2.26 m (W)		
	pacting speed, 9.6 km/h (S)		
	ift thickness, 18 cm (L)		
No. of passes			
825G productio	$n \equiv$		
W	$\frac{1}{P} \xrightarrow{\text{(conversion factor)}} (\text{conversion factor})$		
CCY/hr =	(conversion factor)		
	Р		
_ 2.26	\times 9.6 \times 18 \times 10		
—	3		
= 1302	2		

Given the compaction requirement of 1280 CCM/h, the 825G is an adequate compactor match-up for the rest of the fleet. However, any change to job layout that would increase fleet production would upset this balance.



Estimating Production Off-the-Job Systems • Economic Haul Distances

Mining and Earthmoving

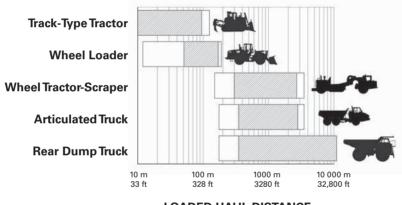
SYSTEMS

Caterpillar offers a variety of machines for different applications and jobs. Many of these separate machines function together in mining and earthmoving systems.

- Bulldozing with track-type tractors
- Load-and-Carry with wheel loaders
- Scrapers self-loading, elevator, auger, or push-pull configurations, or push-loaded by track-type tractors
- Articulated trucks loaded by excavators, track loaders or wheel loaders
- Off-highway trucks loaded by shovels, excavators or wheel loaders

Haul System Selection: In selecting a hauling system for a project, there may seem to be more than one "right" choice. Many systems may meet the distance, ground conditions, grade, material type, and production rate requirements. After considering all of the different factors, one hauling system usually provides better performance. This makes it critical for the dealer and customer to work together to get accurate information for their operation or project. Caterpillar is committed to providing the correct earthmoving system to match the customer's specific needs.

$\bullet \bullet \bullet$



GENERAL LOADED HAUL DISTANCES FOR MOBILE SYSTEMS

LOADED HAUL DISTANCE

Mining and Earthmoving

Production EstimatingLoading MatchFuel Consumption and Productivity

PRODUCTION ESTIMATING

Loading Match — Loading tools have a production range that varies with material, bucket configuration, target size, operator skill and load area conditions. The loader/truck matches given in the following table are with the typical number of passes and production range.

Your Cat[®] dealer can provide advice and estimates based on your specific conditions.

FUEL CONSUMPTION AND PRODUCTIVITY

Fuel efficiency is the term used to relate fuel consumption and machine productivity. It is expressed in units of material moved per volume of fuel consumed. Common units are cubic meters or tonnes per liter of fuel (cubic yards or tons/gal). Determining fuel efficiency requires measuring both fuel consumption and production.

Measuring fuel consumption involves tapping into the vehicle's fuel supply system — without contaminating the fuel. The amount of fuel consumed during operation is then measured on a weight or volumetric basis and correlated with the amount of work the machine has done. Cat machines equipped with VIMS[™] system can record fuel consumed with relative accuracy, given the engine is performing close to specifications.

Cat Earthmoving and Mining Systems Production/50 Min. Hr.

Please refer to the individual machine section for production targets.

Cat Aggregate Systems Production/50 Min. Hr.

Please refer to the individual machine section for production targets.

Mining and Earthmoving

FORMULAS AND RULES OF THUMB

Production, hourly	= Load (BCM)/cycle × cycles/hr
	= Load (BCY)/cycle × cycles/hr
Load Factor (L.F.)	$=\frac{100\%}{100\% + \%}$ swell
Load (bank measure)	= Loose cubic meters (LCM) \times L.F.
	= Loose cubic yards (LCY) × L.F.
	Compacted cubic meters (or yards)
Shrinkage Factor (S.F.)	Bank cubic meters (or yards)
Density	= Weight/Unit Volume
Load (bank measure)	$= \frac{\text{Weight of load}}{\text{Bank density}}$
Rolling Resistance Fac = $20 \text{ kg/t} + (6 \text{ kg/t/c})$ = $40 \text{ lb/ton} + (30 \text{ lb/c})$	tor m \times cm)
Rolling Resistance = RR Factor (kg/t) = RR Factor (lb/ton	\times GMW (tons) a) \times GMW (tons)
Rolling Resistance (gen	
penetration	5% of GMW per inch tire
vertical	change in elevation (rise)
% Grade = corre	esponding horizontal distance (run)
Grade Resistance Facto	$pr = 10 \text{ kg/m ton } \times \% \text{ grade}$ = 20 lb/ton $\times \% \text{ grade}$
	R Factor (kg/t) × GMW (tons) R Factor (lb/ton) × GMW (tons)
<i>Grade Resistance</i> = 1%	of GMW \times % grade

Total Resistance = Rolling Resistance (kg or lb) + Grade Resistance (kg or lb) Total Effective Grade (%) = RR(%) + GR(%)*Usable pull (traction limitation)* = Coeff. of traction \times weight on drivers = Coeff. of traction \times (Total weight \times % on drivers) *Pull required* = Rolling Resistance + Grade Resistance = Total Resistance *Total Cycle Time* = Fixed time + Variable time Fixed time: See respective machine production section. *Variable time* = Total haul time + Total return time Travel Time = $\frac{\text{Distance (m)}}{\overline{}}$ Speed (m/min) = _____ (ft) Speed (fpm) 60 min/hr $Cycles per hour = \frac{1}{\text{Total cycle time (min/cycle)}}$ Adjusted production = Hourly production \times Efficiency factor Hourly production required No. of units required =Unit hourly production No. of scrapers a Scraper cycle time pusher will load = Pusher cycle time Pusher cycle time (min) = 1.40 Load time (min) + 0.25 min GMW (kg) × Total Effective Grade \times Speed (km/h) Grade Horsepower = 273.75 GMW (lb) × Total Effective Grade \times Speed (mph) = -375

Notes -

Loose Material	Fill Factor
Mixed Moist Aggregates	95-100%
Uniform Aggregates up to 3 mm (1/8")	95-100
3 mm-9 mm (1/8"-3/8")	90-95
12 mm-20 mm (1/2"-3/4")	85-90
24 mm (1") and over	85-90
Blasted Rock	
Well Blasted	80-95%
Average Blasted	75-90
Poorly Blasted	60-75
Other	
Rock Dirt Mixtures	100-120%
Moist Loam	100-110
Soil, Boulders, Roots	80-100
Cemented Materials	85-95

NOTE: Loader bucket fill factors are affected by bucket penetration, breakout force, rack back angle, bucket profile and ground engaging tools such as bucket teeth or bolt-on replaceable cutting edges.

NOTE: For bucket fill factors for hydraulic excavators, see bucket payloads in the hydraulic excavator section.

NOTE: Above values are not valid for Hydraulic Mining Shovels.

ANGLE OF REPOSE OF VARIOUS MATERIALS

	ANGLE BETWEEN HORIZONTAL AND SLOPE OF HEAPED PILE	
MATERIAL	Ratio Degrees	
Coal, industrial	1.4:1-1.3:1	35-38
Common earth, Dry	2.8:1-1.0:1	20-45
Moist	2.1:1-1.0:1	25-45
Wet	2.1:1-1.7:1	25-30
Gravel, Round to angular	1.7:1-0.9:1	30-50
Sand & clay	2.8:1-1.4:1	20-35
Sand, Dry	2.8:1-1.7:1	20-30
Moist	1.8:1-1.0:1	30-45
Wet	2.8:1-1.0:1	20-45

TYPICAL ROLLING RESISTANCE FACTORS

Various tire sizes and inflation pressures will greatly reduce or increase the rolling resistance. The values in this table are approximate, particularly for the track and track + tire machines. These values can be used for estimating purposes when specific performance information on particular equipment and given soil conditions is not available. See Mining and Earthmoving Section for more detail.

	ROLLING RESISTANCE, PERCENT*			
	Tires		Track	Track
UNDERFOOTING	Bias	Radial	**	+Tires
A very hard, smooth roadway, concrete, cold asphalt or dirt sur- face, no penetration or flexing A hard, smooth, stabilized surfaced	1.5%*	1.2%	0%	1.0%
roadway without penetration under load, watered, maintained A firm, smooth, rolling roadway	2.0%	1.7%	0%	1.2%
with dirt or light surfacing, flexing slightly under load or undulat- ing, maintained fairly regularly, watered	3.0%	2.5%	0%	1.8%
no water, 25 mm (1") tire pen- etration or flexing A dirt roadway, rutted or flexing	4.0%	4.0%	0%	2.4%
under load, little maintenance, no water, 50 mm (2") tire pen- etration or flexing	5.0%	5.0%	0%	3.0%
bilization, 100 mm (4") tire pen- etration or flexing	8.0%	8.0%	0%	4.8%
Loose sand or gravel	10.0%	10.0%	2%	7.0%
Rutted dirt roadway, soft under travel, no maintenance, no sta- bilization, 200 mm (8") tire pen- etration and flexing	14.0%	,	5%	10.0%
way, 300 mm (12") tire penetra- tion, no flexing	20.0%	20.0%	8%	15.0%

*Percent of combined machine weight.

**Assumes drag load has been subtracted to give Drawbar Pull for good to moderate conditions. Some resistance added for very soft conditions.

MOTO GRADERS

Specifications Motor Graders Global Versions

MODEL	14M3			16M3		
Base Power — Net	178 kW	238 hp	216 kW	290 hp		
VHP Range — Net	178-213 kW	238-285 hp	216-259 kW	290-348 hp		
VHP Plus Range — Net	180-215 kW	241-289 hp	-	-		
Operating Weight*	25 968 kg	57,250 lb	32 411 kg	71,454 lb		
Engine Model	C13 /	ACERT	C13 A	CERT		
Rated Engine RPM	18	350	20	00		
No. of Cylinders		6	6			
Displacement	12.5 L	763 in ³	12.5 L	763 in ³		
Max. Torque:						
Tier 4 Final ¹	1542 N⋅m	1137 lb-ft	1771 N·m	1306 lb-ft		
Tier 2 and Tier 3 Equivalent ²	1542 N⋅m	1137 lb-ft	1721 N·m	1270 lb-ft		
No. of Speeds Forward/Reverse	8	/6	8	/6		
Top Speed: Forward	50.5 km/h	31.4 mph	51.7 km/h	32.1 mph		
Reverse	39.9 km/h	24.8 mph	40.8 km/h	25.3 mph		
Std. Tires – Front and Rear		5R25		iR25		
Front Axle/Steering:						
Oscillation Angle	3	2°	3	5°		
Wheel Lean Angle – Left/Right	-	/17.1°	-			
Steering Angle		0°	18°/17° 47.5°			
Articulation Angle		0°	47.5° 20°			
Minimum Turning Radius**	7.9 m	25'11"	9.3 m	30'6"		
No. Circle Support Shoes		6		6		
Hydraulics:		0		,		
PumpType	Variabl	e Piston	Variable	e Piston		
Max. Pump Flow	257 L/min	68 gpm	280 L/min	74 gpm		
Tank Capacity	64 L	16.9 U.S. gal	70 L	18.5 U.S. gal		
	24 100 kPa	-	24 750 kPa	-		
Implement Pressure: Max.	3400 kPa	3495 psi	3400 kPa	3590 psi		
Min.	3400 KFa	493 psi	3400 KPa	493 psi		
Interior Sound Level/SAE J919:		10/4)				
Tier 4 Final/EU Certified ¹		IB(A)	71 dB(A) 72 dB(A)			
Tier 2 and Tier 3 Equivalent ²	/3 0	IB(A)	/2 d	B(A)		
Electrical:						
System Size		4V	24V			
Std. Battery CCA @ 0° F		25	1400			
Std. Alternator	1	50	1	50		
GENERAL DIMENSIONS:	0505					
Height (to top of ROPS)	3566 mm	140.4"	3719 mm	146.4"		
Overall Length	9677 mm	381"	10 593 mm	417"		
With Ripper and Pushplate	10 899 mm	429.1"	12 051 mm	474.4"		
Wheelbase	6616 mm	260.5"	7365 mm	290"		
Blade Base	2880 mm	113.4"	3066 mm	120.7"		
Overall Width (at top of front tires)	3050 mm	120.1"	3411 mm	134.3"		
Standard Blade: Length	4267 mm	14'0"	4877 mm	16'0"		
Height	585 mm	23.0"	787 mm	31.0"		
Thickness	25.4 mm	1.0"	25 mm	1.0"		
Lift Above Ground	438 mm	17.2"	400 mm	15.7"		
Max. Shoulder Reach:***						
Frame Straight — Left	3460 mm	136.2"	2311 mm	91"		
Frame Straight — Right	3350 mm	131.9"	2311 mm	91"		
Fuel Tank Capacity	416 L	109.9 U.S. gal	496 L	131 U.S. gal		

*Operating Weight — based on standard machine configuration with full fuel tank, coolant, lubricants and operator. **Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

¹Meets Tier 4 Final/Stage IV/Japan 2014 (Tier 4 Final) emission standards.

² Meets Tier 2/Stage II/Japan 2001 (Tier 2) equivalent and Tier 3/Stage IIIA/Japan 2006 (Tier 3) equivalent emission standards.

PRODUCTION

The motor grader is used in a variety of applications in a variety of industries. Therefore, there are many ways to measure its operating capacity, or production. One method expresses a motor grader's production in relation to the area covered by the moldboard.

Formula:

$A = S \times (L_e - L_c)$) ×	1000 \times	Е	(Metric)
$A = S \times (L_e - L_c)$) ×	5280 \times	Е	(English)

where

- A: Hourly operating area (m²/h or ft²/h)
 S: Operating speed (km/h or mph)
 - L_e : Effective blade length (m or ft)
 - L_0 : Width of overlap (m or ft)
 - E: Job efficiency

Operating Speeds:

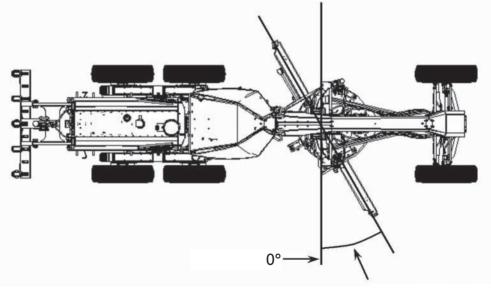
Typical operating speeds by application

Finish Grading:	0-4 km/h	(0-2.5 mph)
Heavy Blading:	0-9 km/h	(0-6 mph)
Ditch Repair:	0-5 km/h	(0-3 mph)
Ripping:	0-5 km/h	(0-3 mph)
Road Maintenance:	5-16 km/h	(3-9.5 mph)
Haul Road Maintenance:	5-16 km/h	(3-9.5 mph)
Snow Plowing:	7-21 km/h	(4-13 mph)
Snow Winging:	15-28 km/h	(9-17 mph)

Effective Blade Length:

Since the moldboard is usually angled when moving material, an effective blade length must be computed to account for this angle. This is the actual width of material swept by the moldboard.

NOTE: Angles are measured as shown below. The effective length becomes shorter as the angle increases.



Moldboard Angle

Moldboard Length, m (ft)	Effective Length, m (ft) 30 degree blade angle	Effective Length, m (ft) 45 degree blade angle
3.658 (12)	3.17 (10.4)	2.59 (8.5)
4.267 (14)	3.70 (12.1)	3.02 (9.9)
4.877 (16)	4.22 (13.9)	3.45 (11.3)
7.315 (24)	6.33 (20.8)	5.17 (17.0)

For other blade lengths and carry angles:

Effective length = COS [Radians (Blade L)] 3 Blade Length

Width of Overlap:

The width of overlap is generally 0.6 m (2.0 ft). This overlap accounts for the need to keep the tires out of the windrow on the return pass.

Job Efficiency:

Job efficiencies vary based on job conditions, operator skill, etc.

A good estimation for efficiency is approximately 0.70 to 0.85, but actual operating conditions should be used to determine the best value.

Example problem:

A Cat motor grader with a 3.66 m (12 ft) moldboard is performing road maintenance on a township road. The machine is working at an average speed of 13 km/h (8 mph) with a moldboard carry angle of 30 degrees. What is the motor grader's production based on coverage area?

Note: Due to the long passes involved in road maintenance — fewer turnarounds — a higher job efficiency of 0.90 is chosen.

Solution:

From the table, the effective blade length is 3.17 m (10.4 ft).

Metric

Production,
$$A = 13 \text{ km/h} \times (3.17 \text{ m} - 0.6 \text{ m}) \times 1000 \times 0.90$$

= 30 069 m²/hr (3.07 hectares/hr)

English

Production, A = 8 mph × (10.4 ft - 2.0 ft) × 5280×0.90 = 319,334 ft²/hr (7.33 acres/hr)

To pinpoint the theoretical number of motor graders required to properly maintain your haul roads, based on your specific mining applications, please download the haul road maintenance calculator on *https://catminer.cat.com*.

Haul road maintenance impacts cycle time, tire, frame and drive train components, safety and ultimately your cost per ton. To achieve optimal truck productivity, your haul roads must be properly maintained.

Moderate: • Road Maintenance

- Pad Cleaning
- Rock Clearing
- Shoulder Sweeping

- Difficult: Ripping
 - Spreading Dump Material
 - Road Profiling/Reshaping

BLADE PULL

This specification is also known as drawbar pull. This spec can be calculated as follows:

Variables:

Rear weight of machine = Wr

Tire traction

coefficient = T (Look up the table entitled "Coefficient of Traction Factors")

 $Wr \times T = Blade Pull$

Example problem:

Calculate the blade pull for a 140M Global Version version machine operating in a quarry pit...

Metric

RW = 10501 kg

T = 0.65

 $10\,501 \times 0.65 = 6825.65$

English

RW = 23,151 lbT = 0.65

 $23,151 \times 0.65 = 15,048.15$

BLADE DOWN PRESSURE

This spec can be calculated as follows: Variables:

Blade to front axle length = BA

Wheel base length = WB

Weight on front wheels = FW

Blade down pressure = BD

$$\frac{WB}{WB - BA} \times FW = BD$$

Example problem:

Calculate the blade down pressure for a 140M Global Version version machine...

Metric

BA = 2565 mm FW = 4223 kg WB = 6086 mm BD = ? $\frac{6086}{(6086 - 2565)} \times 4223 = 7299 kg$ English BA = 101 in FW = 9310 lb WB = 240 in BD = ? $\frac{240}{(240 - 101)} \times 9310 = 16,075 \text{ lb}$

This specification is only a minor indicator of a motor grader's productivity. It alone gives no measure of overall machine productivity. When considering motor grader production you need an optimum balance between the machine's front and rear weights. If a machine has too much weight on the front axle, it might have a high blade down pressure spec. It will, however, lack the essential rear weight and traction needed to push through the load. Too much weight in the rear and it will not have the necessary weight in the front during heavy cuts to maintain proper steering control.

Cat machines are built with this optimum balance in mind. A Cat motor grader is engineered with the proper weight distribution necessary for maximum productivity.

Effective Blade Length*

		Moldboard							
		3.66 r	n (12')	4.27 r	n (14')	4.88 m (16')		7.32 m (24')	
		m	ft	m	ft	m	ft	m	ft
	0°	3.66	12.00	4.27	14.00	4.88	16.00	7.32	24.00
	5°	3.64	11.95	4.25	13.95	4.86	15.94	7.29	23.91
	10°	3.60	11.82	4.20	13.79	4.80	15.76	7.21	23.64
ം	15°	3.53	11.59	4.12	13.52	4.71	15.45	7.07	23.18
Angle°	20°	3.44	11.28	4.01	13.16	4.58	15.04	6.87	22.55
Ā	25°	3.32	10.88	3.87	12.69	4.42	14.50	6.63	21.75
	30°	3.17	10.39	3.69	12.12	4.22	13.86	6.33	20.78
	35°	3.00	9.83	3.50	11.47	4.00	13.11	5.99	19.66
	40°	2.80	9.19	3.27	10.72	3.74	12.26	5.61	18.39
	45°	2.59	8.49	3.02	9.90	3.45	11.31	5.17	16.97

*Effective blade length is the amount of blade coverage the machine is capable of when the blade is at a given angle.

EXTREME SLOPE OPERATION

There are two ways of defining slope work. The slope perpendicular to the machine's direction of travel is commonly referred to as "Side Sloping." The slope parallel to the machine's direction of travel — the machines ability to travel up or down terrain, is commonly referred to as "Gradeability."

Side Sloping capability for our Cat graders is somewhat subjective, but general agreement among professional operators is that working on a slope ratio of 2.5:1 (21.8 degrees) is the safe limit ... an experienced operator may be able to operate on a 2:1 (28 degrees) slope. Many factors influence this limit such as operator experience, machine configuration, tires and soil conditions, but a 2.5:1 is achievable. Further, a 3:1 slope is the approximate maximum side slope a grader can work on in straight frame configuration. The steeper side slopes all require the machine be articulated to safely navigate the slope.

Gradeability is approximately 22 degrees. This is established by the grader's ability to stop without skidding the tires while moving downhill. The motor grader can, however, *climb* grades steeper than 22 degrees. The traction coefficient is the critical factor in determining whether a grader can safely navigate the slope. Caterpillar recommends that you never climb a slope steeper than you can safely descend.

Maximum lubrication angle: We have measured the graders on a tilt table and pump cavitation occurs around 30 degrees (58% or 1.7:1). This is beyond the grade or slope a motor grader can operate on.

When working side hills and slopes, consideration should be given to the following important points.

- Speed of Travel At higher speeds, inertia forces tend to make the grader less stable.
- Roughness of Terrain or Surface Ample allowance should be made where the terrain or surface is uneven.
- Mounted Equipment Mounted attachments such as front plows, snow wings, rippers and other mounted equipment cause the tractor to balance differently.
- Nature of Surface New earthen fills may give way with the weight of the grader. Rocky surfaces may promote side slipping of grader.
- Excessive Loads or Side Draft This may cause wheel slippage, where the downhill tires "dig in," increasing the angle of grader.
- Tire Selection and Maintenance Consideration should be given to proper tire selection and air pressure. For more information, consult Caterpillar publications Motor Grader Tire Selection Guide and Operation and Maintenance Manual.
- Drawbar, Circle and Blade Position The position of the blade can affect the stability of the machine.
- Articulation Angle Articulation angle can affect the stability of the machine.
- Wheel Lean Angle Wheel lean angle can affect the stability of the machine.
- **NOTE:** Safe operation on steep slopes may require special machine maintenance as well as excellent operator skill and proper equipment setup for the specific application. Consult Caterpillar publications for further operating tips — Operation & Maintenance Manual, Motor Grader Application Guide, and the Grade Comparison Chart in the Tables section of this Performance Handbook.

WHEELED LOADERS

Wheel Loaders Specifications Integrated Toolcarriers

MODEL	98	BOM	982M		
Emission Standards	Tier 4	4 Final*	Tier 4 Final*		
Maximum Engine: Net	288 kW	386 hp	292 kW	392 hp	
Gross	317 kW	425 hp	325 kW	436 hp	
Engine Model	C13	ACERT	C13 ACERT		
Maximum Net Power Engine RPM	1	700	1700		
Bore	130 mm	5.1"	130 mm	5.1"	
Stroke	157 mm	6.2"	157 mm	6.2"	
No. Cylinders		6		6	
Displacement	12.5 L	762.8 in ³	12.5 L	762.8 in ³	
Speeds Forward:	km/h	mph	km/h	mph	
1st	6.9	4.3	6.2	3.9	
2nd	13.3	8.3	11.9	7.4	
3rd	23.5	14.6	21.1	13.1	
4th	39.5	24.5	37.5	23.3	
5th		_	_		
Speeds Reverse:	km/h	mph	km/h	mph	
1st	7.8	4.8	7.0	4.3	
2nd	15.2	9.4	13.6	8.5	
3rd	26.9	16.7	24.1	15.0	
4th	39.5	24.5	39.5	24.5	
Hydraulic Cycle Time, Rated Load in Bucket:	Sec	conds	Seconds		
Raise (from Carry Position)		5.3	5.3		
Dump (at Maximum Raise)		1.7	1.7		
Lower (Empty, Float Down)		3.1	3.1		
Total	10.1		10.1		
Tread Width	2440 mm	8'0"	2540 mm	8'4"	
Width Over Tires	3265 mm	10'9"	3452 mm	11'4"	
Ground Clearance	453 mm	1'6"	426 mm	1'5"	
Fuel Tank Capacity	426 L	112.5 U.S. gal	426 L	112.5 U.S. gal	
DEF Tank Capacity	21 L	5.5 U.S. gal	21 L	5.5 U.S. gal	
Hydraulic Tank Capacity	180 L	48 U.S. gal	180 L	48 U.S. gal	

*Meets Tier 4 Final, Stage IV and Japan 2014 (Tier 4 Final) emission standards.

NOTE: Net Engine Power is provided according to SAE J1349 and ISO 9249. Gross Engine Power is provided according to SAE J1995. Machines may only be available in certain regions. Contact your local Cat dealer for product availability.

Wheel Loaders Integrated Toolcarriers

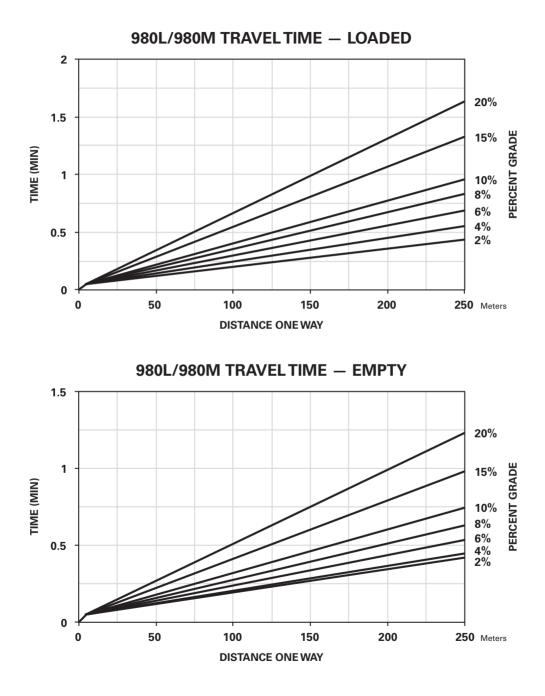
MODEL	99	992K 993K		994K		
Maximum Engine: Net	607 kW	814 hp	764 kW	1024 hp	1297 kW	1739 hp
Gross	671 kW	900 hp	773 kW	1036 hp	1377 kW	1847 hp
Rated Payload:*		-		-		-
STD	21.8 tonnes	24 tons	22.7 tonnes	30 tons	40.8 tonnes	45 tons
HL, EHL, SHL	19 tonnes	21 tons	24.9 tonnes	27.5 tons	38.1 tonnes	42 tons
Gross Rated Bucket Payload:*						
STD	33 687 kg	74,265 lb	42 912 kg	94,603 lb	64 791 kg	142,838 lb
HL	30 138 kg	66,441 lb	40 459 kg	89,195 lb	61 458 kg	135,489 lb
Engine Model	C32 A0	ERT**	C32 A0	CERT**	35	16E
Emission Level						
Rated Engine RPM	1750		19	00	16	00
Bore	145 mm	5.7"	145 mm	5.7"	170 mm	6.7"
Stroke	162 mm	6.4"	162 mm	6.4"	215 mm	8.5"
No. Cylinders	1	2	1	2	16	
Displacement	32.1 L	1959 in ³	32.1 L	1959 in ³	78 L	4766 in ³
Speeds Forward:	km/h	mph	km/h	mph	km/h	mph
1st	7.1	4.4	6.8	4.2	7.4	4.6
2nd	12.2	7.6	11.9	7.4	12.9	8.0
3rd	20.6	12.8	20.5	12.7	24.0	14.9
Speeds Reverse:	km/h	mph	km/h	mph	km/h	mph
1st	7.4	4.6	7.5	4.7	8.1	5.0
2nd	13.0	8.1	13.1	8.1	14.1	8.8
3rd	22.4	13.9	22.5	13.9	24.0	14.9
Hydraulic Cycle Time, Rated Load in Bucket:	Sec	onds	Seconds		Seconds	
Raise	9	.4	9.2		12.6	
Dump	1	.8	1.8		3.1	
Lower (Empty, Float Down)	3	8.7	3.1		4.2	
Total	14	1.9	14.1		19.9	
Tread Width	3.3 m	10'10"	3.54 m	11'6"	4.3 m	14'1"
Width Over Tires	4.5 m	14'9"	4.93 m	16'2"	5.49 m	18'10"
Ground Clearance	682 mm	26.8"	721 mm	2'5"	898 mm	33"
Fuel Tank Capacity	1610 L	425 U.S. gal	2170 L	573 U.S. gal	3445 L	910 U.S. gal
Hydraulic Systems:		-		2		-
Lift, Tilt	646 L	171 U.S. gal	755 L	199 U.S. gal	1022 L	270 U.S. gal
Tank Only	326 L	86 U.S. gal	553 L	146 U.S. gal	756 L	200 U.S. gal
Steering and Brakes	231 L	61 U.S. gal	227 L	60 U.S. gal	379 L	100 U.S. gal
Tank Only	159 L	42 U.S. gal	185 L	48.9 U.S. gal	340 L	90 U.S. gal

*Changes in bucket weight, including field installed wear iron, can impact rated payload. Consult your Cat dealer for assistance in selecting and configuring the proper bucket for the application. The Cat Large Wheel Loader Payload Policy is a guideline intended to maximize wheel loader structural and component life. The Cat Payload Policy is that the "Gross Bucket plus Payload Capacity" is the MAXIMUM weight that should be carried on the end of the Lift Arm/Boom. **Products available to meet Tier 2/Stage II/Japan 2001 (Tier 2) equivalent OR Tier 4 Final/Stage IV/Japan 2014 (Tier 4 Final) emission standards. NOTE: The 994K meets Tier 1 equivalent emission standards.

Wheel Loaders Integrated Toolcarriers

Travel Time – Loaded and Empty

- 980L/980M
- 29.5R25 L4 Tires

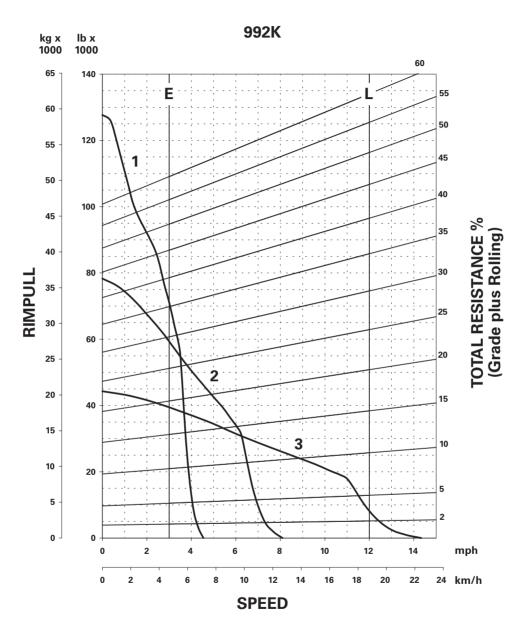


Curves assume use of highest operating speed attainable.

In load-and-carry applications it is important to consult the tire manufacturer on load-speed ratings and pressure recommendations. Meets Tier 2/Stage II/Japan 2001 (Tier 2) equivalent OR Tier 3/Stage IIIA/Japan 2006 (Tier 3) equivalent emission standards.

992K Rimpull-Speed-Gradeability • Standard Machine

Wheel Loaders Integrated Toolcarriers



KEY

1 – 1st Gear

2 - 2nd Gear

3 - 3rd Gear

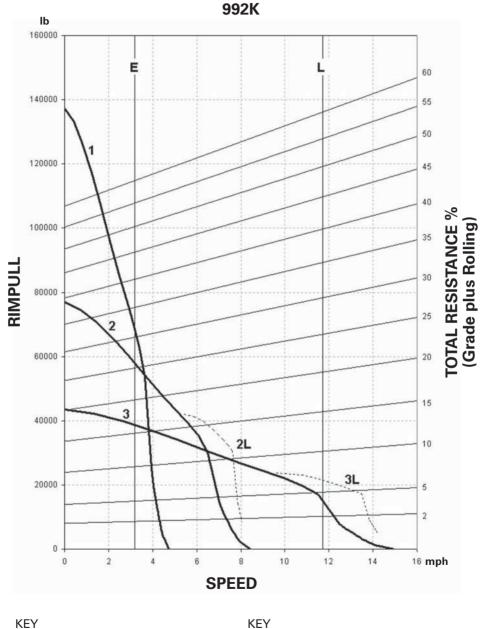
KEY

E — Empty 92 797 kg (204,580 lb) L — Loaded 114 570 kg (252,580 lb)

Calculated Pull: Idle Hydraulics Curves Assume NO SLIP Conditions

Wheel Loaders **Integrated Toolcarriers**

992K Rimpull-Speed-Gradeability • Lock-Up Clutch

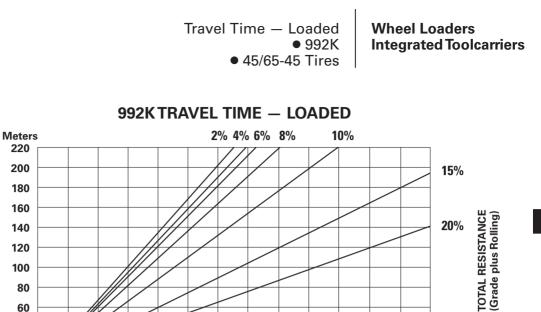


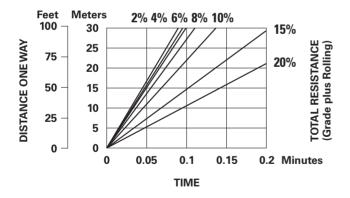
KEY

- 1 1st Gear
- 2 2nd Gear
- 3 3rd Gear

- E Empty 92 797 kg (204,580 lb)
- L Loaded 114 570 kg (252,580 lb)

Calculated Pull: Idle Hydraulics Curves Assume NO SLIP Conditions





Feet

700

600

500

400

300

200

100

0

40

20

0 4

0.1

0.2

0.3

0.4

0.5

0.6

0.7

TIME

0.8

0.9

1

1.1

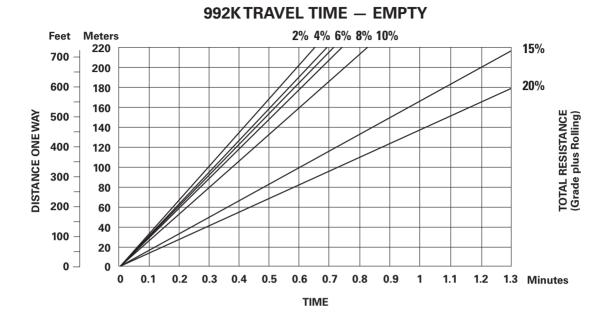
1.2

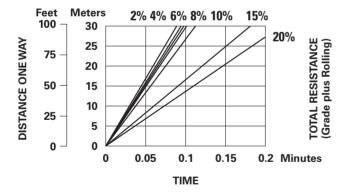
1.3 Minutes

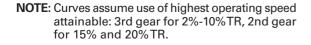
DISTANCE ONE WAY

NOTE: Curves assume use of highest operating speed attainable: 3rd gear for 2%-10% TR, 2nd gear for 15% and 20% TR. In load-and-carry applications it is important to consult the tire manufacturer on Ton-MPH ratings and pressure recommendations.









In load-and-carry applications it is important to consult the tire manufacturer on Ton-MPH ratings and pressure recommendations.

TRACKED DOZERS

MODEL	D	6T	D6T XL			
Emission Standards		tage IIIA/ er 3) equivalent		tage IIIA/ er 3) equivalent		
Flywheel Power	149 kW	200 hp	149 kW	200 hp		
Operating Weight:1						
Power Shift Differential Steer						
SU Blade	20 580 kg	45,370 lb	21 600 kg	47,620 lb		
Engine Model	C9 A	CERT	C9 A	CERT		
Rated Engine RPM: Power Shift	18	50	18	350		
No. of Cylinders		6		6		
Bore	112 mm	4.4"	112 mm	4.4"		
Stroke	149 mm	5.9"	149 mm	5.9"		
Displacement	8.8 L	537 in ³	8.8 L	537 in ³		
Track Rollers (Each Side)		6		7		
Width of Standard Track Shoe	560 mm	22"	560 mm	22"		
Length of Track on Ground	2.61 m	8'7"	2.81 m	9'3"		
Ground Contact Area (w/Std. Shoe)	2.92 m ²	4531 in ²	3.15 m²	4878 in ²		
Track Gauge	1.88 m	74"	1.88 m	74"		
GENERAL DIMENSIONS:						
Height ² (Stripped Top) ³	2.40 m	7'11"	2.40 m	7'11"		
Height ² (To Top of ROPS Canopy)	3.11 m	10'2"	3.11 m	10'2"		
Height ² (To Top of ROPS Cab)	3.11 m	10'2"	3.11 m	10'2"		
Overall Length (without Blade)	3.85 m	12'7"	3.85 m	12'7"		
with SU Blade	5.08 m	16'8"	5.33 m	17'6"		
with Angle Blade	5.00 m	16'5"	5.21 m	17'1"		
Width (over Trunnion)	2.64 m	8'8"	2.64 m	8'8"		
Width (w/oTrunnion — Std. Track)	2.44 m	8'0"	2.44 m	8'0"		
Ground Clearance ²	384 mm	1'3"	384 mm	1'3"		
Blade Types and Widths:						
Angle Straight	4.16 m	13'8"	4.16 m	13'8"		
Full 25° Angle	3.77 m	12'5"	3.77 m	12'5"		
Semi-U	3.26 m	10'8"	3.26 m	10'8"		
FuelTank Refill Capacity	425 L	112 U.S. gal	425 L	112 U.S. gal		
Operating weight includes cab operator lubricants coolant	full fuel tank standard track h	wdraulic controls and f	luid SII blade drawba	ar and counterweight		

¹ Operating weight includes cab, operator, lubricants, coolant, full fuel tank, standard track, hydraulic controls and fluid, SU blade, drawbar and counterweight. ² Dimensions measured from ground line. Add grouser height for total dimension on hard surfaces.

³ Height (StrippedTop) — without ROPS canopy, exhaust, seat back or other easily removed encumbrances.

Track-Type Tractor Sustainability

Well matched engine and power train systems enhance productivity and fuel efficiency.

MODEL	D	9R	D	9T	D9T		
Emission Standards		-	Japan 20	Stage IIIA/ 106 (Tier 3) valent ¹		al/Stage IV/ (Tier 4 Final)	
Flywheel Power	302 kW	405 hp	306 kW	410 hp	325 kW	436 hp	
Operating Weight: ²							
Power Shift Clutch Brake	48 784 kg	107,548 lb		-		-	
Power Shift Differential Steer		-	47 872 kg	105,539 lb	48 361 kg	106,618 lb	
Engine Model	34080	SCAC	C18	ACERT	C18	ACERT	
Rated Engine RPM	19	900	1	833	1	800	
No. of Cylinders		8		6		6	
Bore	137 mm	5.4"	145 mm	5.7"	145 mm	5.7"	
Stroke	152 mm	6"	183 mm	7.2"	183 mm	7.2"	
Displacement	18 L	1099 in ³	18.1 L	1106 in ³	18.1 L	1106 in ³	
Track Rollers (Each Side)		8		8		8	
Width of Standard Track Shoe	610 mm	24"	610 mm	24"	610 mm	24"	
Length of Track on Ground	3.47 m	11'5"	3.47 m	11'5"	3.47 m	11'5"	
Ground Contact Area (w/Std. Shoe)	4.24 m ²	6569 in ²	4.24 m ²	6569 in ²	4.24 m ²	6569 in ²	
Track Gauge	2.25 m	7'5"	2.25 m	7'5"	2.25 m	7'5"	
GENERAL DIMENSIONS:							
Height ³ (Stripped Top) ^₄	3.69 m	12'1"	3.69 m	12'1"	3.69 m	12'1"	
Height ³ (ToTop of ROPS Canopy)	4.00 m	13'1"	4.00 m	13'1"	4.00 m	13'1"	
Height ³ (To Top of FOPS Cab)	3.82 m	12'6"	3.82 m	12'6"	3.82 m	12'6"	
Overall Length (with SU Blade)⁵	6.88 m	22'6"	6.88 m	22'6"	6.88 m	22'6"	
(without Blade)	5.18 m	17'0"	5.18 m	17'0"	5.18 m	17'0"	
(with SU Blade and Ripper)⁵	8.23 m	27'0"	8.23 m	27'0"	8.23 m	27'0"	
(without Blade and Ripper)	4.91 m	16'1"	4.91 m	16'1"	4.91 m	16'1"	
Width (over Trunnion)	3.30 m	10'8"	3.30 m	10'8"	3.30 m	10'8"	
Width (w/oTrunnion — Std. Shoe)	2.88 m	9'5"	2.88 m	9'5"	2.88 m	9'5"	
Ground Clearance ⁶	496 mm	1'7"	496 mm	1'7"	496 mm	1'7"	
Blade Types and Widths:							
Universal	4.65 m	15'3"	4.65 m	15'3"	4.65 m	15'3"	
Semi-U	4.31 m	14'2"	4.31 m	14'2"	4.31 m	14'2"	
FuelTank Refill Capacity	818 L	216 U.S. gal	889 L	235 U.S. gal	821 L	217 U.S. gal	
DEF Tank Refill Capacity		_			36 L	9.5 U.S. gal	

¹ Product available to meet Tier 2/Stage II/Japan 2001 (Tier 2) equivalent OR Tier 3/Stage III/Japan 2006 (Tier 3) equivalent emission standards. ² Operating weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluids, semi universal blade with tilt, back-up alarm, seat belts, lights, and single shank ripper.

D9R equipped with track guides, ROPS/IS/POS cab, single shank ripper and SU blade.
 ³ Dimensions measured from ground line. Add grouser height for total dimension on hard surfaces.

⁴ Height (StrippedTop) – without ROPS canopy, exhaust, seat back or other easily removed encumbrances.

⁵ Includes drawbar.

⁶ Per ISO 6746 – Must add grouser height for total dimension on hard surfaces.

MODEL	D10T2		D1	11T	D11	T CD
Emission Standards		I/Stage IV/ (Tier 4 Final) ¹		I/Stage IV/ (Tier 4 Final) ¹		I/Stage IV/ (Tier 4 Final) ¹
Flywheel Power	447 kW	600 hp	634 kW	850 hp	634 kW	850 hp
Beverse Gears	538 kW	722 hp		_		_
Operating Weight: ²		· ·· p				
Power Shift Clutch Brake	70 171 kg	154.700 lb	104 236 kg	229,800 lb	112 718 kg	248,500 lb
Engine Model	0	ACERT	0	CERT	0	CERT
Rated Engine RPM	-	300		300		800
No. of Cylinders		12		12		2
Bore	137 mm	5.4"	145 mm	5.71"	145 mm	5.71"
Stroke	152 mm	6"	162 mm	6.38"	162 mm	6.38"
Displacement	27 L	1648 in ³	32.1 L	1959 in ³	32.1 L	1959 in ³
Track Rollers (Each Side)		8	-	8	-	8
Width of Standard Track Shoe	610 mm	24"	710 mm	28"	915 mm	36"
Length of Track on Ground (Idler to Idler)	3.88 m	12'9"	4.44 m	14'7"	4.44 m	14'7"
Ground Contact Area (w/Std. Shoe)	4.74 m ²	7347 in ²	6.31 m ²	9781 in ²	8.13 m ²	12,605 in ²
Track Gauge	2.55 m	8'4"	2.89 m	9'6"	2.89 m	9'6"
GENERAL DIMENSIONS:		-				
Height (Stripped Top) ³	3.222 m	10'7"	3.64 m	11'11"	3.64 m	11'11"
Height (To Top of ROPS Canopy)	4.41 m	14'5"	4.70 m	15'5"	4.70 m	15'5"
Height (To Top of FOPS Cab)	4.10 m	13'5"	4.39 m	14'5"	4.39 m	14'5"
Overall Length:						
(with SU Blade and SS Ripper)⁴	9.16 m	30'1"	10.59 m	34'9"	10.70 m	35'1"
(without Blade and Ripper)⁵	5.32 m	17'5"	6.16 m	20'3"	6.16 m	20'3"
Width (over Trunnion)	3.74 m	12'3"	4.38 m	14'4"	4.38 m	14'4"
Width (w/oTrunnion – Std. Shoe)	3.30 m	10'10"	3.78 m	12'5"	3.81 m	12'6"
Ground Clearance ⁶	632 mm	2'1"	675 mm	2'3"	675 mm	2'3"
Blade Types and Widths:						
CarryDozer		_	-	_	6.71 m	22'0"
Universal	5.26 m	17'3"	6.36 m	20'10"	-	_
Semi-U	4.94 m	16'3"	5.60 m	18'4"	.	_
FuelTank Refill Capacity	1204 L	314 U.S. gal	1609 L	425 U.S. gal	1609 L	425 U.S. gal
FuelTank Refill Capacity (Extra Capacity)	-	_	1987 L	505 U.S. gal	1987 L	505 U.S. gal

¹Product available to meet Tier 2/Stage II/Japan 2001 (Tier 2) equivalent OR Tier 4 Final/Stage IV/Japan 2014 (Tier 4 Final) emission standards.

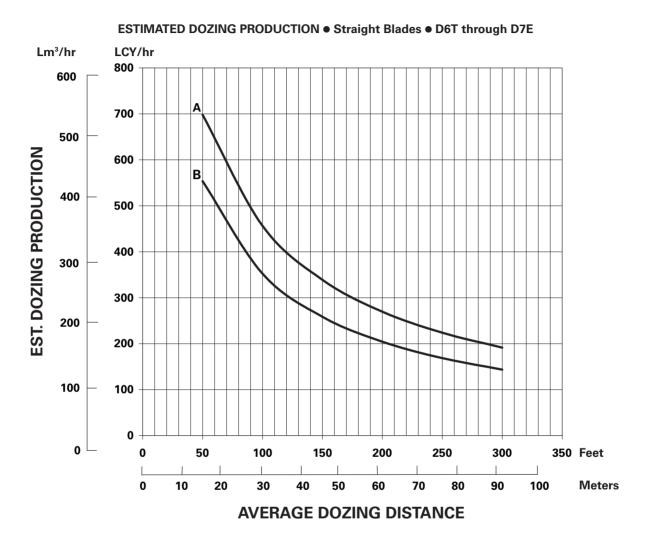
² Operating weight includes coolant, lubricants, full fuel tank, ROPS, FOPS cab, SU ABR bulldozer (D10T2) or U ABR bulldozer (D11T), dual tilt, single-shank ripper with pin-puller, fast fuel, standard ES shoes, and operator. D11T CD has 11 Carrydozer and single-shank Carrydozer ripper.

³ Height (Stripped Top) – without ROPS canopy, cab, exhaust, lift cylinders, seat back or other easily removed encumbrances.

⁴ Overall length of D1T CD includes Straight (CarryDozer) Blade and SS Ripper.
 ⁵ Overall length of machine from front tag link trunnion to rigid drawbar and excludes track grouser height.

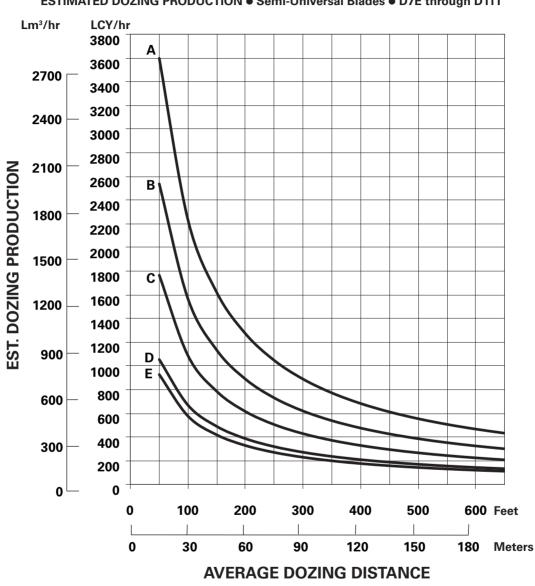
⁶ Per ISO 6746 – Must add grouser height for total dimension on hard surfaces.

All dimensions are approximate.



KEY A — D7E B — D6T

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.



ESTIMATED DOZING PRODUCTION • Semi-Universal Blades • D7E through D11T

KEY

- A D11T
- B D10T2 C - D9T
- D D8T
- E D7E

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

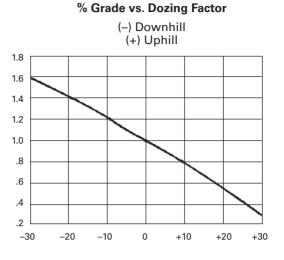
Bulldozers

Job Factors Estimating Production Off-the-Job • Example Problem

JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR
OPERATOR -	
Excellent	1.00
Average	0.75
Poor	0.60
MATERIAL —	
Loose stockpile	1.20
Hard to cut; frozen —	
with tilt cylinder	0.80
without tilt cylinder	0.70
Hard to drift; "dead" (dry, non-	0.80
cohesive material) or very sticky material	
Rock, ripped or blasted	0.60-0.80
SLOT DOZING	1.20
SIDE BY SIDE DOZING	1.15-1.25
VISIBILITY -	
Dust, rain, snow, fog or darkness	0.80
JOB EFFICIENCY -	
50 min/hr	0.83
40 min/hr	0.67
BULLDOZER*	
Adjust based on SAE capacity relative to the base blade used in the Estimated Dozing Production graphs.	
GRADES — See following graph.	

*NOTE: Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.



ESTIMATING DOZER PRODUCTION OFF-THE-JOB

Example problem:

Determine average hourly production of a D8T/8SU (with tilt cylinder) moving hard-packed clay an average distance of 45 m (150 feet) down a 15% grade, using a slot dozing technique.

Estimated material weight is 1600 kg/Lm³ (2650 lb/ LCY). Operator is average. Job efficiency is estimated at 50 min/hr.

Uncorrected Maximum Production — 458 Lm³/h (600 LCY/hr) (example only)

Applicable Correction Factors:

Hard-packed clay is "hard to cut" material0.80
Grade correction (from graph)1.30
Slot dozing
Average operator
Job efficiency (50 min/hr)0.83
Weight correction (2300/2650)–0.87

- Production = Maximum Production \times Correction Factors
 - = (600 LCY/hr) (0.80) (1.30) (1.20) (0.75)(0.83) (0.87)
 - = 405.5 LCY/hr

To obtain production in metric units, the same procedure is used substituting maximum uncorrected production in Lm³.

> = $458 \text{ Lm}^3/\text{h} \times \text{Factors}$ = $309.6 \text{ Lm}^3/\text{h}$

OFF-HIGHWAY TRUCKS

MODEL	793D S ⁻	tandard	793D XLWS			
BodyType	MS	SD II	MS	D II		
Target Gross Machine Weight §	383 740 kg	846,000 lb	383 740 kg	846,000 lb		
Basic Machine Weight*	51 135 kg	112,734 lb	51 310 kg	113,119 lb		
Attachments**	65 898 kg	145,281 lb	67 514 kg	148,844 lb		
Body Weight without Liners***	26 980 kg	59,481 lb	26 980 kg	59,481 lb		
Full Liner	6209 kg	13,688 lb	6209 kg	13,688 lb		
Operating Machine Weight	150 223 kg	331,184 lb	152 013 kg	335,132 lb		
Debris (3% of Operating Machine Weight)	4507 kg	9936 lb	4560 kg	10,054 lb		
Empty Operating Weight	154 729 kg	341,119 lb	156 574 kg	345,186 lb		
Target Payload §	229.0 m tons	252.4 tons	227.2 m tons	250.4 tons		
Capacity:						
Heaped (2:1) (SAE) Base Body	176 m³	230 yd ³	176 m ³	230 yd ³		
Distribution Empty:						
Front	46.	.2%	46	5%		
Rear	53.	.8%	54	!%		
Distribution Loaded:						
Front	33.	.3%	33	3%		
Rear	66.	.7%	66	7%		
Engine Model	3516B	HD EUI	3516B	ID EUI		
Number of Cylinders	1	16	1	6		
Bore	170 mm	6.7"	170 mm	6.7"		
Stroke	215 mm	8.5"	215 mm	8.5"		
Displacement	78 L	4760 in ²	78 L	4760 in ²		
Net Power	1694 kW	2273 hp	1694 kW	2273 hp		
Gross Power	1801 kW	2415 hp	1801 kW	2415 hp		
StandardTires	40/0	0R57	40/0	0R57		
Machine Clearance Turning Circle	33 m	107'0"	33 m	107'0"		
Fuel Tank Refill Capacity	4353 L	1150 U.S. gal	4353 L	1150 U.S. gal		
Top Speed (Loaded)	59.9 km/h	37.2 mph	59.9 km/h	37.2 mph		
GENERAL DIMENSIONS (Empty):						
Height to Canopy Rock Guard Rail	6.6 m	21'8"	6.6 m	21'8"		
Wheelbase	5.91 m	19'5"	5.91 m	19'5"		
Overall Length (Base Body)	13.01 m	42'9"	13.01 m	42'9"		
Loading Height (Base Body)	6.5 m	21'5"	6.5 m	21'5"		
Height at Full Dump	13.25 m	43'6"	13.25 m	43'6"		
Body Length (Target Length)	8.99 m	29'6"	8.99 m	29'6"		
Width (Operating)	8.3 m	27'3"	8.3 m	27'3"		
Width (Shipping)****	4.1 m	13'5"	4.1 m	13'5"		
FrontTireTread	5.63 m	18'6"	5.63 m	18'6"		

*See Weight Definitions and Relations on page 18 of this section. Note: No mandatory or optional attachments or fuel.

**Typical selection of mandatory and optional attachments.

*** Data provided for the 793D Standard (MA1) is for a representative body and liner package. Several dual slope, flat floor, and mine specific design (MSD) bodies and liner packages are available. All weights, capacities, and dimensions are dependent on the machine configuration (body type, attachments, tires, and optional equipment selected).

****Disassembled.

§Reference Caterpillar's latest 10/10/20 Payload Policy for information on gross machine operating weight and target payload.

NOTE: Contact Mining Representative to use Caterpillar Weight Configurator for application specific weights.

Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - <th>MODEL</th> <th>794</th> <th>AC</th> <th>795</th> <th>AC</th> <th>79</th> <th>7F</th>	MODEL	794	AC	795	AC	79	7F	
Basic Machine Weight* 122 031 kg 269,032 lb 118 807 kg 261,924 lb 86 412 kg 190,506 lb Attachments** 37 409 kg 82,472 lb 79 503 kg 175,273 lb 124 033 kg 228,274 lb Body Weight without Liners*** 28 186 kg 62,140 lb 7623 kg 16,806 lb 7652 kg 16,870 lb Operating Machine Weight 217 419 kg 479,327 lb 244 596 kg 539,240 lb 266 422 kg 587,359 lb G3% of Operating Machine Weight - 7338 kg 16,77 lb 7993 kg 176,271 b 7993 kg 176,271 b 274 415 kg 604,980 lb Target Payload \$ 291 m tons 320 tons 313-317 m tons 345-350 tons 335-353 m tons 335-353 m tons 315-350 yd² Distribution Loaded: - - 7338 kg 67,7' 66,7'' 66,7'' Front 49.0% 48% 69,7'' 75 mm 6,9''' 75 mm Distribution Loaded: - - - 220 mm 8,7'' 26 Front	BodyType	HE	Body	MS	DII	MS	DII	
Attachments** 37 409 kg 82,472 lb 79 503 kg 175,273 lb 128 083 kg 282,374 lb Body Weight without Liners*** 28 186 kg 62,140 lb 38 663 kg 85,237 lb 44 275 kg 97610 lb Full Linert - - 7632 kg 15,806 lb 266 422 kg 587,359 lb Operating Machine Weight 217 419 kg 479,327 lb 244 596 kg 539,240 lb 266 422 kg 587,359 lb Operating Machine Weight 217 419 kg 479,327 lb 251 933 kg 155,417 lb 293 kg 17621 lb Empty Operating Weight 217 419 kg 479,327 lb 251 933 kg 555,417 lb 274 415 kg 604,980 lb Capacity: Haaped (2:1) (SAE) Base Body 180-222 m² 26-290 yd² 213 m² 280 yd² 240-267 m² 315-350 yd² Distribution Loaded: Front 33.0" 52% 54.3"s 516 su 52% 54.3"s Bore 175 mm 6.9" 175 mm 6.9" 200 mm 8.7" Distribution Loaded: 175 mm 6.9" 175 mm 6.9" 220 mm 8.7" <t< td=""><td>Target Gross Machine Weight §</td><td>521 631 kg</td><td>1,150,000 lb</td><td>570 166 kg</td><td>1,257,000 lb</td><td>623 690 kg</td><td>1,375,000 lb</td></t<>	Target Gross Machine Weight §	521 631 kg	1,150,000 lb	570 166 kg	1,257,000 lb	623 690 kg	1,375,000 lb	
Body Weight without Liners*** 28 186 kg 62,140 lb 38 663 kg 85,237 lb 44 275 kg 97,610 lb Full Linerf - 7623 kg 16,806 lb 7652 kg 16,806 lb 7652 kg 16,806 lb 7652 kg 108,707 lb Operating Machine Weight 217 419 kg 479,327 lb 244 596 kg 539,240 lb 266 422 kg 587,359 lb Empty Operating Weight 217 419 kg 479,327 lb 245 596 kg 555,410 274 415 kg 604,980 lb Target Payload 5 291 m tons 320 tons 313-317 m tons 345 -350 tons 376-400 tons Capacity: Heaped (2:1) (SAE) Base Body 180-222 m ³ 236-290 yd ⁴ 213 m ³ 280 yd ⁴ 240-267 m ³ 315-350 yd ⁴ Distribution Loaded: Front 49.0% 487% 45.7% 54.3% Pront 33.0% 53.3% 66.7% 67% 66.7% 67% Istribution Loaded: Front 6.9° 220 mm 8.7° 220 mm 8.7° Displacement 85 L 5.8° </td <td>Basic Machine Weight*</td> <td>122 031 kg</td> <td>269,032 lb</td> <td>118 807 kg</td> <td>261,924 lb</td> <td>86 412 kg</td> <td>190,506 lb</td>	Basic Machine Weight*	122 031 kg	269,032 lb	118 807 kg	261,924 lb	86 412 kg	190,506 lb	
Full Liner17623 kg16.806 lb7652 kg16.870 lsOperating Machine Weight217 419 kg479,327 ls244 596 kg539,240 lb266 422 kg557,351 lsG% of Operating Machine Weight217 419 kg479,327 ls251 933 kg555,417 lb274 415 kg604,800 lsEmpty Operating Weight217 419 kg479,327 ls251 933 kg555,417 lb274 415 kg604,800 lsTarget Payload 5291 mtons320 tons313-317 mtons345-350 tons335-363 mtons370-400 tonsCapacity:180-222 m²236-290 yd²213 m²280 yd²240-267 m²315-350 yd²Distribution Empty:180-222 m²236-290 yd²213 m²280 yd²240-267 m²315-350 yd²Front49.0*48.5*45.7*52.8*54.3*33.7*Rear51.0*52.8*54.3*53.8*54.3*Pistribution Loaded:33.3*33.3*33.3*54.3*33.3*Rear67.0*67.7*67.7*67.7*54.3*Stroke220 mm8.7*220 mm8.7*220 mm8.7*Bore175 mm6.9*175 m106 lc6469 in*Stroke220 mm8.7*253 kW3705 hg370 kgDisplacement85 L175 m6.9*126 kg379 kgStroke220 mm8.7*253 kW380 hg393 kgGross Power251-2610 kW37 mb64.9*106 lcFuelTank Refill Cap	Attachments**	37 409 kg	82,472 lb	79 503 kg	175,273 lb	128 083 kg	282,374 lb	
Operating Machine Weight Debris (3% of Operating Machine Weight) 217 419 kg 479,327 lb 244 596 kg 539,240 lb 266 422 kg 587,359 lb [G% of Operating Machine Weight] 217 419 kg 479,327 lb 233 kg 16,177 lb 793 kg 17,621 lb Empty Operating Weight 217 419 kg 479,327 lb 251 933 kg 555,417 lb 274 415 kg 604,980 lb Target Payload 5 291 m tons 320 tons 313-317 m tons 345-350 tons 335-363 m tons 370-400 tons Capacity: Heaped (2:1) (SAE) Base Body 180-222 m ³ 236-290 yd ⁴ 213 m ² 280 yd ⁴ 240-267 m ³ 315-350 yd ³ Distribution Empty: Front 49.0% 48% 45.7% 54.3% Front 33.0% 33% 33.3% 66.7% 51.8% 51.87 in ³ 33.3% 66.7% Engine Model C175-16 C175-16 C175-20 200 mm 8.7" 220 mm 8.7" 220 mm 8.7" 280 kW 3795 hp Distribution Loaded: T75 mm 6.9" 175 mm<	Body Weight without Liners***	28 186 kg	62,140 lb	38 663 kg	85,237 lb	44 275 kg	97,610 lb	
Debris (3% of Operating Machine Weight) – 7338 kg 16,177 lb 7993 kg 17,621 lb Empty Operating Weight 217 419 kg 479,327 lb 251 933 kg 555,471 lb 274 415 kg 604,980 lb Target Payload 5 291 m tons 320 tons 313-317 m tons 345-350 tons 335-363 m tons 370-400 tons Capacity: Heaped (2:1) (SAE) Base Body 180-222 m² 236-290 yd² 213 m² 280 yd² 240-267 m² 315-350 yd² Front 49.0% 48% 45.7% 54.3% 54.3% 54.3% Distribution Loaded: 51.0% 52% 54.3% 54.3% 54.3% Front 33.0% 66.9" 175 mm 6.9" 220 mm 8.7" 220 mm 8.7" Bore 175 mm 6.9" 175 mm 6.9" 175 mm 6.9" 235 kW 3400 hp 2393 kW 3795 hp Stroke 2051-2610 kW 2750-3500 hp 253 kW 3400 hp 2393 kW 3795 hp Standard Tires 53/80/R63 <t< td=""><td>Full Liner†</td><td>-</td><td>_</td><td>7623 kg</td><td>16,806 lb</td><td>7652 kg</td><td>16,870 lb</td></t<>	Full Liner†	-	_	7623 kg	16,806 lb	7652 kg	16,870 lb	
(3% of Operating Machine Weight) $-$ 7338 kg16, 177 lb7933 kg7933 kg7933 kg7933 kg7933 kg7933 kg7933 kg7933 kg7933 kg7933 kg6938 kg604, 980 lb604, 980 lb780 lb <td>Operating Machine Weight</td> <td>217 419 kg</td> <td>479,327 lb</td> <td>244 596 kg</td> <td>539,240 lb</td> <td>266 422 kg</td> <td>587,359 lb</td>	Operating Machine Weight	217 419 kg	479,327 lb	244 596 kg	539,240 lb	266 422 kg	587,359 lb	
Empty Operating Weight Target Payload § 217 419 kg 479,327 lb 251 933 kg 555,417 lb 274 415 kg 604,980 lb Target Payload § 231 m tons 320 tons 313-317 m tons 345-350 tons 335-363 m tons 370-400 tons Heaped (2:1) (SAE) Base Body 180-222 m² 236-290 yd² 213 m² 280 yd² 240-267 m² 315-350 yd² Distribution Empty: Front 49.0% 48% 45.7% 545.3% Paer 51.0% 52% 54.3% 55.417 lb 33.3% Rear 67.0% 67% 66.7% 545.3% 55.7% Engine Model C175-16 C175-16 C175-17 C175-17 Number of Cylinders 175 mm 6.9" 175 mm 6.9" Stroke 220 mm 8.7" 220 mm 8.7" 220 mm 8.7" Stroke 2051-2610 kW 2750 3500 hp 558/80 kB 387.0" 106 L 6469 in² Gross Power 2051-2610 kW 2750 3500 hp 553/80 kB 559/80 kB 2535 kW	Debris							
Target Payload § 291 m tons 320 tons 313-317 m tons 345-350 tons 335-363 m tons 370-400 tons Capacity: Heaped (2:1) (SAE) Base Body 180-222 m² 236-290 yd² 213 m² 280 yd² 240-267 m² 315-350 yd² Distribution Empty: 49.0% 48% 45.7% 54.3% Pront 49.0% 52% 54.3% 55.0% Distribution Loaded: 51.0% 52% 54.3% 56.7% Front 33.0% 333.3% 66.7% 66.7% Engine Model C175-16 C175-16 C175-10 C175-10 Number of Cylinders 16 16 8.7° 220 mm 8.7° 220 mm 8.7° 230 m 8.7° 220 mm 8.7° 230 m	(3% of Operating Machine Weight)	-	_	7338 kg	16,177 lb	7993 kg	17,621 lb	
Capacity: Heaped (2:1) (SAE) Base Body Distribution Empty: Front 180-222 m² 236-290 yd² 213 m² 280 yd² 240-267 m² 315-350 yd² Distribution Empty: Front 49.0% 48% 45.7% Bear 51.0% 52% 54.3% Distribution Loaded: Front 33.0% 333% 66.7% 66.7% Engine Model C175-16 C175-16 C175-10 C175 Number of Cylinders 175 mm 6.9" 175 mm 6.9" Stroke 220 mm 8.7" 220 mm 8.7" 220 mm 8.7" Displacement 85 L 5187 in² 85 L 5187 in² 106 L 6469 in² Stroke 220 mm 8.7" 230 kW 3795 hp 5680 kB 580 kB 5980	Empty Operating Weight	217 419 kg	479,327 lb	251 933 kg	555,417 lb	274 415 kg	604,980 lb	
Heaped (2:1) (SAE) Base Body 180-222 m³ 236-290 yd³ 213 m³ 280 yd³ 240-267 m³ 315-350 yd³ Distribution Empty: Front 49.0% 48% 45.7% 54.3% Rear 51.0% 33% 33.3% 54.3% Distribution Loaded: Front 33.0% 33.3% 66.7% 54.3% Front 33.0% 67% 66.7% 54.3% 54.3% Distribution Loaded: Front 53.0% 67% 66.7% 54.3% Front 33.0% 67% 67% 66.7% 56.7% 56.7% Engine Model C175-16 C175-16 C175-16 51.7% 52.0 mm 8.7" 220 mm 8.7" 230 kW 3795 hp Stroke 201-2610 kW 2750-3500 kP3 253 kW 3400 tp 59.80WF63 59.80WF63 59.80WF63 59.80WF63 59.80WF63 59.80WF63 59.80WF63 <	Target Payload §	291 m tons	320 tons	313-317 m tons	345-350 tons	335-363 m tons	370-400 tons	
$ \begin{array}{ c c c c c } \hline \begin{tabular}{ c c c c } \hline \begin{tabular}{ c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Capacity:							
Front 49.% 48% 45.7% Rear 51.0% 52% 54.3% Distribution Loaded: 33.0% 33.3% 33.3% Front 33.0% 67.7% 66.7% 66.7% Rear 67.0% 67.7% 66.7% 66.7% 66.7% Engine Model C175-16 C175-16 C175-16 C175-16 Bore 175 mm 6.9° 175 mm 6.9° 220 mm 8.7° 220 mm 8.7° 220 mm 8.7° Stroke 220 mm 8.7° 220 mm 8.7° 220 mm 8.7° 280 kW 3795 hp Gross Power 2051-2610 kW 2750-3500 hp 2535 kW 3400 hp 2938 kW 3795 hp Gross Power 2051-2610 kW 2750-3500 hp 2535 kW 3400 hp 2938 kW 3200 hp <t< td=""><td>Heaped (2:1) (SAE) Base Body</td><td>180-222 m³</td><td>236-290 yd³</td><td>213 m³</td><td>280 yd³</td><td>240-267 m³</td><td>315-350 yd³</td></t<>	Heaped (2:1) (SAE) Base Body	180-222 m ³	236-290 yd³	213 m ³	280 yd ³	240-267 m ³	315-350 yd³	
Rear 51.0% 52% 54.3% Distribution Loaded: Front 33.0% 333% 33.3% Rear 67.0% 67% 66.7% Engine Model C175-16 C175-16 C175-16 Number of Cylinders 15 6.9" 175 mm 6.9" Bore 175 mm 6.9" 175 mm 6.9" Stroke 220 mm 8.7" 220 mm 8.7" Displacement 85 L 5187 in³ 85 L 5187 in³ 106 L 6469 in³ Net Power - 220 mm 8.7" 283 kW 4000 hp Standard Tires 53/8/L 5187 in³ 85 L 5187 in³ 106 L 6469 in³ Machine Clearance Turning Circle 32.4 m 106'0" 38.7 m 1270" 42.1 m 1381" FuelTank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 679 km/h 42.2 mp/h GENERAL DIMENSIONS (Empty): - - - 771 m 254" Meelbase 6.65 m 21'10" 6.73 m 22'1"	Distribution Empty:							
Distribution Loaded: 33.0% 333% 33.3% Front 33.0% 33% 33.3% Rear 67.0% 67% 66.7% Engine Model C175-16 C175-16 C175-17 Number of Cylinders 16 C175-17 C175-17 C175-17 Bore 175 mm 6.9" 175 mm 6.9" C175-17 Stroke 220 mm 8.7" 220 mm 8.7" 220 mm 8.7" Displacement 85 L 5187 in³ 85 L 5187 in³ 106 L 6469 in³ Stroke 200 mm 8.7" 283 kW 3395 hp 3375 hp Gross Power 2051-2610 kW 2750-3500 hp 2535 kW 3400 hp 2983 kW 4000 hp Standard Tires 53/80783 56/807 1757 mt 1381" FuelTank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 7571 L 2000 U.S. gal GENERAL DIMENSIONS (Empty): Height to Canopy Rock Guard Rail 759 m 24'11"<	Front	49.	0%	48	%	45.	7%	
$ \begin{array}{ c c c c c } Front & 33.0\% & 33.\% & 33.\% & 33.7\% & 63.7\% & 67.\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 66.7\% & 77.5\% & 66.7\% & 77.5\% & 66.7\% & 77.5\% &$	Rear	51.	0%	52	%	54.3	3%	
Rear 67.0% 67.% 67.% 66.7% Engine Model C175-16 C175-16 C175-16 C175-16 Number of Cylinders 175 mm 6.9" 175 mm 6.9" 175 mm 6.9" Bore 175 mm 6.9" 175 mm 6.9" 220 mm 8.7" 205 mm 8.7" 220 mm 8.7" 220 mm 8.7" 205 mm 3.75 106 L 9.75 105 mm 205 mm 3.75 105 mm 255 kW 3400 hp 2933 kW 4000 hp 318 mm 105 mm	Distribution Loaded:							
Engine Model C175-16 C175-16 C175-17 C175-17 Number of Cylinders 175 mm $6.9"$ 20 mm $8.7"$ 220 mm $8.7"$ 230 mm 2300 US. gat $7571 L$ 2000 US. gat<	Front	33.	0%	33	%	33.3%		
Number of Cylinders 16 16 Bore 175 mm 6.9" 175 mm 6.9" 175 mm 6.9" Stroke 220 mm 8.7" 220 mm 8.7" 220 mm 8.7" Displacement 85 L 5187 in³ 85 L 5187 in³ 106 L 6469 in³ Net Power — — 2830 kW 3795 hp 2830 kW 3795 hp Gross Power 2051-2610 kW 2750-3500 hp 2535 kW 3400 hp 2983 kW 4000 hp Standard Tires 53/8∪R63 56/8∪R63 59/8∪R63 59/8∪R63 59/8∪R63 Machine Clearance Turning Circle 32.4 m 106'0" 38.7 m 127'0" 42.1 m 138'1" Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 7571 L 2000 U.S. gal Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph Meelbase 6.65 m 21'10" 6.73 m 22'1" 7.0 m 23'7" <td>Rear</td> <td>67.</td> <td>0%</td> <td>67</td> <td>%</td> <td colspan="3">66.7%</td>	Rear	67.	0%	67	%	66.7%		
Bore 175 mm $6.9"$ 175 mm $6.9"$ 175 mm $6.9"$ Stroke 220 mm $8.7"$ 220 mm $8.7"$ 220 mm $8.7"$ Displacement $85 L$ $5187 in^3$ $85 L$ $5187 in^3$ $106 L$ $6469 in^3$ Net Power $ 2330 kW$ $3795 hp$ Gross Power $2051-2610 kW$ $2750-3500 hp$ $2535 kW$ $3400 hp$ $2983 kW$ $4000 hp$ Standard Tires $53/E^3$ $56/E^3$ $56/E^3$ $59/E^3$ $59/E^3$ Machine Clearance Turning Circle $32.4 m$ $1060"$ $38.7 m$ $1270"$ $42.1 m$ $138'1"$ Fuel Tank Refill Capacity $4922 L$ $1300 U.S. gal$ $7192 L$ $1900 U.S. gal$ $7571 L$ $2000 U.S. gal$ GENERAL DIMENSIONS (Empty): $ -$ Height to Canopy Rock Guard Rail $759 m$ $24'11"$ $780 m$ $25'8"$ $771 m$ $25'4"$ Overall Length (Base Body) 15	Engine Model	C17	5-16	C17	5-16	C175-20		
Stroke 220 mm 8.7" 220 mm 8.7" 220 mm 8.7" Displacement 85 L 5187 in³ 85 L 5187 in³ 106 L 6469 in³ Net Power - - 2830 kW 3795 hp 2830 kW 3795 hp Gross Power 2051-2610 kW 2750-3500 hp 2535 kW 3400 hp 2983 kW 4000 hp Standard Tires 53/80R3 56/80R63 59/80R63 59/80R63 Machine Clearance Turning Circle 32.4 m 106'0" 38.7 m 127'0" 42.1 m 138'1" Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - - - - - - Height to Canopy Rock Guard Rail 7.59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.00 m 23'0" Loading Height (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Empty)	Number of Cylinders	1	6	1	6			
Displacement $85 L$ $5187 in^3$ $85 L$ $5187 in^3$ $106 L$ $6469 in^3$ Net Power $ 2830 kW$ $3795 hp$ Gross Power $2051-2610 kW$ $2750-3500 hp$ $2535 kW$ $3400 hp$ $2983 kW$ $4000 hp$ Standard Tires $53/80 kG^3$ $56/80 RG^3$ $59/80 KG^3$ $59/80 KG^3$ Machine Clearance Turning Circle $32.4 m$ $106'0''$ $38.7 m$ $127'0''$ $42.1 m$ $138'1''$ Fuel Tank Refill Capacity $4922 L$ $1300 U.S. gal$ $7192 L$ $1900 U.S. gal$ $7571 L$ $2000 U.S. gal$ Top Speed (Loaded) $60 km/h$ $37 mph$ $64 km/h$ $40 mph$ $67.9 km/h$ $42.2 mph$ GENERAL DIMENSIONS (Empty):Height to Canopy Rock Guard Rail $7.59 m$ $24'11''$ $7.80 m$ $25'8''$ $7.71 m$ $25'4''$ Wheelbase $6.65 m$ $21'10''$ $6.73 m$ $22'1''$ $7.20 m$ $23'0''$ Overall Length (Base Body) $6.71 m$ $22'2''$ $ 7.00 m$ $23'0''$ Loading Height (Empty) $ 7.04 m$ $23'2''$ $ -$ Height at Full Dump $14.75 m$ $48'5''$ $15.06 m$ $49'9''$ $15.70 m$ $51'6''$ Body Length (Target Length) $10.21 m$ $33'6''$ $15.15 m$ $49'9''$ $9.98 m$ $32'0''$ Width (Operating) $9.09 m$ $29'10''$ $8.97 m$ $29'6'''$ $9.76 m$ $32'0'''$	Bore	175 mm	6.9"	175 mm	6.9"	175 mm	6.9"	
Net Power $ 2830 \text{ kW}$ $3795 \text{ hp}}{2983 \text{ kW}}$ Gross Power $2051-2610 \text{ kW}$ $2750-3500 \text{ hp}}{53/8063}$ 2535 kW 3400 hp 2983 kW $4000 \text{ hp}}{2983 \text{ kW}}$ Standard Tires 32.4 m $106'0''$ 38.7 m $127'0''$ 42.1 m $138'1''$ Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 7571 L 2000 U.S. gal Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 42.2 mh 42.2 mh GENERAL DIMENSIONS (Empty): $ -$ Height to Canopy Rock Guard Rail 7.59 m $24'11''$ 7.80 m $25'8''$ 7.71 m $25'4''$ Overall Length (Base Body) 15.47 m $50'9'''$ 15.15 m $49'9'''$ 15.08 m $48'9'''''''''''''''''''''''''''''''''''$	Stroke	220 mm	8.7"	220 mm	8.7"	220 mm	8.7"	
Gross Power 2051-2610 kW 2750-3500 hp 2535 kW 3400 hp 2983 kW 4000 hp Standard Tires 53/80R63 38.7 m 127'0" 42.1 m 138'1" Machine Clearance Turning Circle 32.4 m 106'0" 38.7 m 127'0" 42.1 m 138'1" Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 67.9 km/h 42.2 mph Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - - - - - - Height to Canopy Rock Guard Rail 7.59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" - 7.00 m 23'0" - Height at Full Dump 14.75 m 48'5" 15.06 m 49'9" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98	Displacement	85 L	5187 in ³	85 L	5187 in ³	106 L	6469 in ³	
Standard Tires 53/80R63 56/80R63 59/80R63 Machine Clearance Turning Circle 32.4 m 106'0" 38.7 m 127'0" 42.1 m 138'1" Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 7571 L 2000 U.S. gal Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - - - - - Height to Canopy Rock Guard Rail 7.59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.00 m 23'0" Loading Height (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" - 7.00 m 23'0" Loading Height (Empty) - - 7.04 m 23'2" - Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m <td>Net Power</td> <td>-</td> <td>_</td> <td></td> <td>-</td> <td>2830 kW</td> <td>3795 hp</td>	Net Power	-	_		-	2830 kW	3795 hp	
Machine Clearance Turning Circle 32.4 m 106'0" 38.7 m 127'0" 42.1 m 138'1" Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 7571 L 2000 U.S. gal Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - - - - - - Height to Canopy Rock Guard Rail 7.59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.20 m 23'7" Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Empty) - - 7.00 m 23'0" - Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Gross Power	2051-2610 kW	2750-3500 hp	2535 kW	3400 hp	2983 kW	4000 hp	
Fuel Tank Refill Capacity 4922 L 1300 U.S. gal 7192 L 1900 U.S. gal 7571 L 2000 U.S. gal Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - - - - - - Height to Canopy Rock Guard Rail 7.59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.20 m 23'7" Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" - 7.00 m 23'0" Loading Height (Empty) - 7.04 m 23'2" - - Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	StandardTires	53/8	0R63	56/8	0R63	59/80	0R63	
Top Speed (Loaded) 60 km/h 37 mph 64 km/h 40 mph 67.9 km/h 42.2 mph GENERAL DIMENSIONS (Empty): - <td>Machine Clearance Turning Circle</td> <td>32.4 m</td> <td>106'0''</td> <td>38.7 m</td> <td>127'0"</td> <td>42.1 m</td> <td>138'1"</td>	Machine Clearance Turning Circle	32.4 m	106'0''	38.7 m	127'0"	42.1 m	138'1"	
GENERAL DIMENSIONS (Empty): Image: constraint of the system Z59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.20 m 23'7" Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" — 7.00 m 23'0" Loading Height (Empty) — 7.04 m 23'2" — 7.00 m 23'0" Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Fuel Tank Refill Capacity	4922 L	1300 U.S. gal	7192 L	1900 U.S. gal	7571 L	2000 U.S. gal	
Height to Canopy Rock Guard Rail 7.59 m 24'11" 7.80 m 25'8" 7.71 m 25'4" Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.20 m 23'7" Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" - 7.00 m 23'0" Loading Height (Empty) - 7.04 m 23'2" - 7.00 m 23'0" Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Top Speed (Loaded)	60 km/h	37 mph	64 km/h	40 mph	67.9 km/h	42.2 mph	
Wheelbase 6.65 m 21'10" 6.73 m 22'1" 7.20 m 23'7" Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" — 7.00 m 23'0" Loading Height (Empty) — 7.04 m 23'2" — 49'9" 15.70 m 51'6" Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	GENERAL DIMENSIONS (Empty):							
Overall Length (Base Body) 15.47 m 50'9" 15.15 m 49'9" 15.08 m 48'9" Loading Height (Base Body) 6.71 m 22'2" — 7.00 m 23'0" Loading Height (Empty) — 7.04 m 23'2" — 15.70 m 51'6" Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Height to Canopy Rock Guard Rail	7.59 m	24'11''	7.80 m	25'8"	7.71 m	25'4"	
Loading Height (Base Body) 6.71 m 22'2" – 7.00 m 23'0" Loading Height (Empty) – 7.04 m 23'2" –	Wheelbase	6.65 m	21'10''	6.73 m	22'1"	7.20 m	23'7"	
Loading Height (Empty) – 7.04 m 23'2" – Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Overall Length (Base Body)	15.47 m	50'9''	15.15 m	49'9"	15.08 m	48'9"	
Height at Full Dump 14.75 m 48'5" 15.06 m 49'6" 15.70 m 51'6" Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Loading Height (Base Body)	6.71 m	22'2"	-	-	7.00 m	23'0"	
Body Length (Target Length) 10.21 m 33'6" 15.15 m 49'9" 9.98 m 32'6" Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Loading Height (Empty)	-	_	7.04 m	23'2"		-	
Width (Operating) 9.09 m 29'10" 8.97 m 29'6" 9.76 m 32'0"	Height at Full Dump	14.75 m	48'5"	15.06 m	49'6"	15.70 m	51'6"	
	Body Length (Target Length)	10.21 m	33'6''	15.15 m	49'9"	9.98 m	32'6"	
Width (Shinping) 9 09 m 29'10 " 8 97 m 29'6 " 9 76 m 32'0 "	Width (Operating)	9.09 m	29'10''	8.97 m	29'6"	9.76 m	32'0"	
	Width (Shipping)	9.09 m	29'10"	8.97 m	29'6"	9.76 m	32'0"	
FrontTireTread 7.04 m 23'1" 6.24 m 20'6" 6.53 m 20'5"	FrontTireTread	7.04 m	23'1''	6.24 m	20'6"	6.53 m	20'5"	

*See Weight Definitions and Relations on page 18 of this section. Note: No mandatory or optional attachments or fuel.

**Typical selection of mandatory and optional attachments.

***Data provided is for a representative body and liner package. Several dual slope, flat floor, and mine specific design (MSD) bodies and liner packages are available. All weights, capacities, and dimensions are dependent on the machine configuration (body type, attachments, tires, and optional equipment selected). §Reference Caterpillar's latest 10/10/20 Payload Policy for information on gross machine operating weight and target payload. †Liner used for 797F is a ¹/₈ solid liner.

NOTE: Contact Mining Representative to use Caterpillar Weight Configurator for application specific weights.

USE OF BRAKE PERFORMANCE CURVES

The speed that can be maintained when the machine is descending a grade with retarder applied can be determined from the retarder curves in this section when gross machine weight and total effective grade are known.

Select appropriate grade distance chart that covers total downhill haul; don't break haul into individual segments.

To determine brake performance: Read from gross weight down to the percent effective grade. (Effective grade equals actual % grade *minus* 1% for each 10 kg/ metric ton (20 lb/U.S. ton) of rolling resistance.) From this weight-effective grade point, read horizontally to the curve with the highest obtainable speed range, then down to maximum descent speed brakes can safely handle without exceeding cooling capacity. When braking, engine RPM should be maintained at the highest possible level without overspeeding. If cooling oil overheats, reduce ground speed to allow transmission to shift to next lower speed range.

Brake Performance Curves are made in compliance with ISO 10268 and applicable to Sea Level and 32° C (90° F) temperature. Contact Factory for Application Specific Performance.

USE OF RIMPULL-SPEED-GRADEABILITY CURVES

For best results, use Caterpillar Fleet Production and Cost Analysis (FPC) to simulate cycle time, fuel burn, and production for Application Specific Performance inquiries. Contact Factory Representative or visit catminer.cat. com/stb for more information.

(See Wheel Tractor Scraper Section)

Total Effective Grade (or Total Resistance) is grade assistance *minus* rolling resistance.

10 kg/metric ton (20 lb/U.S. ton) = 1% adverse grade.

Example —

With a favorable grade of 20% and rolling resistance of 50 kg/metric ton (100 lb/U.S. ton), find Total Effective Grade.

(50 kg/metric ton) = 50 ÷ 10 = 5% Effective Grade (from Rolling Resistance)
100 lb/ton = 100 ÷ 20 = 5% Effective Grade 20% (grade) - 5% (resistance) = 15% Total Effective Grade

TYPICAL FIXED TIMES FOR HAULING UNITS

Wait time, delays and operator efficiency all impact cycle time. Minimizing truck exchange time can have a significant effect on productivity.

Fixed time for hauling units include:

- 1. Truck load time (various with loading tool)
- 2. Truck maneuver in load area (Truck exchange) (Typically 0.6-0.8 min.)
- 3. Maneuver and dump time at dump point (Typically 1.0-1.2 min.)

Total cycle time is the combination of:

- 1. The above fixed time
- 2. Hauling time (Loaded)
- 3. Return time (Empty)

Example — assume load tool spots hauler with full bucket 988F 5130B

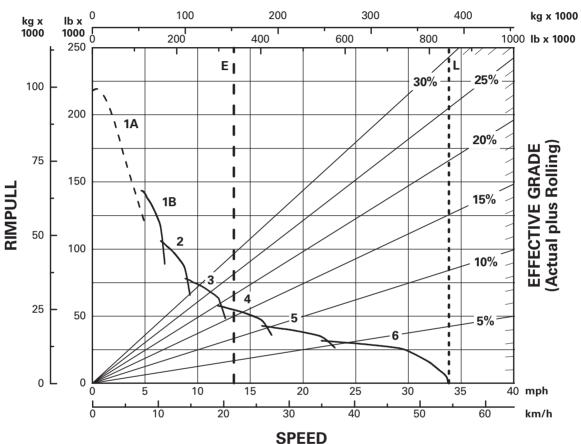
cycle	times		.45
First pass	(dump time)		.05 min.
2 passes	(full cycle)		.50
3 passes			.95
4 passes			1.40
5 passes			1.85
6 passes			2.30
7 passes			2.75
8 passes		4.30	3.20
9 passes			3.65
10 passes			4.10

NOTE: Other sizes of loading tools will have different cycle times. See Wheel Loader section for **average** cycle times for truck loading.

Mining & Off-Highway Trucks

793D Rimpull-Speed-Gradeability

- Standard Arrangement*
- 40.00R57 Tires
- 1778 mm (5'10") Tire Radius



GROSS WEIGHT

KEY

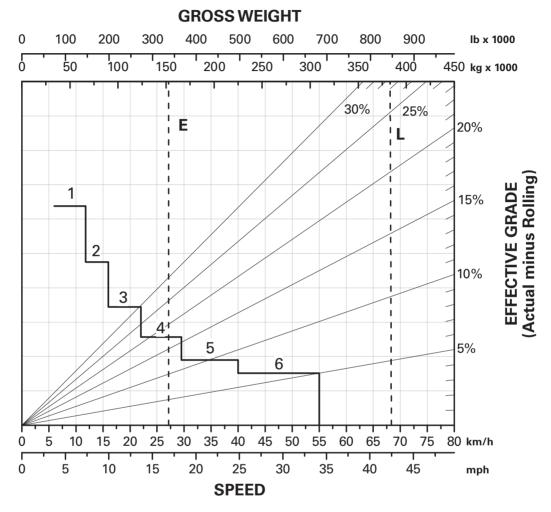
- 1A 1st Gear (Torque Converter)
- 1B 1st Gear
- 2 2nd Gear
- 3 3rd Gear
- 4 4th Gear
- 5 5th Gear
- 6 6th Gear

- KEY
- E Empty Operating Weight 154 729 kg (341,119 lb)
- L Target GMW 383 740 kg (846,000 lb)

*At Sea Level.

793D Brake PerformanceStandard Arrangement*

• Continuous Grade Retarding





KEY

- 1 1st Gear
- 2 2nd Gear
- 3 3rd Gear
- 4 4th Gear
- 5 5th Gear
- 6 6th Gear

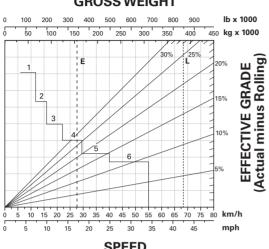
- KEY
- E Empty Operating Weight 154 729 kg (341,119 lb)
- L Target GMW 383 740 kg (846,000 lb)

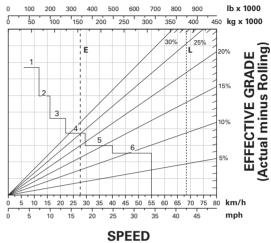
*At Sea Level.

Mining & Off-Highway Trucks

793D Brake Performance

- Standard Arrangement*
- 450 m (1500 ft) 600 m (2000 ft)
- 900 m (3000 ft) 1500 m (5000 ft)



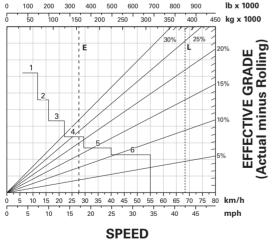


GROSS WEIGHT

GRADE DISTANCE - 600 m (2000 ft)

SPEED GRADE DISTANCE - 450 m (1500 ft)







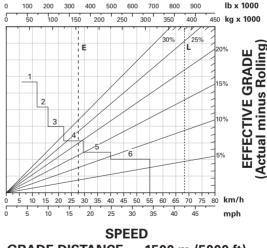


5 - 5th Gear 6 - 6th Gear

- KEY
- E Empty Operating Weight 154 729 kg (341,119 lb)
- L Target GMW 383 740 kg (846,000 lb)

*At Sea Level.





GRADE DISTANCE - 1500 m (5000 ft)

Appendix B.2.7 Misc. Unit Costs



Revegetation/Reclamation Rangeland Rehabilitation Landscaping / Fencing Hydroseeding **Environmental Consulting**

ROCKY MOUNTAIN RECLAMATION

Phone

(307) 745-5235 (307) 745-5230

ron@reveg.us www.reveg.us

P.O. Box 1695 Laramie, WY 82073

FREEPORT MCMORAN – NEW MEXICO MINING OPERATIONS

PRICE ESTIMATES FOR REVEGETATION SERVICES FOR BUDGETING ESTIMATES

Table 1 – Freeport McMoRan, New Mexico Mining Operations – Price Estimates for **Revegetation Services for Budgeting Estimates, prepared April, 2018.**

	ESTIMATED)	COST/UNIT	
REVEGETATION OPERATION	QUANTITY	UNITS	(\$)	TOTAL COST
I. <u>OPERATIONS:</u>				
1 SCARIFYING	500	Acres	\$30.00	\$15,000.00
2 DISCING	500	Acres	\$20.00	\$10,000.00
3 DRILL SEEDING (special Rangeland Drill)	500	Acres	\$80.00	\$40,000.00
4 MULCHING	500	Acres	\$148.00	\$74,000.00
5 CRIMPING	500	Acres	\$55.00	\$27,500.00
6 DAILY PER DIEM, ETC.	50	Days	\$385.00	\$19,250.00
7 MOBILIZATION	1	Each	\$13,500.00	\$13,500.00
Subtotal				\$199,250.00
II. <u>MATERIALS:</u>				
1 SEED at 8.9 PLS/acre	500	Acres	\$210.00	\$105,000.00
2 HAY MULCH - nox. weed free, native	1000	Tons	\$245.00	\$245,000.00
Subtotal				\$350,000.00
TOTAL ESTIMATED REVEGETATION COST	Г <mark>BEFORE</mark> ТА	X		\$549,250.00
Add New Mexico Gross Receipts Tax	5.9375	%	=	\$32,611.72
ESTIMATED REVEGETATION COST PER A	CRE:		\$1,163.72	
TOTAL ESTIMATED REVEGETATION COST	ſ			\$581,861.72

Estimate prepared by Ron Schreibeis, Rocky Mountain Reclamation, for use for Budgeting Estimates.



T.G. McCauley, Inc. P.O. Box 443 Cliff, NM 88028 575-535-2341 Fax 575-535-2343

Lic# 377614

tgmccauleyinc@gmail.com

March 13, 2018

To: Jean Humphrey RE: rip rap to Cobre Mine

Here is the pricing for TG McCauley, Inc to deliver material to Cobre Mine. The conversion factor that was used for this size and type of material is 1.316. The price includes delivery but not any applicable sales tax. Please contact us with any questions. Thank you.

MATERIAL 15" rip rap 8" rip rap **QTY- CY** 50,000 yards 20,000 yards **QYT-TONS** 65,800 tons 26,320 tons **DEL PRICE** \$39.00/ ton \$31.00/ ton

T.G. McCauley, Inc

Appendix B.2.8 Well Abandonment Costs

Wet Drill Hole Abandonment Unit Costs

		w/o		
MMD	Indirects	Indirects	Inflation 2013 to 2018	Unit Cost
(\$/ft)	(%)	(\$/ft)	(%)	\$/ft
\$ 14.00	28.30%	\$ 10.04	5.607 %	10.60

Unit cost based on NM EMNRD MMD Guidance:

http://www.emnrd.state.nm.us/MMD/MARP/documents/MMD_Part3FAGuidelines_Sept2013.pdf

Inflation factor calculated from information at

https://edzarenski.com/2016/10/24/construction-inflation-index-tables-2017/

Appendix B.2.9

Down Drain Channel Bench Top Channel Berm Unit Costs

Type 1 Top Channel Unit Cost Development

							Production	Maximum						Direct			
						Soil	Method/	Push	Normal		Work			Drive	#		
Task Description	Equipment	Productivity	Productivity	Material	Grade	Weight	Blade	Distance	Production	Operator	Hour	Visibility	Elevation	Trans.	passes	Width	Speed
		(cy/hr)	(hr/lf)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor		(feet)	(miles/hr)
Excavate	D11T	807	-	1.0	1.00	3,300	1.00	175	1853	0.75	50	1.00	1.00	1.00			
Waste	D11T	719	-	1.0	1.00	3,300	1.00	200	1651	0.75	50	1.00	1.00	1.00			
Finish Grade	D9T	-	0.0013	1.0	1.00	3,300	1.00	-	-	0.75	50	1.00	1.00	1.00	3	14.25	1

Task Description	Equipment	Volume ¹ (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	DownDrain Cost (\$/lf)
Excavate	D11T	2.4	0.003	\$414.50	\$26.29	\$440.79	\$1.34
Waste	D11T	2.4	0.003	\$414.50	\$26.29	\$440.79	\$1.50
Finish Grade	D9T	-	0.0013	\$178.02	\$26.29	\$204.31	\$0.27
Total							\$3.10

Notes:

10' Bottom width, 3:1 side slopes, 2' deep, 1' thick riprap, 0.5' thick gravel Volumes based on cross-section area for excavation and waste Finish Grade assume 3 passes

Type 2 Top Channel Unit Cost Development

Task Description	Equipment	Productivity	Productivity	Material	Grade	Soil Weight	Production Method/ Blade	Maximum Push Distance	Normal Production	Operator	Work Hour	Visibility	Elevation	Direct Drive Trans.	# passes	Width (feet)	Speed (miles/hr)
		(cy/hr)	(hr/lf)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor		(leel)	(miles/m)
Excavate	D11T	807	-	1.0	1.00	3,300	1.00	175	1853	0.75	50	1.00	1.00	1.00			
Waste	D11T	719	-	1.0	1.00	3,300	1.00	200	1651	0.75	50	1.00	1.00	1.00			
Finish Grade	D6T XL SU	-	0.0013	1.0	1.00	3,300	1.00	-	-	0.75	50	1.00	1.00	1.00	3	17.5	1

\$4.78

Task Description	Equipment	Volume ¹	Productivity	Equipment Cost	Operator Cost (IV)	Dozer Cost	DownDrain Cost
Task Description	Lquipinent	(cy/lf)	(hrs/lf)	(\$/hr)	(\$/hr)	(\$/hr)	(\$/lf)
Excavate	D11T	7.6	0.009	\$414.50	\$26.29	\$440.79	\$4.13
Waste	D11T	7.6	0.011	\$414.50	\$26.29	\$440.79	\$4.63
Finish Grade	D6T XL SU	-	0.0013	\$88.86	\$26.29	\$115.15	\$0.15
Total							\$8.91

Notes:

20' Bottom width, 3:1 side slopes, 3' deep, 2.5' thick riprap, 0.5' thick gravel Volumes based on cross-section area for excavation and waste Finish Grade assume 2' overlap.

Downdrain (Type 2 Chanenel) Unit Cost Development

							Production	Maximum						Direct			
						Soil	Method/	Push	Normal		Work			Drive	#		
Task Description	Equipment	Productivity	Productivity	Material	Grade	Weight	Blade	Distance	Production	Operator	Hour	Visibility	Elevation	Trans.	passes	Width	Speed
		(cy/hr)	(hr/lf)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor		(feet)	(miles/hr)
Excavate	D11T	1,291	-	1.0	1.60	3,300	1.00	175	1853	0.75	50	1.00	1.00	1.00			
Waste	D11T	1,151	-	1.0	1.60	3,300	1.00	200	1651	0.75	50	1.00	1.00	1.00			
Finish Grade	D6T XL SU	-	0.0008	1.0	1.60	3,300	1.00	-	-	0.75	50	1.00	1.00	1.00	3	17.5	1

Task Description	Equipment	Volume ¹ (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	DownDrain Cost (\$/lf)
Excavate	D11T	7.6	0.006	\$414.50	\$26.29	\$440.79	\$2.58
Waste	D11T	7.6	0.007	\$414.50	\$26.29	\$440.79	\$2.89
Finish Grade	D6T XL SU	-	0.0008	\$88.86	\$26.29	\$115.15	\$0.09
Total							\$5.57

Notes:

20' Bottom width, 3:1 side slopes, 3' deep, 2.5' thick riprap, 0.5' thick gravel Volumes based on cross-section area for excavation and waste

Finish Grade assume 2' overlap.

Outslope Channel Unit Cost Development

							Production	Maximum						Direct			
						Soil	Method/	Push	Normal		Work			Drive	#		
Task Description	Equipment	Productivity	Productivity	Material	Grade	Weight	Blade	Distance	Production	Operator	Hour	Visibility	Elevation	Trans.	passes	Width	Speed
		(cy/hr)	(hr/lf)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor		(feet)	(miles/hr)
Excavate	D11T	807	-	1.0	1.00	3,300	1.00	175	1853	0.75	50	1.00	1.00	1.00			
Waste	D11T	1,151	-	1.0	1.60	3,300	1.00	200	1651	0.75	50	1.00	1.00	1.00			
Finish Grade	D6T XL SU	-	0.0004	1.0	1.00	3,300	1.00	-	-	0.75	50	1.00	1.00	1.00	1	17.5	1

Task Description	Equipment	Volume ¹ (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	DownDrain Cost (\$/lf)
Excavate	D11T	0.43	0.0005	\$414.50	\$26.29	\$440.79	\$0.23
Waste	D11T	0.43	0.0004	\$414.50	\$26.29	\$440.79	\$0.16
Finish Grade	D6T XL SU	-	0.0004	\$88.86	\$26.29	\$115.15	\$0.05
Total							\$0.45

Notes:

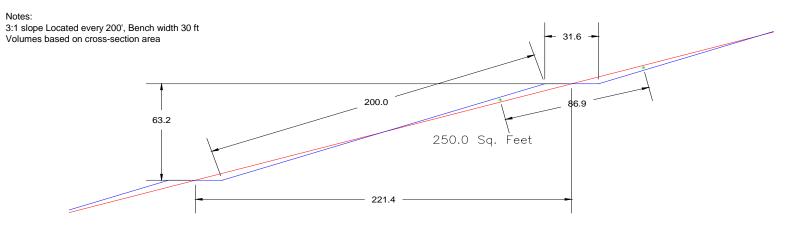
Bench width 30 ft, 5% slope towards interior, 0.5' deep riprap by 20' wide riprap on 5% slope and 3' wide riprap on the 3:1 slope Volumes based on cross-section area for excavation and waste Finish Grade assume 2' overlap.

Linear_Foot_Cost_2018_20180519.xlsx Outslope Channel 4/8

Bench Unit Cost Development for Stockpiles 3:1 slope

							Production	Maximum						Direct			
						Soil	Method/	Push	Normal		Work			Drive	#		I
Task Description	Equipment	Productivity	Productivity	Material	Grade	Weight	Blade	Distance	Production	Operator	Hour	Visibility	Elevation	Trans.	Passes	Width	Speed
		(cy/hr)	(hrs/lf)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor		(feet)	(miles/hr)
Excavate	D11T	2362		1.0	1.6	3300	1.0	86.9	3389	0.75	50	1.0	1.0	1.0	-	-	-
Finish Grade	D9T		0.0013	1.0	1.0	3300	1.0	-	-	0.75	50	1.0	1.0	1.0	3	14.25	1.0

Task Descriptic	on Equipment	Volume (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	Bench Cost (\$/lf)
Excavate	D11T	9.26	0.0039	\$414.50	\$26.29	\$440.79	\$1.73
Finish Grade Total	D9T	-	0.0013	\$178.02	\$26.29	\$204.31	\$0.27 \$1.99



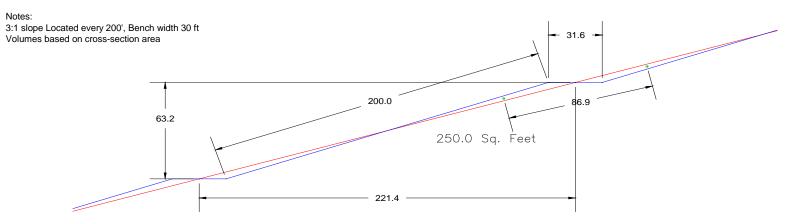
Bench Unit Cost Development for Stockpiles 2.5:1 slope

						Soil	Production Method/	Maximum Push	Normal	_	Work			Direct Drive	#		
Task Description	Equipment	Productivity (cy/hr)	Productivity (hrs/lf)	Material Factor	Grade Factor	Weight (lb/cy)	Blade Factor	Distance (feet)	Production (cy/hr)	Operator Factor	Hour (min/hr)	Visibility Factor	Elevation Factor	Trans. Factor	Passes	Width (feet)	Speed (miles/hr
Excavate Finish Grade	D11T D9T	2917 -	- 0.0013	1.0 1.0	1.8 1.0	3300 3300	1.0 1.0	78.0 -	3720	0.75 0.75	50 50	1.0 1.0	1.0 1.0	1.0 1.0	3	14.25	1.0
Task Description	Equipment	Volume (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	Bench Cost (\$/lf)										
Excavate Finish Grade Total	D11T D9T	9.52	0.0033 0.0013	\$414.50 \$178.02	\$26.29 \$26.29	\$440.79 \$204.31	\$1.44 \$0.27 \$1.71										_
2.5:1 slope Locate Volumes based or			31 ft								78.3				-		
			65.0)			175.0			-							

Bench Unit Cost Development for Tailings 3:1 slope

							Production	Maximum						Direct			
						Soil	Method/	Push	Normal		Work			Drive	#		
Task Description	Equipment	Productivity	Productivity	Material	Grade	Weight	Blade	Distance	Production	Operator	Hour	Visibility	Elevation	Trans.	Passes	Width	Speed
		(cy/hr)	(hrs/lf)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	Factor	(min/hr)	Factor	Factor	Factor		(feet)	(miles/hr)
Excavate	D11T	2688		1.0	1.6	2900	1.0	86.9	3389	0.75	50	1.0	1.0	1.0	-	-	-
Finish Grade	D9T		0.0011	1.0	1.0	2900	1.0	-	-	0.75	50	1.0	1.0	1.0	3	14.25	1.0

Task Descriptic	on Equipment	Volume (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	Bench Cost (\$/lf)
Excavate	D11T	9.26	0.0034	\$414.50	\$26.29	\$440.79	\$1.52
Finish Grade Total	D9T	-	0.0011	\$178.02	\$26.29	\$204.31	\$0.23 \$1.75



Berm Unit Cost Development

Task Description	Equipment	Productivity	Material	Grade	Soil Weight	Production Method/ Blade	Maximum Push Distance	Normal Production	Operator	Work Hour	Visibility	Elevation	Direct Drive Trans.
		(cy/hr)	Factor	Factor	(lb/cy)	Factor	(feet)	(cy/hr)	•	(min/hr)	Factor	Factor	Factor
Excavate	D6T XL SU	196	1.0	1.00	3,300	1.00	100	449	0.75	50	1.00	1.00	1.00
Finish	D6T XL SU	340	1.0	1.00	3,300	1.00	50	781	0.75	50	1.00	1.00	1.00

Task Description	Equipment	Volume (cy/lf)	Productivity (hrs/lf)	Equipment Cost (\$/hr)	Operator Cost (IV) (\$/hr)	Dozer Cost (\$/hr)	Berm Cost (\$/lf)
Excavate	D6T XL SU	3.7	0.0189	\$88.86	\$26.29	\$115.15	\$2.18
Finish Grade	D6T XL SU	1.2	0.0035	\$88.86	\$26.29	\$115.15	\$0.41
Total							\$2.59

Berm 2:1 slope, 5' high, 10' top width

Excavate								
Berm Dimensions	10	5	50 ft3/lf					
Derm Dimensions	10	5	50 ft3/lf					
Total			100 ft3/lf					
Volume			3.7 cy/lf					

-	
Finish Grade	
Slope length x1	11.2 ft
Slope length x1	11.2 ft
Top length	10 ft
Total Length	32.4 ft
Depth	1 ft
Width	1 ft
Volume	32.4 ft3/lf
Volume	1.2 cy/lf

Rip Rap Load and Haul Unit Cost

Rip Rap Haul		Cobre Ri	Cobre Riprap Haulage			
Direct Costs	Earthmoving Subtotal, Direct Costs	Current \$ \$	138,646 138,646			
Total Costs		\$	138,646			

Hauling			April 18, 2018
	Truck Optimum Cycle No. of Task		Travel Time Travel Time Travel Time Loaded Loaded Empty Empty
Task Description	Location 1 Location 2 Equipment Volume Time Trucks Productivity Time (cy) (min) (cy/hr) (hrs)		Segment 1 Segment 2 Segment 1 Segment 2 (min/ft) (min/ft) (min/ft)
Haul riprap	Borrow Area Destination str 793 74,470 13 2 1,302 69 57.2	126 169 12 7,920 7,920 0 0.0% 0.0% 2.5% 2,414 0 3% 0% 3% 3% 3.3 2.7 7.8 0.7 1.1 50 0	0.00135 0.00110 0.00113 0.00113
Loader	Net Loader Bucket Cycle Task	Heaped Bucket Bucket Fill Haul Haul Rolling Load Swing Dump Swing Work	
Task Description	Location 1 Location 2 Equipment Volume Capacity Time Productivity Time (cy) (cy) (min) (cy/hr) (hours erial Borrow Area Destination str 992/K 7/4/70 14.0 0.65 1,0/77 69	Capacity Factor Distance Grade Resistance Bucket Loaded Bucket Empty Hour	

Equipment Type	t	Task	Location 1	Location 2	Owning and Operating Cost (\$/hr)	Fuel Consumption (gal/hr)	Fuel Consumption (gal)	Labo Cost (\$/h	t	Number of Units (Equipment)	Time Req'd (hrs)	Total Cost (\$)	
Dozers-Ear D11T CD	thmoving	Dozer Assist	Borrow Area	-	\$414.50	26	1,772	\$	26.29	1	69	\$	30,481
Water True Motor Gra			roads roads		\$86.99 \$99.13	8 14	539 992	-	26.29 26.29	1 1	69 69	\$ \$	7,833 8,673
Loaders Trucks	Cat 992K Loader	Load riprap	Borrow Area	9 Stockpile	\$294.35	26	1,772	\$	26.56	1	69	\$	22,191
TTUCKS	Cat 793 truck	Haul riprap	Borrow Area	9 Stockpile	\$478.45	26	3,545	\$	23.84	2	138	\$	69,467
											riprap haul total \$/yd^3	\$ \$	138,646 1.86

Data Sources:

1. Equipment unit rates from EquipmentWatch Custom Cost Evaluator March 2018 (http://www.equipmentwatch.com). See attachments for rate development.

2. Griffin Propane March 12, 2018; Cobre receives an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Cobre Mine (per MMD's requirements). The indirect cost is removed from the all-inclusive fuel quote and accounted for in the indirects.

3. https://www.electricitylocal.com/states/new-mexico/silver-city/

4. Labor rates based on NM Department of Labor Type H (Heavy Engineering) 2018 labor rates.

https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Prevailing_Wage_Poster_H_2018.pdf Owning and Adjusted

Rip Rap Placment Unit Cost

Gravel Placement

<u>Assumptions:</u> 300hp 980G Front Loader 3.65 CY Bucket (heaped) 85% bucket fill ¹ Net 3.1 CY				
Load Time ¹				0.65 min
Delivery Travel Time ¹	150 ft at	4 mph =	5.87 ft/sec	0.43 min
Unload and Maneuver Time ¹	20 sec +	20 sec		0.67 min
Return Travel Time ¹				0.43 min
				2.17 min

300 hp 980G Front End Loader Operating, Ownership, Fuel, and Labor Cost (per hour)

	Fuel Use Gal per Hour ²		Fuel Total \$	/hr ^{2,4}		er/Operate \$/hr	Owner/Oj \$/hr w/l		Owner/(\$/hr w/ Lab	'Fuel &
Cat 980G Loader	10	0.2	\$	20.16	\$	55.72	\$	75.88	\$	102.44
³ Cost per cubic yard at 2.	17 minutes per load, 50 minute	e wo	rk hour							
		23 I	oads per hou	r						
Loader	costs \$102.44 per hour,		\$4.43 per load							
Cost pe	er CY		\$1.43							
Fuel		\$1.9718 per gallon								

NOTES:

1. Equipment unit rates from EquipmentWatch Custom Cost Evaluator March 2018 (http://www.equipmentwatch.com). See attachments for rate development.

2. Griffin Propane March 12, 2018; Cobre receives an all-inclusive quote (direct and indirect costs) for the delivery of fuel to Cobre Mine (per MMD's requirements). The indirect

3. https://www.electricitylocal.com/states/new-mexico/silver-city/

4. Labor rates based on NM Department of Labor Type H (Heavy Engineering) 2018 labor rates.

https://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Prevailing_Wage_Poster_H_2018.pdf

RipRapProdUnitRates_20180519.xlsx Gravel Placement 2/4

Table 12: D11 Dozer 2015 Average Work Hour

	D11T Dozer										
D11T Dozer Information	Hours	Comments									
Hours/Day	8	Work Hours per Day									
Downtime	15%	2018 EquipmentWatch,									
Availability	6.8	Hours/Day									
Availability	51	Minutes/Hour									
% Availability	85%										

Equipment	Eq	uipment	# Equipment		Op	erator	# Operator		Total
		(\$/hr)			(\$/hr)			(\$/hr)
0 + 0001/1		204.25				26.56		<u>,</u>	222.01
Cat 992K Loader	Ş	294.35		1	Ş	26.56	1	. Ş	320.91
793 Haul Truck	\$	478.45		2	\$	23.84	2	\$	1,004.58
980G Loader	\$	75.88		0	\$	26.56	1	\$	102.44
14M Grader	\$	99.13		0	\$	26.29	1	\$	125.42
Water Truck	\$	86.99		1	\$	23.84	1	\$	110.83
Supervisor	Ş	-		-	Ş	23.48	1	Ş	23.48

APPENDIX B.3 ENGINEERING QUANTITIES



TECHNICAL MEMORANDUM

DATE:	October 8, 2014	Telesto #	200189
то:	Cobre Mining Company		
FROM:	April Tischer		
SUBJECT:	Earthwork Cost Estimate Take	eoff Summary	y Quantity Definitions

This technical memorandum presents a summary discussion of the engineering quantities used in developing the reclamation earthwork cost estimate for the Continental Mine for the anticipated end of year 2019 topography. The reclamation quantities are summarized in Tables 1 through 3. Tables 1 and 2 list the quantities associated with the earthwork. Table 3 provides the riprap and gravel volume per foot for each channel type. The quantities for each facility were separated into sections of uniform slope, and matching reclamation criteria. A summary description of each item shown in Table 1 is presented below which includes the basis for determining each particular quantity.

Item 1.1 Outslope Cut - Pushdown

This item includes earthwork cut volume (cut) required for regrading tailings pond and stockpile outslopes. Quantities were calculated using Autodesk Civil 3D. The cut and fill volumes within each section were balanced to within 10%. The average of the cut and fill volumes were used in the cost estimate. The cut area is near the top of the slope and the fill area is near the base. It was assumed that the cut material will be pushed down the slope, where it will be placed as fill. Quantities required to excavate benches are included separately in Item 6.1.

Item 1.2 Outslope Fill - Pushdown

This item includes earthwork fill volumes (fill) required for regrading the tailings pond and stockpile outslopes. Quantities were calculated using Autodesk Civil 3D.

The cut and fill volumes within each section were balanced to within 10%. The average of the cut and fill volumes was used in the cost estimate. The cut area is near the top of the slope and the fill area is near the base. It was assumed that the cut material will be pushed down the slope, where it will be placed as fill. Quantities required to excavate benches are included separately in Item 6.1.

Item 1.3 Outslope Cut/Fill Pushdown Distance

This item is the average sloped distance between the approximate centroids of the cut and fill blocks for regrading the stockpile and tailings outslopes.

Item 1.4 Outslope Surface Grade

This item is the final overall grade of the regraded outslope, prior to cutting in any benches. For locations where benches are not required it is equal to the final slope.

Item 2.1 Top Cut

This item includes the earthwork cut volume required for regrading the tailings pond and stockpile top surfaces. Quantities were calculated using Autodesk Civil 3D. The cut and fill volumes within each section were balanced to within 10%. The average of the cut and fill volumes was used in the cost estimate. It was assumed that the cut material will be pushed to where it will be placed as fill.

Item 2.2 Top Fill

This item includes the earthwork fill volume required for regrading the tailings pond and stockpile top surfaces. Quantities were calculated using Autodesk Civil 3D. The cut and fill volumes within each section were balanced to within 10%. The average of the cut and fill volumes was used in the cost estimate. It was assumed that the cut material will be pushed to where it will be placed as fill.

Item 2.3 Top Cut/Fill Push Distance

This item is the average distance between the estimated centroid of the cut and fill blocks for regrading the stockpile and tailings top surfaces.

Item 2.4 Top Surface Grade %

This item is the final overall grade of the regraded top surface. Where no quantities are indicated in Items 2.2 and 2.3, the grading is done by area, Item 4.1, to obtain a smooth finish at the grade specified.

Item 3.1 Outslope Surface Approximate Sloped Area

This item includes the outslope area that will receive cover, and revegetation. Revegetation costs include chiseling or ripping, scarifying, discing, rangeland drill seeding, mulching, crimping, and mobilization. The planer (horizontal) area was multiplied by a slope correction factor to approximate the true sloped surface area.

Item 3.2 Outslope Surface Cover Push Distance

This item is the estimated average push distance to spread cover material over tailings or stockpile outslopes. It assumes the truck haul and dumping can be coordinated to minimize push distance.

Item 3.3 Outslope Surface Cover Depth

This item is the depth of cover, measured normal to the slope, to be placed over the tailings and stockpile outslopes. It does not include material that may already be approved as cover already in place for a particular facility.

Item 3.4 Outslope Surface Cover Fill

This item is the quantity of cover fill to cover the stockpile and tailings outslopes at the depth specified in Item 3.3, over the area specified in Item 3.1. Cover fill

volumes were obtained by multiplying the area specified in Item 3.1 by Item 3.3 and converting to cubic yards.

Item 4.1 Top Surface Area

This item includes stockpile and tailings top surfaces as well as surface impoundments that will receive grading, cover, and revegetation where indicated. Grading involves making one pass with a blade over the surface to obtain a smooth finished grade. Revegetation costs include chiseling or ripping, scarifying, discing, rangeland drill seeding, mulching, crimping, and mobilization. This item includes borrow areas that require revegetation.

Item 4.2 Top Surface Cover Push Distance

This item is the estimated average push distance to spread cover material over stockpile and tailings top surfaces as well as surface impoundments. It assumes the truck haul and dumping can be coordinated to minimize push distance.

Item 4.3 Top Surface Cover Depth

This item is the depth of cover to be placed over stockpile and tailings top surfaces as well as surface impoundments. It does not include material that may already be approved as cover already in place for a particular facility.

Item 4.4 Top Surface Cover Fill

This item is the quantity of cover fill to cover the stockpile and tailings top surfaces as well as surface impoundments at the depth specified in Item 4.3 over the area specified in Item 4.1. Cover fill volumes were obtained by multiplying the area specified in Item 4.1 by Item 4.3 and converting to cubic yards.

Item 5.1 Cover Source

This item provides the location cover material is assumed to be obtained for each facility based on the 2014 mine expansion plan, the volume of available cover

material, and proximity to the facility being covered. These haul routes are subject to change based on those factors. Borrow locations are used to determine haul distance and grades in Items 5.2 through 5.8.

Item 5.2 - 5.5 Cover Haul Distance

These items describe the two-dimensional haul distance between the approximate centroid of the borrow source and cover areas. Depending on the terrain, the haul route has been divided into as many as three segments. If the grades along the haul route are generally uniform, the haul route was described using one or two haul segments. The Drawings in the CCP show the main haul routes.

Item 5.6 - 5.8 Cover Haul Grades

These items represent the grades of the haul segments described in Items 5.2-5.5.

Item 6.1 Outslope Bench Length

This item represents the length of benches to be cut into the stockpile outslopes. The length of benches is equal to the length of the outslope channels. Bench cross sections are shown in the CCP Drawings.

Item 6.2 Outslope Channel Length

This item represents the length of surface water channels to be constructed on benches of the stockpile outslopes. It was assumed that channels will be located on each outslope bench. The conceptual channel locations and channel cross sections are shown on the CCP Drawings.

Item 6.3 Outslope Channel Riprap

This item includes the volume of riprap material required for the outslope channels described in Item 6.2. Because there is no known source of material that can supply these quantities in the vicinity of the stockpiles, it was assumed that all

riprap is purchased. This assumption may change if a nearby source is identified. The riprap quantity calculations are summarized in Table 3.

Item 7.1 Channel Length

This item represents the length of surface water channels to be constructed on the stockpile and tailings top surfaces. The conceptual channel locations and channel cross-sections are shown on the CCP Drawings.

Item 7.2 Channel Riprap

This item includes the volume of riprap material required for the top channels described in Item 7.1. The riprap quantity calculations are summarized in Table 3.

Item 7.3 Gravel

This item includes the volume of gravel required for the top channels described in Item 7.1. The gravel quantity calculations are summarized in Table 3.

Item 8.1 Downdrain Length

This item represents the length of the downdrains to be constructed on the stockpiles and tailings. The conceptual downdrain locations, and channel cross-sections are shown on the Drawings in the CCP.

Item 8.2 Downdrain Riprap

This item includes the volume of riprap material required for the downdrains described in Item 8.1. The downdrain riprap calculations are summarized in Table 3.

Item 8.3 Downdrain Gravel

This item includes the volume of gravel required for the downdrains described in Item 8.1. The gravel quantity calculations are summarized in Table 3.

Item 9.1 Perimeter

This item describes the length of safety berm and fence.



Continental Mine Closure/Closeout Plan Update Quantity Summary Sheet

SOLUTIONS INCORPORA		Quantity Currin																						<u> </u>	'
		1																						·	
TABLE 1 - STOCKPILI	E QUANTITY SUMMARY																								
		Outslope	Outslope	Outslope	Outslope	Тор	Тор	Тор	Top Surface	Outslope	Outslope Surface	Outslope	Outslope	Top Surface	Top Surface	Тор	Тор	Cover	Cover Fill	Cover Fill	Cover Fill	Cover Fill	Cover Fill	Cover Fill	Cover Fill
		Cut	Fill	Cut/Fill	Surface	Cut	Fill	Cut/Fill	Grade %	Surface	Cover	Surface	Surface Cover	Surface	Cover	Surface	Surface	Source	Haul Dist.	Haul Dist.	Haul Dist.			Haul Grade	
		Pushdown		Pushdown	Grade %			Push	2.240 /0	Area	Push	Cover depth	Cover	Area	Push	Cover depth	Cover		Distance	Distance	Distance	Distance		Grade	Grade
Facility Type	Item	i dondo im	i dondo ini	Distance				Distance		7100	Distance	Depth	Fill	7.104	Distance	Depth	Fill		Total	Leg 1	Leg 2	Leg 3	Leg 1	Leg 2	Leg 3
		(CY)	(CY)	(ft)		(CY)	(CY)	(ft)		(Acres)	(FT)	(Inches)	(CY)	(Acres)	(FT)	(Inches)	(CY)		(ft)	(ft)		(ft)	(%)	(%)	(%)
		Item 1.1	Item 1.2	Item 1.3	Item 1.4			(/	Item 2.4	Item 3.1	Item 3.2	Item 3.3	Item 3.4	Item 4.1	Item 4.2	Item 4.3	Item 4.4	Item 5.1	Item 5.2	Item 5.3	Item 5.4	Item 5.5	Item 5.6	Item 5.7	Item 5.8
	South Waste Rock Disposal Facility				-33% to -28%	_				256	100	36	1,237,104			36		North OB Stockpile	12,559	2,310	7,312	2,937	-8.9%		
	South Waste Rock Disposal Facility	-	-	-	-33% 10 -26%	000,000	000,000	540	-1% -1%	200			1,237,104	85 25	100 100	36	1	North OB Stockpile	12,559	2,310	7,312	2,937	-8.9%	-1.0% -1.0%	4.1% 4.1%
	Disturbed Area Adjacent and North of South Waste Rock Disposal	-	-	-	-		-	-	- 1 70	-	-	-	-	20	100	30	119,540		12,559	2,310	7,312	2,937	-0.9%	-1.0%	4.1%
	Facility													21											1
Stockpiles	Hanover Mountain Deposit	-	-	-	-		-	-	-	-	-	-	-	93	- 100	-	- 451.572	- North OB Stockpile	- 5,707	1,759	2,466	- 1482	-9.9%	-8.1%	- 6.7%
	Pearson-Barnes Mine Area	-	-	-	-		-	-	- 17%	-	-	-	-	12	100	36	57.596	North OB Stockpile	12,559	2,310	7,312	2,937	-9.9%	-1.0%	4.1%
	Pearson-Barnes Mine Area	-			_	- [-	-	17%		-	-	-	12	100	36	57,596	North OB Stockpile	12,559	2,310	7,312	2,937	-8.9%	-1.0%	4.1%
	Low Grade WRF	-			-33%			_		- 28	100	- 12	44,899	-	100		-	North OB Stockpile	5,310	2,310	3,000	2,957	-8.9%	-2.3%	4.170
	Low Grade WRF		_	_	0070		-	-	-	20	100	12	44,899		_	-	-	North OB Stockpile	5,310	2,310	3,000	0	-8.9%	-2.3%	
		-	-	-	-33%		-	-	-	20	100	12	44,099	-	-	-	-		5,510	2,310	3,000	0	-0.9%	-2.3%	-
	Main Tailin na luan ann der anti	170.000	100.005	050	000/	10 51 1	50.075	000	0.00/	36.3	100	36	475.007	108	100	10	004.044	North OB Stockpile; Reclaim Pond Outlet Channel cut	7 400	2,310	1.0.10	0.040	0.00/	4 50/	
	Main Tailings Impoundment ¹	176,903	163,685	250	-33%	42,514	59,075	200	-0.8%	36.3	100	36	175,837	108	100	18	261,844	Reclaim Pond Outlet Channel cut used	7,193	2,310	1,940	2,943	-8.9%	1.5%	3.6%
	Declaim Dand Quillat Channel					60.000													4 470	4470			0.00/	1	1
	Reclaim Pond Outlet Channel	-		-		62,226	-	-	-		-		-	-	-	-	-	for cover material	1,172	1172	-	-	-0.9%	-	-
	Tailing Pipeline Corridor ²	-	-	-	-	-	-	-	-1%	-	-	-	-	1.4	100	36	7,000	North OB Stockpile	7,193	2,310	1,940	2,943	-8.9%	1.5%	3.6%
	Top Soil Stockpile	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-
	NOBS (proposed)	-	-	-	-	-	-	-	-	-	-	-	-	17.4	-	-	-	-	-	-	-	-	-	-	-
	South OB Stockpile (proposed)	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-	-	-		
	Channel Cut used as Borrow Area Near Main Tailings Impoundment	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	
Borrow Areas	OB Stockpile-1	-	-		-		-	-	-	-	-	-	-	4.6	-	-	-	-	-	-	-	-	-		-
	OB Stockpile-2	-	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-
	OB Stockpile-3 OB Stockpile-4	-	-	-	-		-	-	-	-	-	-	-	5 4.3	-	-	-	-	-	-	-	-	-	-	-
	OB Stockpile-4 OB Stockpile-5	-	-	-	-		-	-	-	-	-	-	-	4.3 3.3	-	-	-		-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-	-	-		-
Roads	Haul Roads ³	-	-	-	-	-	-	-	-1%	-	-	-	-	45	-	-	-	-	-	-	-	-	-		-
	Exploration Roads	-	-	-	-	-	-	-	-1%	-	-	-	-	37	-	-	-	 	-	-	-	-	-	-	-
Continental Pit	Continental Pit berm and fence disturbance					-	-	-	-	-	-	-	-	17.6	-	-	-	- Nexth OD Obselveite	-	-	-	-	-	-	-
	Grape Gulch Pond #3 (HDPE lined; reclaimed year 12) Blackman's Seep (HDPE Lined; reclaimed year 5)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.4	100	36	1,839 48	North OB Stockpile	3,856	2310	1,546	-	-8.9%	-7.8%	-
		-	-	-	-	-	-	-	-1%	-	-	-	-	0.01	100	36	10	North OB Stockpile	3,856	2310 2310	1,546 1,546	-	-8.9%	-7.8% -7.8%	-
	Upper Creek Containment Pond 1 (HDPE Lined; Reclaimed year 12) Magnetite Seepage Pond (HDPE Lined) (Reclaimed year 12)	-	-	-	-	-	-	-	-1% -1%		-	-	-	1.1 0.2	100 100	36 36		North OB Stockpile North OB Stockpile	3,856 6,480	2,310	1,940	2,230	-8.9% -8.9%	1.5%	-4.0%
		-	-	-	-	-	-	-	-170	-	-	-	-	0.2	100			OB-1 Stockpile, OB-2 Stockpile, OB-3	0,400	2,310	1,940	2,230	-0.97	1.5 /0	-4.0 %
																		Stockpile, Topsoil Stockpile, South OB							1
	SWRF Dam 1 (Reclaimed year 12)								-1%	-				0.5	100	36	2,517	Stockpile, Topson Stockpile, South OB	3,630	3,630		_	-0.3%		1
	SWRF Dani T (Reciained year 12)	-	-	-	-	-	-	-	-170	-	-	-	-	0.5	100	30	2,517	OB-1 Stockpile, OB-2 Stockpile, OB-3	3,030	3,030	-	-	-0.3%		-
																		Stockpile, Topsoil Stockpile, South OB							1
	SWRF Dam 2 (Reclaimed year 12)					_	-	_	-1%	-	_	_		0.3	100	36		Stockpile	3,630	3,630		_	-0.3%	-	-
	SWRF Dani 2 (Reciained year 12)	-	-	-	-		-	-	-1 /0		-	-	-	0.3	100		1,040	OB-1 Stockpile, OB-2 Stockpile, OB-3	3,030	3,030	-	-	-0.3 /0	-	
Surface Impoundments ⁴																		Stockpile, Topsoil Stockpile, South OB							1
Surface impoundments	SWRF Dam 3 (Reclaimed year 12)	_		_	_		-	_	-1%	-	_	_	_	0.8	100	36	4,066	Stockpile	3,630	3,630	_		-0.3%		1 -
	SWRF Dam 1 (Reclaimed year 12)	-		_	_	_	-	_	-1%		-	-	_	0.5	100	36	,	North OB Stockpile	14,159	2,310	7,312	4,537	-8.9%	-1.0%	2.6%
	SWRF Dam 1 (Reclaimed year 12) SWRF Dam 2 (Reclaimed year 12)	-			- -			-	-1%	- -	-	-	-	0.3	100	36	1,646	North OB Stockpile	13,759	2,310	7,312	4,537	-8.9%	-1.0%	2.0%
	SWRF Dam 3 (Reclaimed year 12)			-		-	-	-	-1%	- -	-	-	-	0.8	100	36		North OB Stockpile	12,759	2,310	7,312	3,137	-8.9%	-1.0%	3.8%
	Decant Pond #4 (HDPE lined; reclaimed year 12)	-		-	-		-	-	-1%	-	-	-	-	0.6	100	36	3,001	North OB Stockpile	4,110	2,310	1,800	-	-8.9%	-1.1%	-
	North Tailings Decant Pond (Reclaimed year 12)	_	_	-	1	- 1	-	-	-1%	-	-	-	-	0.5	100	36	2,226	North OB Stockpile	4,110	2,310	1,800	1 -	-8.9%	-1.1%	-
	East WRF Containment (Proposed; Reclaimed Year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.5	100	36		North OB Stockpile	4,110	2,310	1,800	-	-8.9%	-1.1%	-
	Decant Pond #4 (HDPE lined; reclaimed year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.6	100	36	,	North OB Stockpile	4,110	2,310	1,800	-	-8.9%	0.3%	-
	Decant Pond #4 (HDPE lined; reclaimed year 12)	-	-	-	-	- 1	-	-	-1%	-	-	-	-	0.6	100	36	3,001	OB-4 Stockpile	1,000	1000	-	-	2.5%	-	-
	North Tailings Decant Pond (Reclaimed year 12)	-	-	-	-	- 1	-	-	-1%	-	-	-	-	0.5	100	36	2,226	OB-4 Stockpile	1,000	1000	-	-	2.5%	-	-
	East WRF Containment (Proposed; Reclaimed Year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.5	100	36		OB-4 Stockpile	1,000	1000	-	-	2.5%	-	-
·										·															·
		Be	ench	Outslop	e Channel		ype 1 Chan			Type 2 Cha			Downdrain		Perimeter										
		Length	Length	Length	Riprap	Length	Riprap	Gravel	Length	Riprap	Gravel	Length	Riprap	Gravel											
		3:1 slope	2.5:1 slope																						
Facility Type	Item	(ft)	(ft)	(ft)	(CY)	(FT)	(CY)	(CY)	(ft)	(CY)	(CY)	(ft)	(CY)	(CY)	(ft)										
		Item 6.1a	Item 6.1b		Item 6.3			Item 7.3	Item 7.1	Item 7.2	Item 7.3	Item 8.1	Item 8.2		Item 9.1										
Stockpiles	South Waste Rock Disposal Facility	14,126	25,463	39,589	17,023	3,964	3,817	2,202	-	-	-	8,595	36,959	9,025	-										
Tailings	Main Tailings Pond	3,894	-	3,894	1,674	-	-	-	2,141	9,206	2,248	1,353	5,818	1,421	-										
I annigs	Magnetite Tailings	-	-	-	-	-	-	-	-	-	-	420	1,806	441	-										

Stockpiles	Item	Cut Pushdown	Fill Pushdown	Cut/Fill Pushdown	Surface	Cut	Fill	Cut/Fill	Grade %	Surface	Carran	Curfaaa	Curfage Cover	Surface	Cover	Surface	Surface	0	Haul Dist.	Haul Dist.	Haul Dist.	Haul Dist.	Haul Grade	Haul Grade
		Pushdown	Pusnaown	Plichanun				Duch		Area	Cover	Surface	Surface Cover		Cover	Cover depth		Source			Distance		Crede	Crede
				Distance	Grade %			Push Distance		Area	Push Distance	Cover depth Depth	Cover Fill	Area	Push Distance	Depth	Cover Fill		Distance Total	Distance Leg 1	Leg 2	Distance Leg 3	Grade Leg 1	Grade Leg 2
		(CY)	(CY)	(ft)		(CY)	(CY)	(ft)		(Acres)	(FT)	(Inches)	(CY)	(Acres)	(FT)	(Inches)	(CY)		(ft)	(ft)	(ft)	_009 0 (ft)	(%)	(%)
		Item 1.1	Item 1.2	Item 1.3	Item 1.4	Item 2.1	Item 2.2	Item 2.3	Item 2.4	Item 3.1	Item 3.2	Item 3.3	Item 3.4	Item 4.1	Item 4.2	Item 4.3	Item 4.4	Item 5.1	Item 5.2	Item 5.3	Item 5.4	Item 5.5	Item 5.6	Item 5.7
	South Waste Rock Disposal Facility	-	-	-	-33% to -28%	666,680	666,680	540	-1%	256	100	36	1,237,104	85	100	36	412,368	North OB Stockpile	12,559	2,310	7,312	2,937	-8.9%	-1.0%
	South Waste Rock Disposal Facility	-	-	-	-	-	-	-	-1%	-	-	-	-	25	100	36	119,548	North OB Stockpile	12,559	2,310	7,312	2,937	-8.9%	-1.0%
Stockpiles –	Disturbed Area Adjacent and North of South Waste Rock Disposal													04										
E	Facility Hanover Mountain Deposit	-	-	-	-	-	-	-		-	-	-	-	21 93	- 100	- 36	- 451,572	- North OB Stockpile	- 5,707	- 1,759	- 2,466	- 1482	-9.9%	- -8.1%
	Pearson-Barnes Mine Area	-	-	-	-	-	-	-	17%	-		-	-	<u> </u>	100	36	57,596	North OB Stockpile	12,559	2,310	7,312	2.937	-9.9%	-1.0%
	Pearson-Barnes Mine Area	-	-	-	-	1 - 1	-	-	17%	-	-	-	-	12	100	36	57,596	North OB Stockpile	12,559	2,310	7,312	2,937	-8.9%	-1.0%
	Low Grade WRF	-	-	-	-33%	-	-	-	-	28	100	12	44,899	-	-	-	-	North OB Stockpile	5,310	2,310	3,000	0	-8.9%	-2.3%
	Low Grade WRF	-	-	-	-33%	-	-	-	-	28	100	12	44,899	-	-	-	-	North OB Stockpile	5,310	2,310	3,000	0	-8.9%	-2.3%
	···· – ··· · · · · 1																	North OB Stockpile; Reclaim Pond						
	Main Tailings Impoundment ¹	176,903	163,685	250	-33%	42,514	59,075	200	-0.8%	36.3	100	36	175,837	108	100	18	261,844	Outlet Channel cut Reclaim Pond Outlet Channel cut used	7,193	2,310	1,940	2,943	-8.9%	1.5%
	Reclaim Pond Outlet Channel	-	_		_	62,226	-			_			_		_		_	for cover material	1,172	1172	_		-0.9%	_
	Tailing Pipeline Corridor ²	-		-			-		-1%			-		1.4	100	36	7.000	North OB Stockpile	7,193	2,310	1,940	2,943	-8.9%	1.5%
<u> </u>	Top Soil Stockpile	-	-	-			-	-	-170	-	-	-		0.2	-	-	-		-	-	-	2,343	-0.978	-
	NOBS (proposed)	-	-	- 1	-		-	-		-	-	-	-	17.4	- 1	-	-	∦	-	-	-	-	-	-
	South OB Stockpile (proposed)	-	-	-	-	-	-	-	-	-	-	-	-	18.3	-	-	-	-	-	-	-	-	-	-
	Channel Cut used as Borrow Area Near Main Tailings Impoundment	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-
orrow Areas	OB Stockpile-1	-	-		-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	-	-	-	-	-
	OB Stockpile-2	-	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-
	OB Stockpile-3 OB Stockpile-4	-	-	-	-		-			-	-	-	-	э 4.3	-	-	-	-	-	-	-	-	-	
	OB Stockpile-5	-	-	-		- 1	-	-	-	-	-	-	-	3.3	-	-	-	-	-	-	-	-	-	-
	Haul Roads ³	-		_	-		-	-	-1%	-		-		45		-	_		-	-		-	-	
Roads	Exploration Roads	-	-	-	-	-	-	-	-1%	-	-	-	-	37	-	-	-	-	-	-	-	-	-	-
ontinental Pit	Continental Pit berm and fence disturbance					<u> </u>	-	-	-	-	-	-	-	17.6	-	-	-	-	-	-	-	-	-	-
	Grape Gulch Pond #3 (HDPE lined; reclaimed year 12)	-	-	-	-	- 1	-	-	-1%	-	-	-	-	0.4	100	36	1,839	North OB Stockpile	3,856	2310	1,546	-	-8.9%	-7.8%
	Blackman's Seep (HDPE Lined; reclaimed year 5)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.01	100	36	48	North OB Stockpile	3,856	2310	1,546	-	-8.9%	-7.8%
	Upper Creek Containment Pond 1 (HDPE Lined; Reclaimed year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	1.1	100	36	5,469	North OB Stockpile	3,856	2310	1,546	-	-8.9%	-7.8%
	Magnetite Seepage Pond (HDPE Lined) (Reclaimed year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.2	100	36	968	North OB Stockpile	6,480	2,310	1,940	2,230	-8.9%	1.5%
										_								OB-1 Stockpile, OB-2 Stockpile, OB-3 Stockpile, Topsoil Stockpile, South OB						
	SWRF Dam 1 (Reclaimed year 12)	-	_	_	-	_	_	-	-1%	-	_	_	-	0.5	100	36	2,517	Stockpile	3,630	3,630	_	_	-0.3%	-
									170					0.0	100	00	2,011	OB-1 Stockpile, OB-2 Stockpile, OB-3	0,000	0,000			0.070	
										-								Stockpile, Topsoil Stockpile, South OB						
	SWRF Dam 2 (Reclaimed year 12)	-	-	-	-	-	-	-	-1%		-	-	-	0.3	100	36	1,646	Stockpile	3,630	3,630	-	-	-0.3%	-
																		OB-1 Stockpile, OB-2 Stockpile, OB-3						
ce Impoundments ⁴									10/	-					100		4 9 9 9	Stockpile, Topsoil Stockpile, South OB					0.00/	
	SWRF Dam 3 (Reclaimed year 12)	-	-	-	-	-	-	-	-1%		-	-	-	0.8	100	36	4,066	Stockpile	3,630	3,630	-	-	-0.3%	-
	SWRF Dam 1 (Reclaimed year 12) SWRF Dam 2 (Reclaimed year 12)	-	-	-	-	-	-	-	-1% -1%	-	-	-	-	0.5 0.3	100 100	36 36	2,517 1.646	North OB Stockpile North OB Stockpile	14,159 13,759	2,310 2,310	7,312 7,312	4,537 4,137	-8.9% -8.9%	-1.0% -1.0%
	SWRF Dam 3 (Reclaimed year 12)	-	-	-	-	-	-	-	-1%	-			-	0.3	100	36	4,066	North OB Stockpile	12,759	2,310	7,312	3,137	-8.9%	-1.0%
	Decant Pond #4 (HDPE lined; reclaimed year 12)	-	-	-	-	- 1	-	-	-1%	-	-	-	-	0.6	100	36	3,001	North OB Stockpile	4,110	2,310	1,800	-	-8.9%	-1.1%
	North Tailings Decant Pond (Reclaimed year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.5	100	36	2,226	North OB Stockpile	4,110	2,310	1,800	-	-8.9%	-1.1%
	East WRF Containment (Proposed; Reclaimed Year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.5	100	36	2,420	North OB Stockpile	4,110	2,310	1,800	-	-8.9%	-1.1%
	Decant Pond #4 (HDPE lined; reclaimed year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.6	100	36	3,001	North OB Stockpile	4,110	2,310	1,800	-	-8.9%	0.3%
	Decant Pond #4 (HDPE lined; reclaimed year 12) North Tailings Decant Pond (Reclaimed year 12)	-	-	-	-	-	-	-	-1%	-	-	-	-	0.6	100	36 36	3,001	OB-4 Stockpile	1,000	1000 1000	-	-	2.5%	
	East WRF Containment (Proposed; Reclaimed Year 12)	-	-	-	-	-	-	-	-1% -1%	-	-	-	-	0.5 0.5	100 100	30	2,226 2,420	OB-4 Stockpile OB-4 Stockpile	1,000 1,000	1000	-	-	2.5% 2.5%	-
I						<u> </u>			170	-				0.0	100	30	2,720		1,000	1000			2.570	
		Benc	ch	Outslope	e Channel	Ту	pe 1 Chann	nel		Type 2 Char	nel		Downdrain		Perimeter									
		Length	Length	Length	Riprap	Length	Riprap	Gravel	Length	Riprap	Gravel	Length	Riprap	Gravel										
		3:1 slope	2.5:1 slope			/ _					1000													
cility Type	Item	(ft)	(ft)	(ft) Item 6.2	(CY) Item 6.3	(FT)	(CY)	(CY)	(ft) Item 7.1	(CY) Item 7.2	(CY) Item 7.3	(ft) Item 8.1	(CY) Item 8.2	(CY) Item 8.3	(ft)									
tockpiles	South Waste Rock Disposal Facility	Item 6.1a 14,126	Item 6.1b 25,463		17,023							8,595	36,959	9,025										
	Main Tailings Pond	3,894	20,403	39,589	17,023	3,904	3,817	2,202	- 2,141	- 9,206	- 2,248	1,353	5,818	9,025	-									
Failings —	Magnetite Tailings	- 3,094	-	- 3,094	-	-	-	-	-	9,200	-	420	1,806	441	-									
	Safety berm, Pits perimeter	-	-	-	-	- 1	-	-		-	-	-	-	-	6,635									
ntinental Pit	Chain link fence, Pits perimeter	-	-	-	-	-	-	-	-	-	-	-	-	-	2,453									
/lountain Deposit	Cofety have Dite a stress tar	-	-	-	-	<u> </u>	-	-	-	-	-	<u> </u>	-	-	6,670									

¹Includes South Buttress area.

² Includes lengths of pipe from Mills 1 and 2 up to the top of the tailing impoundment, assumes pipelines on top of tailings are covered when the top is covered. Flushing the pipelines is covered under water management. ³ CHR is included separately in Appendix B.4

⁴Surface Impoundment Areas are equal to the top surface area of the pond as described by surveyed stage-volume relationships. NOBS - North Overburden Stockpile

OB - Overburden

WRF - Waste Rock Facility

Made By:	AAT	Date:	5-Dec-14

Table 2 Miscellaneous Quantities

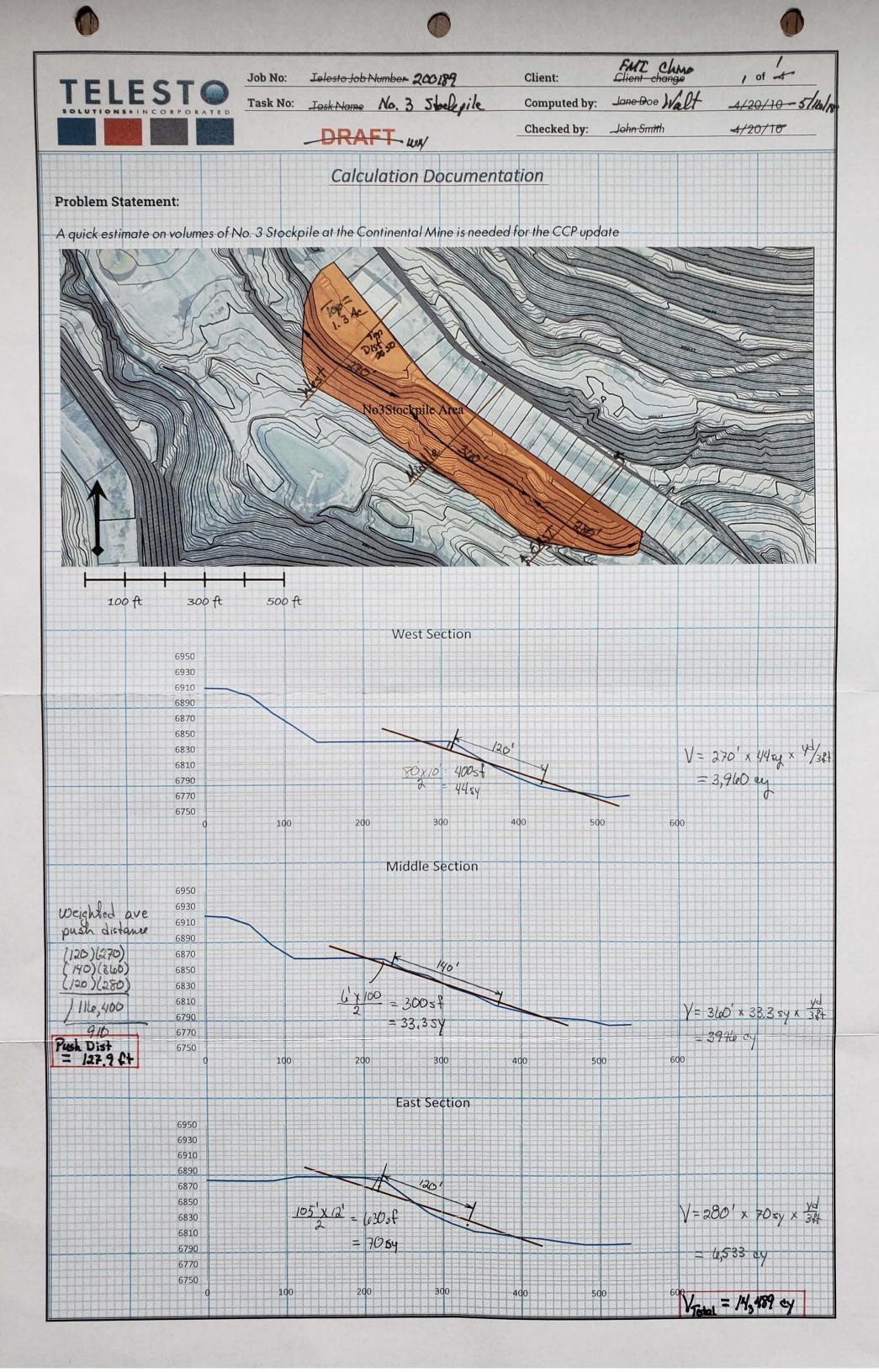
Item	Description	Quantity	Units
Monitoring wells*	Reclamation year 100	7	each
Reinforced Concrete Wall Demolition	SWRF Dam 1 (Reclaimed year 12)	270	ft
Reinforced Concrete Wall Demolition	SWRF Dam 2 (Reclaimed year 12)	153	ft
Reinforced Concrete Wall Demolition	SWRF Dam 3 (Reclaimed year 12)	235	ft
Reinforced Concrete Wall Demolition	East WRF Containment (Proposed;	000	<i>c</i> ,
	Reclaimed Year 12)	200	ft

*Assume each well 100-feet deep based on average depth to water.

Table 3 Channel Quantities

Item	Material	Units	Amount	Description ¹					
Outslope Channel	Riprap	(cy/ft)	1143	Bench width 30 ft, 5% slope towards interior, 0.5' deep riprap by 20' wide riprap on 5% slope and 3' wide riprap on the 3:1 slope					
Top Surface Channels Type 1	Riprap	(cy/ft)	0.96	0' Bottom width, 3:1 side slopes, 2' deep, 1' thick riprap, 0.5' thick gravel					
	Gravel	(cy/ft)	0.56						
Top Surface Channels Type 2	Riprap	(cy/ft)	4.30	20' Bottom width, 3:1 side slopes, 3' deep, 2.5' thick riprap, 0.5' thick gravel					
Top Surface Charmels Type 2	Gravel	(cy/ft)	1.05	20 Bottom width, 5.1 side slopes, 5 deep, 2.5 thick hprap, 0.5 thick graver					
Downdrain (Type 2 Channel)	Riprap	(cy/ft)	4.30	20' Bottom width, 3:1 side slopes, 3' deep, 2.5' thick riprap, 0.5' thick gravel					
Downdrain (Type 2 Channel)	Gravel	(cy/ft)	1.05	zo boltom width, 3.1 side slopes, 3 deep, 2.3 thick hprap, 0.3 thick graver					

¹Cross Sections are shown in the CCP Drawings.



Appendix C Water Management Cost Estimate Summary Report

Prepared for Freeport-McMoRan Inc. Chino Mines Company 99 Santa Rita Mine Road Vanadium, New Mexico 88043

Prepared by Telesto Solutions Inc. 2950 East Harmony Road Suite 200 Fort Collins, Colorado 80528

> December 2014 Updated May 2018



Signature Page

Appendix C Water Management Cost Estimate Summary Report

December 2014 Updated May 2018



Report Authors and Contributors

Telesto Solutions, Inc.

Jean Humphrey by: / ZN

Jean Humphrey - Primary Author

Walter Niccoli, PE - Report Review

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1.0 INTRODUCTION

As part of the update to the 2014 Continental Mine Closure Closeout Plan (CCP) update, Telesto Solutions Inc. (Telesto) prepared a water management reclamation cost estimate for financial assurance for Freeport-McMoRan Cobre Mining Company (Cobre). Freeport-McMoRan Chino Mines Company (Chino) has now taken over Cobre. This water management reclamation cost estimate update 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) 2023 mine plan (formerly submitted as the EOY 2019 mine plan), and assumes reclamation would begin in 2024 (Reclamation Year 0). The original 2014 CCP mine planning dates have not been retained in this document, and thus there is a four year difference with the submitted 2014 CCP. This update brought all costs and schedules into currency with a 2018 start of mining date.

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 flowing (Condition in the aforementioned sources will decrease the water requiring management. Facilities and post closure uses, based on EOY 2023 mine plan, are shown in Table C-1. Water quality monitoring is assumed to continue for a 100-year period.

2.0 TOTAL COST ESTIMATE FOR WATER MANAGEMENT

The total current dollar cost for water management during and after reclamation is estimated to be **\$2,990,000.** A summary of the estimate is provided in Table C-2. The costs presented in this estimate are current (2018) dollar costs, a net present value calculation will be presented separately. The remainder of this document describes the specifics used to develop the estimated cost.

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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
Seep	s Routed to Uppe	r 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
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 fo 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

1

 Table C-1
 Water Management Facilities Descriptions

Freeport-McMoRan Chino Mines Company 20180517_appendix c text_water_management_cost_estimate-jeh.docx

Telesto Solutions, Inc. May 2018

ltem	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost
Capital and Replacement		28.3%	
Ponds and Tanks	\$520,594.94	\$147,328	\$667,923
Pumps	\$659,426.27	\$186,618	\$846,044
Pipelines	\$0.00	\$0	\$0
Electrical	\$0.00	\$0	\$0
Subtotal	\$1,180,021.20	\$333,946	\$1,513,967
Removal ¹		28.3%	
Pumps	\$149,324.06	\$42,259	\$191,583
Pipelines	\$114,136.15	\$32,301	\$146,437
Electrical	\$52,380.78	\$14,824	\$67,205
Subtotal	\$315,840.98	\$89,384	\$405,225
Operations and Maintenance		17%	
Ponds and Tanks	\$225,298.15	\$38,301	\$263,599
Pumps	\$113,383.30	\$19,275	\$132,658
Pipelines	\$128,879.24	\$21,909	\$150,788
Electrical Infrastructure	\$117,758.66	\$20,019	\$137,778
Materials		17%	
Electricity and Fuel	\$30,408.18	\$5,169	\$35,578
Environmental Sampling	\$297,192.00	\$50,523	\$347,715
Subtotal	\$912,919.54	\$155,196	\$1,068,116
Total Estimated Cost	\$2,408,781.72	\$579,000	\$2,987,307

Table C-2 Water Management Cost Summary

3.0 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 drain down

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

¹ Removal costs for ponds and tanks is included in the earthwork portion of the cost estimate.

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 the projected EOY 2023 topography. The EOY 2023 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, 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 2023. 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 2023. 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 (including Hanover Mountain)
- 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 semiempirical 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- 3. Managed water volumes as a function of time are summarized in Table C-4.

4.0 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-5 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_2018_0517.xlsx spreadsheet, is provided in CCP Appendix D.

	Seep	Stormwater Volume (acre-ft)	Seepage Volume (acre-ft)	Stormwater Flow Rate, Pre- Reclamation	Average Seepage Flow Rate, Pre- Reclamation (gpm)
	•	(acre-it)	(acre-it)	(gpm)	(gpiii)
	Stormwater and Seeps				
N	Routed to Upper Creek Containment Pond 1				
sd	(excludes Cottonwood				
ee	Seep)	46.6	2	2	8.91
it S	Cottonwood Seep	40.0	3.15		1.95
าค	Upper Creek Containment		5.15		1.95
h	Pond 1 Average Estimated				
Main Tailing Impoundment Seeps ²	Yearly Stormwater Runoff ³	16.35	-	10.14	-
du	Estimated Seepage Routed				
	to Upper Creek				
ling	Containment Pond 1	-	33.43	-	20.73
Tai	Dam Toe Seep	-	116.8	-	72.42
. <u>.</u>	Peach Tree Spring Seep	-	19.57	-	12.13
Ma	Weber Pond	-	0	-	0.00
	Total Main Tailing				
	Impoundment Seepage	-	169.8	-	105.27
Estrada	a Seep ²	-	2.34	- 1.45	
Union	Hill Adit Seep ²		0.52	- 0.32	
Cemen	t Pond (Replaced by EOY				
2019 w	vith East WRF Containment) ²	-	1.30	-	0.81
Magne	tite Interceptor Trench ²	-	0.45	-	0.28

Table C-3	Estimated	Stormwater	Flow and	Seepage	Quantities
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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 in 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 2024 (Reclamation Year 0)

² Measured 2013 seepage volumes (Golder 2014).

³ The estimated yearly stormwater runoff for Upper Creek Containment 1 is based on EOY 2023 mine configuration and calculations in Appendix C.1

Closure Year	Average SWRDF Seeps (gpm)⁴	Average Main Tailings Impoundment (gpm) ⁵	Average Storm Water Runoff (gpm) ⁶	Average Magnetite Tailings Impoundment (gpm) ⁷	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

Table C-4 Water Management Volumes through Time

Table C-5 Cost Estimate Sheet Descriptions

Worksheet	Description				
Cobre_WM_2017.xlsx (Water Management Sheets)					
1 Reclamation and O&M	Ponds/Tanks, Pumps, Pipelines, and Electrical Infrastructure capital				
Costs	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				
	Cost summary including indirect cost percentages and direct costs				
4 Summary	calculated on Sheets 1and 2				

- 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).

⁴ 1Average seep flow rate at EOY 2023 based on average East WRF, Union Hill, and Estrada Seeps flow rates 2013 (Golder 2014)

⁵ Calculated drain down rates, see Appendix C.2

⁶ Calculated stormwater runoff for reclaimed areas, See Appendix C.1

⁷ 4Average seep flow rate at EOY 2023 based on average Magnetite Interceptor Trench Seeps flow rates 2013 (Golder 2014)

- 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)

4.1 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-6 and age at reclamation. The SWRF Dams 1-3 are currently 19 years old, all membrane lined ponds are 29 years old, the Surge Tank is 49 years old, and the East Waste Rock Facility Containment is new in 2023
- 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

Table C-6 Water	Management Variables
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Description	Variable
RSMeans NM Discount Rate	0.856
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

4.2 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-6 and age at reclamation. Currently the SWRF Dam 1-3 pond and booster pumps are 115 years old, the Surge Tank and Reclaim Pond pumps are 11 years old, the Union Hill Adit Seep and Estrada Seep pumps are 9 years old, the East Waste Rock Facility Containment pumps will be new in 2023, and all other pumps are 24 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.

4.3 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-6 and age at reclamation. Assumptions and methods for this portion of the cost estimate include:

- The Bullfrog Pipeline was assumed to be 7 years old,
- The SWRF Dams 1, 2 and 3 pipelines are 15 years old
- East WRF Containment pipelines are new at the start of reclamation.
- All other pipelines were assumed to be 24 years old at the start of reclamation.

4.4 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

4.5 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-7.

Table C-7 Water Treatment Unit Costs

Item	Base Unit Costs	Units	Scaled Unit Costs	RSMeans Line Item No.	RSMeans Page	Comment
Utility Pole Demo	\$214.50	ea	\$183.61	02 41 13.80 0100	36	Professional Judgment 15 to 30 gpm - includes pump control, control panel, installation, and flow meter.
Cross Arm Demo	\$93.00	ea	\$79.61	02 41 13.80 0300	36	Professional Judgment 50 gpm - includes pump control, control panel, installation, and flow meter.
Wood Electrical Utility Poles a.)	\$696.5	ea	\$596	33 71 16.33 6020	399	Professional Judgment 100 to 700 gpm - includes pump control, control panel, installation, and flow meter.
Utility Pole Installation b.)	\$1,259	ea	\$1,078	33 71 16.23 6010	399	Professional Judgment 800 to 2000 gpm - includes pump control, control panel, installation, and flow meter.
Utility Pole Installation c.)	\$1.95	ea	\$1.67	33 71 16.33 9000	399	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 3/4"-4" diameter
Utility Pole Installation d.)	\$335.00	ea	\$287	33 71 16.33 7600	399	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 5/4 -4 - diameter
Electrical Wiring Installation	\$579.00	wire mi	\$496	33 71 39.13 0110	402	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 0 -6 diameter
Electrical Wiring Installation	\$15,295.00	wire mi	\$13,093	33 71 39.13 0150	402	Selective Demo, utility poles, wood, 20'-30' high
Electrical Wiring Installation	\$309.00	wire mi	\$265	33 71 39.13 0810	402	Selective Demo, cross arms, wood, 2'-6' long
Potential Transformers	\$5,261.00	ea	\$4,503	33 71 26.26 4100	403	Steel Pipe Schedule 40, black 24" diameter (221113.48 1210) without coupling and hanger
Pipe Removal	\$1.95 \$1.95	lf	\$1.67	02 41 13.38-1600	29	Membrane lining, 2X60 mil thick
Fipe Removal	φ1.95		φ1.07	02 41 13.30-1000	29	Assume similar to 10' high 33 degree slope concrete retaining wall, cast concrete reinforced concrete cantilever, including excavation, backfill &
Pipe Removal	\$2.73	lf	\$2.34	02 41 13.38-1700	29	reinforced.
Pipe Removal	\$4.53	lf	\$3.88	02 41 13.38-1800	29	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 4" diameter
Excavation of Soil	\$8.28	су	\$7.088	G1030 120 1600	498	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 6" diameter
Reservoir Liners HDPE	\$2.74	sf	\$2.34544	31 05 19.53 1200	218	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 8" diameter
Small Concrete Dam	\$92,125	ea	\$78,859	32 32 13.10 3100	323	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 10" diameter
Water Treatment Tank	\$295,500	ea	\$252,948	33 16 23.13 1000	358	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 12" diameter
Pump	\$10,000	ea	\$10,298.21	-	-	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 14" diameter
Pump	\$15,000	ea	\$15,447.32	-	-	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 16" diameter
Pump	\$25,000	ea	\$25,745.53	-	-	250,000 gallon steel tank, not including foundation., height/diameter Less than 1
Pump	\$30,000	ea	\$30,894.63	-	-	Digging holes in rock
Water Supply Piping	\$8.81	lf	\$7.54	33 14 13.35 0100	352	Wood, class 1 type C, CCA/ACA-treated, 30' high, excludes excavation, backfill and cast-in-place concrete
Water Supply Piping	\$12.29	lf	\$10.52	33 14 13.35 0200	352	Cross arms 4' long, includes hardware and insulators
Water Supply Piping	\$16.74	lf	\$14.33	33 14 13.35 0300	352	Disposal of pole and hardware surplus material, assumes 100 feet of wire per pole
Water Supply Piping	\$19.93	lf	\$17.06	33 14 13.35 0400	352	13 to 26 kV
Water Supply Piping	\$22.73	lf	\$19.46	33 14 13.35 0500	352	Material handling and spotting-conductors, primary circuits
Water Supply Piping	\$33.55	lf	\$28.72	33 14 13.35 0600	352	Conductors, per wire, 210-636 kcmil
Water Supply Piping	\$41.15	lf	\$35.22	33 14 13.35 0700	352	Disposal of surplus material, high voltage conductors
Water Distribution Piping	\$218.35	lf	\$187	22 11 13.48 1780 and 1210	168	3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mi round trip. Removes the overhead and profit (34% based on RS Means Crews O&P markup)
Electric Rate	\$0.0502	kWh	0.0502	-	-	Industrial rate date looked up 3/01/2018 (http://www.electricitylocal.com/states/new-mexico/silver-city/) Subtracting indirect costs
Pump Removal Cost	\$5,000	ea	\$5,149.11	-	-	Engineering Judgment
Electric Panel Cost	\$10,000	ea	\$10,298.21	-	-	Engineering Judgment
Diesel Fuel Cost (\$/gal)	\$2.350	gal	\$2.350	-	-	Griffin Propane verbal Quote, Silver City, NM (March, 2018) less indirect cost of 17%.
Environmental Sampler	\$60	hr	\$61.79	-		Engineering Judgment
Environmental Samle Rev	\$70	hr	\$72.09		-	Engineering Judgment
Environmental Sampling	\$239	sample	\$239.32	-	_	23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab.com).
Shipping Env. Samples	\$59.83	cooler	\$59.83	_	_	Overnight FedEx \$70 for a 10 lb. package 30"x18"x18" Silver City, NM to Casper, WY Energy Labs
	400.00	000101	φ00.00		I	ereniight eally greater a reast package of Are Are enver exy, this to dapper, the Energy Labo

5.0 REFERENCES

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APPENDIX C.1 RUNOFF CALCULATIONS



TECHNICAL MEMORANDUM

DATE:	September 30, 2014	Telesto #	200189
TO:	Cobre Mining Company		
FROM:	April Tischer and Jon Cullor		
SUBJECT:	Sample Runoff Calculation: S	CS Curve Nu	mber 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.

$S(in) = \frac{1000}{CN} - 10$ $I_a(in) = 0.2S$ $Q(in / day) = \frac{(P - I_a)^2}{(P - I_a) + S} P > I_a$ $Q(in / day) = 0 P \le I_a$											
$\mathcal{Q}(gpm) = \mathcal{Q}\left(\frac{in}{day}\right) * \frac{1}{12}\left(\frac{ft}{in}\right) * \frac{1}{1440}\left(\frac{day}{\min}\right) * 43560\left(\frac{ft^2}{ac}\right) * 1(ac) * 7.48\left(\frac{gal}{ft^3}\right)$											
Yr	t	P	CN	S	la	Q	Q	Q	Annual		
	time	precipitation	curve number	storativity	initial abstraction	runoff depth	runoff volume	runoff volume			
	(day)	(in)		(in)	(in)	(in/day)	(gallons/day)	(gpm/ac)	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	59	0.00	95	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

TELESTO SOLUTIONS · IN CORPORATED	Job No.: 200189-002-02	Client: FCX-Cobre Mining Co.	Page <u>1</u> of <u>15</u>
	Task: MTI Drain Down	Computed By: W. Niccoli	Date: 10/07/14
		Checked By: D. Bauer	Date: 10/10/14

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.

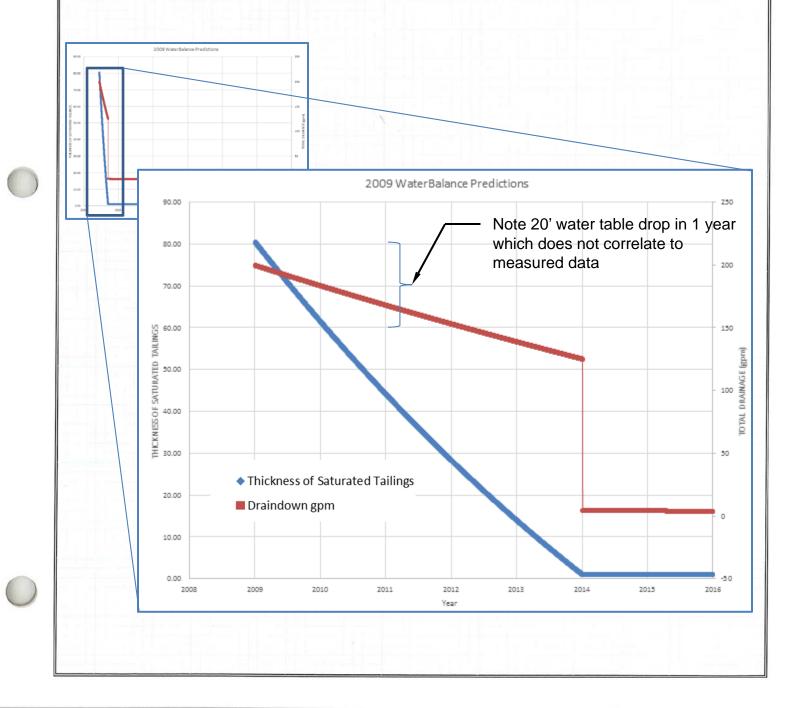
Data and Assumptions:

- 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

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TELESTO	Task: MTI Drain Down	Computed By: W. Niccoli	Date: 10/07/14
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Calculations:

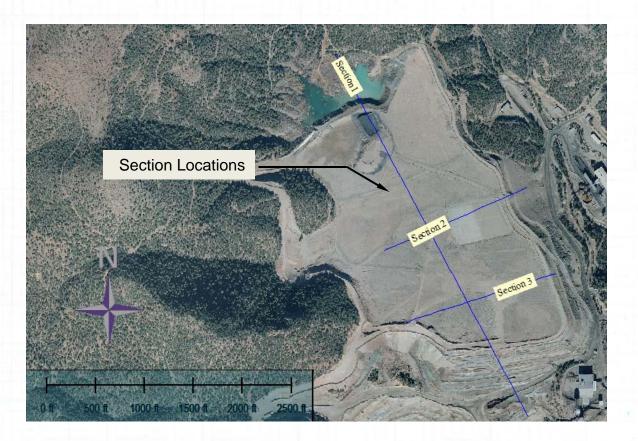
- 1. The previous drain down model is:
 - a. The model is a mass balance approach that estimates the change in storage term by considering the relationship between the unsaturated and saturated zone within the MTI
 - b. Inflows considered are net precipitation infiltration
 - c. Outflows are a sum of 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):

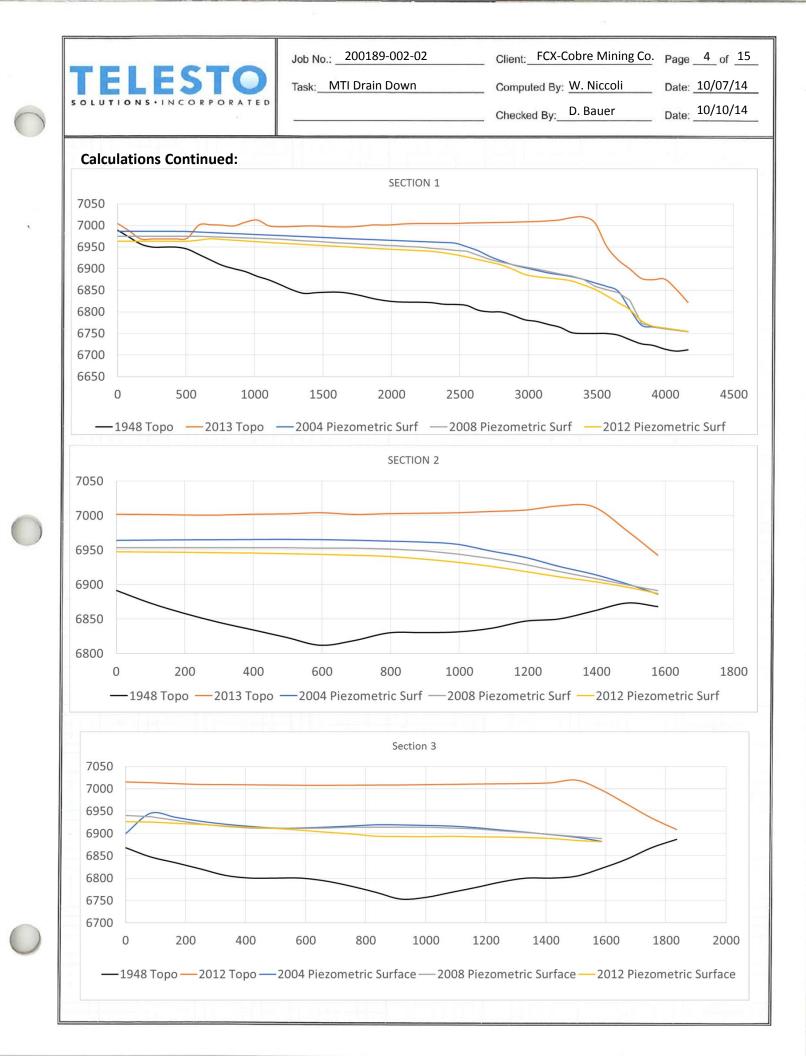


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Client: FCX-Cobre Mining Co.	Page 3 of 15
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- 2. Using Global Mapper, terrain models were built for the current and 1948 topography (also the approach used in 2004 and 2009, FYI), and for 2004, 2008 and 2012 pieziometric 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:

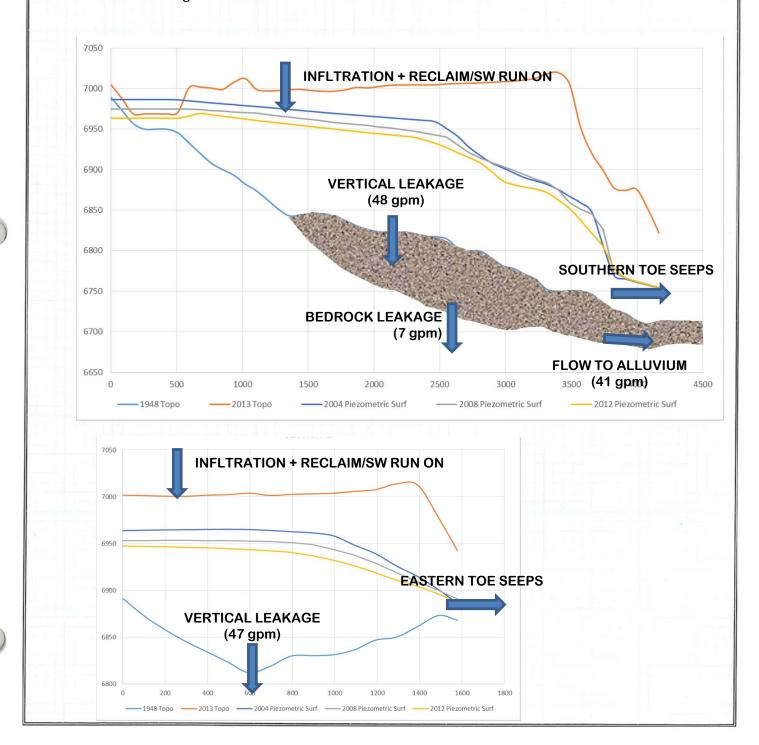




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Calculations Con'd:

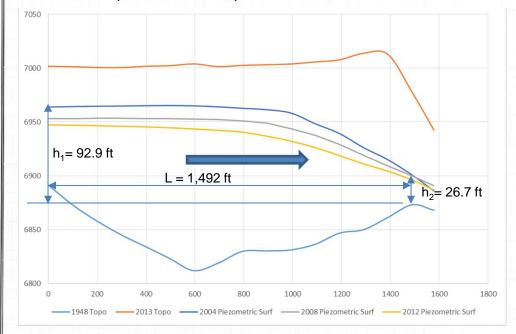
- 3. Update to the Conceptual Model used in 2009
 - a. The 2009 Conceptual Model assumed that all drainage water moved vertically and then was distributed amongst the known (MTI seeps)
 - b. For the update, separate the components into the eastern tailings seeps (those reporting to Upper Creek Pond),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

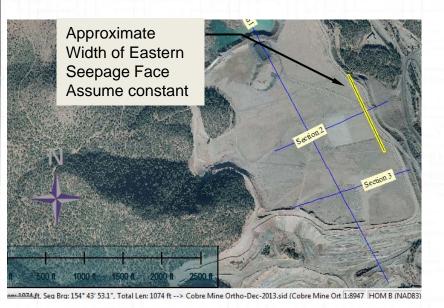


Job No.: 200189-002-02	Client: FCX-Cobre Mining Co.	Page 6 of 15
Task: MTI Drain Down	Computed By: W. Niccoli	Date: 10/07/14
	Checked By:D. Bauer	Date: 10/10/14
	Task:MTI Drain Down	Job No.: 200189-002-02 Client: FCX-Cobre Mining Co. Task: MTI Drain Down Computed By: W. Niccoli Checked By: D. Bauer

Calculations Con'd:

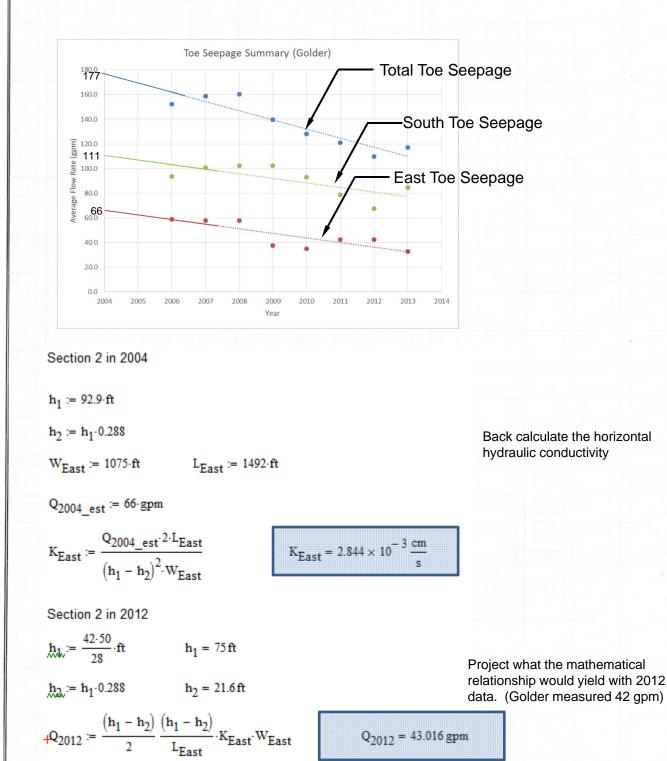
- 4. Build mathematical relationships to represent the three main drainage components
 - a. Eastern Seeps: 2-D Darcy's Law based on non-confined conditions. Use water balance (adjust 2009 spreadsheet) to update for vertical infiltration. Assume only saturated portion above seep outlet is available for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





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- 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)





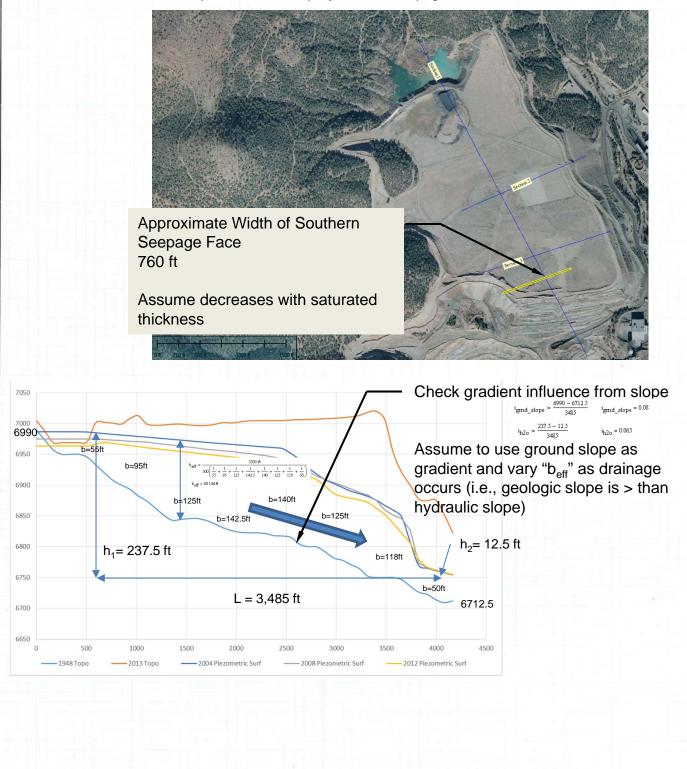
Job No.:	200189-002-02	

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Calculations Continued:

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



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

 $K_{south} = 1.554 \times 10^{-3} \cdot \frac{cm}{m}$

Section 1 in 2004

 $W_{south} \coloneqq 760 \cdot ft$

Q₂₀₀₄ south est = 111 gpm

 $K_{south} \coloneqq \frac{Q_{2004_south_est}}{b_{eff} \cdot W_{south} \cdot i_{grnd_slope}}$

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

Section 1 in 2012

$$b_{eff_2012} \coloneqq \frac{3300 \cdot \pi}{500 \left(\frac{1}{35} + \frac{1}{77.5} + \frac{1}{107.5} + \frac{1}{120} + \frac{1}{115} + \frac{1}{112.5} + \frac{1}{100} + \frac{1}{50}\right)}$$

$$b_{eff_2012} \coloneqq 65.602.9$$

^beff_2012 = 65.608 ft

Q_{south_2012} ≔ ^beff_2012[.]W_{south}^{.i}gmd_slope^{.K}south

Q_{south_2012} = 90.867.gpm

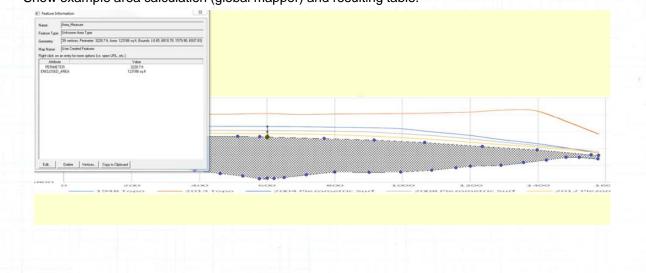
Project what the mathematical relationship would yield with 2012 data. Golder measured 67.3 gpm. 30% rpd.... May have to revisit this relationship. - likely have to vary the width because it gets smaller with shallower depths

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.

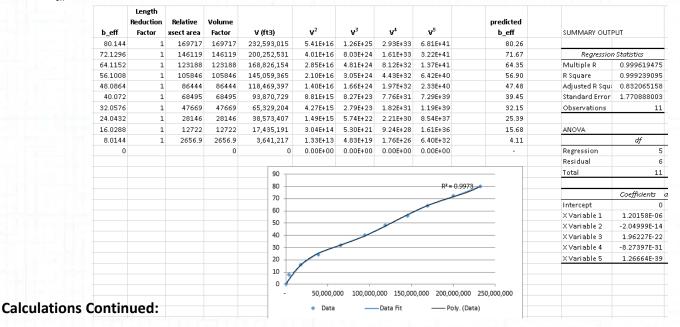
Relate b_{eff} to saturated volume curve:

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.

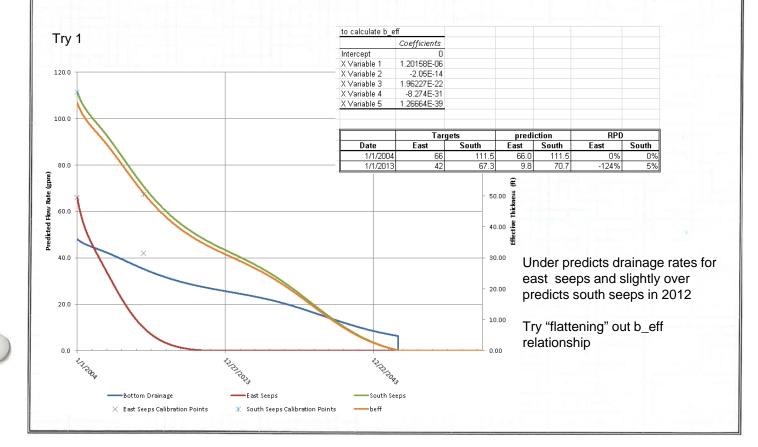


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Relate b_{eff} to saturated volume curve as a starting point – this relationship will become one calibration parameter:

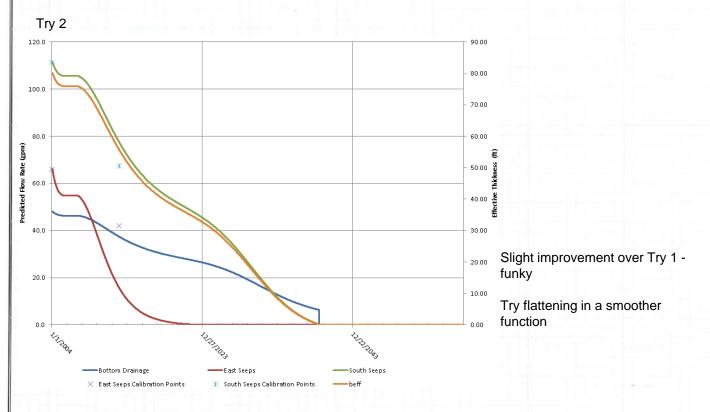


5. Update the water balance and calibrate to the two known drainage values. (Adjust previous xcel sheet)

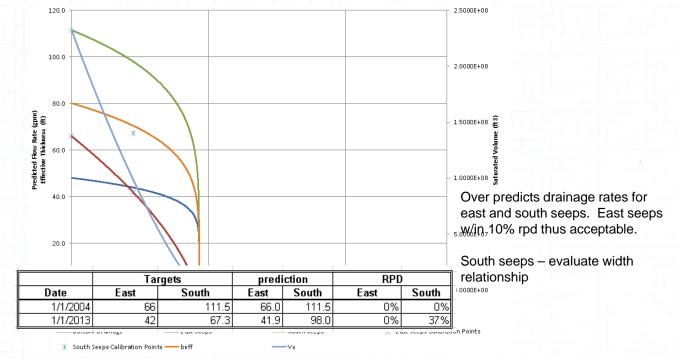


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5. Update the water balance and calibrate to the two known drainage values. (Adjust previous xcel sheet)



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



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- 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

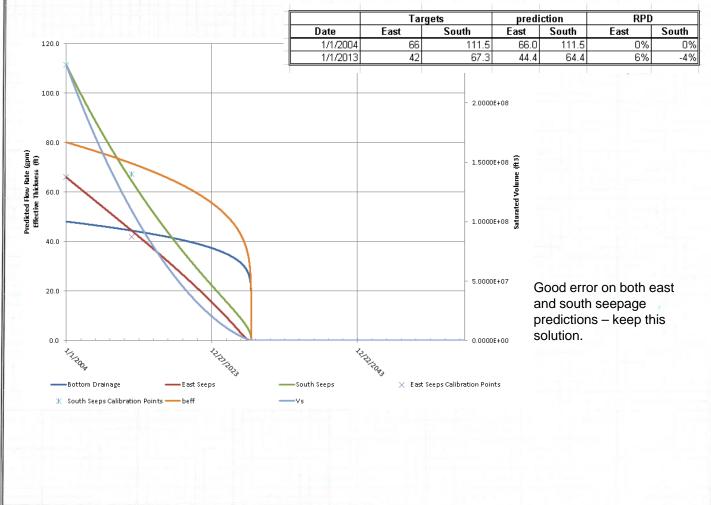
Try 5 - try 1/(X-y)

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







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D		Checked By: D. Bauer	Date: 10/10/14

Results:

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

estima		
Courtie	Post	Current
	Cover	Average Seepage (gpm)
	0	62.7
	1	56.4
	2	50.2
	2	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
1000	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

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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.

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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 Treatment Unit Costs

Unit Cost \$/unit	Units	Las Cruces 85.6% ²	T	ъ	
			Line Item	Page	Reference
\$214.50	ea	\$183.61	02 41 13.80 0100	36	Professional Judgment 15 to 30 gpm - includes pump control, control panel, install
\$93.00	ea	\$79.61	02 41 13.80 0300	36	Professional Judgment 50 gpm - includes pump control, control panel, installation,
\$696.5	ea	\$596	33 71 16.33 6020	399	Professional Judgment 100 to 700 gpm - includes pump control, control panel, inst
\$1,259	ea	\$1,078	33 71 16.23 6010	398	Professional Judgment 800 to 2000 gpm - includes pump control, control panel, in
\$1.95	ea	\$1.67	33 71 16.33 9000	399	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 3/4"-4" diamete
\$335.00	ea	\$287	33 71 16.33 7600	399	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 6"-8" diameter
\$579.00	wire mi	\$496	33 71 39.13 0110	402	Site Demo, pipe removal, sewer/water no excavation, plastic pipe, 10"-18" diameter
\$15,295.00	wire mi	\$13,093	33 71 39.13 0150	402	Selective Demo, utility poles, wood, 20'-30' high
\$309.00	wire mi	\$265	33 71 39.13 0810	403	Selective Demo, cross arms, wood, 4'-6' long
\$5,261.00	ea	\$4,503	33 71 26.26 4100	402	Steel Pipe Schedule 40, black 24" diameter (221113.48 1210) without coupling an
\$1.95	lf	\$1.67	02 41 13.38-1600	29	Membrane lining, 2X60 mil thick
					Assume similar to 10' high 33 degree slope concrete retaining wall, cast concrete r
\$2.73	lf	\$2.34	02 41 13.38-1700	29	excavation, backfill & reinforced.
\$4.53	lf	\$3.88	02 41 13.38-1800	29	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
	cy		G1030 120 1600	498	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$2.74	sf	\$2.34544	31 05 19.53 1200	218	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$92,125	ea	\$78,859	32 32 13.10 3100	323	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$295,500	ea	\$252,948	33 16 23.13 1000	358	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$10,000	ea	\$10,298.21	-	-	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$15,000	ea	\$15,447.32	-	-	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill,
\$25,000	ea	\$25,745.53	-	-	250,000 gallon steel tank, not including foundation., height/diameter Less than 1
\$30,000	ea	\$30,894.63	-	-	Digging holes in rock
\$8.81	lf	\$7.54	33 14 13.35 0100	352	Wood, class 1 type C, CCA/ACA-treated, 30' high, excludes excavation, backfill a
\$12.29	lf	\$10.52	33 14 13.35 0200	352	Cross arms 4' long, includes hardware and insulators
\$16.74	lf	\$14.33	33 14 13.35 0300	352	Disposal of pole and hardware surplus material, assumes 100 feet of wire per pole
\$19.93	lf	\$17.06	33 14 13.35 0400	352	13 to 26 kV
\$22.73	lf	\$19.46	33 14 13.35 0500	352	Material handling and spotting-conductors, primary circuits
\$33.55	lf	\$28.72	33 14 13.35 0600	352	Conductors, per wire, 210-636 kcmil
		\$35.22	33 14 13.35 0700		Disposal of surplus material, high voltage conductors
					3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mi round trip. This value removes Means Crews O&P markup)
\$0.0502	kWh	0.0502	-	-	Industrial rate date looked up 3/01/2018 (http://www.electricitylocal.com/states/n indirect costs
\$5.000	ea	\$5.149.11	_	_	Engineering Judgment
			_	_	Engineering Judgment
			_	_	Griffin Propane verbal Quote, Silver City, NM (March, 2018) less indirect cost of
					Engineering Judgment
			-	-	Engineering Judgment
			-		23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab
\$239 \$59.83	cooler	\$239.32 \$59.83	-	-	23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab Overnight FedEx \$70 for a 10 lb. package 30"x18"x18" Silver City, NM to Caspe
	\$696.5 \$1,259 \$1.95 \$335.00 \$579.00 \$15,295.00 \$309.00 \$5,261.00 \$1.95 \$2.73 \$4.53 \$8.28 \$2.74 \$92,125 \$295,500 \$10,000 \$15,000 \$15,000 \$15,000 \$25,000 \$30,000 \$8.81 \$12.29 \$16.74 \$19.93 \$22.73 \$33.55 \$41.15 \$218.35	\$696.5 ea \$1,259 ea \$1.95 ea \$335.00 ea \$579.00 wire mi \$15,295.00 wire mi \$309.00 wire mi \$57,261.00 ea \$1,95 If \$2,73 If \$4.53 If \$8.28 cy \$2.74 sf \$92,125 ea \$295,500 ea \$10,000 ea \$15,000 ea \$15,000 ea \$25,000 ea \$30,000 ea \$15,000 ea \$25,000 ea \$33,0,000 ea \$25,000 ea \$33,0,000 ea \$33,0,000 ea \$218,35 If \$16,74 If \$19,93 If \$218,35 If \$33,55 If \$41,15 If </td <td>\$696.5 ea \$596 \$1,259 ea \$1,078 \$1.95 ea \$1.67 \$335.00 ea \$287 \$579.00 wire mi \$496 \$15,295.00 wire mi \$13,093 \$309.00 wire mi \$265 \$5,261.00 ea \$4,503 \$1.95 If \$1.67 \$2.73 If \$2.34 \$4.53 If \$3.88 \$8.28 cy \$7.088 \$2.74 sf \$2.34544 \$92,125 ea \$78,859 \$295,500 ea \$252,948 \$10,000 ea \$10,298.21 \$15,000 ea \$30,894.63 \$8.81 If \$7.54 \$12.29 If \$10.52 \$16.74 If \$14.33 \$19.93 If \$17.06 \$22.73 If \$19.46 \$33.55 If \$28.72 <t< td=""><td>\$696.5 ea \$596 33 71 16.33 6020 \$1,259 ea \$1,078 33 71 16.23 6010 \$1.95 ea \$1.67 33 71 16.33 9000 \$335.00 ea \$287 33 71 16.33 7600 \$579.00 wire mi \$496 33 71 39.13 0110 \$15,295.00 wire mi \$13,093 33 71 39.13 0150 \$309.00 wire mi \$265 33 71 39.13 0810 \$5,261.00 ea \$4,503 33 71 26.26 4100 \$1.95 If \$1.67 02 41 13.38-1600 \$2,73 If \$2.34 02 41 13.38-1700 \$4.53 If \$3.88 02 41 13.38-1800 \$8.28 cy \$7.088 G1030 120 1600 \$2.74 sf \$2.34544 31 05 19.53 1200 \$92,125 ea \$78,859 32 32 13.10 3100 \$10,000 ea \$10,298.21 - 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- \$\$10,000

38 Description Notes:

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

40 2) City Cost Index Las Cruces-Total 85.6% (weighted average) R.S. Means Heavy Construction Cost Data, 32nd Annual Edition, 2018, pg. 21.

41 3) Griffin's Propane verbal quote March 12, 2018 of \$ 2.75/gal from which the indirect costs are then subtracted.

4) https://edzarenski.com/2016/10/24/construction-inflation-index-tables-2017/ 42

Inflation Adjustment 2014 to 2018 1.0298

allation, and flow meter.

on, and flow meter.

stallation, and flow meter.

installation, and flow meter.

ter

eter

and hanger

reinforced concrete cantilever, including

ill, 4" diameter

ll, 6" diameter

ll, 8" diameter

ll, 10" diameter

ill, 12" diameter

ill, 14" diameter

ll, 16" diameter

and cast-in-place concrete

es the overhead and profit (34% based on RS

es/new-mexico/silver-city/) Subtracting

of 17% .

ab.com).

per, WY Energy Labs

***Surge Tank is Industrial PMLU.

					Descriptio	n			Variable					
							2018 R	SMeans NM Discount Rate	0.856					
							Steel	l Tank Life Expectancy (yr)	50					
								l Pond Life Expectancy (yr)	30					
								e Dam Life Expectancy (yr)	50					
								Pump Life Expectancy (yr)	20					
							HDPE Pi	peline Life Expectancy (yr)	100					
								Pump / Motor Efficiency						
							*	l Consumption Rate (gal/hr)	1.0	_				
							C	hezy Head Loss Coefficient	150	_				
								Power Pole Spacing (ft)	100	_				
								aintenance to Capital Factor		_				
								aintenance to Capital Factor		_				
						A	*	aintenance to Capital Factor		_				
							l Electrical Infrastructure Ma	1	1.5% 48,155	_				
				Estim	atad avaraga stormyyata	runoff, after 12-year vegetation es	ormwater runoff non-revegeta		2,530	-				
				Esuii	aleu average stormwaler	Tunon, alter 12-year vegetation es	tablishinent period (Conditio	Spreadsheet Year (2014)	-6	-				
							Pa	clamation Start Year (2020)	0	-				
							Ku	Reclamation Finished		-				
							Vagatation Established	Assume stormwater released		-				
							0							
							0							
Fanks									I					
lanks									1	Direct Cost New		Direct Cost	Direct Cost	
[anks	Constructio	Capacity	Canacity	Pond Area				First	·	Direct Cost New	Direct Cost New and	Direct Cost	Maintenance	
Fanks ation	Constructio	Capacity (gallons)	Capacity	Pond Area	Age Today (yr)	Age at Reclamation (yr)	Removal Year**	First Replacement	Number of	and	Direct Cost New and Replacement (\$)	Maintenance	Maintenance Ponds Closed	Direct Cost (\$)
	Constructio n Type	Capacity (gallons)	Capacity (cy)	Pond Area (acres)	Age Today (yr)	Age at Reclamation (yr)		First Replacement Year	·	and Replacement	Direct Cost New and Replacement (\$)	Maintenance Ponds Closed Post	Maintenance Ponds Closed Post Closure	Direct Cost (\$)
					Age Today (yr)	Age at Reclamation (yr)	Removal Year**	First Replacement	Number of	and		Maintenance	Maintenance Ponds Closed	Direct Cost (\$)
		(gallons)	(cy)		Age Today (yr) 19		Removal Year**	First Replacement Year	Number of	and Replacement (\$/ea)	Replacement (\$)	Maintenance Ponds Closed Post Closure (\$/yr)	Maintenance Ponds Closed Post Closure (\$)	
ation	n Type concrete dar	(gallons) 1,116,800	(cy) 5,530	(acres)		25	Removal Year** (yr)	First Replacement Year	Number of	and Replacement		Maintenance Ponds Closed Post Closure (\$/yr) \$1,183	Maintenance Ponds Closed Post Closure (\$) \$15,378	\$15,378
ation am 1 (181-2003-Dam 1)	n Type	(gallons)	(cy)	(acres)			Removal Year** (yr)	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859	Replacement (\$) \$0	Maintenance Ponds Closed Post Closure (\$/yr)	Maintenance Ponds Closed Post Closure (\$)	
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2)	n Type concrete dar concrete dar	(gallons) 1,116,800 827,700	(cy) 5,530 4,098	(acres) - -	19 19	25 25	Removal Year** (yr)	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859 \$78,859	Replacement (\$) \$0 \$0 \$0	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378	\$15,378 \$15,378
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3)	n Type concrete dar concrete dar concrete dar	(gallons) 1,116,800 827,700 2,925,300	(cy) 5,530 4,098 14,485	(acres) - - -	19 19 19	25 25 25	Removal Year** (yr) 12 12 12 12 12	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$78,859	Replacement (\$) \$0 \$0 \$0 \$0 \$0 \$0 \$0	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378	\$15,378 \$15,378 \$15,378
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3) ond #4	n Type concrete dan concrete dan concrete dan HDPE lined	(gallons) 1,116,800 827,700 2,925,300 972,500	(cy) 5,530 4,098 14,485 4,815.310	(acres) - - 0.62	19 19 19 19 19 0 29	25 25 25	Removal Year** (yr) 12 12 12 12 12	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$78,859 \$138,064	Replacement (\$) \$0 \$0 \$0 \$138,064	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183 \$1,183 \$2,071	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378 \$15,378 \$26,922	\$15,378 \$15,378 \$15,378 \$15,378 \$164,986
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3) ond #4 eek Containment Pond #1 ilch Pond #3 n's Seep (Pond #2)	n Type concrete dan concrete dan concrete dan HDPE lined HDPE lined	(gallons) 1,116,800 827,700 2,925,300 972,500 1,879,200	(cy) 5,530 4,098 14,485 4,815.310 9,304.813	(acres) - - 0.62 1.29	19 19 19 19 0	25 25 25	Removal Year** (yr) 12 12 12 12 12	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$78,859 \$138,064 \$285,575	Replacement (\$) \$0 \$0 \$0 \$138,064 \$0	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183 \$1,183 \$2,071 \$4,284	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378 \$15,378 \$26,922 \$55,687	\$15,378 \$15,378 \$15,378 \$164,986 \$55,687
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3) ond #4 eek Containment Pond #1 ilch Pond #3	n Type concrete dan concrete dan concrete dan HDPE lined HDPE lined HDPE lined	(gallons) 1,116,800 827,700 2,925,300 972,500 1,879,200 911,600	(cy) 5,530 4,098 14,485 4,815.310 9,304.813 4,513.765	(acres) - - 0.62 1.29 0.38 - -	19 19 19 19 0 29 29 29 49	25 25 25	Removal Year** (yr) 12 12 12 12 12	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$78,859 \$138,064 \$285,575 \$88,311	Replacement (\$) \$0 \$0 \$0 \$138,064 \$0 \$88,311 \$292 \$252,948	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183 \$1,183 \$2,071 \$4,284 \$1,325	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378 \$15,378 \$26,922 \$55,687 \$17,221 \$43.87 \$49,325	\$15,378 \$15,378 \$15,378 \$164,986 \$55,687 \$105,532 \$336 \$302,273
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3) ond #4 eek Containment Pond #1 alch Pond #3 n's Seep (Pond #2) nk*** e Seepage Pond	n Type concrete dan concrete dan concrete dan HDPE lined HDPE lined HDPE lined unlined	(gallons) 1,116,800 827,700 2,925,300 972,500 1,879,200 911,600 25,000	(cy) 5,530 4,098 14,485 4,815.310 9,304.813 4,513.765 123.787 1,745.395 47.534	(acres) - - 0.62 1.29 0.38 - - 0.20	19 19 19 19 0 29 29	25 25 25 25 25 6 35 35	Removal Year** (yr) 12 12 12 12 12	First Replacement Year	Number of	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$78,859 \$138,064 \$285,575 \$88,311 \$292	Replacement (\$) \$0 \$0 \$0 \$138,064 \$0 \$88,311 \$292	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183 \$1,183 \$2,071 \$4,284 \$1,325 \$4,39 \$3,794 \$615	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378 \$15,378 \$26,922 \$55,687 \$17,221 \$43.87	\$15,378 \$15,378 \$15,378 \$164,986 \$55,687 \$105,532 \$336
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3) ond #4 eek Containment Pond #1 ilch Pond #3 n's Seep (Pond #2) nk*** e Seepage Pond F Containment	n Type concrete dan concrete dan concrete dan HDPE lined HDPE lined HDPE lined unlined steel HDPE lined concrete	(gallons) 1,116,800 827,700 2,925,300 972,500 1,879,200 911,600 25,000 352,500 9,600 900,000	(cy) 5,530 4,098 14,485 4,815.310 9,304.813 4,513.765 123.787 1,745.395 47.534 4,456.328	(acres) - - 0.62 1.29 0.38 - - 0.20 0.50	19 19 19 19 0 29 29 29 49 29 -1	25 25 25 25 25 6 35 35 35 55 35 5	Removal Year** (yr) 12 12 12 12 12 12 12 12 12 9 12	First Replacement Year (yr) - - 5 - 0 0 0 0 0 0 0 0 0	Number of Replacements 0 0 0 1 0 1 1 1 1 1 1 1 0	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$138,064 \$285,575 \$88,311 \$292 \$252,948 \$40,979 \$112,696	Replacement (\$) \$0 \$0 \$0 \$138,064 \$0 \$88,311 \$292 \$252,948	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183 \$2,071 \$4,284 \$1,325 \$4.39 \$3,794 \$615 \$1,690	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378 \$15,378 \$26,922 \$55,687 \$17,221 \$43.87 \$49,325	\$15,378 \$15,378 \$15,378 \$164,986 \$55,687 \$105,532 \$336 \$302,273
ation am 1 (181-2003-Dam 1) am 2 (181-2003-Dam 2) am 3 (181-2003-Dam 3) ond #4 eek Containment Pond #1 alch Pond #3 n's Seep (Pond #2) nk*** e Seepage Pond	n Type concrete dan concrete dan concrete dan HDPE lined HDPE lined HDPE lined unlined steel HDPE lined concrete nt require no maintenan	(gallons) 1,116,800 827,700 2,925,300 972,500 1,879,200 911,600 25,000 352,500 9,600 900,000 cc beyond wh	(cy) 5,530 4,098 14,485 4,815.310 9,304.813 4,513.765 123.787 1,745.395 47.534 4,456.328	(acres) - - 0.62 1.29 0.38 - - 0.20 0.50	19 19 19 19 0 29 29 29 49 29 -1	25 25 25 25 25 6 35 35 35 55 35 5	Removal Year** (yr) 12 12 12 12 12 12 12 12 9 12 12 12	First Replacement Year (yr) - - - 5 - 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Number of	and Replacement (\$/ea) \$78,859 \$78,859 \$78,859 \$78,859 \$138,064 \$285,575 \$88,311 \$292 \$252,948 \$40,979 \$112,696 : -	Replacement (\$) \$0 \$0 \$0 \$138,064 \$0 \$88,311 \$292 \$252,948 \$40,979	Maintenance Ponds Closed Post Closure (\$/yr) \$1,183 \$1,183 \$1,183 \$1,183 \$2,071 \$4,284 \$1,325 \$4,39 \$3,794 \$615	Maintenance Ponds Closed Post Closure (\$) \$15,378 \$15,378 \$15,378 \$15,378 \$26,922 \$55,687 \$17,221 \$43.87 \$49,325 \$7,991	\$15,378 \$15,378 \$15,378 \$164,986 \$55,687 \$105,532 \$336 \$302,273 \$48,970

Cobre Mining Company	
Water Management Worksheet #1	
5/17/18	

1

Cobre_WM_20180517d.xlsx Reclamation and O&M Costs Sheet 1 Page 2 of 9

Water Management Cost Estimate

Pumps											$\frac{44 Q^{1.85}}{^5 D_i^{4.865}}$						
From	То	Number	Age Today (yr)	Age at Reclamation (yr)	Removal Year (yr)	First Replacement Year (yr)	Number of Replacements	Average Combined Operational Pump Rate (gpm)	ping 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)	through	Direct Pump Cost New and Replacement (\$/replacement)
SWRF Dam 1 (18			15	21	12	0	1	1760	6650	6719	61	130	82	61	120.9	0	\$61,789
SWRF Dam 2 (18			15	21	12	0	1	1940	6613	6715	54	156	109	81	48.7	0	\$61,789
SWRF Dam 3 (18		2	15	21	12	0	1	940	6556	6745	11	200	68	51	96.9	0	\$51,491
Decant Pond #4		2	24 24	30 30	12	0	1	3000 3000	6688 6700	6700 6925	l 10	13 235	14 254	10	0	18001800	\$51,491 \$51,491
Booster Pump 2 Decant Pond #4	Surge Tank	2	24 24	30 30	12	0	1	3000 1760	6688	6925 7000	10	235 343	254 218	189 162	0	0	\$51,491 \$61,789
Magnetite Interce		1	24	30 30	5	0	1	100	6670	6695	0	25	1	102	0	146643	\$15,447
Magnetite Seepag	-	2	24	30	12	0	1	100	6695	6750	7	62	2	2	13.1	0	\$30,895
Estrada Seep	Decant Pon		9	15	5	5	1	45	6575	6688	19	132	2	$\frac{2}{2}$	0	762541	\$20,596
Union Hill Adit S			9	15	5	5	1	30	6575	6688	96	209	2	2	0	169454	\$20,596
Upper Creek Con		2	24	30	12	0	1	1980	6810	6925	358	473	338	252	53.7	0	\$61,789
Grape Gulch Pone	l Surge Tank	2	24	30	12	0	1	1100	6775	6925	14	164	65	49	6.5	0	\$61,789
Blackman's Seep			24	30	9	0	1	125	6775	6810	0	35	2	1	0	0	\$15,447
Surge Tank	Reclaim Po	2	10	16	9	4	1	3497	6925	7000	26	101	128	95	0	0	\$61,789
Reclaim Pond	Surge Tank	1	10	16	5	4	1	1240	7000	7010	46	56	25	19	316.1	0	\$30,895
East WRF Contai		2	-1	5	12	-	0	2000	6560	6688	70	198	143	106	69.8	423634	\$20,596
tailings pipeline f		1						4318	6825	7000	13	188	293	219			
Mill No 1 Mill No 2	Tailings Im Tailings Im	1						4318	6950	7000	13	63	293 98	73			
Pumps (continue	d)			e Pre Completed				Post Closure Post Compl	eted Reclamation (Reclam	ation Year 6 to 12)]					
Pumps (continue From	e d) To	Average Pumping Rate (gal/yr)		igh Reclamation	n Year 5) Direct Annual Operational Cost	Direct	Average Pumping Rate (gal/yr)	Operating Time	eted Reclamation (Reclam Annual Electrical Usage (kWh/yr)	ation Year 6 to 12) 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 (\$)
	То	Pumping Rate	(Throu Operating Time	igh Reclamation Annual Electrical Usage	n Year 5) Direct Annual Operational	Direct Operational Cost	Pumping Rate	Operating Time	Annual Electrical	Direct Annual Operational Cost	Cost	New and Replacement			Removal		Electricity and Fuel
From SWRF Dam 1 (18 SWRF Dam 2 (18	To 31SWRF Dan 31SWRF Dan	Pumping Rate (gal/yr) 5,821,936 2,345,147	(Throu Operating Time (hr/yr) 55.1 20.1	Annual Electrical Usage (kWh/yr) 3,381 1,636	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82	Direct Operational Cost (\$) 1,018 492	Pumping Rate (gal/yr) 305,888 123,216	Operating Time (hr/yr) 3 1	Annual Electrical Usage (kWh/yr) 178 86	Direct Annual Operational Cost (\$/yr) \$9 \$4	Cost (\$) \$62 \$30	New and Replacement (\$) \$61,789 \$61,789	(\$/yr) \$927 \$927	Maintenance (\$) \$12,049 \$12,049	Removal (\$) \$10,298 \$10,298	(\$) \$84,136 \$84,136	Electricity and Fuel (\$) \$1,080 \$523
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300	(Throu Operating Time (hr/yr) 55.1 20.1 227.5	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578	Direct Operational Cost (\$) 1,018 492 3,468	Pumping Rate (gal/yr) 305,888 123,216 8,412,249	Operating Time (hr/yr) 3 1 149	Annual Electrical Usage (kWh/yr) 178 86 7,552	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379	Cost (\$) \$62 \$30 \$2,652	New and Replacement (\$) \$61,789 \$61,789 \$51,491	(\$/yr) \$927 \$927 \$772	Maintenance (\$) \$12,049 \$12,049 \$10,041	Removal (\$) \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830	Electricity and Fuel (\$) \$1,080 \$523 \$6,120
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319	Operating Time (hr/yr) 3 1 149 31	Annual Electrical Usage (kWh/yr) 178 86 7,552 308	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15	Cost (\$) \$62 \$30 \$2,652 \$108	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491	(\$/yr) \$927 \$927 \$772 \$772	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578	Direct Operational Cost (\$) 1,018 492 3,468	Pumping Rate (gal/yr) 305,888 123,216 8,412,249	Operating Time (hr/yr) 3 1 149	Annual Electrical Usage (kWh/yr) 178 86 7,552	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491	(\$/yr) \$927 \$927 \$772 \$772 \$772	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0	Operating Time (hr/yr) 3 1 149 31 131 0	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$772 \$927	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po pt Magnetite T	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 0.0 24.4	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Intercer Magnetite Seepag	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po pt Magnetite T e Decant Pon	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0	Operating Time (hr/yr) 3 1 149 31 131 0	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$1 \$3	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$772 \$927 \$232 \$463	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$5,149 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce	To BISWRF Dan BISWRF Dan BIBUIIfrog pir Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon Decant Pon	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 0.0 24.4	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon Decant Pon e Decant Pon	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$3 \$0 \$1 \$3 \$0	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854	Removal (\$) \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82 \$135
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po ot Magnetite T e Decant Pon Decant Pon ta Decant Pon ta Surge Tank	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 0 0	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$101 \$4	New and Replacement (\$) \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$20,596	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$927 \$927	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049	Removal (\$)\$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep	To 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon Decant Pon de Decant Pon ta Surge Tank 1 Surge Tank (F Upper Cree	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$3 \$0 \$1 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$3 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$4 \$0	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$61,789 \$61,789 \$15,447	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$927 \$927 \$927 \$927 \$927	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$2,317	Removal (\$) \$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$32,748 \$32,748 \$32,748 \$32,748 \$32,748 \$32,748	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$16,132 \$0 \$5 \$82 \$135 \$82 \$135 \$48 \$1,752 \$74 \$0
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep Surge Tank	To BISWRF Dan BISWRF Dan BISWRF Dan BIBUIIfrog pig Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon de Decant Pon ta Surge Tank I Surge Tank I Surge Tank (F Upper Cree Reclaim Po	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 0.0	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 0	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$0 \$1 \$1 \$3 \$0 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$2,652	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$309 \$309 \$327 \$927 \$927 \$927 \$927	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268	Removal (\$)\$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$0
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep Surge Tank Reclaim Pond	To 31SWRF Dan 31SWRF Dan 31SWRF Dan 31Bullfrog pir Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon Decant Pon ta Surge Tank 1 Surge Tank (FUpper Cree Reclaim Po Surge Tank	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0	$\begin{array}{r} {\rm Year \ 5)} \\ \hline {\rm Direct} \\ {\rm Annual} \\ {\rm Operational} \\ {\rm Cost} \\ \hline (\$/yr) \\ \hline 170 \\ 82 \\ 578 \\ 66 \\ 1,241 \\ 0 \\ 1 \\ 11 \\ 23 \\ 8 \\ 275 \\ 12 \\ 0 \\ 0 \\ 481 \\ \end{array}$	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$2,652 \$0 \$0 \$0 \$103 \$103 \$103 \$103 \$103 \$103	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$30,895	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$463	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$32,748 \$84,136 \$84,136 \$84,136 \$32,748 \$84,136 \$84,136 \$84,136 \$32,748 \$84,136 \$84,356 \$33,824	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep Surge Tank Reclaim Pond East WRF Contai	To BISWRF Dan BISWRF Dan BISWRF Dan BIBUIIfrog pig Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon de Decant Pon ta Surge Tank I Surge Tank I Surge Tank I Surge Tank I Decant Pon Surge Tank	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 0.0	Igh Reclamation Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485	n Year 5) Direct Annual Operational Cost (\$/yr) 170 82 578 66 1,241 0 1 11 23 8 275 12 0 0 0	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 0	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$0 \$1 \$1 \$3 \$0 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$4 \$0 \$0 \$0 \$101 \$2,652	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$309 \$309 \$327 \$927 \$927 \$927 \$927	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268	Removal (\$)\$10,298	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,137 \$32,748	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep Surge Tank Reclaim Pond East WRF Contai <i>tailings pipeline f</i>	To BISWRF Dan BISWRF Dan BISWRF Dan BIBUIIfrog pir Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon de Decant Pon ta Surge Tank I Surge Tank I Surge Tank (FUpper Cree Reclaim Po Surge Tank m Decant Pon <i>Jurge Tank</i>	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359	$\begin{array}{r} \mbox{Year 5)} \\ \hline \mbox{Direct} \\ \mbox{Annual} \\ \mbox{Operational} \\ \mbox{Cost} \\ \hline \mbox{($/yr)} \\ \hline \mbox{170} \\ \mbox{82} \\ \mbox{578} \\ \mbox{66} \\ \mbox{1,241} \\ \mbox{0} \\ \mbox{1} \\ \mbox{11} \\ \mbox{23} \\ \mbox{8} \\ \mbox{275} \\ \mbox{12} \\ \mbox{0} \\ \mbox{0} \\ \mbox{481} \end{array}$	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$2,652 \$0 \$0 \$0 \$103 \$103 \$103 \$103 \$103 \$103	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$30,895 \$0	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$463	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,135 \$38,824 \$14,315 \$0	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066 \$0
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep Surge Tank Reclaim Pond East WRF Contai <i>tailings pipeline fr</i> Mill No 1	To BISWRF Dan BISWRF Dan BISWRF Dan BIBUIIfrog pip Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon de Decant Pon ta Surge Tank I Surge Tank I Surge Tank (FUpper Cree Reclaim Po Surge Tank m Decant Pon <i>burge Tank</i> Surge Tank	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851 5,764,479	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5 22.2	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359 4,865	$\begin{array}{r} \mbox{Year 5)} \\ \hline \mbox{Direct} \\ \mbox{Annual} \\ \mbox{Operational} \\ \mbox{Cost} \\ \hline \mbox{($/yr)} \\ \hline \mbox{170} \\ \mbox{82} \\ \mbox{578} \\ \mbox{66} \\ \mbox{1,241} \\ \mbox{0} \\ \mbox{1} \\ \mbox{11} \\ \mbox{23} \\ \mbox{8} \\ \mbox{275} \\ \mbox{12} \\ \mbox{0} \\ \mbox{0} \\ \mbox{481} \end{array}$	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$2,652 \$0 \$0 \$0 \$103 \$103 \$103 \$103 \$103 \$103	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$61,789 \$30,895 \$0 \$244	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$463	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,2914 \$81,356 \$38,824 \$14,315 \$0 \$2244	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$0 \$2,885 \$1,066 \$0 \$0 \$0 \$0
From SWRF Dam 1 (18 SWRF Dam 2 (18 SWRF Dam 2 (18 SWRF Dam 3 (18 Decant Pond #4 Booster Pump 2 Decant Pond #4 Magnetite Interce Magnetite Seepag Estrada Seep Union Hill Adit S Upper Creek Con Grape Gulch Pone Blackman's Seep Surge Tank Reclaim Pond East WRF Contai <i>tailings pipeline fr</i> Mill No 1 Mill No 2	To BISWRF Dan BISWRF Dan BISWRF Dan BIBUIIfrog pir Booster Pur Surge Tank Reclaim Po of Magnetite T e Decant Pon de Decant Pon ta Surge Tank I Surge Tank I Surge Tank (FUpper Cree Reclaim Po Surge Tank m Decant Pon <i>Jurge Tank</i>	Pumping Rate (gal/yr) 5,821,936 2,345,147 12,833,300 23,496,119 23,496,119 0 146,643 777,473 762,541 169,454 2,585,922 313,007 0 0 15,221,786 3,784,851	(Throu Operating Time (hr/yr) 55.1 20.1 227.5 130.5 130.5 130.5 0.0 24.4 129.6 282.4 94.1 21.8 4.7 0.0 0.0 204.6 31.5	Annual Electrical Usage (kWh/yr) 3,381 1,636 11,520 1,317 24,734 0 17 216 450 159 5,485 231 0 0 - 3,359	$\begin{array}{r} \mbox{Year 5)} \\ \hline \mbox{Direct} \\ \mbox{Annual} \\ \mbox{Operational} \\ \mbox{Cost} \\ \hline \mbox{($/yr)} \\ \hline \mbox{170} \\ \mbox{82} \\ \mbox{578} \\ \mbox{66} \\ \mbox{1,241} \\ \mbox{0} \\ \mbox{1} \\ \mbox{11} \\ \mbox{23} \\ \mbox{8} \\ \mbox{275} \\ \mbox{12} \\ \mbox{0} \\ \mbox{0} \\ \mbox{481} \end{array}$	Direct Operational Cost (\$) 1,018 492 3,468 397 7,446 0 5 65 135 48 1,651 69 0 0 0 2,885	Pumping Rate (gal/yr) 305,888 123,216 8,412,249 5,494,319 23,496,119 0 146,643 179,787 0 0 135,866 16,446 0 0 799,763	Operating Time (hr/yr) 3 1 149 31 131 0 24	Annual Electrical Usage (kWh/yr) 178 86 7,552 308 24,734 0 17 50 0 17 50 0 0 288 12 0 0 25	Direct Annual Operational Cost (\$/yr) \$9 \$4 \$379 \$15 \$1,241 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$3 \$0 \$1 \$1 \$1 \$1 \$0 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1	Cost (\$) \$62 \$30 \$2,652 \$108 \$8,687 \$0 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$18 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$0 \$101 \$4 \$4 \$0 \$0 \$0 \$101 \$4 \$2,652 \$0 \$0 \$0 \$103 \$103 \$103 \$103 \$103 \$103	New and Replacement (\$) \$61,789 \$61,789 \$61,789 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$51,491 \$61,789 \$15,447 \$30,895 \$20,596 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$15,447 \$61,789 \$30,895 \$0	(\$/yr) \$927 \$927 \$772 \$772 \$772 \$927 \$232 \$463 \$309 \$309 \$309 \$309 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$927 \$463	Maintenance (\$) \$12,049 \$12,049 \$10,041 \$10,041 \$10,041 \$5,561 \$1,390 \$6,024 \$1,854 \$1,854 \$1,854 \$12,049 \$12,049 \$12,049 \$12,049 \$2,317 \$9,268 \$2,781	Removal (\$)\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149\$10,298\$5,149	(\$) \$84,136 \$84,136 \$71,830 \$71,830 \$71,830 \$71,830 \$77,649 \$21,987 \$47,217 \$32,748 \$32,748 \$32,748 \$84,136 \$84,136 \$84,136 \$84,136 \$84,136 \$84,135 \$38,824 \$14,315 \$0	Electricity and Fuel (\$) \$1,080 \$523 \$6,120 \$505 \$16,132 \$0 \$5 \$82 \$135 \$48 \$1,752 \$74 \$0 \$0 \$0 \$2,885 \$1,066 \$0

Cobre Mining Company Water Management Worksheet #1 5/17/18

Cobre_WM_20180517d.xlsx Reclamation and O&M Costs Sheet 1 Page 3 of 9

Water Management Cost Estimate

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 (181SWRF D		4,466	10	15	21	12	-	0	\$17.06	\$3.32	\$76,190	\$0	\$762	\$9,905	\$14,824	\$24,728.71
SWRF Dam 2 (181SWRF D	an HDPE	3,300	10	15	21	12	-	0	\$17.06	\$3.32	\$56,298	\$0	\$563	\$7,319	\$10,954	\$18,272.44
SWRF Dam 3 (181Bullfrog J	oip HDPE	220	6	15	21	12	-	0	\$10.52	\$2.00	\$2,314	\$0	\$23	\$301	\$440	\$740.96
Decant Pond #4 Booster P	ur HDPE	100	15	24	30	12	-	0	\$35.22	\$3.32	\$3,522	\$0	\$35	\$458	\$332	\$789.85
Booster Pump 2 Surge Tax	nk HDPE	1,936	15	24	30	12	-	0	\$35.22	\$3.32	\$68,194	\$0	\$682	\$8,865	\$6,426	\$15,291.43
Decant Pond #4 Reclaim I	Poi HDPE	5,502	12	24	30	5	-	0	\$19.46	\$3.32	\$107,052	\$0	\$1,071	\$6,423	\$18,263	\$24,685.86
Magnetite Intercept Magnetite	T HDPE	200	5	24	30	5	-	0	\$10.52	\$2.00	\$2,104	\$0	\$21	\$126	\$400	\$526.32
Magnetite Seepage Decant Po	on HDPE	1,188	4	24	30	12	-	0	\$7.54	\$1.43	\$8,959	\$0	\$90	\$1,165	\$1,697	\$2,862.14
Estrada Seep Decant Po	on HDPE	3,470	3	24	30	5	-	0	\$7.54	\$1.43	\$26,169	\$0	\$262	\$1,570	\$4,958	\$6,528.17
Union Hill Adit See Decant Pe	on HDPE	5,250	2	24	30	5	-	0	\$7.54	\$1.43	\$39,592	\$0	\$396	\$2,376	\$7,501	\$9,876.91
Upper Creek Conta Surge Tar	nk HDPE	1,770	6	24	30	12	-	0	\$10.52	\$2.00	\$18,621	\$0	\$186	\$2,421	\$3,541	\$5,961.36
Upper Creek Conta Surge Ta		1,770	8	24	30	12	-	0	\$14.33	\$2.00	\$25,363	\$0	\$254	\$3,297	\$3,541	\$6,837.86
Grape Gulch Pond Surge Ta		861	8	24	30	12	-	0	\$14.33	\$2.00	\$12,338	\$0	\$123	\$1,604	\$1,722	\$3,326.21
Blackman's Seep (FUpper Cr		100	5	24	30	9	-	0	\$10.52	\$2.00	\$1,052	\$0	\$11	\$105	\$200	\$305.24
Surge Tank Bullfrog		31,850	8	7	13	12	_	0	\$14.33	-	\$456,393	\$0	\$4,564	\$59,331	\$0	\$59,331.05
Surge Tank Reclaim I	-	3,923	15	24	30	9	_	0	\$28.72	\$3.32	\$112,664	\$0	\$1,127	\$11,266	\$13,022	\$24,287.98
Reclaim Pond Surge Ta		3,855	9	24	30	5	_	0	\$14.33	\$3.32	\$55,240	\$0	\$552	\$3,314	\$12,796	\$16,110.28
East WRF Contain Decant Po		4,073	10	3	9	12	_	0	\$17.06	\$3.32	\$69,486	\$0	\$695	\$9,033	\$13,519	\$22,552.63
tailings pipeline flushing		.,	10	C	2			Ŭ	<i><i><i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>₁,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i>q</i>,,<i></i></i></i>	<i>\\</i>	<i>q07</i> ,100	4 v	φ σ y σ	<i> </i>	<i><i><i>q 10 ,0 1 /</i></i></i>	<i> </i>
Mill No 1 Tailings I	mj HDPE	6,850	21													
Mill No 2 Tailings I	-	6,850	21													
*Bullfrog pipeline has an Ind	ustrial PMLU	-,	21]	Direct Annual Costs:	_	\$11.416	_	_	_
*Bullfrog pipeline has an Ind	astrial PMLU		21								Direct Annual Costs: irect Cost Subtotals:	- \$0	\$11,416	- \$128,879	- \$114,136	\$243,015
*Bullfrog pipeline has an Ind	astrial PMLU											- \$0		- \$128,879	- \$114,136	
	ustrial PMLU Line (ft)	Number of Poles			Direct Cost Wiring Installation (\$)	Number Transformer Stations	Direct Cost Transformer (\$)	Direct Cost Electrical Panel (\$)	Direct Cost New (\$)			- \$0 Direct Cost Removal (\$)		- \$128,879	- \$114,136	
Electrical Infrastructure From To	Line (ft)	Number o Poles	f	r Pole and crossarm (\$)	Wiring Installation (\$)	Transformer		Electrical Panel (\$)	(\$)	D Direct Cost Maintenance (\$/yr)	irect Cost Subtotals: Direct Cost Maintenance (\$)	Direct Cost Removal (\$)	- Direct Cost (\$)	\$128,879	- \$114,136	
Electrical Infrastructure From To SWRF Dam 1 (181SWRF D	Line (ft) an 1,166	Number of Poles 13	f Removal Yea 12.0	r Pole and crossarm (\$) \$25,510.38	Wiring Installation (\$)	Transformer	\$9,007	Electrical Panel (\$) \$20,596		D Direct Cost Maintenance (\$/yr) \$873	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69	Direct Cost Removal (\$) \$3,422	- Direct Cost (\$) \$14,766	- \$128,879	\$114,136	
Electrical Infrastructure From To SWRF Dam 1 (181SWRF D SWRF Dam 2 (181SWRF D	Line (ft) an 1,166	Number o Poles	f Removal Year 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46	Wiring Installation (\$) \$3,059.13	Transformer	\$9,007 \$9,007	Electrical Panel (\$) \$20,596 \$20,596	(\$) \$58,173 \$104,981	D Direct Cost Maintenance (\$/yr) \$873 \$1,575	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22	Direct Cost Removal (\$) \$3,422 \$8,949	- Direct Cost (\$) \$14,766 \$29,421	- \$128,879	\$114,136	
Electrical Infrastructure From To SWRF Dam 1 (181SWRF D SWRF Dam 2 (181SWRF D SWRF Dam 3 (181Road Decant Pond #4 Surge Tat	Line (ft) an 1,166 an 3,300 220	Number of Poles 13	f Removal Yea 12.0	r Pole and crossarm (\$) \$25,510.38	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19	Transformer	\$9,007	Electrical Panel (\$) \$20,596	(\$) \$58,173	D Direct Cost Maintenance (\$/yr) \$873	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69	Direct Cost Removal (\$) \$3,422	- Direct Cost (\$) \$14,766	\$128,879	\$114,136	
Electrical Infrastructure From To SWRF Dam 1 (181SWRF D SWRF Dam 2 (181SWRF D SWRF Dam 3 (181Road Decant Pond #4 Surge Tat Upper Creek Containment Pond Office #1, Grape Gulch Area	Line (ft) an 1,166 an 3,300 220	Number or Poles 13 34 4	f Removal Year 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007	Electrical Panel (\$) \$20,596 \$20,596 \$20,596	(\$) \$58,173 \$104,981 \$38,030	D Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053	- Direct Cost (\$) \$14,766 \$29,421 \$8,469	\$128,879	\$114,136	
Electrical Infrastructure From To SWRF Dam 1 (181SWRF D SWRF Dam 2 (181SWRF D SWRF Dam 3 (181Road Decant Pond #4 Surge Tat Upper Creek Containment Pond Office #1, Grape Gulch Area Pond #3, and	Line (ft) an 1,166 an 3,300 220 ak 2,036 582	Number or Poles 13 34 4 22 7	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065	D Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705	\$128,879	\$114,136	
Electrical InfrastructureFromToSWRF Dam 1 (181SWRF DSWRF Dam 2 (181SWRF DSWRF Dam 3 (181RoadDecant Pond #4Surge TatUpper CreekContainment PondOffice#1, Grape GulchAreaPond #3, andUpper CreSurge TankUpper Cr	Line (ft) an 1,166 an 3,300 220 ak 2,036 582 eel 1,770	Number of Poles 13 34 4 22 7 19	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$851	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063	\$128,879	\$114,136	
Electrical InfrastructureFromToSWRF Dam 1 (181SWRF DSWRF Dam 2 (181SWRF DSWRF Dam 3 (181RoadDecant Pond #4Surge TatUpper CreekContainment PondOffice#1, Grape GulchAreaPond #3, andSurge TankSurge TankUpper CreMagnetite TailingsDecant Poc	Line (ft) an 1,166 an 3,300 220 ak 2,036 582 eel 1,770 an 1,188	Number or Poles 13 34 4 22 7	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$851 \$651	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330	\$128,879	\$114,136	
Electrical InfrastructureFromToSWRF Dam 1 (181SWRF DSWRF Dam 2 (181SWRF DSWRF Dam 3 (181RoadDecant Pond #4Surge TatUpper CreekContainment PondOffice#1, Grape GulchAreaPond #3, andSurge TankSurge TankUpper CreMagnetite TailingsDecant PoEstrada SeepRoad	Line (ft) an 1,166 an 3,300 220 ak 2,036 582 ee! 1,770 on 1,188 500	Number of Poles 13 34 4 22 7 19	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$851 \$651 \$651 \$418	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422 \$1,579	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089	\$128,879	\$114,136	
Electrical InfrastructureFromToSWRF Dam 1 (181SWRF DSWRF Dam 2 (181SWRF DSWRF Dam 3 (181RoadDecant Pond #4Surge TatUpper CreekContainment PondOffice#1, Grape GulchAreaPond #3, andSurge TankSurge TankUpper CreMagnetite TailingsDecant PoEstrada SeepRoadUnion Hill Adit Sec Road	Line (ft) an 1,166 an 3,300 220 ak 2,036 582 eel 1,770 an 1,188 500 727	Number or Poles 13 34 4 22 7 19 13 6 9	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0 5.0 5.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02 \$17,661.03	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$577.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80 \$1,907.36	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887 \$34,370	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$451 \$851 \$651 \$418 \$516	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87 \$3,093.30	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422 \$1,579 \$2,369	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089 \$5,462	\$128,879	\$114,136	
Electrical InfrastructureFromToSWRF Dam 1 (181SWRF DSWRF Dam 2 (181SWRF DSWRF Dam 3 (181RoadDecant Pond #4Surge TatUpper CreekContainment PondOffice#1, Grape GulchAreaPond #3, andSurge TankSurge TankUpper CreMagnetite TailingsDecant PoEstrada SeepRoadUnion Hill Adit Se RoadEast WRF Contain Decant Po	Line (ft) an 1,166 an 3,300 220 ak 2,036 582 eel 1,770 om 1,188 500 727 om 4,582	Number or Poles 13 34 4 22 7 19 13 6 9 47	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0 5.0 12.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02 \$17,661.03 \$92,229.84	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$5,77.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80 \$1,907.36 \$12,021.37	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887 \$34,370 \$119,053	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$851 \$651 \$418 \$516 \$1,786	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87 \$3,093.30 \$23,215.30	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422 \$1,579 \$2,369 \$12,371	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089 \$5,462 \$35,587	\$128,879	\$114,136	
Electrical InfrastructureFromToSWRF Dam 1 (181SWRF DSWRF Dam 2 (181SWRF DSWRF Dam 3 (181RoadDecant Pond #4Surge TatUpper CreekContainment PondOffice#1, Grape GulchAreaPond #3, andSurge TankSurge TankUpper CreMagnetite TailingsDecant PoEstrada SeepRoadUnion Hill Adit Sec Road	Line (ft) an 1,166 an 3,300 220 ak 2,036 582 eel 1,770 an 1,188 500 727	Number or Poles 13 34 4 22 7 19 13 6 9	f Removal Year 12.0 12.0 12.0 12.0 12.0 12.0 12.0 5.0 5.0 5.0 5.0	r Pole and crossarm (\$) \$25,510.38 \$66,719.46 \$7,849.35 \$43,171.41 \$13,736.36 \$37,284.40 \$25,510.38 \$11,774.02 \$17,661.03	Wiring Installation (\$) \$3,059.13 \$8,657.91 \$5,77.19 \$5,341.67 \$1,526.94 \$4,643.79 \$3,116.85 \$1,311.80 \$1,907.36 \$12,021.37	Transformer Stations 2 2 2 2	\$9,007 \$9,007 \$9,007 \$9,007 \$9,007 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503 \$4,503	Electrical Panel (\$) \$20,596 \$20,596 \$20,596 \$20,596 \$20,596 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298 \$10,298	(\$) \$58,173 \$104,981 \$38,030 \$78,116 \$30,065 \$56,730 \$43,429 \$27,887 \$34,370	Direct Cost Maintenance (\$/yr) \$873 \$1,575 \$570 \$1,172 \$451 \$451 \$451 \$851 \$651 \$418 \$516	irect Cost Subtotals: Direct Cost Maintenance (\$) \$11,343.69 \$20,471.22 \$7,415.81 \$15,232.68 \$5,862.66 \$11,062.31 \$3,908.60 \$2,509.87 \$3,093.30	Direct Cost Removal (\$) \$3,422 \$8,949 \$1,053 \$5,791 \$1,843 \$5,001 \$3,422 \$1,579 \$2,369	- Direct Cost (\$) \$14,766 \$29,421 \$8,469 \$21,024 \$7,705 \$16,063 \$7,330 \$4,089 \$5,462	\$128,879	\$114,136	

Cobre Mining Company Water Management Worksheet #1 5/17/18

Cobre_WM_20180517d.xlsx Reclamation and O&M Costs Sheet 1 Page 4 of 9

Cobre Mining Company Water Management Worksheet #2 5/17/18

Environmental Sampling, Analysis and Reporting $^{\left(1\right) }$

S	hipping and .	Analysis									
Shipping (coolers per sample)	Shipping Cost (\$/cooler)	Shipping Cost (\$/sample)	Analysis (\$/sample)	Analysis and Shipping Cost (\$/sample)	Labor	Reporting (hour/sample)	Rate (\$/hour)	Review Work per Sample (hours)	Review Work Rate (\$/hour)	Reporting Cost (\$/sample)	Total Sample Cost (\$/sample)
0.14	\$ 60	\$ 9	\$ 239	\$ 248	1.0	0.5	\$ 60	0.1	\$ 70	\$ 100	\$ 348

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

Sampling Schedule and Cost

		Tailings			Stockpiles		Ir	ntercept We	ells		Sampling			Yearly
		Semi-			Semi-			Semi-		Total Well	Events	C	ost	Cost
Year	Quarterly	Annual	Annual	Quarterly	Annual	Annual	Quarterly	Annual	Annual	Locations	Per Year	(\$/sa	mple)	(\$)
0-5	1			4	•		2			7	4	\$	348	\$ 9,74
5 - 12		1			4			2		7	2	\$	348	\$ 4,87
12-99			1			4			2	7	1	\$	348	\$ 2,43
											Total Cos	st Year	s 0-99	\$ 297,192

Energy Labs Unit Rates:

23 Constituents. Energy Laboratories, Inc., Quote March 2018 (www.energylab.com).

20 Constituents. Energy Eaborate	o, mo.,	Quoto	1110
Alkalinity Total as CaCO3	\$ 10.00		
Anions by Ion Chromatography	\$ 30.00		
Chloride			
Fluoride			
Sulfate			
Total Dissolved Solids	\$ 20.00		
Nitrogen - Nitrate+Nitrite as N	\$ 45.00		
Metals by ICP/ICPMS, total	\$ 160.00		
Aluminum			
Arsenic			
Cadmium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Magnesium			
Manganese			
Nickel			
Potassium			
Selenium			
Sodium			
Zinc			
Sample Prep	\$ 15.00		
	\$ 280	-	

Water Management Cash Flow

	Electricity, F	uel, and Environme		Costs Percentage Costs Percentage	17% 17%											
PONDS & TAN	Capital	O&M	PUMPS	Capital	Removal	Electricity and Fuel	O&M	PIPELINES	Capital	Removal	Maintenance	ELECTRIC	Removal N	TRUCTURE Maintenance	ENVIROMEN	ITAL SAMPLING
	Annual Cost	Annual Cost		Annual Cost	Annual Cost	Annual Cost	Annual Cost		Annual Cost	Annual Cost	Annual Cost		Annual Cost	Annual Cost		Annual Cost
Year	COSI	(\$)	Year	COSI	COSI	(\$)	(\$)	Year	COSI	COSI	(\$)	Year	COSI	(\$)	Year	(\$)
0	\$490,787	\$20,278	0	\$674,280	\$0		\$11,928	0	\$0	\$0		0	\$0	\$11,597	0	\$11,400
1	\$0	\$20,278	1	\$0	\$0		\$11,928	1	\$0	\$0		1	\$0	\$11,597	1	\$11,400
2	\$0	\$20,278	2	\$0	\$0		\$11,928	2	\$0	\$0 \$0		2	\$0	\$11,597	2	\$11,400
3	\$0 \$0	\$20,278 \$20,278	3	\$0 \$118,913	\$0 \$0	. ,	\$11,928 \$11,928	3	\$0 \$0	\$0 \$0		3	\$0 \$0	\$11,597 \$11,597	3	\$11,400 \$11,400
4 5	₄₀ \$177,136	\$20,278 \$20,278	4 5	\$52,850	ەن \$52,850	. ,	\$11,928 \$11,928	4 5	\$0 \$0	ەن \$56,347		4	۵ 0 \$9,456	\$11,597 \$11,597	4 5	\$5,700
6	\$0	\$20,278	6	\$02,000 \$0	¢02,000 \$0		\$9,308	6	\$0	¢00,047 \$0		6	\$0 \$0	\$9,742	6	\$5,700
7	\$0	\$20,278	7	\$0	\$0	\$1,958	\$9,308	7	\$0	\$0	\$10,663	7	\$0	\$9,742	7	\$5,700
8	\$0	\$20,278	8	\$0	\$0	. ,	\$9,308	8	\$0	\$0		8	\$0	\$9,742	8	\$5,700
9	\$0 \$0	\$20,278	9	\$0 \$0	\$19,819		\$9,308 \$7,050	9	\$0	\$16,963		9	\$0	\$9,742	9	\$5,700 \$5,700
10 11	\$0 \$0	\$20,273 \$20,273	10 11	\$0 \$0	\$0 \$0		\$7,952 \$7,952	10 11	\$0 \$0	\$0 \$0		10 11	\$0 \$0	\$9,742 \$9,742	10 11	\$5,700 \$5,700
12	\$0 \$0	\$20,273	12	\$0 \$0	₄₀ \$118,913		\$7,952 \$7,952	12	\$0 \$0	پ و 73,126		12	\$57,749	\$9,742 \$9,742	12	\$2,850
13	\$0	\$0	13	\$0	\$0 \$0		\$0 \$0	13	\$0	\$0		13	\$0 \$0	\$0	13	\$2,850
14	\$0	\$O	14	\$O	\$0		\$0	14	\$0	\$0	\$0	14	\$0	\$0	14	\$2,850
15	\$0	\$0	15	\$0	\$0		\$0	15	\$0	\$0		15	\$0	\$0	15	\$2,850
16	\$0	\$0	16	\$0	\$0		\$O	16	\$0	\$0 \$0		16	\$0	\$0	16	\$2,850
17	\$0 \$0	\$0 \$0	17	\$0 \$0	\$0 \$0		\$0 \$0	17	\$0 \$0	\$0 \$0		17	\$0 \$0	\$0 \$0	17	\$2,850 \$2,850
18 19	\$0 \$0	\$0 \$0	18 19	\$0 \$0	\$0 \$0		\$0 \$0	18 19	\$0 \$0	\$0 \$0		18 19	\$0 \$0	\$0 \$0	18 19	\$2,850 \$2,850
20	\$0 \$0	\$0 \$0	20	\$0 \$0	\$0 \$0		\$0 \$0	20	\$0 \$0	\$0 \$0		20	\$0 \$0	\$0 \$0	20	\$2,850
21	\$0	\$0	21	\$0	\$0		\$0	21	\$0	\$0		21	\$0	\$0	21	\$2,850
22	\$ 0	\$ 0	22	\$0	\$0	\$0	\$0	22	\$0	\$0	\$0	22	\$0	\$0	22	\$2,850
23	\$0	\$0	23	\$0	\$0		\$0	23	\$0	\$0		23	\$0	\$0	23	\$2,850
24	\$0	\$0	24	\$0	\$0 \$0		\$0	24	\$0	\$0 \$0		24	\$0	\$0	24	\$2,850
25 26	\$0 \$0	\$0 \$0	25 26	\$0 \$0	\$0 \$0		\$0 \$0	25 26	\$0 \$0	\$0 \$0		25 26	\$0 \$0	\$0 \$0	25 26	\$2,850 \$2,850
20	\$0 \$0	\$0 \$0	20	\$0 \$0	\$0 \$0		\$0 \$0	20	\$0 \$0	\$0 \$0		20	\$0 \$0	\$0 \$0	20 27	\$2,850 \$2,850
28	\$0	\$0	28	\$0	\$0	¢O	\$0 \$0	28	\$0	\$0		28	\$0	\$0	28	\$2,850
29	\$0	\$O	29	\$O	\$0		\$0	29	\$0	\$0		29	\$0	\$0	29	\$2,850
30	\$0	\$0	30	\$0	\$0		\$0	30	\$0	\$0		30	\$0	\$0	30	\$2,850
31	\$0	\$0	31	\$0	\$0 \$0		\$0	31	\$0	\$0 \$0		31	\$0	\$0	31	\$2,850
32 33	\$0 \$0	\$0 \$0	32 33	\$0 \$0	\$0 \$0		\$0 \$0	32 33	\$0 \$0	\$0 \$0		32 33	\$0 \$0	\$0 \$0	32 33	\$2,850 \$2,850
33	\$0 \$0	\$0 \$0	33	\$0 \$0	\$0 \$0		\$0 \$0	33	\$0 \$0	\$0 \$0		33	\$0 \$0	\$0 \$0	33	\$2,850 \$2,850
35	\$0	\$0	35	\$0	\$0		\$0 \$0	35	\$0	\$0		35	\$0	\$0	35	\$2,850
36	\$0	\$0	36	\$0	\$0		\$0	36	\$0	\$0		36	\$0	\$0	36	\$2,850
37	\$0	\$0	37	\$0	\$0	-	\$0	37	\$0	\$0		37	\$0	\$0	37	\$2,850
38	\$0	\$0	38	\$0	\$0 \$0		\$0	38	\$0	\$0 \$0		38	\$0	\$0	38	\$2,850
39 40	\$0 \$0	\$0 \$0	39 40	\$0 \$0	\$0 \$0		\$0 \$0	39 40	\$0 \$0	\$0 \$0		39 40	\$0 \$0	\$0 \$0	39 40	\$2,850 \$2,850
40	\$0 \$0	\$0 \$0	40	\$0 \$0	\$0 \$0		\$0 \$0	40	\$0 \$0	\$0 \$0		40	\$0 \$0	\$0 \$0	40	\$2,850 \$2,850
42	\$0	\$0	42	\$0	\$0		\$0	42	\$0	\$0		42	\$0	\$0	42	\$2,850
43	\$0	\$0	43	\$0	\$0	\$0	\$0	43	\$0	\$0	\$0	43	\$0	\$0	43	\$2,850
44	\$0	\$0	44	\$0	\$0		\$0	44	\$0	\$0		44	\$0	\$0	44	\$2,850
45	\$0 \$0	\$0 \$0	45	\$0	\$0		\$0 \$0	45	\$0	\$0 \$0		45	\$0 \$0	\$0	45	\$2,850
46 47	\$0 \$0	\$0 \$0	46 47	\$0 \$0	\$0 \$0		\$0 \$0	46 47	\$0 \$0	\$0 \$0		46 47	\$0 \$0	\$0 \$0	46 47	\$2,850 \$2,850
47	\$0 \$0	\$0 \$0	48	\$0 \$0	\$0 \$0		\$0 \$0	47 48	\$0 \$0	\$0 \$0		47	\$0 \$0	\$0 \$0	47	\$2,850 \$2,850
49	\$0	\$0	49	\$0	\$0		\$0 \$0	49	\$0	\$0		49	\$0	\$0	49	\$2,850
50	\$0	\$0	50	\$0	\$0		\$0	50	\$0	\$0	\$0	50	\$0	\$0	50	\$2,850
51	\$0	\$0	51	\$0	\$0		\$0	51	\$0	\$0	\$0	51	\$0	\$0	51	\$2,850
52	\$0 \$0	\$0 \$0	52	\$0 \$0	\$0 \$0		\$0 \$0	52	\$0 \$0	\$0 \$0		52	\$0 \$0	\$0 \$0	52	\$2,850 \$2,850
53 54	\$0 \$0	\$0 \$0	53	\$0 \$0	\$0 \$0		\$0 \$0	53	\$0 \$0	\$0 \$0		53	\$0 \$0	\$0 \$0	53 54	\$2,850 \$2,850
54 55	\$0 \$0	\$0 \$0	54 55	\$0 \$0	\$0 \$0		\$0 \$0	54 55	\$0 \$0	\$0 \$0		54 55	\$0 \$0	\$0 \$0	54 55	\$2,850 \$2,850
56	\$0 \$0	\$0 \$0	56	\$0 \$0	\$0 \$0		\$0 \$0	56	\$0 \$0	\$0 \$0		56	\$0 \$0	\$0 \$0	56	\$2,850 \$2,850
57	\$0	\$0	57	\$0	\$0		\$0	57	\$0	\$0		57	\$0	\$0	57	\$2,850
58	\$0	\$0	58	\$0	\$0	\$0	\$0	58	\$0	\$0	\$0	58	\$0	\$0	58	\$2,850
59	\$0	\$0	59	\$0	\$0	\$0	\$0	59	\$0	\$0	\$0	59	\$0	\$0	59	\$2,850

28.3%

Capital Indirect Costs Percentage

Cobre_WM_20180517d.xlsx

Water Management Cash Flow Sheet 3

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Cobre Mining Company Water Management Worksheet #3 5/17/2018

Total Cash Flow (\$)

\$1,237,272 \$72,205 \$72,205

\$72,205 \$191,118 \$415,144 \$57,650

\$57,650 \$57,650 \$94,432

\$54,959 \$54,959

\$301,897 \$2,850

\$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

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Water Management Cash Flow

	Electricity, F	uel, and Environment	O&M Indirec	t Costs Percentage t Costs Percentage t Costs Percentage	28.3% 17% 17%			
PONDS & TAN	ĸs		PUMPS					PIPELINES
Year	Capital Annual Cost	O&M Annual Cost (\$)	Year	Capital Annual Cost	Removal Annual Cost	Electricity and Fuel Annual Cost (\$)	O&M Annual Cost (\$)	Year
60	\$0	\$0	60	\$0	\$0	\$0	\$0	60
61	\$0	\$0	61	\$0	\$0	\$0	\$0	61
62	\$0	\$ 0	62	\$0	\$0	\$0	\$0	62
63	\$0	\$0	63	\$0	\$0	\$0	\$0	63
64	\$0	\$0	64	\$0	\$0	\$0	\$0	64
65	\$0	\$ 0	65	\$0	\$0	\$0	\$0	65
66	\$0	\$0	66	\$0	\$0	\$0	\$0	66
67	\$0	\$0	67	\$0	\$0	\$0	\$0	67
68	\$0	\$0	68	\$0	\$0	\$0	\$0	68
69	\$0	\$0	69	\$0	\$0	\$0	\$0	69
70	\$0	\$O	70	\$0	\$0	\$0	\$O	70
71	\$0	\$0 \$0	71	\$0	\$0	\$0	\$0	71
72	\$0	\$0 \$0	72	\$0	\$0 \$0	\$0	\$0	72
73	\$0 \$0	\$0 \$0	73	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	73
74 75	\$0 \$0	\$0 \$0	74 75	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	74 75
75	\$0 \$0	\$0 \$0	76	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	75
70	\$0 \$0	\$0 \$0	78	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	70
78	\$0 \$0	\$0 \$0	78	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	78
70	\$0 \$0	\$0 \$0	79	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	70
80	\$0	\$0	80	\$0 \$0	\$0	\$0	\$0 \$0	80
81	\$0	\$0	81	\$0	\$0	\$0	\$0 \$0	81
82	\$0	\$0	82	\$0	\$0	\$0	\$0	82
83	\$0	\$0	83	\$0	\$0	\$0	\$0	83
84	\$0	\$0	84	\$0	\$0	\$0	\$ 0	84
85	\$0	\$0	85	\$0	\$0	\$0	\$0	85
86	\$0	\$ 0	86	\$0	\$0	\$0	\$0	86
87	\$0	\$0	87	\$0	\$0	\$0	\$0	87
88	\$0	\$ 0	88	\$0	\$0	\$0	\$0	88
89	\$0	\$ 0	89	\$0	\$0	\$0	\$0	89
90	\$0	\$0	90	\$0	\$0	\$0	\$0	90
91	\$0	\$0	91	\$0	\$0	\$0	\$0	91
92	\$0	\$0	92	\$0	\$0	\$0	\$0	92
93	\$0	\$0 \$0	93	\$0	\$0 \$0	\$0	\$0	93
94	\$0	\$0 \$0	94	\$0	\$0 \$0	\$0	\$0	94
95	\$0	\$0 \$0	95	\$0	\$0 \$0	\$0	\$0	95
96	\$0 \$0	\$0 \$0	96	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	96
97	\$0 \$0	\$0 \$0	97	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	97
98 99	\$0 \$0	\$0 \$0	98	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	98 99
99 Total Cost	\$0 \$667.023	\$0 \$263 500	99	\$0 \$846,044		\$0 \$35 578	\$0 \$132.658	99
al Direct Cost	\$667,923 \$520,595	\$263,599 \$225,298		\$846,044 \$659,426	\$191,583 \$149,324	\$35,578 \$30,408	\$132,658 \$113,383	
	ψ020,030	ψΖΖΟ,ΖΘΟ		ψ009,420	ψ1+3,324	φ50,400	ψ110,000	
	Total Cost	\$2.987.307						

Total Cost Total Direct Cost \$2,987,307 \$2,408,782

> Cobre_WM_20180517d.xlsx Water Management Cash Flow Sheet 3 Page 7 of 9

Cobre Mining Company Water Management Worksheet #3 5/17/2018

Total

Cash

Flow (\$)

> \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850

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\$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,850 \$2,987,307

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Qualit	- 1	D		ELECTRIC		STRUCTURE	ENVIROME	NTAL SAMP	LING
Capit		Removal	Maintenance			Maintenance		Appuel	
Annu Cost		Annual Cost	Annual Cost		Annual Cost	Annual Cost		Annual Cost	
005	L	COSI	(\$)	Year	COSI	(\$)	Year	(\$)	
	\$0	\$0		60	\$0	<u>(</u>	60		
	\$0 \$0	\$0 \$0		61	\$0 \$0	\$0 \$0	61	\$2,850 \$2,850	
	\$0 \$0	\$0 \$0		62	\$0 \$0	\$0 \$0	62		
	\$0 \$0	\$0 \$0		63	\$0 \$0	\$0 \$0	63		
	\$0 \$0	\$0 \$0		64	\$0 \$0	\$0 \$0	64		
	\$0 \$0	\$0 \$0		65	\$0 \$0	\$0 \$0	65		
	\$0 \$0	\$0 \$0		66	\$0 \$0	\$0 \$0	66		
	\$0 \$0	\$0 \$0		67	\$0 \$0	\$0 \$0	67		
	\$0 \$0	\$0 \$0		68	\$0 \$0	\$0 \$0	68		
	\$0 \$0	\$0 \$0		69	\$0 \$0	\$0 \$0	69		
	\$0 \$0	\$0 \$0		70	\$0 \$0	\$0 \$0	70		
	\$0 \$0	\$0 \$0		70	\$0 \$0	\$0 \$0	70	\$2,850 \$2,850	
	\$0 \$0	\$0 \$0		72	\$0 \$0	\$0 \$0	72		
	\$0 \$0	\$0 \$0		73	\$0 \$0	\$0 \$0	72		
	\$0 \$0	\$0 \$0		73	\$0 \$0	\$0 \$0	74	. ,	
	\$0	\$0 \$0		75	\$0	\$0	75	. ,	
	\$0	\$0 \$0		76	\$0	\$0 \$0	76	. ,	
	\$0 \$0	\$0 \$0		70	\$0 \$0	\$0 \$0	70		
	\$0	\$0 \$0		78	\$0	\$0 \$0	78		
	\$0	\$0 \$0		79	\$0	\$0	79		
	\$0	\$0 \$0		80	\$0	\$0	80		
	\$0	\$0 \$0		81	\$0	\$0	81	\$2,850	
	\$0	\$0 \$0		82	\$0	\$0	82		
	\$0	\$0 \$0		83	\$0	\$0	83		
	\$0	\$C		84	\$0	\$0	84		
	\$0	\$0 \$0		85	\$0	\$0	85		
	\$0	\$0		86	\$0	\$0	86		
	\$0	\$C		87	\$0	\$0	87		
	\$0	\$0		88	\$0	\$0	88		
	\$0	\$0		89	\$0	\$0	89	\$2,850	
	\$0	\$0		90	\$0	\$0	90		
	\$0	\$0		91	\$0	\$0	91	\$2,850	
	\$0	\$0		92	\$0	\$0	92		
	\$0	\$0		93	\$0	\$0	93		
	\$0	\$0		94	\$0	\$0	94		
	\$0	\$0		95	\$0	\$0	95	\$2,850	
	\$0	\$0		96	\$0	\$0	96	\$2,850	
	\$0	\$0		97	\$0	\$0	97		
	\$0	\$0		98	\$0	\$0	98	\$2,850	
	\$0	\$0		99	\$0	\$0	99		
	\$0	\$146,437			\$67,205	\$137,778		\$347,715	
	\$0	\$114,136			\$52,381	\$117,759		\$297,192	
			-			-			

Water Management Summary

Cobre Mining Company

Based on Projected 201 DIRECT COSTS	9 Mine Plan	Curr	ent Value
	Capital		\$1,495,862
	Operations and Maintenance		\$585,319
Osmital			
Capital INDIRECT COSTS ¹	Mobilization and Demobilization	2.00/	
INDIRECT COSTS		3.8%	\$56,843
	Contingencies	4.0%	\$59,834
	Engineering Redesign Fee	2.5%	\$37,397
	Contractor Profit and Overhead	15.0%	\$224,379
	Project Management Fee	3.0%	\$44,876
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	28.3%	•
	Subtotal, Indirect Costs		\$423,329
Operations and Mainte			
INDIRECT COSTS ¹	Mobilization and Demobilization	0.0%	\$0
	Contingencies	4.0%	\$23,413
	Engineering Redesign Fee	0.0%	\$0
	Contractor Profit and Overhead	10.0%	\$58,532
	Project Management Fee	3.0%	\$17,560
	State Procurement Cost	0.0%	\$0
	Indirect Percentage Sum =	17.0%	
	Subtotal, Indirect Costs		\$99,504
ELECTRICITY, FUEL,	AND SAMPLING		\$383,292
TOTAL COST			\$2,987,307
New Mexic OSM. 2000. U.S. Depa	Plan Guidelines for Existing Mines, Mining Act Reclam co Energy, Minerals and Natural Resources Departmer artment of the Interior, Office of Surface Mining Reclam for Calculation of Reclamation Bond Amounts. April 5	nt. April 30, 19 nation and Enfo	96.

Notes:

1)

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

Water Management Summary

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost
Capital and Replacement		28.3%	
Ponds and Tanks	\$520,594.94	\$147,328	\$667,923
Pumps	\$659,426.27	\$186,618	\$846,044
Pipelines	\$0.00	\$0	\$0
Electrical	\$0.00	\$0	\$0
Subtotal	\$1,180,021.20	\$333,946	\$1,513,967
Removal ¹		28.3%	
Pumps	\$149,324.06	\$42,259	\$191,583
Pipelines	\$114,136.15	\$32,301	\$146,437
Electrical	\$52,380.78	\$14,824	\$67,205
Subtotal	\$315,840.98	\$89,384	\$405,225
Operations and Maintenance		17%	
Ponds and Tanks	\$225,298.15	\$38,301	\$263,599
Pumps	\$113,383.30	\$19,275	\$132,658
Pipelines	\$128,879.24	\$21,909	\$150,788
Electrical Infrastructure	\$117,758.66	\$20,019	\$137,778
Materials		17%	
Electricity and Fuel	\$30,408.18	\$5,169	\$35,578
Environmental Sampling	\$297,192.00	\$50,523	\$347,715
Subtotal	\$912,919.54	\$155,196	\$1,068,116
Total Estimated Cost	\$2,408,781.72	\$579,000	\$2,987,308

¹Removal costs for ponds and tanks is included in the earthwork portion of the cost estimate.

APPENDIX C.4 SUPPORTING DOCUMENTATION



05 Common Work Results for Earthwork

5 19 – Geosynthetics for Earthwork

19.53 Reservoir Liners HDPE ESERVOIR LINERS HDPE	Crew	Daily Output	Labor- Hours	Unit	Мс
Membrane lining					
30 mil thick	3 Churk	1050	012	CF	
60 mil thick	3 Skwk	1600	.013	5.f.	
120 mil thick		1440			
23 - Coment and Concrete for	The second secon	1440	.017	V	

3.30 Plant Mixed Pitumineur Concrete for Earthwork

3.30 Plant Mixed Bituminous Concrete

ANT MIXED BITUMINOUS CONCRETE

Asphaltic concrete plant mix (145 lb./C.F.)

Asphaltic concrete less than 300 tons add trucking costs

See Section 31 23 23.20 for hauling costs

All weather patching mix, hot

Ton

T

Aatorial	2018 Bo	are Costs Fauinment	Total	In
Aaterial	2018 Bo Labor	are Costs Equipment	Total	In
Aaterial .41	2018 Bo Labor .68	are Costs Equipment	Total 1.09	In
		are Costs Equipment		In
.41	.68	are Costs Equipment	1.09	In

65

02 4	1 Demolition		
02 41	13 - Selective Site Demolition		
02 41 13	3.33 Railtrack Removal	Daily Labor- Crew Output Hours U	nit Material
	The second second sectors		

15 20

5 0 5

5

5 5

-

			Daily	Labor-			2018 Ba			Total
	13.33 Railtrack Removal	Crew	Output		Unit	Material	Labor	Equipment	Total	Incl O&F
3800	Turnouts using new bolts and spikes	B-14	1	48	Ea.		2,025	310	2,335	3,425
02 41	13.34 Selective Demolition, Utility Materials									
010	SELECTIVE DEMOLITION, UTILITY MATERIALS R024119-10									
)015	Excludes excavation									
)020	See other utility items in Section 02 41 13.33									
)100	Fire hydrant extensions	B-20	14	1.714	Ea.		76.50		76.50	117
)200	Precast utility boxes up to 8' x 14' x 7'	B-13	2	28			1,225	295	1,520	2,175
0300	Handholes and meter pits	B-6	2	12			525	156	68]	965
)400	Utility valves 4"-12"	B-20	4	6			268		268	410
)500	14"-24"	B-21	2	14			650	65	715	1,050
02 41	13.36 Selective Demolition, Utility Valves and Accesso	ries								
010	SELECTIVE DEMOLITION, UTILITY VALVES & ACCESSORIES								£ 7	
0015	Excludes excavation									
0100	Utility valves 4"-12" diam.	B-20	4	6	Ea.		268		268	410
0200	14"-24" diam.	B-21	2	14			650	65	715	1,050
)300	Crosses 4"-12" diam.	B-20	8	3			134		134	205
)400	14"-24" diam.	B-21	4	7			325	32.50	357.50	530
)500	Utility cut-in valves 4"-12" diam.	B-20	20	1.200			53.50		53.50	82
0600	Curb boxes	"	20	1.200			53.50		53.50	82

0010 0015 0020	SELECTIVE DEMOLITION, WATER & SEWER PIPING AND FITTINGS Excludes excavation See other utility items in Section 02 41 13.23								
0020	Concrete pipe 4"-10" diameter	B-6	250	.096	L.F.	4.19	1.25	5.44	7.70
0100	42"-48" diameter	B-13B	96	.583		25.50	10.35	35.85	50
0200	60"-84" diameter	"	80	.700		30.50	12.45	42.95	60
0300	96″ diameter	B-13C	80	.700		30.50	23.50	54	72
0400	108"-144" diameter	"	64	.875		38.50	29.50	68	90
0450	Concrete fittings 12" diameter	B-6	24	1	Ea.	43.50	13	56.50	81
0480	Concrete end pieces 12" diameter		200	.120	L.F.	5.25	1.56	6.81	9.65
0485	15″ diameter		150	.160		7	2.08	9.08	12.90
0490	18″ diameter		150	.160		7	2.08	9.08	12.90
0500	24"-36" diameter		100	.240	*	10.50	3.12	13.62	19.35
0600	Concrete fittings 24"-36" diameter		12	2	Ea.	87.50	26	113.50	162
0700	48"-84" diameter	B-13B	12	4.667		204	83	287	400
0800	96″ diameter	"	8	7		305	124	429	600
0900	108"-144" diameter	B-13C	4	14	V	610	470	1,080	1,450
1000	Ductile iron pipe 4" diameter	B-21B	200	.200	L.F.	8.70	2.48	11.18	15.95
1100	6"-12" diameter		175	.229		9.95	2.83	12.78	18.20
1200	14"-24" diameter		120	.333	•	14.50	4.13	18.63	26.50
1300	Ductile iron fittings 4"-12" diameter		24	1.667	Ea.	72.50	20.50	93	133
1400	14"-16" diameter		18	2.222		96.50	27.50	124	178
1500	18"-24" diameter		12	3.333	W	145	41.50	186.50	266
1600	Plastic pipe 3/4"-4" diameter	B-6	700	.034	L.F.	1.50	.45	1.95	2.76
1700	6″-8″ diameter		500	.048		2.10	.63	2.73	3.87
1800	10"-18" diameter		300	.080		3.49	1.04	4.53	6.45
1900	20"-36" diameter		200	.120		5.25	1.56	6.81	9.65
1910	42"-48" diameter		180	.133		5.80	1.74	7.54	10.75
1920	54"-60" diameter		160	.150	-	6.55	1.95	8.50	12.10
2000	Plastic fittings 4"-8" diameter		75	.320	Ea.	13.95	4.17	18.12	25.50
2100	10"-14" diameter		50	.480		21	6.25	27.25	39
2200	16"-24" diameter		20	1.200		52.50	15.60	68.10	96.50

For customer support on your Heavy Construction Costs with RSMeans data, call 800.448.8182.

09 4	1 13 – Selective Site Demolition									
		CALENCE ALCON	Daily	Labor-	<u> </u>		2018 Bar	e Costs		Total
02 41	13.78 Selective Demolition, Radio Towers	Crew	Output		Unit	Material		Equipment	Total	Incl O&P
0800	120'	K-2	.80	30	Ea.		1,550	298	1,848	2,825
0900	190′		.40	60	-		3,125	595	3,720	5,625
02 41	13.80 Selective Demo., Utility Poles and Cross Arm	S								
0010	SELECTIVE DEMOLITION, UTILITY POLES & CROSS ARMS									
0100	Utility poles, wood, 20'- 30' high	R-3	6	3.333	Ea.		193	21.50	214.50	315
0200	35′-45′ high	"	5	4			232	26	258	375
0300	Cross arms, wood, 4'-6' long	1 Elec	5	1.600	-		93		93	139
02 41	13.82 Selective Removal, Pavement Lines and Mark	ings								
0010	SELECTIVE REMOVAL, PAVEMENT LINES & MARKINGS									
0015	Does not include traffic control costs									
0020	See other items in Section 32 17 23.13									Namana
0100	Remove permanent painted traffic lines and markings	B-78A		.016	C.L.F.		.82	1.71	2.53	3.12
0200	Temporary traffic line tape	2 Clab		.011	L.F.		.43		.43	.65
0300	Thermoplastic traffic lines and markings	B-79A	500	.024	C.L.F.		1.23	2.62	3.85	4.75
0400	Painted pavement markings	B-78B	500	.036	S.F.		1.48	.70	2.18	3.02
02 41	13.84 Selective Demolition, Walks, Steps and Pave	rs								
0010	SELECTIVE DEMOLITION, WALKS, STEPS AND PAVERS									
0100	Splash blocks	1 Clab	300	.027	S.F.		1.06		1.06	1.62
0200	Tree grates	"	50	.160	Ea.		6.40		6.40	9.70
0300	Walks, limestone pavers	2 Clab	150	.107	S.F.		4.25		4.25	6.4
0400	Redwood sections		600	.027			1.06		1.06	1.62
0500	Redwood planks		480	.033			1.33		1.33	2.02
0600	Shale paver		300	.053			2.13		2.13	3.24
0700	Tile thinset paver		675	.024	- W		.94		.94	1.44
0800	Wood round	B-1	350	.069	Ea.		2.78		2.78	4.23
0900	Asphalt block	2 Clab	450	.036	S.F.		1.42		1.42	2.16
1000	Bluestone		450	.036			1.42		1.42	2.10
1100	Slate, 1" or thinner		675	.024			.94		.94	1.44
1200	Granite blocks		300	.053			2.13		2.13	3.24
1300	Precast patio blocks		450	.036			1.42		1.42	2.10
1400	Planter blocks		600	.027			1.06		1.06	1.62
1500	Brick paving, dry set		300	.053			2.13		2.13	3.24
1600	Mortar set		180	.089			3.54		3.54	5.4
1700	Dry set on edge		240	.067	*		2.66		2.66	4.0
1800	Steps, brick		200	.080	L.F.		3.19		3.19	4.8
1900	Railroad tie		150	.107			4.25		4.25	6.4
2000	Bluestone		180	.089			3.54		3.54	5.4
2100	Wood/steel edging for steps		1000				.64		.64	.9
2200	Timber or railroad tie edging for steps	V	400	.040	Ŵ		1.59		1.59	2.4
02 4	1 13.86 Selective Demolition, Athletic Surfaces									
0010	SELECTIVE DEMOLITION, ATHLETIC SURFACES			-						
0100	Synthetic grass		2000		S.F.		.32		.32	.4
0200	Surface coat latex rubber	"	2000	.008	"		.32	4	.32	.4
0300	Tennis court posts	B-110	16	1	Ea.		47	19.55	66.55	92.5
02 4	1 13.88 Selective Demolition, Lawn Sprinkler System	ns								
0010	SELECTIVE DEMOLITION, LAWN SPRINKLER SYSTEMS				1					
0100	Golf course sprinkler system, 9 hole	4 Clat	b .10	320	Ea.		12,800		12,800	19,400
0200	Sprinkler system, 24' diam. @ 15' OC, per head	B-20	110	.218	Head		9.75		9.75	14.9
0300	60' diam. @ 24' OC, per head	"	52	.462	"		20.50		20.50	31.5
0400	Sprinkler heads, plastic	2 Cla	b 150	.107	Ea.		4.25		4.25	6.4
0500	Impact circle pattern, 28'-76' diam.		75	.213			8.50		8.50	12.9

02 41 Demolition

09 A·	1 13.88 Selective Demolition, Lawn Sprinkler Systems	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	re Costs Equipment	Total	Total Incl 0&P
)600	Рор-ир, 42'-76' diam.	2 Clab		.320	Ea.	muleriul	12.75	сцортот	12.75	19.4
)700	39'-99' diam.	L club	50	.320			12.75		12.75	19.4
0800	Sprinkler valves		40	.400			15.95		15.95	24.5
0900	Valve boxes		40	.400			15.95		15.95	24.5
1000	Controls		2	8			320		320	485
1100	Backflow preventer		4	4			159		159	243
1200	Vacuum breaker	1	4	4			157		159	243
	1 13.90 Selective Demolition, Retaining Walls	W	<u> </u>	т	V.		177		137	240
0010	SELECTIVE DEMOLITION, RETAINING WALLS									
0020	See other retaining wall items in Section 32 32									
0100	Concrete retaining wall, 6' high, no reinforcing	B-13K	200	.080	L.F.		4.49	8.30	12.79	15.9
0200	8' high		150	.107			6	11.10	17.10	21
0300	10' high		150	.107			6	11.10	17.10	21
0400	With reinforcing, 6' high		200	.080			4.49	8.30	12.79	15.9
0500	8' high		150	.107			6	11.10	17.10	21
0600	10' high		120	.133			7.50	13.85	21.35	26.5
0700	20' high		60	.267			14.95	27.50	42.45	53
0800	Concrete cribbing, 12' high, open/closed face		150	.107	S.F.		6	11.10	17.10	21
0900	Interlocking segmental retaining wall	B-62	800	.030	5.1.		1.31	.22	1.53	2.2
1000	Wall caps	"	600	.040			1.75	.29	2.04	2.9
1100	Metal bin retaining wall, 10' wide, 4'-12' high	B-13	1200	.047			2.04	.49	2.53	3.6
200	10' wide, 16'-28' high		1000	.056			2.04	.59	3.04	4.3
1300	Stone filled gabions, 6' x 3' x 1'		170	.329	₩ Ea.		14.40	3.48	17.88	26
1400	6' x 3' x 1'-6"		75	.747	LU.		32.50	7.90	40.40	20 58
1500	6' x 3' x 3'		25	2.240			98	23.50	121.50	175
1600	9′ x 3′ x 1′		75	.747			32.50	7.90		58
1700	9' x 3' x 1'-6"		33	1.697			52.50 74	17.90	40.40	
1800	9' x 3' x 3'		12	4.667					91.90	133
1900	12' x 3' x 1'		42	4.007			204	49	253	365
2000	12 × 3 × 1 · - 6"						58.50	14.05	72.55	104
2100	12 x 3 x 1 0 12' x 3' x 3'		20	2.800			122	29.50	151.50	219
	13.92 Selective Demolition, Parking Appurtenances	V	6	9.333	W		410	98.50	508.50	730
0010	SELECTIVE DEMOLITION, PARKING APPURTENANCES	1								
0100	Bumper rails, garage, 6" wide	B-6	300	.080	L.F.		3.49	1.04	4.53	6.4
0200	12" channel rail	00	300	.080	L.I.		3.49	1.04	4.53	6.4
0300	Parking bumper, timber		1000	.024			1.05	.31	1.36	1.9
0400	Folding, with locks	B-1	1000	.240	Ea.		9.70	.01	9.70	1.7
0500	Flexible fixed garage stanchion	B-6	150	.160	LU.		7.70	2.08	9.08	14.0
0600	Wheel stops, precast concrete	0-0	120	.200			8.75	2.60	11.35	
0700	Thermoplastic		120	.200						16.1
00800	Pipe bollards, 6"-12" diam.		80	.200			8.75	2.60	11.35	16.1
Para Para Para	11 16 – Structure Demolition	V	00	.300	V		13.10	3.91	17.01	24
2 C C C C				A Present						1
0010	I 16.13 Building Demolition BUILDING DEMOLITION Large urban projects, incl. 20 mi. haul R024119-10	1.1.1.1.	151111			A., The second				
0011	G III IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII									
0020	No foundation or dump fees, C.F. is vol. of building standing		01500	000		1. 1. 1. 1.		10		
0020	Steel	B-8	21500		C.F.		.14	.13	.27	.3
0050	Concrete		15300	.004			.19	.19	.38	.5
	Masonry		20100	.003			.15	.14	.29	.3
D100	Mixture of types	4	20100				.15	.14	.29	.3
)500	Small bldgs, or single bldgs, no salvage included, steel	B-3	14800	.003			.14	.15	.29	.3
0600	Concrete		11300	.004			.19	.20	.39	.5
0650										

For customer support on your Heavy Construction Costs with RSMeans data, call 800.448.8182.

22 11 Facility Water Distribution 22 11 13 – Facility Water Distribution Piping

22 11	13.48 Pipe, Fittings and Valves, Steel, Grooved-Joint	Crew		Labor- t Hours		Material	2018 Bare Costs Labor Equipmer	nt Total	Total Incl O&P		L.C.	13.48 Pipe, Fittings and Valves, Steel, Grooved-Joint
0010	PIPE, FITTINGS AND VALVES, STEEL, GROOVED-JOINT									47	1	3" diameter
0012	Fittings are ductile iron. Steel fittings noted.									48	100 B	4" diameter
0020	Pipe includes coupling & clevis type hanger assemblies, 10' OC									48		5" diameter
1000	Schedule 40, black									48		6" diameter
1040	3/4" diameter	1 Plum	71	.113	L.F.	6.05	7	13.0	17 17 1	48	30	8" diameter
1050	1″ diameter		63	.127		5.85	7.90	13.7			40	10" diameter
1060	1-1/4" diameter		58	.138		6.95	8.55	15.5			50	12" diameter
1070	1-1/2" diameter		51	.157		7.55	9.75	17.3	-0.0	48	51	14" diameter
1080	2″ diameter		40	.200	55	8.75	12.45	21.2		48	52	16" diameter
1090	2-1/2" diameter	Q-1	57	.281		11.45	15.70	27.1		48	53	18" diameter
1100	3" diameter		50	.320		13.85	17.90	31.7		48	54	20" diameter
1110	4" diameter		45	.356		24	19.90	43.9	and the second second	48	55	24" diameter
1120	5″ diameter		37	.432		43.50	24	67.5		49	00	For galvanized tees, add
1130	6″ diameter	Q-2	42	.571		49	33	82	104	49	39	Couplings
1140	8″ diameter		37	.649		81	37.50	118.50		49	40	Flexible, standard, painted
1150	10" diameter		31	.774		108	45	153	187	49	50	3/4" diameter
1160	12" diameter		27	.889		121	51.50	172.50		49	60	1" diameter
1170	14" diameter		20	1.200		128	69.50	197.50		49	70	1-1/4" diameter
1180	16" diameter		17	1.412		189	82	271	330	49	80	1-1/2" diameter
1190	18" diameter		14	1.714		194	99.50	293.50			90	2" diameter
1200	20" diameter		12	2	0.01214220	230	116	346	430	50	000	2-1/2" diameter
1210	24" diameter		10	2.400		258	139	397	495)10	3" diameter
1740	To delete coupling & hanger, subtract				V	200		0//	1/5	51)20	3-1/2" diameter
1750	3/4″ diam. to 2″ diam.					65%	27%			10 B	030	4" diameter
1760	2-1/2" diam. to 5" diam.	1.189				41%	18%		AT PAR)40	5" diameter
1770	6" diam. to 12" diam.					31%	13%)50	6" diameter
1780	14" diam. to 24" diam.					35%	10%				070	8" diameter
1800	Galvanized										090	10" diameter
1840	3/4″ diameter	1 Plum	71	.113	L.F.	6.25	7	13.25	17.4	No. 10. 10. 10. 10. 10. 10. 10. 10. 10. 10	110	12" diameter
1850	1" diameter		63	.127		6.50	7.90	14.40	4	5	120	14" diameter
1860	1-1/4" diameter		58	.138		7.80	8.55	16.35		5	130	16" diameter
1870	1-1/2" diameter		51	.157		8.65	9.75	18.40	1000	2	140	18" diameter
1880	2" diameter		40	.200		10	12.45	22.45			150	20" diameter
1890	2-1/2" diameter	Q-1	57	.281		12.95	15.70	28.65		2	160	24″ diameter
1900	3" diameter		50	.320		15.75	17.90	33.65			200	For galvanized couplings, add
1910	4" diameter		45	.356		26.50	19.90	46.40		5	750	Flange, w/groove gasket, black steel
1920	5″ diameter		37	.432		31	24	55	71		754	See Line 22 11 13.47 0620 for gasket & bolt set
1930	6" diameter	Q-2	42	.571		33	33	66	86.5	10 B - 192	760	ANSI class 125 and 150, painted
1940	8" diameter		37	.649		50.50	37.50	88	112	2	780	2" pipe size
1950	10" diameter		31	.774		103	45	148	181	10 C	790	2-1/2" pipe size
1960	12" diameter		27	.889		124	51.50	175.50	215		800	3" pipe size
2540	To delete coupling & hanger, subtract			,	Y		51.50	175.50	LIJ		820	4" pipe size
2550	3/4" diam. to 2" diam.					36%	27%				830	5" pipe size
2560	2-1/2" diam. to 5" diam.					19%	18%				840	6" pipe size
2570	6" diam. to 12" diam.					14%	13%		1	St. 6	850	8" pipe size
4690	Tee, painted					11/0	10/0		126		860	10" pipe size
4700	3/4″ diameter	1 Plum	38	.211	Ea.	77	13.10	90.10	104	11. 10. 10.0	870	12" pipe size
4740	1″ diameter		33	.242		59.50	15.05	74.55	1		880	14" pipe size
4750	1-1/4" diameter		27	.296	12 22	59.50	18.40	74.33	93		890	16" pipe size
4760	1-1/2" diameter		22	.364		59.50	22.50	82	99.5	and the second second	900	18" pipe size
4770	2" diameter		17	.471		59.50	29.50	89	110	3	910	20" pipe size
4780	2-1/2" diameter	Q-1	27	.593		59.50	33	92.50			920	24" pipe size
		Q.I	/	.370	+	57.50	00	72.30	110	8	000	Butterfly valve, 2 position handle, with standard trim

22 11 Facility Water Distribution 22 11 13 – Facility Water Distribution Piping

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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Baı Labor	re Costs Equipment	Total	Total Incl 0&P
$\begin{array}{c c c c c c c c c c c c c c c c c c c $							Equipment		151
13 123 123 287 69 356 422 14 1.714 725 99.50 824.50 99 12 2 945 116 1,061 1,22 10 2.400 1,225 139 1,340 1,55 9 2.667 1,225 155 1,300 1,57 9 3.556 2,475 210 2,685 3,05 9 3.556 2,475 210 2,685 3,05 8 4 3,775 237 4,012 4,50 100 .080 6. 21.50 4.97 2.647 3 100 .080 21.50 4.97 2.647 3 100 .080 21.50 4.97 2.647 3 100 .080 21.50 4.97 2.647 3 100 .080 21.50 4.97 2.647 3 1010 .080 21.50 </td <td>u.</td> <td></td> <td></td> <td></td> <td></td> <td>52.50</td> <td></td> <td>175.50</td> <td>216</td>	u.					52.50		175.50	216
0.2 17 1.412 330 82 412 442 442 14 1.714 725 99.50 824.50 95 12 2 945 116 1,061 1,22 9 2.667 1,225 139 1,364 1,55 9 2.667 1,375 174 1,549 1,77 0.3 10 3.200 1,725 189 1,914 2,17 9 3.556 2,475 210 2,685 3,03 9 3.556 2,475 210 2,685 3,03 9 3.556 2,475 210 2,685 3,03 9 3.56 2,475 210 2,685 3,03 9 3.56 2,475 210 2,647 3 100 0.80 62 2,475 210 3,420 9 1010 0.80 21.50 4.97 2,647 3 3 1010 0.80 20 33 9,95 42.95 3					287	69		356	420
14 1.714 725 99.50 824.50 95 12 2 945 116 1,061 1,22 10 2.400 1,225 139 1,364 1,55 9 2.667 1,225 155 1,380 1,57 9 3.556 2.475 210 2.685 3,03 9 3.556 2.475 210 2.685 3,03 9 3.556 2.475 210 2.685 3,03 9 3.556 2.475 210 2.685 3,03 9 3.556 2.475 210 2.685 3,03 9 3.50 7.40 37.90 - - 100 .080 21.50 4.97 2.647 - 80 .100 28 6.20 34.20 - 67 .119 30.50 7.40 37.90 - 9 .200 38 11.20 49.20 - 67 .239 42 13.35 55.35 5.35 <td></td> <td></td> <td></td> <td></td> <td>330</td> <td>82</td> <td></td> <td>412</td> <td>490</td>					330	82		412	490
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9 2.667 $1,225$ 155 $1,380$ $1,57$ Q_3 10 3.200 $1,775$ 189 $1,914$ $2,17$ 9 3.556 $2,475$ 210 $2,685$ 3.09 9 3.556 $2,475$ 210 $2,685$ 3.09 100 0.80 $Ea.$ 21.50 4.97 26.47 3.050 100 0.80 $Ea.$ 21.50 4.97 26.47 3.050 67 $.119$ 30.50 7.40 37.90 4.295 4.97 67 $.129$ 33.8 11.20 49.20 4.97 26.47 $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $4.2.95$ $3.37.9$ $3.37.9$ $3.37.9$ $3.37.9$ $3.37.9$ $3.37.9$ $3.37.9$ $3.37.9$ <th< td=""><td></td><td>12</td><td>2</td><td></td><td>945</td><td>116</td><td></td><td>1,061</td><td>1,225</td></th<>		12	2		945	116		1,061	1,225
8 3 1,375 174 1,549 1,77 9 3,556 2,475 210 2,685 3,09 9 3,556 2,475 210 2,685 3,09 1Plum 100 0.80 Ec. 21,50 4.97 26,47 3 1Plum 100 0.80 Ec. 21,50 4.97 26,47 3 0.0 0.80 100 28 6.20 34,20 4 67 119 30,50 7.40 37,90 4 37,90 4 0.1 30 30,50 7.40 37,90 4 9 3,256 5,53 5 0.1 30 20 61 17,90 78,90 4 14 1 0.2 50 .40 0.80 22,50 114 1 0.2 50 .40 10.8 28 53 53 50 .320 .61 17,75 <td></td> <td>10</td> <td>2.400</td> <td></td> <td>1,225</td> <td>139</td> <td></td> <td>1,364</td> <td>1,550</td>		10	2.400		1,225	139		1,364	1,550
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9 3.556 2.475 210 2.685 3.03 1 9 3.556 2.475 237 2.01 2.685 3.02 1 9 3.556 2.475 237 26.47 3 1 100 0.80 21.50 4.97 26.47 3 100 0.80 21.50 4.97 26.47 3 80 .100 28 6.20 34.20 34.20 67 .119 30.50 7.40 37.90 42.25 34.20 61 33 9.95 42.25 34.20 42.25 42.25 42.25 61 7.70 33 9.95 42.25 35.35 55.35 55.35 57 .281 60.50 15.70 76.20 76.20 76.20 50 .320 .61 17.90 78.90 78.90 79.90 42 .571 .753 325 43.50 368.50 4 .20 .20 .200 610 69.50 679.50 7 </td <td>4</td> <td>8</td> <td>3</td> <td></td> <td>1,375</td> <td>174</td> <td></td> <td></td> <td>1,775</td>	4	8	3		1,375	174			1,775
B A $3,775$ 237 $4,012$ $4,50$ 1 Plum 100 .080 En. 21.50 4.97 26.47 37.90 100 .080 En. 21.50 4.97 26.47 37.90 80 .100 .28 6.20 34.20 34.20 47.97 67 .119 30.50 7.40 37.90 42.95 42.95 42.95 57.90 61 .200 38 11.20 47.920 49.20 49.20 49.20 49.20 49.20 49.20 $55.35.5$ $55.55.5$ $55.55.5$ $55.55.5.5.5.5$ $55.55.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.$	Q-3	10	3.200		1,725				2,175
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50 .160 33 9.95 42.95 42.95 Q-1 80 .200 38 11.20 49.20 67 .239 42 13.35 55.35 55.35 57 .281 60.50 15.70 76.20 50 .320 61 17.90 78.90 42 .571 175 33 208 2 42 .571 175 33 208 2 35 .686 286 40 326 3 32 .750 325 43.50 368.50 4 20 1.200 610 69.50 679.50 7 18 1.333 .710 .77.50 787.50 9 16 1.500 1.125 87 1.212 1.3 13 1.846 157 24 181 2 23 .696 226 39 265 3 23 .696 226 39 265 3 19 .842 <t< td=""><td></td><td></td><td></td><td></td><td>30.50</td><td></td><td></td><td>37.90</td><td>44.50</td></t<>					30.50			37.90	44.50
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50 320 61 17.90 78.90 40 400 91.50 22.50 114 1 0^2 50 480 108 28 136 1 42 571 175 33 208 2 35 $.686$ 286 40 326 33 32 $.750$ 325 43.50 368.50 4 24 1 465 58 523 6 20 1.200 610 69.50 679.50 7 18 1.333 710 77.50 787.50 9 16 1.500 $1,125$ 87 $1,212$ $1,3$ 13 1.846 $1,225$ 107 $1,332$ $1,5$ $q-1$ 37 $.432$ 157 24 181 22 $Q-1$ 37 $.432$ 126 21.50 147.50 12 $Q-1$ 37 $.432$ 126		67	.239		42	13.35		55.35	66.50
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									2,275
2 1 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2					and the second sec				2,275
		5		1 1 4				AND	3,450

32 31 Fences and Gates 32 31 26 – Wire Fences and Gates

0010 W 0015 0020 0210 0500 0500 0600 0700 0900 1000 1200 1300 1350 1360 1400 1600 1700 2100 2200 32 31 32 31	16' high Security fence, prison grade, set in concrete, 10' high 26.20 Wire Fencing, General /IRE FENCING, GENERAL Barbed wire, galvanized, domestic steel, hi-tensile 15-1/2 ga. Standard, 12-3/4 ga. Barbless wire, 2-strand galvanized, 12-1/2 ga. Helical razor ribbon, stainless steel, 18" diam. x 18" spacing Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide	B-80	20 25	1.600 1.280	M.L.F.	79 61.50 130 146	71 57	30.50 24.50	180.50 143 130	229
32 31 2 0010 W 0015 0020 0500 0500 0700 0700 0700 1000 1200 1300 1350 1360 1400 1350 1360 1400 1600 1700 2100 2200 32 31 32 31 9 0010 FI 0011 0020 0050 0070	 26.20 Wire Fencing, General /IRE FENCING, GENERAL Barbed wire, galvanized, domestic steel, hi-tensile 15-1/2 ga. Standard, 12-3/4 ga. Barbless wire, 2-strand galvanized, 12-1/2 ga. Helical razor ribbon, stainless steel, 18" diam. x 18" spacing Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide 	•	25	1.280	M.L.F.	130	5/	24.50	130	00
0010 W 0015 0020 0210 0500 0500 0700 0700 0700 0700 1200 1350 1350 1360 1400 1350 1360 1400 1200 0200 032 31 200 32 31 200 32 31 200 50 0010 FI 0011 0020 0050 0070 0050 0070	 /IRE FENCING, GENERAL Barbed wire, galvanized, domestic steel, hi-tensile 15-1/2 ga. Standard, 12-3/4 ga. Barbless wire, 2-strand galvanized, 12-1/2 ga. Helical razor ribbon, stainless steel, 18" diam. x 18" spacing Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide 				M.L.F.					140
0015 0020 0210 0500 0700 0700 1000 1200 1300 1350 1360 1400 1600 1700 2200 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Barbed wire, galvanized, domestic steel, hi-tensile 15-1/2 ga. Standard, 12-3/4 ga. Barbless wire, 2-strand galvanized, 12-1/2 ga. Helical razor ribbon, stainless steel, 18" diam. x 18" spacing Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide				M.L.F.					140
0020 0210 0500 0600 0700 1000 1200 1300 1350 1360 1400 1600 1700 2100 2100 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Standard, 12-3/4 ga. Barbless wire, 2-strand galvanized, 12-1/2 ga. Helical razor ribbon, stainless steel, 18" diam. x 18" spacing Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide				M.L.F.					
0210 0500 0600 0700 0900 1000 1200 1300 1350 1360 1400 1600 1700 2100 2200 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Barbless wire, 2-strand galvanized, 12-1/2 ga. Helical razor ribbon, stainless steel, 18" diam. x 18" spacing Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide					146				142
0500 0600 0700 1200 1200 1300 1350 1360 1400 1400 1600 1700 2200 32 31 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Helical razor ribbon, stainless steel, 18″ diam. x 18″ spacing Hardware cloth galv., 1/4″ mesh, 23 ga., 2′ wide 3′ wide 1/2″ mesh, 19 ga., 2′ wide								146	160
0600 0700 0900 1200 1300 1350 1360 1400 1400 1400 1400 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide 3' wide 1/2" mesh, 19 ga., 2' wide				W	146			146	160
0700 0900 1000 1200 1350 1350 1360 1400 1400 1400 2100 2200 32 31 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	3' wide 1/2" mesh, 19 ga., 2' wide				C.L.F.	174			174	191
0900 1000 1200 1300 1350 1360 1400 1600 1700 2100 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	1/2" mesh, 19 ga., 2' wide				C.S.F.	34.50			34.50	38
1000 1200 1300 1350 1360 1400 1600 1700 2100 2200 32 31 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070						26.50			26.50	29
1200 1300 1350 1350 1400 1400 1700 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070						36			36	39.5
1300 1350 1360 1400 1600 2100 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	4' wide					45			45	49.5
1350 1360 1400 1600 2100 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Chain link fabric, steel, 2″ mesh, 6 ga., galvanized					61			61	67
1360 1400 1600 1700 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	9 ga., galvanized					54			54	59.5
1400 1600 1700 2200 32 31 32 31 32 31 9 0010 FI 0011 0020 0050 0070	Vinyl coated					30			30	33
1600 1700 2100 2200 32 31 32 31 2 0010 FI 0011 0020 0050 0070	Aluminized					184			184	203
1700 2100 2200 32 31 32 31 2 0010 FI 0011 0020 0050 0070	2-1/4" mesh, 11-1/2 ga., galvanized					42.50			42.50	46.5
2100 2200 32 31 32 31 2 0010 FI 0011 0020 0050 0070	1-3/4'' mesh (tennis courts), $11-1/2$ ga. (core), vinyl coated					48			48	53
2200 32 31 32 31 2 0010 FI 0011 0020 0050 0070	9 ga., galvanized				V	85			85	93.5
32 31 32 31 2 0010 FI 0011 0020 0050 0070	Welded wire fabric, galvanized, 1″ x 2″, 14 ga.	2 Carp	1600	.010	S.F.	.65	.51		1.16	1.4
32 31 2 0010 FI 0011 0020 0050 0070	2" x 4", 12-1/2 ga.				C.S.F.	33			33	36
0010 FI 0011 0020 0050 0070	29 – Wood Fences and Gates									
0010 FI 0011 0020 0050 0070	29.10 Fence, Wood									
0011 0020 0050 0070	ENCE, WOOD								13	
0020 0050 0070	Basket weave, 3/8" x 4" boards, 2" x 4"									
0050 0070	stringers on spreaders, 4" x 4" posts									
0070	No. 1 cedar, 6' high	B-80C	160	.150	L.F.	26	6.20	1.22	33.42	39.5
	Treated pine, 6' high	"	150	.160	"	37	6.60	1.31	44.91	52
	Board fence, 1" x 4" boards, 2" x 4" rails, 4" x 4" post		150				0.00			
0220	Preservative treated, 2 rail, 3' high	B-80C	145	.166	L.F.	10.30	6.85	1.35	18.50	23
0240	4' high		135	.178		11.85	7.35	1.45	20.65	25.5
0260	3 rail, 5' high		130	.185		12.40	7.65	1.51	21.56	27
0300	6' high		125	.192		15.30	7.95	1.57	24.82	30.5
0320	No. 2 grade western cedar, 2 rail, 3' high		145	.166		12.35	6.85	1.35	20.55	25.5
0340	4' high		135	.178		11.75	7.35	1.45	20.55	25.5
0360	3 rail, 5' high		130	.185		13.85	7.65	1.51	23.01	28.5
0400	6' high		125	.192		14.75	7.95	1.57	24.27	30
0420	No. 1 grade cedar, 2 rail, 3' high		145	.166		13.30	6.85	1.35	21.50	26.5
0440	4' high		135	.178		14.70	7.35	1.45	23.50	29
0460	3 rail, 5' high		130	.185	1320 (234)	17.40	7.65	1.51	26.56	32.5
0500	6' high		125	.103		21.50	7.95	1.57	31.02	37.5
0860			160	.150		9.75	6.20	1.22	17.17	21.5
0870	Open rail fence split rails 2 rail 3' high no 1 cedar		160	.150		8.15	6.20	1.22	15.57	19.7
0880	Open rail fence, split rails, 2 rail, 3' high, no. 1 cedar No. 2 cedar			.150	COLUMN ST	12.15	6.60	1.31	20.06	25
0890	No. 2 cedar			160	1 1 1		0.00	1.01	20.00	
0920	No. 2 cedar 3 rail, 4′ high, no. 1 cedar		150	.160				1 31	15 91	20
0930	No. 2 cedar 3 rail, 4′ high, no. 1 cedar No. 2 cedar		150 150	.160		8	6.60	1.31	15.91	20 24.5
0940	No. 2 cedar 3 rail, 4′ high, no. 1 cedar No. 2 cedar Rustic rails, 2 rail, 3′ high, no. 1 cedar		150 150 160	.160 .150		8 12.30	6.60 6.20	1.22	19.72	24.5
0950	No. 2 cedar 3 rail, 4' high, no. 1 cedar No. 2 cedar Rustic rails, 2 rail, 3' high, no. 1 cedar No. 2 cedar		150 150 160 160	.160 .150 .150		8 12.30 11.15	6.60 6.20 6.20	1.22 1.22	19.72 18.57	24.5 23
1240	No. 2 cedar 3 rail, 4' high, no. 1 cedar No. 2 cedar Rustic rails, 2 rail, 3' high, no. 1 cedar No. 2 cedar 3 rail, 4' high		150 150 160 160 150	.160 .150 .150 .160		8 12.30 11.15 11.80	6.60 6.20 6.20 6.60	1.22 1.22 1.31	19.72 18.57 19.71	24.5 23 24.5
1240	No. 2 cedar 3 rail, 4' high, no. 1 cedar No. 2 cedar Rustic rails, 2 rail, 3' high, no. 1 cedar No. 2 cedar 3 rail, 4' high No. 2 cedar		150 150 160 160 150 150	.160 .150 .150 .160 .160		8 12.30 11.15 11.80 8.05	6.60 6.20 6.20 6.60 6.60	1.22 1.22 1.31 1.31	19.72 18.57 19.71 15.96	24.5 23 24.5 20.5
1270	No. 2 cedar 3 rail, 4' high, no. 1 cedar No. 2 cedar Rustic rails, 2 rail, 3' high, no. 1 cedar No. 2 cedar 3 rail, 4' high		150 150 160 160 150	.160 .150 .150 .160		8 12.30 11.15 11.80	6.60 6.20 6.20 6.60	1.22 1.22 1.31	19.72 18.57 19.71	24.5

20 31 Fences and Gates

			Daily	Labor-	11.9	W	2018 Ba		Total	Total Incl 0&P
231	29.10 Fence, Wood	Crew	Output		Unit	Material	Labor	Equipment	20.87	25.50
300	No. 2 cedar, treated wood rails, 6' high	B-80C	160	.150	L.F.	13.45	6.20	1.22		315
320	Gate, 3'-6" wide		8	3	Ea.	89.50	124	24.50	238	26
360	Treated pine, treated rails, 6' high		160	.150	L.F.	13.95	6.20	1.22	21.37	
400	8′ high		150	.160	"	19.80	6.60	1.31	27.71	33.50
420	Gate, 3'-6" wide		9	2.667	Ea.	100	110	22	232	300
	29.20 Fence, Wood Rail									
010	FENCE, WOOD RAIL								14.00	10.10
012	Picket, No. 2 cedar, Gothic, 2 rail, 3' high	B-1	160	.150	L.F.	8.10	6.10		14.20	18.15
050	Gate, 3'-6" wide	B-80C	9	2.667	Ea.	78	110	22	210	277
400	3 rail, 4' high		150	.160	L.F.	9.10	6.60	1.31	17.01	21.50
500	Gate, 3'-6" wide		9	2.667	Ea.	95	110	22	227	295
5000	Fence rail, redwood, 2″ x 4″, merch. grade, 8′	· B-1	2400	.010	L.F.	2.53	.41		2.94	3.40
000	Fence post, select redwood, earth packed & treated, 4" x 4" x 6'		96	.250	Ea.	14	10.15		24.15	31
6010	4″ x 4″ x 8′		96	.250		19.25	10.15		29.40	36.50
6020	Set in concrete, 4" x 4" x 6'		50	.480		22	19.45		41.45	53.50
6030	4″ x 4″ x 8′		50	.480		23	19.45		42.45	55
6040	Wood post, 4' high, set in concrete, incl. concrete		50	.480		14.20	19.45		33.65	45
6050	Earth packed		96	.250		17.20	10.15		27.35	34.50
6060	6' high, set in concrete, incl. concrete		50	.480		17.70	19.45		37.15	49
6070	Earth packed		96	.250		12.10	10.15		22.25	29

32 32 Retaining Walls

32 32	13.10 Retaining Walls, Cast Concrete									
010	RETAINING WALLS, CAST CONCRETE									
1800	Concrete gravity wall with vertical face including excavation & backfill									
1850	No reinforcing									
1900	6' high, level embankment	(-17(36	2.306	L.F.	89	122	15.80	226.80	300
2000	33° slope embankment		32	2.594		103	137	17.80	257.80	345
2200	8' high, no surcharge		27	3.074		110	163	21	294	395
2300	33° slope embankment		24	3.458		133	183	23.50	339.50	450
2500	10' high, level embankment		19	4.368		157	231	30	418	560
2600	33° slope embankment	V	18	4.611	V	217	244	31.50	492.50	650
2800	Reinforced concrete cantilever, incl. excavation, backfill & reinf.									44
2900	6' high, 33° slope embankment	C-17C	35	2.371	L.F.	80.50	125	16.25	221.75	298
3000	8' high, 33° slope embankment		29	2.862		93	151	19.65	263.65	355
3100	10' high, 33° slope embankment		20	4.150		121	219	28.50	368.50	500
3200	20' high, 500 lb./L.F. surcharge		7.50	11.067	*	360	585	76	1,021	1,375
3500	Concrete cribbing, incl. excavation and backfill									
3700	12' high, open face	B-13	210	.267	S.F.	40.50	11.65	2.81	54.96	65.50
3900	Closed face	"	210	.267	"	38	11.65	2.81	52.46	62.50
4100	Concrete filled slurry trench, see Section 31 56 23.20									
32 3	2 23 – Segmental Retaining Walls									
	23.13 Segmental Conc. Unit Masonry Retaining Wal	ls								
0010	SEGMENTAL CONC. UNIT MASONRY RETAINING WALLS									
7100	Segmental retaining wall system, incl. pins and void fill									
7120	base and backfill not included									
7140	Large unit, 8" high x 18" wide x 20" deep, 3 plane split	B-62	300	.080	S.F.	12.75	3.49	.58	16.82	20
7150	Straight split		300	.080		12.85	3.49	.58	16.92	20
	Medium, It. wt., 8" high x 18" wide x 12" deep, 3 plane split		400	.060		6.30	2.62	.44	9.36	11.3

For customer support on your Heavy Construction Costs with RSMeans data, call 800.448.8182.

323

33	16 Water Utility Storage Ta	e Tank	5				2018 8	Bare Costs	Tetal	To
33	16 23 – Ground-Level Steel Water Storage		Daily Output	Labor- Hours	Unit	Material	Labor	Equipment	Total	Ind
	6 23.13 Steel Water Storage Tanks	Crew	Outpor	110212					000.000	
					Ea.				202,000	
	STEEL WATER STORAGE TANKS				Lu.				295,500	
0910	Steel, ground level, ht./diam. less than 1, not incl. fdn., 100,000 gallons								417,000	44
1000	250,000 gallons								538,000	59
1200	500,000 gallons								558,000	7
1250 1300	750,000 gallons 1,000,000 gallons								1,043,000	1,1
1500	2,000,000 gallons								2,121,000	2,33
1600	4,000,000 gallons				-				3,095,000	3,40
1800	6,000,000 gallons								4,068,000	4,4)
1850	8,000,000 gallons								5,050,000	5,55
1910	10,000,000 gallons				*				5,050,000	2,2.
2100	Steel standpipes, ht./diam. more than 1,100' to overflow, no fdn.			-	-				EAL 500	11
2200	500,000 gallons				Ea.				546,500	60
2400	750,000 gallons								722,500	79
2500	1,000,000 gallons								1,060,500	1,16
2700	1,500,000 gallons								1,749,000	1,92
2800	2,000,000 gallons				*				2,327,000	2,55
33 16	36 – Ground-Level Reinforced Concrete	Water	Sto	rage	Tan	ks				
33 16 36	.16 Prestressed Conc. Water Storage Tanks			-3-						

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33 14 Water Utility Transmission and Distribution

14 13	3 – Public Water Utility Distribution I		Daily	/ Lab	or-		period (see	2018 Bare		Total	Total
	5 Water Supply, Polyvinyl Chloride Pipe	Crew		ut Ho	urs l	Jnit	Material		Equipment	Total 634	Incl 0&P 3
	20" diameter	B-20A	9.14			Ea.	465	169	some set	746	905 1
5	24" diameter	v	7.53	3 4.2	250	V	540	206		740	105
0	35 Water Supply, HDPE										1
000000000000000000000000000000000000000											1
0 WATE	ER SUPPLY, HDPE utt fusion joints, SDR 21 40′ lengths not including excavation or backfill								1 71	0.01	11.45
		B-22A	40	0.	100	L.F.	2.50	4.60	1.71	8.81	11.65
00	4" diameter		38	0.	105		5.65	4.84	1.80	12.29	10.00
00	6" diameter		32	0.	125		8.85	5.75	2.14	16.74 19.93	-1
00	8″ diameter 10″ diameter		30	0.	133		11.50	6.15	2.28	22.73	24.50 0 28 2
00	12" diameter		26		154		13	7.10	2.63 9.85	33.55	40.50 2
00	14" diameter	B-221			.182		15.35	8.35	12.05	41.15	50 3
00	16" diameter		18		.222		18.90	10.20	12.05	56.65	68 3
00	18" diameter				.286		28	13.15	21.50	89.40	107 3
00	24" diameter		1	00	.400		49.50	18.40	21.30	07.40	3
00	Fittings										4
00	Elbows, 90 degrees					-	17.05	57.50	21.50	96.25	
00	4" diameter	B-22	- A - s	1000	1.250	Ea.	17.25	65.50		1	
00	6" diameter	all the second se		1000	1.429		44.50	76.50			276 5
100	8" diameter				1.667		116 252	102	38	392	475 6
500	10" diameter				2.222		232	153	57	507	620 6
500	12" diameter				3.333		570	204	241	1,015	1,200 6
700	14" diameter	B-2	28		4.444		830	305	360	1,495	1,775 7
800	16" diameter			6	6.667		955	460	540	1,955	2,350 7
900	18" diameter			4	10 13.333	2	1,700	615	720	3,035	3,600 7
000	24" diameter	7	7	3	13.33	3	1,700	015			7
100	Tees	D	004	20	1.333	3 Ea.	21.50	61.5	0 23	106	142 7
200	4" diameter	B-7	22A	30 26	1.538		51.50	and the second line of the secon	26.5	0 149	194 7
300	6″ diameter			20	1.818		130	83.5	0 31	244.5	And a support of the
2400	8″ diameter			15	2.66		172	123	45.5	50 340.5	The second se
2500	10" diameter			10	4		360	· 184	68.5		
2600	12" diameter	R.	22B	8	5		425	230	271	926	1,125
2700	14" diameter	U		6	6.66	7	500	305	360	1,165	1,400
2800	16" diameter			4	10		565	460	540	1,565	1,925
2900	18" diameter			2	20		920	920	1,075	2,915	3,600
3000	24" diameter	anal sale	V								101
4100	Caps	E	-22A	34	1.17	76 E	a. 15	54	20		121 (
4110	4" diameter			30	1.3	33	30.5				153 (.50 193 (
4120	6" diameter			26	1.5	38	51	71		.50 148.	
4130	8″ diameter 10″ diameter			20	2		161	92		100000	
4150	10" diameter		V	14	2.8	57	201	131	49	381	4/5
4160		1					-				
Contraction of the local division of the loc	13.40 Water Supply, Black Steel Pipe										(
	WATER SUPPLY, BLACK STEEL PIPE										
0011	Not including excavation or backfill		B-35A	20	8 .2	69	L.F. 31.	State Law Law Street			5.50 0.
1000	Pipe, black steel, plain end, welded, 1/4" wall thk, 8" diam.			20		75	40		ALCOST DU LO DU LO	CARDER Disc Astronomy	2.20
1010	10" diameter			19		.87	47				0.25
1020	12" diameter			17		320					7.40
1030	18" diameter			19	100 11 100	287		.50 1		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	L.IJ
1040	5/16" wall thickness, 12" diameter			17		320	92				1.70 100
1050	18" diameter			28	.96 1.	.934	173		- CA. 18.37		7.50
1060	36" diameter 3/8" wall thickness, 18" diameter			43	.20 1.	296	108	6	3 4	12 21	5 201

33 14 Water Utility Transmission and Distribution

	10.40 Weter Coursely Dia de Cteral Dia a			Labor-		u I	2018 Bar		T. 1	Total
	13.40 Water Supply, Black Steel Pipe	Crew	Output		Unit	Material		Equipment	Total	Incl O&P
080	24″ diameter 30″ diameter	B-35A	36	1.556	L.F.	146	75.50	50	271.50	330
090				1.842	164 968	179	89.50	59.50	328	400
100	1/2" wall thickness, 36" diameter			2.147		279	105	69.50	453.50	540
110	48" diameter			2.583		475	126	83.50	684.50	810
135	7/16" wall thickness, 48" diameter			2.692		360	131	87	578	690
140	5/8" wall thickness, 48" diameter	♥	21.68	2.583	*	510	126	83.50	719.50	850
-	13.45 Water Supply, Copper Pipe									
010	WATER SUPPLY, COPPER PIPE								66 <u>26</u>	
020	Not including excavation or backfill									
000	Tubing, type K, 20' joints, 3/4" diameter	Q-1	400	.040	L.F.	6.75	2.24		8.99	10.80
200	1" diameter		320	.050		9.40	2.80		12.20	14.55
000	1-1/2" diameter		265	.060		14.30	3.38		17.68	21
020	2" diameter		230	.070		22	3.89		25.89	30
040	2-1/2" diameter		146	.110		34.50	6.15		40.65	47.50
060	3″ diameter		134	.119		47	6.70		53.70	62
012	4″ diameter	v	95	.168		79.50	9.40		88.90	102
016	6″ diameter	Q-2	80	.300	V	124	17.40		141.40	163
000	Tubing, type L									
108	2″ diameter	Q-1	230	.070	L.F.	14.05	3.89		17.94	21.50
010	3" diameter	-	134	.119		37	6.70		43.70	50.50
012	4″ diameter		95	.168		46.50	9.40		55.90	65
016	6″ diameter	Q-2	80	.300	W	108	17.40		125.40	145
165	Fittings, brass, corporation stops, no lead, $3/4''$ diameter	1 Plum	19	.421	Ea.	74	26	1	100	121
166	1″ diameter		16	.500		97	31		128	154
167	1-1/2" diameter		13	.615		207	38.50		245.50	286
168	2" diameter		11	.727		325	45		370	430
170	Curb stops, no lead, 3/4" diameter		19	.421		94	26		120	143
171	1″ diameter		16	.500		142	31		173	204
172	1-1/2" diameter		13	.615		268	38.50		306.50	355
173	2″ diameter		11	.727		345	45		390	450
180	Curb box, cast iron, 1/2" to 1" curb stops		12	.667		52	41.50		93.50	120
200	1-1/4" to 2" curb stops		8	1		83.50	62		145.50	186
1220	Saddles, 3/4" & 1" diameter, add					71			71	78
1240	1-1/2" to 2" diameter, add				-	92.50			92.50	102
250	For copper fittings, see Section 22 11 13.25									
33 14	13.90 Water Supply, Thrust Blocks									
010	WATER SUPPLY, THRUST BLOCKS	A PARA ANA								
015	Piping, not including excavation or backfill									
0110	Thrust block for 90 degree elbow, 4" diameter	C-30	41	.195	Ea.	19.35	7.80	3.93	31.08	37.50
0115	6" diameter		23	.348		33.50	13.85	7	54.35	65
0120	8″ diameter		14	.571		51.50	23	11.50	86	104
0125	10" diameter		9	.889		74	35.50	17.90	127.40	155
0130	12" diameter		7	1.143		101	45.50	23	169.50	206
0135	14" diameter		5	1.600		135	64	32	231	282
0140	16" diameter		4	2		171	79.50	40.50	291	355
0145	18" diameter		3	2.667		210	106	53.50	369.50	450
0150	20" diameter		2.50	3.200		254	128	64.50	446.50	545
0155	24" diameter		2	4		365	159	80.50	604.50	730
0210	Thrust block for tee or deadend, 4" diameter		65	.123	193	13.30	4.90	2.48	20.68	25
0215	6" diameter		35	.123		23.50	9.10	4.60	37.20	45
			10000	.381		10000000	00.000 A.C.	1000000000	10000000000000000000000000000000000000	72
0220	8″ diameter		21	181		36.50	15.20	7.65	59.35	11

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33 71 Electrical Utility Transmission and Distribution 33 71 16 – Electrical Utility Poles

	71 16.23 Steel Electrical Utility Poles	Crew	Daily 1 Outpu		Unit	Material	2018 Bai Labor	re Costs Equipment	Total	Total Incl 0&I
0880		R-13	1.40	30	Ea.	7,200	1,700	168	9,068	10,6
0900			1.25	33.600		9,425	1,900	188	11,513	13,4
0920			1.15	36.522		11,800	2,050	205	14,055	16,
0940			1	42		14,400	2,375	235	17,010	19,
0960			.90	46.667		15,900	2,625	261	18,786	21,
0980	Ladder clips					253			253	-1,
1000	, , , , , ,	R-15/	9.20	5.217		1,050	266	30.50	1,346.50	1,
1020	25'		7.65	6.275		1,125	320	37	1,482	1,
1040	30′		6.55	7.328		1,250	375	43	1,668	1,
1060	35'		5.75	8.348		1,350	425	49	1,824	2,
1080	40'		5.15	9.320		1,425	475	55	1,955	2,
1200	Two 6′ arms, 20′		6.55	7.328		1,350	375	43	1,768	2,
1220	25'		5.75	8.348		1,375	425	49	1,849	2,
1240	30'		5.15	9.320		1,425	475	55	1,955	2,
1260	35'		4.60	10.435		1,625	530	61.50	2,216.50	2,
1280	40'		4.20	11.429		1,875	585	67.50	2,527.50	3,
400	One 12' truss arm, 25'		7.65	6.275		1,300	320	37	1,657), 1,
420	30'		6.55	7.328		1,350	375	43	1,768	2,
440	35'		5.75	8.348		1,450	425	49	1,924	2,
1460	40'		5.15	9.320		1,625	475	55	2,155	2,
480	45'					1,875	530	61.50	2,466.50	2,
600	Two 12' truss arms, 25'		5.75	8.348		1,525	425	49	1,999	
620	30′		5.15	9.320		1,575	475	55	2,105	2,
640	35'			10.435		1,700	530	61.50	2,103	2,
660	40'			11.429		1,875	585	67.50	2,527.50	2,
680	45'			12.468		2,125	635	73.50	2,833.50	3,
3400	Galvanized steel, tapered, 10'			3.097		425	158	18.25	601.25	3,
3420	12′			4.174		500	213	24.50		
3440	14'		9.20	5.217		370	266		737.50	8
3460	16′		8.45	5.680		385	200	30.50	666.50	1
480	18′		7.65	6.275		395		33.50	708.50	1
500	20'		7.10	6.761			320	37	752	-
000	Digging holes in earth, average	R-5		3.500		380	345	40	765	-
010	In rock, average	с-У "		19.512			178	48	226	3
020	Formed plate pole structure		4.31	17.312			990	269	1,259	1,8
030	Material handling and spotting	D 7	2.40	20	r.		005	10		
040	Erect steel plate pole	R-7	2.40	20	Ea.	10,400	825	69	894	1,3
050	Guys, anchors and hardware for pole, in earth	R-5		45.128		10,400	2,300	620	13,320	15,5
060	In rock			12.500		630	635	172	1,437	1,8
070	Foundations for line poles		17.96	4.900		750	249	67.50	1,066.50	1,2
080	Excavation, in earth	D C	105.00	150	C.V.		22			
090	In rock	R-5	135.38		С.Ү.		33	8.95	41.95	
110	Concrete foundations		20	4.400			224	60.50	284.50	4
3 7 [.]		Ŵ	11	8	V	153	405	110	668	9
010	WOOD ELECTRICAL UTILITY POLES									
011	Excludes excavation, backfill and cast-in-place concrete									
020	12" Ponderosa Pine Poles treated 0.40 ACQ, 16'	R-3	3.20	6.250	Ea.	075	2/0	10 50	1 075 50	
000	Wood, class 3 yellow pine, penta-treated, 25'	R-15A		6.250 5.581	cu.	875	360	40.50	1,275.50	1,
020	30'	AC 1-7				278	285	33	596	1
)40	35'		7.70			320	320	36.50	676.50	8
060	40'			8.276		400	420	48.50	868.50	1,1
080	40 45'			9.057		475	460	53.50	988.50	1,2
500	чJ		4./0	10.213		515	520	60	1,095	1,4

33 71 Electrical Utility Transmission and Distribution

	16 - Electrical Utility Poles	Grow	Daily Output	Labor- Hours	Unit	Material	2018 Bare Labor E	Costs quipment	Total	Total Incl 0&P
37110	6.33 Wood Electrical Utility Poles	Crew R-15A		11.429	Ea.	635	585	67.50	1,287.50	1,650
100	50'	K-1 JA		12.632	Lu.	745	645	74.50	1,464.50	1,875
120	55'			13.714		995	700	81	1,776	2,250
140	60'			15.714		1,300	765	88.50	2,153.50	2,675
160	65'		3.20				815	94	2,734	3,325
180	70'		3	16		1,825	875	101	3,326	4,000
200	75'			17.143		2,350			596	770
6000	Wood, class 1 type C, CCA/ACA-treated, 25'			5.581		278	285	33	696.50	895
020	30′			6.234		340	320	36.50		
5040	35'		5.80	8.276		475	420	48.50	943.50	1,225
5060	40'		5.30			555	460	53.50	1,068.50	1,375
5080	45'			10.213		675	520	60	1,255	1,600
6100	50′		4.20	11.429		740	585	67.50	1,392.50	1,775
6120	55'	\downarrow	3.80	12.632		835	645	74.50	1,554.50	1,975
6200	Electric & tel sitework, 20' high, treated wd., see Section 26 56 13.10	R-3	3.10	6.452		189	375	42	606	815
6400	25' high		2.90	6.897		238	400	44.50	682.50	910
	30' high		2.60	7.692		340	445	50	835	1,100
6600	35' high		2.40	8.333		480	485	54	1,019	1,325
6800	40' high		2.30	8.696		640	505	56.50	1,201.50	1,525
7000	45' high			11.765		870	680	76	1,626	2,075
7200	4.5 right Cross arms with hardware & insulators	V			Y					
7400		1 Elec	2.50	3.200	Ea.	149	186		335	440
7600	4' long	T LIO	2.40			165	194		359	470
7800	5' long		2.20			171	212		383	505
3000	6' long	R-7	20.8		Mile	171	95	7.95	102.95	154
	Disposal of polo & bardware curplus material	K-/	20.0	Z.300	Mile		15	1.15		
9100 33 7 1	Disposal of pole & hardware surplus material Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes	"	40	1.200	"		49.50	4.15	53.65	80.
33 71 0010 L	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES	"	40	1.200	"		49.50	4.15	53.65	80.
9100 33 71 33 71 0010 L 0011	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank	"	40	1.200	"		49.50	4.15	53.65	80.
9100 33 71 33 71 0010 L 0011 1000	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial	" d Manl	40 hole	1.200 S		30		4.15	53.65	
9100 33 71 33 71 0010 L 0011 1000 1010	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter	"	40 hole	1.200 S	" L.F.	.30	1.37	4.15	1.67	2
9100 33 71 33 71 0010 L 0011 1000 1010 1020	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter	" d Manl	40 hole	1.200 S 0 .024 0 .028		.40	1.37	4.15	1.67 2.01	2
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter	" d Manl	40 hole 290 260	1.200 S 0 .024 0 .028 0 .031		.40 .66	1.37 1.61 1.79	4.15	1.67 2.01 2.45	2 2 3
9100 33 71 33 71 0010 U 0011 1000 1010 1020 1030 1040	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter	" d Manl	40 hole 290 260 210	1.200 S 0 .024 0 .028 0 .031 0 .038		.40 .66 .97	1.37 1.61 1.79 2.22	4.15	1.67 2.01 2.45 3.19	2 2 3 4
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter	" d Manl	40 hole 290 260 210 180	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044		.40 .66 .97 1.26	1.37 1.61 1.79 2.22 2.59	4.15	1.67 2.01 2.45 3.19 3.85	2 2 3 4 5
9100 33 71 33 71 0010 U 0011 1000 1010 1020 1030 1040	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter	" d Manl	40 hole 290 260 210 180 ec 240	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067	L.F.	.40 .66 .97 1.26 2.26	1.37 1.61 1.79 2.22 2.59 3.88	4.15	1.67 2.01 2.45 3.19 3.85 6.14	2 2 3 4 5 8
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter	" d Manl	40 hole 290 260 210 180 ec 240 160	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100	L.F.	.40 .66 .97 1.26 2.26 3.09	1.37 1.61 1.79 2.22 2.59 3.88 5.80	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89	2 2 3 4 5 8 12
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter	" d Manl	40 hole 290 260 210 180 ec 240 160 120	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36	2 2 3 4 5 8 12 16
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1070	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 ec 240 160 120 90	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 0 .178	LE	.40 .66 .97 1.26 2.26 3.09 4.61 6.05	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40	2 2 3 4 5 8 12 16 22
9100 33 71 33 71 0010 U 0011 1000 1010 1020 1030 1040 1050 1060 1070 1080 1090	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter	" d Manl	40 hole 290 260 210 180 ec 240 160 120 90 ec 48	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 1.78 1.67	LE	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32	2 2 3 4 5 8 12 16 16 22 2 2 15
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1070 1080	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 ec 240 160 120 90 ec 48 38	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 0 .178 1.178 1.167 3 .211	L.F. Eo.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03	2 2 3 4 5 8 12 16 16 22 2 9 19 3
9100 33 71 33 71 0010 U 0011 1000 1010 1020 1030 1040 1050 1060 1070 1080 1090 1110	Disposal of crossarms & hardware surplus material 1 19 – Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 5" diameter 6" diameter Elbows, 1/2" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 ec 240 160 120 90 ec 48 38 32	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 1.78 1.67 3 .211 2 .250	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85	2 2 3 4 5 8 12 16 16 22 2 15 3 19 5 23
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1050 1060 1070 1080 1090 1110 1120 1130	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1.1/2" diameter 2" diameter 4" diameter 5" diameter 6" diameter 8/4" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 160 120 90 ec 48 32 32 21	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 0 .178 1.67 2 .211 2 .250 .381	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22	2 2 3 4 5 8 12 16 16 22 2 2 15 3 15 5 2 3
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1060 1070 1080 1090 1110 1120 1130 1140	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter 5" diameter 5" diameter 1/2" diameter 3/4" diameter 1" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 ec 240 160 120 90 ec 48 38 32	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 0 .178 1.67 2 .211 2 .250 .381	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.9	2 2 3 4 5 8 12 12 14 12 22 2 15 2 3 19 5 2 3 19 5 2 3 19 5 2 3 19 5 2 3 19 5 2 3 19 5 2 3 19 5 2 2 3 19 5 2 2 2 2 3 3 4 4 5 5 8 8 19 19 19 19 19 19 19 19 19 19 19 19 19
9100 33 71 33 71 0010 U 0011 1000 1010 1020 1030 1040 1050 1040 1050 1060 1070 1080 1090 1110 1120 1130 1140 1150	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1.1/2" diameter 2" diameter 4" diameter 5" diameter 6" diameter 8/4" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter 1/2" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 160 120 90 ec 48 32 32 21	1.200 S 1 .200 S 1 .200 S 1 .200 1 .024 1 .028 1 .028 1 .028 1 .038 1 .038 1 .044 1 .067 1 .000 1 .133 1 .178 1 .167 1 .178 1 .167 1 .211 2 .2500 .381 5 .5000 2 .667	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.97 49.50	2 2 3 4 5 8 12 16 16 22 2 19 3 19 5 23 3 1 4 4 0 0 6
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1040 1050 1060 1070 1080 1090 1110 1120 1130 1140 1150 1160	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes JNDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1 ⁿ diameter 1 ⁿ diameter 2 ^m diameter 3 ^m diameter 4 ^m diameter 5 ^m diameter 5 ^m diameter 6 ^m diameter 1 ⁿ diameter 1 ⁿ diameter 1 ⁿ diameter 3/4" diameter 1 ⁿ diameter 1 ⁿ diameter 3 ⁿ diameter 1 ⁿ diameter 3 ⁿ diameter 1 ⁿ diameter 3 ⁿ diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 260 210 180 120 90 ec 48 32 21 10	1.200 S S S S S S S S	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.9 49.50 68.51	2 2 3 4 5 8 12 16 16 22 2 15 2 3 19 5 23 2 3 9 1 44 0 6 5 9
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1070 1080 1090 1110 1120 1130 1140 1150 1160 1170	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1" diameter 2" diameter 4" diameter 5" diameter 6" diameter 8/4" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 1.1/2" diameter 2" diameter 4" diameter 1.1/2" diameter 2" diameter 1.1/2" diameter 1.1/2" diameter 2" diameter 4" diameter 4" diameter 4" diameter 4" diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 240 160 120 90 ec 48 32 32 21 10 12 12	1.200 S S S S S S S S	L.F.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.97 49.50 68.55 84	2 2 3 4 5 8 12 16 16 22 2 3 5 2 3 5 2 3 5 2 3 5 9 1 4 4 0 6 6 5 9 11
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1060 1070 1080 1090 1110 1120 1130 1140 1150 1160 1170 1180	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not ind. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter 1.1/2" diameter 3/4" diameter 1.1/2" diameter 1.1/2" diameter 3/4" diameter 1.1/2" diameter 3' diameter 3'' diameter 1.1/2" diameter 3'' diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 ec 240 160 120 90 ec 48 32 32 21 16 120 90 90 90 90 90 90 90 90 90 90 90 90 90	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 0 .178 1.178 1.67 2.211 2.250 1.381 5.500 2667 .889 1	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.97 49.50 68.51 84 129	2 2 3 4 5 8 12 14 5 2 2 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 5 2
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1070 1080 1070 1120 1130 1140 1150 1160 1170 1180 1190	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter 1-1/2" diameter 1" diameter 1" diameter 3/4" diameter 1-1/2" diameter 3' diameter 3' diameter 1' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3'' diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 160 120 90 ec 48 32 21 16 38 32 21 16 12 90 8	1.200 S 0 .024 0 .028 0 .031 0 .038 0 .044 0 .067 0 .100 0 .133 0 .178 1.167 5 .500 2 .667 .889 1 1.60	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.9 49.50 68.51 84 129 9.1	2. 2 3 4 5 8 12 15 2 2 5 2 35 2 35 2 35 2 35 2 35 2
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1040 1050 1060 1070 1080 1090 1110 1120 1130 1140 1150 1160 1170 1180 1190 1210	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1" diameter 2" diameter 4" diameter 5" diameter 5" diameter 6" diameter 1-1/2" diameter 1" diameter 1-1/2" diameter 3/4" diameter 1-1/2" diameter 3/4" diameter 5" diameter 1-1/2" diameter 5" diameter 1-1/2" diameter 5" diameter 1-1/2" diameter 1-1/2" diameter 3" diameter 4" diameter 5"	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 260 210 180 260 210 180 20 120 90 ec 48 32 21 16 32 21 16 32 32 55	1.200 S 1 .200 S 1 .200 S 1 .024 1 .028 1 .038 1 .038 1 .044 1 .067 1 .000 1 .133 1 .178 1 .167 1 .211 2 .2500 .381 5 .5000 2 .667 .889 1 .600 2 .154	L.F. Ea.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26 36	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58 93	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.97 49.50 68.51 84 129	2 2 3 4 5 8 12 15 2 2 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 2 3 5 12 4 4 5 5 23 5 2 3 5 23 5 2 3 5 23 5 2 3 5 2 3 5 5 11 2 2 2 2 2 2 3 5 5 5 2 3 5 5 1 2 3 5 5 5 2 3 5 5 5 2 3 5 5 2 3 5 5 5 2 3 5 5 5 5
9100 33 71 33 71 0010 L 0011 1000 1010 1020 1030 1040 1050 1060 1070 1080 1070 1120 1130 1140 1150 1160 1170 1180 1190	Disposal of crossarms & hardware surplus material 19 - Electrical Underground Ducts and 19.15 Underground Ducts and Manholes INDERGROUND DUCTS AND MANHOLES Not incl. excavation, backfill and concrete, in slab or duct bank Direct burial PVC, schedule 40, w/coupling, 1/2" diameter 3/4" diameter 1" diameter 1-1/2" diameter 2" diameter 3" diameter 4" diameter 5" diameter 6" diameter 1-1/2" diameter 1" diameter 1" diameter 3/4" diameter 1-1/2" diameter 3' diameter 3' diameter 1' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3' diameter 3'' diameter	" d Manl 1 Ele 2 Ele	40 hole 290 260 210 180 120 90 ec 48 32 21 16 32 21 16 32 21 16 32 32 21 16 32 32 21 8 32 21 8 32 21 8 90 260 240 120 260 240 120 260 240 240 240 240 240 240 240 240 240 24	1.200 S S S S S S S S	L.F. Eo.	.40 .66 .97 1.26 2.26 3.09 4.61 6.05 .62 .78 1.30 2.22 2.91 10.50 17.05 26 36 .21	1.37 1.61 1.79 2.22 2.59 3.88 5.80 7.75 10.35 9.70 12.25 14.55 22 29 39 51.50 58 93 8.95 10.85	4.15	1.67 2.01 2.45 3.19 3.85 6.14 8.89 12.36 16.40 10.32 13.03 15.85 24.22 31.9 49.50 68.51 84 129 9.1	4 5 8 12 12 16 12 22 2 15 2 35 2 35 2 35 2 35 2 35 2 3

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33 71 Electrical Utility Transmission and Distribution

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33 7 [.]	1 23.16 Post Insulators	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	e Costs Equipment	Total	Total Incl O&P
0010	POST INSULATORS									
7400	Insulators, pedestal type	R-11	112	.500	Ea.		27.50	5.90	33.40	48
7490	See also line 33 71 39.13 1000									
33 '	71 26 – Transmission and Distributi	on Equipme	nt							
33 7	1 26.13 Capacitor Banks									
0010	CAPACITOR BANKS									
1300	Station capacitors									
1350	Synchronous, 13 to 26 kV	R-11	3.11	18.006	MVAR	7,375	995	213	8,583	9,85
1360	46 kV		3.33	16.817		9,425	930	199	10,554	12,00
1370	69 kV	1	3.81	14.698		9,275	815	174	10,264	11,60
1380	161 kV		6.51	8.602		8,650	475	102	9,227	10,40
1390	500 kV		10.37	5.400		7,525	299	64	7,888	8,80
1450	Static, 13 to 26 kV		3.11	18.006		6,250	995	213	7,458	8,60
1460	46 kV		3.01	18.605		7,900	1,025	220	9,145	10,50
1470	69 kV		3.81	14.698		7,675	815	174	8,664	9,87
1480	161 kV		6.51	8.602		7,125	475	102	7,702	8,67
1490	500 kV		10.37	5.400	-	6,500	299	64	6,863	7,67
1600	Voltage regulators, 13 to 26 kV	4	.75	74.667	Ea.	280,000	4,125	885	285,010	315,00
33 7	1 26.23 Current Transformers									260
0010	CURRENT TRANSFORMERS									
4050	Current transformers, 13 to 26 kV	R-11	14	4	Ea.	3,450	221	47.50	3,718.50	4,17
4060	46 kV		9.33	6.002		10,000	330	71	10,401	11,60
4070	69 kV		7	8		10,400	445	94.50	10,939.50	12,30
4080	161 kV		1.87	29.947	4	33,800	1,650	355	35,805	40,10
	1 26.26 Potential Transformers				Y I					(in
0010	POTENTIAL TRANSFORMERS									
4100	Potential transformers, 13 to 26 kV	R-11	11.20	5	Ea.	4,925	277	59	5,261	5,87
4110	46 kV	KII	8	7	LU.	10,100	385	82.50	10,567.50	11,80
4120	69 kV		6.22	9.003		10,700	500	106	11,306	12,70
4120	161 kV		2.24	25		23,200	1,375	296	24,871	27,90
4140	500 kV		1.40	40		69,000	2,225	475	71,700	80,0
	71 39 – High-Voltage Wiring	V.	1.10	10	V	07,000	2,225		71,700	00,00
	1 39.13 Overhead High-Voltage Wiring				Sargh I	and a start				
	OVERHEAD HIGH-VOLTAGE WIRING								1.10	
0010										
0100	Conductors, primary circuits	DE	0 70	8.998	Wile		AEE	194	570	8
0110		R-5			w.w.ie		455	124	579	73
0120	For river crossing, add		11	8		12 400	405	110	515	17,8
0150				44.898	41 HE 01	12,400	2,275	620	15,295	31,6
0160	795 to 954 kcmil			47.059	× 12 3	24,800	2,400	650	27,850	52,5
0170	1,000 to 1,600 kcmil		1.47	59.864		42,500	3,050	825	46,375	52,5 71,5
0180	Over 1,600 kcmil			65.185		59,500	3,325	900	63,725	6,5
0200	For river crossing, add, 210 to 636 kcmil						3,600	980	4,580	0,5 7,4
0220	795 to 954 kcmil			80.734			4,100	1,125	5,225	7,4 8,3
0230	1,000 to 1,600 kcmil		.97	90.722			4,600	1,250	5,850	8,3 9,2
0240	Over 1,600 kcmil	×	.87	101	Ŵ		5,150	1,400	6,550	9,2
0300	Joints and dead ends	R-8	6	8	Ea.	1,650	410	47	2,107	
0400	Sagging	R-5	7.33	12.001			610	165	775	1,1
0500	Clipping, per structure, 69 kV	R-10		5	Ea.		274	62.50	336.50	4
0510	161 kV		5.33				495	113	608	
0520	345 to 500 kV		2.53	18.972			1,050	237	1,287	1,8

33 71 Electrical Utility Transmission and Distribution 33 71 23 – Insulators and Fittings

33 7	1 23.16 Post Insulators	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Baı Labor	re Costs Equipment	Total	Total Incl 0&P
0010 7400	POST INSULATORS	D 11	110	500	Γ.		07.50	5.00	22.40	
7400	Insulators, pedestal type See also line 33 71 39.13 1000	R-11	112	.500	Ea.		27.50	5.90	33.40	48
	71 26 – Transmission and Distributi	on Equipme	nt				Million Martin			
	1 26.13 Capacitor Banks									
0010	CAPACITOR BANKS									
1300	Station capacitors									
1350	Synchronous, 13 to 26 kV	R-11	3.11	18.006	MVAR	7,375	995	213	8,583	9,85
1360	46 kV		3.33	16.817		9,425	930	199	10,554	12,00
1370	69 kV		3.81	14.698		9,275	815	174	10,264	11,60
1380	161 kV		6.51	8.602		8,650	475	102	9,227	10,40
1390	500 kV		10.37	5.400		7,525	299	64	7,888	8,80
1450	Static, 13 to 26 kV		3.11	18.006		6,250	995	213	7,458	8,60
1460	46 kV		3.01	18.605		7,900	1,025	220	9,145	10,50
1470	69 kV		3.81	14.698		7,675	815	174	8,664	9,87
1480	161 kV		6.51	8.602		7,125	475	102	7,702	8,67
1490	500 kV		10.37	5.400	-	6,500	299	64	6,863	7,67
1600	Voltage regulators, 13 to 26 kV	V	.75	74.667	Ea.	280,000	4,125	885	285,010	315,00
33 7	1 26.23 Current Transformers									
0010	CURRENT TRANSFORMERS									
4050	Current transformers, 13 to 26 kV	R-11	14	4	Ea.	3,450	221	47.50	3,718.50	4,17
4060	46 kV		9.33	6.002		10,000	330	71	10,401	11,60
4070	69 kV		7	8		10,400	445	94.50	10,939.50	12,30
4080	161 kV		1.87	29.947	*	33,800	1,650	355	35,805	40,100
	1 26.26 Potential Transformers									
0010	POTENTIAL TRANSFORMERS									
4100	Potential transformers, 13 to 26 kV	R-11	11.20	5	Ea.	4,925	277	59	5,261	5,87
4110	46 kV		8	7		10,100	385	82.50	10,567.50	11,80
4120	69 kV	and set all	6.22	9.003		10,700	500	106	11,306	12,70
4130	161 kV		2.24	25		23,200	1,375	296	24,871	27,90
4140	500 kV		1.40	40	↓	69,000	2,225	475	71,700	80,00
	71 39 – High-Voltage Wiring									
Contraction of the	1 39.13 Overhead High-Voltage Wiring									1980
0010	OVERHEAD HIGH-VOLTAGE WIRING									
0100	Conductors, primary circuits									
0110	Material handling and spotting	R-5	9.78	8.998	W.Mile		455	124	579	82
0120	For river crossing, add		11	8			405	110	515	73
0150			a second	44.898		12,400	2,275	620	15,295	17,80
0160	795 to 954 kcmil			47.059		24,800	2,400	650	27,850	31,60
0170	1,000 to 1,600 kcmil			59.864		42,500	3,050	825	46,375	52,50
0180	Over 1,600 kcmil			65.185		59,500	3,325	900	63,725	71,50
0200	For river crossing, add, 210 to 636 kcmil			70.968			3,600	980	4,580	6,52
0220	795 to 954 kcmil			80.734			4,100	1,125	5,225	7,42
0230	1,000 to 1,600 kcmil		.97	90.722		/	4,600	1,250	5,850	8,32
0240	Over 1,600 kcmil	D.O.	.87	101	V [-	1 / 50	5,150	1,400	6,550	9,27
0300	Joints and dead ends	R-8	6	8	Ea.	1,650	410	47	2,107	2,50
0400 0500	Sagging	R-5	7.33	12.001			610	165	775	1,10 48
0500	Clipping, per structure, 69 kV 161 kV	R-10	9.60 5.33	5 9.006	Ea.		274	62.50	336.50	86
0520	345 to 500 kV			18.972			495	113 237	608	1,80
0520	JHJ U JUU KY	× I	2.00	10.772	*		1,050	201	1,287	1,00

33 71 Electrical Utility Transmission and Distribution

10	39 – High-Voltage Wiring		and the second		7					T 1
	9.13 Overhead High-Voltage Wiring	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Baı Labor	re Costs Equipment	Total	Total Incl O&P
33 71 3	Make and install jumpers, per structure, 69 kV	R-8	3.20	15	Ea.	450	770	88	1,308	1,775
0620	161 kV		1.20	40		895	2,050	234	3,179	4,350
0640	345 to 500 kV		.32	150		1,500	7,725	880	10,105	14,200
0700	Spacers	R-10	68.57	.700		89.50	38.50	8.75	136.75	166
0720	For river crossings, add	"	60	.800			44	10	54	77
0800	Installing pulling line (500 kV only)	R-9	1.45	44.138	W.Mile	840	2,125	194	3,159	4,350
0810	Disposal of surplus material, high voltage conductors	R-7	6.96	6.897	Mile		285	24	309	460
0820	With trailer mounted reel stands	"	13.71	3.501	"		145	12.10	157.10	234
0900	Insulators and hardware, primary circuits									
0920	Material handling and spotting, 69 kV	R-7	480	.100	Ea.		4.13	.35	4.48	6.75
0930	161 kV		685.71	.070			2.89	.24	3.13	4.70
0950	345 to 500 kV		960	.050			2.06	.17	2.23	3.35
1000	Disk insulators, 69 kV	R-5	880	.100		91.50	5.10	1.38	97.98	109
1020	161 kV		977.78	.090		104	4.57	1.24	109.81	123
1040	345 to 500 kV		1100	.080.		104	4.07	1.10	109.17	122
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.		7.60	2.07	9.67	13.75
1120	161 kV		880	.100			5.10	1.38	6.48	9.15
1140	345 to 500 kV		880	.100	*		5.10	1.38	6.48	9.15
1150	Disposal of surplus material, high voltage insulators	R-7	41.74	1.150	Mile		47.50	3.98	51.48	77
1300	Overhead ground wire installation								. B	
1320	Material handling and spotting	R-7	5.65	8.496	W.Mile		350	29.50	379.50	570
1340	Overhead ground wire	R-5	1.76	50		3,300	2,550	690	6,540	8,200
1350	At river crossing, add		1.17	75.214	-		3,825	1,025	4,850	6,925
1360	Disposal of surplus material, grounding wire	-	41.74	2.108	Mile		107	29	136	194
1400	Installing conductors, underbuilt circuits									
1420	Material handling and spotting	R-7	5.65	8.496	W.Mile		350	29.50	379.50	570
1440	Conductors, per wire, 210 to 636 kcmil	R-5	1.96	44.898		12,400	2,275	620	15,295	17,800
1450	795 to 954 kcmil		1.87	47.059		24,800	2,400	650	27,850	31,600
1460	1,000 to 1,600 kcmil		1.47	59.864		42,500	3,050	825	46,375	52,500
1470	Over 1,600 kcmil		1.35	65.185		59,500	3,325	900	63,725	71,500
1500	Joints and dead ends	R-8	6	8	Ea.	1,650	410	47	2,107	2,500
1550	Sagging	R-5	8.80	10	W.Mile		510	138	648	915
1600	Clipping, per structure, 69 kV	R-10	9.60	5	Ea.		274	62.50	336.50	480
1620	161 kV		5.33	9.006			495	113	608	865
1640	345 to 500 kV		2.53	18.972	2		1,050	237	1,287	1,800
1700	Making and installing jumpers, per structure, 69 kV	R-8	5.87	8.177		450	420	48	918	1,175
1720	161 kV		.96	50		895	2,575	293	3,763	5,175
1740	345 to 500 kV	V	.32	150		1,500	7,725	880	10,105	14,200
1800	Spacers	R-10	96	.500		89.50	27.50	6.25	123.25	146
1810	Disposal of surplus material, conductors & hardware	R-7	6.96	6.897	Mile		285	24	309	460
2000	Insulators and hardware for underbuilt circuits									
2100	Material handling and spotting	R-7	1200	.040	Ea.		1.65	.14	1.79	2.68
2150	Disk insulators, 69 kV	R-8	600	.080		91.50	4.12	.47	96.09	107
2160	161 kV		686	.070		104	3.60	.41	108.01	121
2170	345 to 500 kV		800	.060		104	3.09	.35	107.44	120
2180	Disposal of surplus material, insulators & hardware	R-7	41.7	4 1.150) Mile		47.50	3.98	51.48	
2300	Sectionalizing switches, 69 kV	R-5	1.26	69.84	1 Ea.	23,500	3,550	960	28,010	32,300
2310	161 kV		.80	110		26,600	5,600	1,525	33,725	39,400
2500	Protective devices		5.50	16	V	7,700	815	220	8,735	9,925
2600	Clearance poles, 8 poles per mile									
2650	In earth, 69 kV	R-5	116	75.86	2 Mile	6,325	3,850	1,050	11,225	13,900

For customer support on your Heavy Construction Costs with RSMeans data, call 800.448.8182.

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buti	on			33	71 Electrical Utility Tran 139 – High-Voltage Wiring	smissio	ona	anc	D	istrib	utio	n		
201 Labor	8 Bare Costs Equipme	ent Total	Total Incl Ogp		1 39 – High-Voltage Wiring 39.13 Overhead High-Voltage Wiring	Crew	Daily Output	Labor- Hours	Unit	Material	2018 Ba Labor	re Costs Equipment	Total	Total Incl O&P
			ind Ogp	371	Make and install jumpers, per structure, 69 kV	R-8	3.20	15	Ea.	450	770	88	1,308	1,775
27.	50 5.	90 33.	40	100	161 kV		1.20	40		895	2,050	234	3,179	4,350
E.r.			48	140	345 to 500 kV		.32	150		1,500	7,725	880	10,105	14,200
-				100	Spacers	R-10	68.57	.700		89.50	38.50	8.75	136.75	166
-				1720	For river crossings, add	"	60	.800	*		44	10	54	77
-				00	Installing pulling line (500 kV only)	R-9		44.138		840	2,125	194	3,159	4,350
				10	Disposal of surplus material, high voltage conductors	R-7	6.96	6.897	Mile "		285	24	309	460
200	213	0.500		1820	With trailer mounted reel stands	"	13./1	3.501	"		145	12.10	157.10	234
995	199	8,583	9,850	190	Insulators and hardware, primary circuits		100	100	-		4.10	0.5	1.10	1.75
930	177	10,554	12,000	0920	Material handling and spotting, 69 kV	R-7	480	.100	Ea.		4.13	.35	4.48	6.75
815 475	102	10,264 9,227	11,600	0930	161 kV		685.7				2.89	.24	3.13 2.23	4.70 3.35
475	64	7,888	10,400	1950	345 to 500 kV	₩ R-5	960 880	.050		91.50	2.06 5.10	.17 1.38	97.98	3.35 109
995	213	7,000	8,800	1000	Disk insulators, 69 kV	K-D				104	4.57	1.30	109.81	109
1.025	220	9,145	8,600	1020	161 kV 345 to 500 kV		977.78	g 0.000 0 1		104	4.57	1.24	109.01	123
815	174	8,664	10,500	1040	See Section 33 71 23.16 for pin or pedestal insulator	Ŵ	1100	.000	4	104	4.07	1.10	107.17	IZZ
475	102	7,702	9,875	1060	Install disk insulator at river crossing, add									
299	64	6,863	8,675	1100	69 kV	R-5	586.67	.150	Ea.		7.60	2.07	9.67	13.75
4,125	885	285,010	7,675	0111	161 kV	K-3	880	.100	LU.		5.10	1.38	6.48	9.15
11120		205,010	315,000	1120	345 to 500 kV		880	.100			5.10	1.38	6.48	9.15
			1	1140	Disposal of surplus material, high voltage insulators	R-7	121000000	1.150	\ ₩ile		47.50	3.98	51.48	77
221	47.50	0 710 50		1150 1300	Overhead ground wire installation	N-7	41./4	1.150	MIIC		47.50	5.70	51.40	11
330	47.50	3,718.50	4,175	1300	Material handling and spotting	R-7	5.65	8 4 9 6	W.Mile		350	29.50	379.50	570
445	94.50	10,401	11,600	1340	Overhead ground wire	R-5	1.76	50	W.IVIIIC	3,300	2,550	690	6,540	8,200
1,650	355	10,939.50 35,805	12,300	1350	At river crossing, add		1.17	75.214		0,000	3,825	1,025	4,850	6,925
1050	000	33,005	40,100	1360	Disposal of surplus material, grounding wire		41.74		Mile		107	29	136	194
	11.			1400	Installing conductors, underbuilt circuits		11.7 1	2.100	mino		107	27	100	
177	50			1420	Material handling and spotting	R-7	5.65	8.496	W.Mile		350	29.50	379.50	570
205	59	5,261	5,875	1440	Conductors, per wire, 210 to 636 kcmil	R-5		44.898		12,400	2,275	620	15,295	17,800
500	82.50	10,567.50	11,800	1450	795 to 954 kcmil			47.059		24,800	2,400	650	27,850	31,600
1375	106	11,306	12,700	1460	1,000 to 1,600 kcmil			59.864		42,500	3,050	825	46,375	52,500
1.225	296 475	24,871	27,900	1470	Over 1,600 kcmil			65.185		59,500	3,325	900	63,725	71,500
	4/ 5	71,700	80,000	1500	Joints and dead ends	R-8	6	8	Ea.	1,650	410	47	2,107	2,500
_				1550	Sagging	R-5	8.80	10	W.Mile		510	138	648	915
	(diagonal)			1600	Clipping, per structure, 69 kV	R-10	9.60	5	Ea.		274	62.50	336.50	480
				1620	161 kV		5.33	9.006			495	113	608	865
Nr.				1640	345 to 500 kV		2.53	18.972			1,050	237	1,287	1,800
105	124	579	825	1700	Making and installing jumpers, per structure, 69 kV	R-8	5.87	8.177		450	420	48	918	1,175
200	110	515	735	1720	161 kV		.96	50		895	2,575	293	3,763	5,175
10	620	15,295	17,800	1740	345 to 500 kV		.32	150		1,500	7,725	880	10,105	14,200
150	650	27,850	31,600	1800	Spacers	R-10	96	.500		89.50	27.50	6.25	123.25	146
32.	825	46,375	52,500	1810	Disposal of surplus material, conductors & hardware	R-7	6.96	6.897	Mile		285	24	309	460



Quote #: C5258 Project Manager: Tessa Parke Expires: 3/23/2019

Analytical Quote

TAT: 7 days QC Level: STD

Matrix: Aqueous

Page 1

Telesto Solutions Inc

Jean Humphrey

1303 No Pope

Silver City, NM 88061

Project Name: Quarterly Samples

Schedule: Water Samples

Comments:

Analyses	Method	Reporting Limit	Analyte Price
Major Ions			
Alkalinity			\$10.00
Alkalinity, Total as CaCO3	A2320 B	5 mg/L	**
** Included in Alkalinity Price			
Anions by Ion Chromatography			\$30.00
Chloride	E300.0	1 mg/L	**
Fluoride	E300.0	0.1 mg/L	**
Sulfate	E300.0	1 mg/L	**
** Included in Anions by Ion Chroma	atography Price		
Metals by ICP/ICPMS, Total			\$160.00
Calcium	E200.7_8	1 mg/L	**
Magnesium	E200.7_8	1 mg/L	**
Potassium	E200.7_8	1 mg/L	**
Sodium	E200.7_8	1 mg/L	**
** Included in Metals by ICP/ICPMS,	, Total Price		
Physical Properties			
Solids, Total Dissolved			\$20.00
Solids, Total Dissolved TDS @ 180 C	A2540 C	10 mg/L	**
** Included in Solids, Total Dissolved	d Price		
Nutrients			
Nitrogen, Nitrate + Nitrite			\$25.00
Nitrogen, Nitrate+Nitrite as N	E353.2	0.01 mg/L	**
** Included in Nitrogen, Nitrate + N	itrite Price		
Nitrogen, Nitrate as N	E353.2	0.01 mg/L	\$0.00

Nitrogen, Nitrite			\$20.00
Nitrogen, Nitrite as N	A4500-NO2 B	0.01 mg/L	**
** Included in Nitrogen, Nitrite P	rice		
Metals, Total			
Metals by ICP/ICPMS, Total			$\sim \sim$
Aluminum	E200.7_8	0.03 mg/L	**
Arsenic	E200.7_8	0.001 mg/L	**
Cadmium	E200.7_8	0.001 mg/L	**
Chromium	E200.7_8	0.005 mg/L	**
Cobalt	E200.7_8	0.005 mg/L	**
Copper	E200.7_8	0.005 mg/L	**
Iron	E200.7_8	0.03 mg/L	**
Lead	E200.7_8	0.001 mg/L	**
Manganese	E200.7_8	0.001 mg/L	**
Nickel	E200.7_8	0.005 mg/L	**
Selenium	E200.7_8	0.001 mg/L	**
Zinc	E200.7_8	0.01 mg/L	**
** Included in Metals by ICP/ICP	MS, Total Price		
~~ Included in Major Ions Metals	-		
	-		

Preps For Water Samples		
Metals Preparation by EPA 200.2	E200.2	\$15.00

Schedule Price/Sample: \$280.00

Schedule Name	Schedule Total
Water Samples	\$280.00
Quote Sub Total:	\$280.00
Discount:	0.00%
Misc Charges:	\$0.00
Quote Total:	\$280.00

Comments: As of January 1st, 2012 ELI will begin charging a \$2.00 per sample surcharge for sample management. This fee will be applied to all solid and aqueous samples.

Quoted prices are based on net 30 days payment of invoices. Discounts will not apply if terms are not met.

Quoted prices reflect standard turn around time of ~7 working days. Additional charges may apply for accelerated TAT. Please advise ELI as to your project specific requirements.

To assure that the quoted analysis and pricing specifications are provided, please include the Quote ID number referenced above on the Chain of Custody or sample submittal documents.

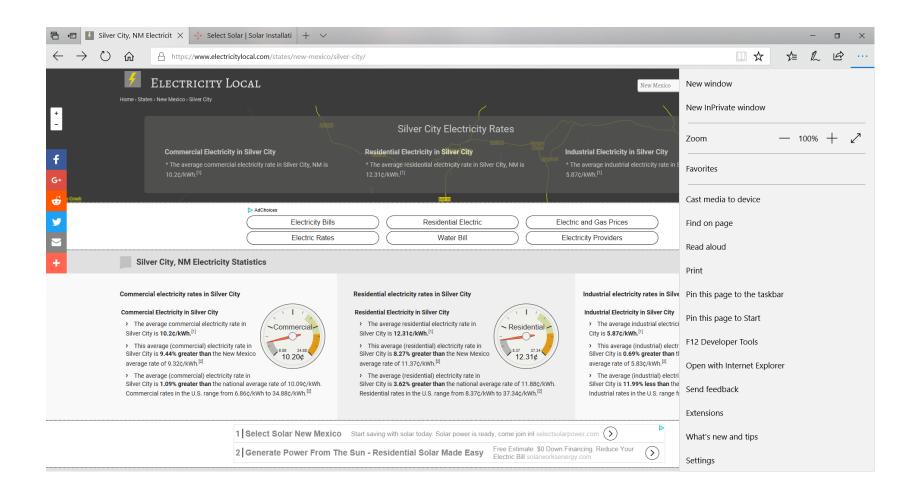


Table 4 Existing and EOY 2019 PMLU Building Information

	Building Information								
Description		Dime	nsions		PMLU				
	L	W	н	Diameter	Previous CCP Designation	EOY 2019 Designation			
Abandoned Building 1 (Shop #1)	51	28	12		Demolish	Removed ²			
Abandoned Building 2 (Shop#2)	60	48	20		Demolish	Removed ²			
Carpenter Shop	60	30	20		Industrial PMLU	Removed ²			
Chemical Lab	90	40	20		Industrial PMLU	Removed ²			
Concentrate Storage Tank			50	30	Demolish	Demolish			
Explosives Storage	10	12	12		Demolish	Removed ²			
Garage	26	12	10		Demolish	Removed ²			
General Offices	118	38	20		Industrial PMLU	Removed ²			
Machine Shop	141	40	20		Industrial PMLU	Removed ²			
Magnetic Separator	15	20	14		Demolish	Demolish			
MCC (Power Generation) Building	40	24	20		Industrial PMLU	Removed ²			
Mill Building #1 and Concentrator	160	140	70		Demolish	Demolish			
Mill Building #2	197	140	70		Demolish	Demolish			
Mine Change Room	152	50	20		Industrial PMLU	Removed ²			
No. 2 Mill Secondary Crusher Building	36	38	50		Demolish	Demolish			
No. 2 Mill Stacker	820	20	15		Demolish	Demolish			
No. 3 Headframe	30	50	100		Demolish	Removed ²			
No. 3 Hoist/Comp Building	150	45	28		Demolish	Removed ²			
No. 4 Headframe and Fan	50	13	42		Demolish	Removed ²			
No. 4 Hoist House and MCC	20	16	14		Demolish	Removed ²			
Oil Storage Building	37	26	16		Demolish	Removed ²			
Ore Bin (large)		20	90	30	Demolish	Demolish			
Ore Bin (large)			90	30	Demolish	Demolish			
Ore Bin (small)			70	30	Demolish	Demolish			
Pioneer Crusher	35	25	40	50	Demolish	Removed ²			
Powder Magazine 1	40	20	20		Demolish	Removed ²			
Powder Magazine 2	40	20	20		Demolish	Removed ²			
Primary Crusher	70	50	60		Demolish	Demolish			
Pump House (near Mill No. 2)	25	25	25		Demolish	Removed ²			
Pump House and Shed for Thickener	10	10	14		Demolish	Demolish			
Safety (Engineering) Building	60	30	12		Industrial PMLU	Removed ²			
Scale House (Guard Shack)	10	10	10		Demolish	Demolish			
Sewage Treatment Facility	25	40	10		Industrial PMLU	Removed ²			
Small Truck Shop	102	40	20		Industrial PMLU	Demolish			
Stacker Hoist	28	23	18		Demolish	Demolish			
Substation No. 2	66	50	30		Industrial PMLU	Demolish			
Surge Tank			18	50	Industrial PMLU	Industrial PMLU			
Thickener MCC	18	18	10	50	Demolish	Demolish			
Thickener MCC	10	22	15		Demolish	Demolish			
Thickener Tank (100-ft diam.)			13	100	Demolish	Demolish			
Thickener Tank (60-ft diam.)			20	60	Demolish	Demolish			
Warehouse	231	40	20		Industrial PMLU	Removed ²			
Water Tank (near stacker and stacker hoist)			120	40	Industrial PMLU	Industrial PMLU			
Water Tank (on Hanover Mountain)			30	25	Demolish	Demolish (moved to new location)			
Nater Tank (on Hanover Mountain)			20	15	Demolish	Removed ²			
Water Tank (on Hanover Mountain)			50	35	Demolish	Demolish (moved to new			
water rank (on nanover Wountain)			50	35	Demolish	location)			

¹ Assume any new replacement building constructed prior to 2019 Full Build Out reclamation will have an Industrial PMLU

² Located within the estimated Hanover Mountain Mine (Hanover Mountain Deposit)/ Cobre Haul Road footprint. Removed Prior to EOY 2019.

Note: The following structures listed in GR002RE 01-1, Appendix D, have been removed: Unleaded Gasoline Above-ground Storage Tank,

Underground Explosives Storage, Underground Fuel Farm, PCB Storage Building, Underground Mine Operations Office, and Ambulance

Garage. Building dimensions have been updated; the No. 3 Headframe and No. 4 Headframe and Fan are listed as separate buildings.

Table 8 Earthwork Capital Costs

ltem	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost
Capital			
Tailing Ponds			
Magnetite Tailing Pond	\$840,196	\$237,776	\$1,077,972
Main Tailings Impoundment	\$2,313,012	\$654,582	\$2,967,594
Subtotal	\$3,153,208	\$892,358	\$4,045,566
Waste Rock and Ore Piles			
SWRDF	\$8,860,289	\$2,507,462	\$11,367,751
Hanover Mountain Deposit	\$1,122,318	\$317,616	\$1,439,934
No. 3 Shaft Stockpile ^{**}	\$56,522	\$15,996	\$72,518
Low Grade WRF	\$323,121	\$91,443	\$414,565
Subtotal	\$10,362,250	\$2,932,517	\$13,294,767
Continental Pit			
Subtotal	\$ 84,223	\$ 23,835	\$108,058
Surface Impoundments			
Subtotal	\$97,518	\$27,598	\$125,116
Historic Sites			
Pearson-Barnes Mine Area	\$163,263	\$46,204	\$209,467
Other Disturbed Areas			
Haul and Exploration Roads	\$75,291	\$21,307	\$96,598
Dist. Area Near SWRDF**	\$17,895	\$5,064	\$22,959
Contingency Disturbance Area**	\$632,427	\$178,977	\$811,404
Borrow Areas**	\$47,750	\$13,513	\$61,263
Wells	\$7,421	\$2,100	\$9,521
Subtotal	\$780,783	\$220,962	\$1,001,744
Demolition			
Buildings	\$1,389,430	\$393,209	\$1,782,638
Cover	\$102,002	\$28,867	\$130,869
Rip & Revegetation	\$1,068	\$302	\$1,370
Subtotal	\$1,492,500	\$422,378	\$1,914,878
Total Capital Cost	\$16,133,746	\$4,565,850	\$20,699,596

CHR Total Capital Cost*	\$433,176	\$122,589	\$555,764

Total	\$16,566,922	\$4,688,439	\$21,255,360
		1 201 1	

*Updated from the 2014 Cobre Haul Road Closeout Plan (Telesto, 2014)

**Added since 2014 CCP

Table 9 Earthwork O&M Costs

	Total Earthwork O&M Cost ¹									
			Revegetation	Total						
Period (years)	Erosion Control	Road Maintenance	Maintenance	(Current Year \$)						
Overall Site	Overall Site									
0 to 19	\$501,874	\$460,107	\$256,388	\$1,218,370						
20 to 39	\$308,846	\$296,843	\$0	\$605,689						
40 to 99	\$231,634	\$445,265	\$0	\$676,89 9						
Totals	\$1,042,355	\$1,202,215	\$256,388	\$2,500,958						
CHR ²										
0 to 11	\$74,610	-	\$17,384	\$91,994						
Totals	\$74,610	\$0	\$17,384	\$91,994						

¹Earthwork O&M costs include 23.3% indirect costs.

²Updated from the 2014 Cobre Haul Road Closeout Plan (Telesto, 2014)

Table 10	Water	Management	Costs
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Item	Subtotal, Direct Costs	Subtotal, Indirect Costs	Total Estimated Cost
Capital and Replacement			
Ponds and Tanks	\$520,595	\$147,328	\$667,923
Pumps	\$659,426	\$186,618	\$846,044
Pipelines	\$0	\$0	\$0
Electrical	\$0	\$0	\$0
Subtotal	\$1,180,021	\$333,946	\$1,513,967
Removal ¹			
Pumps	\$149,324	\$42,259	\$191,583
Pipelines	\$114,136	\$32,301	\$146,437
Electrical	\$52,381	\$14,824	\$67,205
Subtotal	\$315,841	\$89,384	\$405,225
Operations and Maintenance			
Ponds and Tanks	\$225,298	\$38,301	\$263,599
Pumps	\$113,383	\$19,275	\$132,658
Pipelines	\$128,879	\$21,909	\$150,788
Electrical Infrastructure	\$117,759	\$20,019	\$137,778
Materials			
Electricity and Fuel	\$30,408	\$5,169	\$35,578
Environmental Sampling	\$297,192	\$50,523	\$347,715
Subtotal	\$912,920	\$155,196	\$1,068,116
Total Estimated Cost	\$2,408,782	\$578,526	\$2,987,308

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

May 19, 2018

Component	Current Cost	NPV
Earthwork	\$23,848,312	\$21,556,942
Water Management	\$2,987,308	\$2,380,830
Total	\$26,835,620	\$23,937,772

		Yr 1-10	Yr 11-100
	Escalation	Discount	Discount
	Rate	Rate	Rate
Earthwork	3.14%	7.27%	7.42%
Water Management	2.43%	7.27%	7.42%

	ent		272	347	336	366	390	567	701	730	347	325	155	699	594	1,536	1,464	1,396	1,331	1,270	1,211	1,154	1,101	1,050	1,001
Water Management	Water Management	NPV	1,237,272	68,947	65,836	62,866	158,890	329,567	43,701	41,730	39,847	62,325	34,155	32,569	170,594	1,5	1,4	1,3	1,3	1,2	1,2	1,1	1,1	1,0	1,0
Water M	Water Management ⁵	Current Cost	1,237,272	72,205	72,205	72,205	191,118	415,144	57,650	57,650	57,650	94,432	54,959	54,959	301,897	2,850	2,850	2,850	2,850	2,850	2,850	2,850	2,850	2,850	2,850
	Earthwork	NPV	6,953,472	6,693,127	6,466,899	399,389	57,294	65,499	72,987	79,801	76,729	73,775	69,950	67,163	64,487	39,194	25,540	24,522	23,545	22,607	21,706	20,842	13,429	12,894	12,381
	Total Earthwork	Current Cost	6,953,472	6,961,138	6,995,172	449,314	67,037	307,97	92,374	105,043	105,043	105,043	105,043	105,043	105,043	66,492	45,127	45,127	45,127	45,127	45,127	45,127	30,284	30,284	30,284
Earthwork	Haul Road O&M ⁴ Total Earthwork	Current Cost	I	7,666	7,666	7,666	7,666	7,666	7,666	7,666	7,666	7,666	7,666	7,666	7,666	ı	-	1	ī	ĩ	I	1	•	1	
Eart	0&M ³	Current Cost	I.	L	12,669	25,337	38,006	50,674	63,343	76,011	76,011	76,011	76,011	76,011	76,011	45,127	45,127	45,127	45,127	45,127	45,127	45,127	30,284	30,284	30,284
	D&M Reveg Mnt ³	Current Cost	L.		21,366	21,366	21,366	21,366	21,366	21,366	21,366	21,366	21,366	21,366	21,366	21,366	1	I	•	•	ì	κ.	1	ı	,
	Earthwork ¹	Current Cost	6,953,472	6,953,472	6,953,472	394,945	ï	ĩ	ī	ı	t	1	I	I	1	1	1	1	ı	J	ı	ŀ	1	1	,
Ч		Year		2	m	4	S	9	7	∞	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Haul Road O&M ⁴ Total Earthwork Earthwork Water Management ³ Current Cost UNPV Current Cost 2,850 Current Cost 30,284 11,414 2,850 Signal 11,414 2,850 2,850 Signal 10,052 2,850 2,850 Signal 10,103 2,850 2,850 Signal 9,714 2,850 2,850 Signal 30,284 9,714 2,850 Signal 30,284 9,714 2,850 Signal 30,284 8,943 2,850 Signal 8,244 2,850 2,850 Signal 8,244 2,850 2,850 Signal 7,007 2,2850 2,850 Signal 5,244 2,850 2,850 Signal 5,244 2,850 2,850 Signal 5,244 2,850 2,850 Signal 5,244 2,850 2,850 Signal 5,213 2,130 </th <th></th> <th></th> <th></th> <th>Eart</th> <th>Earthwork</th> <th></th> <th></th> <th>Water Ma</th> <th>Water Management</th>				Eart	Earthwork			Water Ma	Water Management
Current Cost S0,284 11,887 Z,850 Z,850 - - - - - - - 2,850 - - 2,850		Earthwork ¹	D&M Reveg Mnt	0&M ³	Haul Road O&M ⁴	Total Earthwork	Earthwork	Water Management ⁵	Water Management
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Year	Current Cost	Current Cost	Current Cost	Current Cost	Current Cost	NPV	Current Cost	NPV
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$									
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	24	1	ı	30,284		30,284	11,887	2,850	954
$ \begin{array}{lcccccccccccccccccccccccccccccccccccc$	25	1	1	30,284	1	30,284	11,414	2,850	910
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	26	1	'	30,284	I	30,284	10,959	2,850	868
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	27	,		30,284		30,284	10,522	2,850	827
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	28	1	т	30,284	ı	30,284	10,103	2,850	789
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	29	1	Ţ	30,284	ı	30,284	9,701	2,850	752
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	30		,	30,284	ł	30,284	9,314	2,850	717
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	31	ł	1	30,284	1	30,284	8,943	2,850	684
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	32	ı	1	30,284	ı	30,284	8,587	2,850	652
$ \begin{array}{lcccccccccccccccccccccccccccccccccccc$	33	t	'	30,284	,	30,284	8,244	2,850	622
$\begin{array}{lcccccccccccccccccccccccccccccccccccc$	34	1	ı	30,284	L	30,284	7,916	2,850	593
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	35		1	30,284	1	30,284	7,601	2,850	566
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	36	'		30,284	1	30,284	7,298	2,850	539
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	37	1	1	30,284	1	30,284	7,007	2,850	514
$\begin{array}{lcccccccccccccccccccccccccccccccccccc$	38	1	1	30,284	,	30,284	6,728	2,850	490
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	39	T	•	30,284	Ţ	30,284	6,460	2,850	468
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	40	L	а.	30,284	Ľ	30,284	6,202	2,850	446
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	41		L	11,282	1	11,282	2,218	2,850	425
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	42	,	ı	11,282	I	11,282	2,130	2,850	405
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	43	,	1	11,282	,	11,282	2,045	2,850	387
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	44			11,282	1	11,282	1,964	2,850	369
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	45	L	'	11,282	1	11,282	1,885	2,850	351
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	46	ı	•	11,282	ı	11,282	1,810	2,850	335
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	47	r	1	11,282	L	11,282	1,738	2,850	320
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	48	1		11,282	1	11,282	1,669	2,850	305
$\begin{array}{ cccccccccccccccccccccccccccccccccccc$	49		,	11,282	1	11,282	1,602	2,850	291
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	50	1	1	11,282		11,282	1,539	2,850	277
	51	t	L	11,282	1	11,282	1,477	2,850	264
	52	r	1	11,282		11,282	1,418	2,850	252
	53	ı	1	11,282		11,282	1,362	2,850	240
	54	1	1	11,282		11,282	1,308	2,850	229

			Eart	Earthwork			Water Ma	Water Management
	Earthwork ¹	D&M Reveg Mnt ³	0&M ³	Haul Road O&M ⁴ Total Earthwork	Total Earthwork	Earthwork	Water Management ⁵	Water Management
Year	Current Cost	Current Cost	Current Cost	Current Cost	Current Cost	NPV	Current Cost	NPV
87	ī	ĩ	11,282	,	11,282	342	2,850	48
88	Ľ	I	11,282	'	11,282	328	2,850	45
89	1	ı	11,282	T	11,282	315	2,850	43
90		1	11,282	1	11,282	303	2,850	41
91	1	1	11,282	1	11,282	291	2,850	39
92	ı	î	11,282	ı	11,282	279	2,850	38
93	ŗ	ĩ	11,282	ī	11,282	268	2,850	36
94	Ľ	ĩ	11,282		11,282	257	2,850	34
95	т	3	11,282	1	11,282	247	2,850	33
96	1	ı	11,282	I	11,282	237	2,850	31
97	1	1	11,282	,	11,282	228	2,850	30
98	1	,	11,282	ı	11,282	219	2,850	28
66	I	ĩ	11,282	T	11,282	210	2,850	27
100			11,282		11,282	201	2,850	26
Total	21,255,360	256,388	2,244,570	91,994	23,848,312	21,556,942	2,987,308	2,380,830

Notes:

distributed equally at \$394,945 through year 4 (which is the total cost of primary revegetation for all facilities - totalling \$1,184,835). 1. Includes all Earthwork Direct and Indirect costs - compare to total of Table 8 from CCP. Vegetation Costs are started in year 2 and 2. Includes all revegetation maintenance costs for the Continental Mine proper as shown in Table 9 - excludes CHR Reveg Mnt costs. Distributed in years 3 through 14

3. Copied from column "N" of tab "20 O&M" from work book titled "Cobre_OM_2018_NOBS_20180517" - cost estimator provided cash flow. Note that the sum of this column and the previous column - "O&M Reveg Mnt" = the Overall Site O&M costs shown in Table 9 of the Revised CCP.

4. Cobre/Chino connecting haul road O&M from Table 9 distributed over 12 years.

5. Cash flow for all water management costs (capital and O&M combined), cash flow copied from tab "3 WM cash flow" in work book titled "Cobre_WM_20180517"

Note that the sum of this column = total water management costs shown in Table 10 of the Revised CCP.

EARTH WORK RECLAMATION ESCALATION RATE -- GEOMETRIC MEAN METHOD

Current Calculation	2017	COBRE	
			% of Escalation
Category	Rate	% of Project	Rate
Earthwork Labor	2.70%	16%	0.42%
#2 Diesel Fuel	4.43%	17%	0.75%
Machinery & Equipment	2.92%	67%	1.97%
Earth Work Reclamation	Escalatio	n Rate:	3.14%

Employment, Hours, and Earnings from the Current Employment Statistics survey (National) Original Data Value

 Series Id:
 CEU2023700003

 Not Seasonally
 Adjusted

 Series Title:
 Average hourly earnings of all employees, heavy and civil engineering construction

 Super Sector:
 Construction

 Industry:
 Heavy and civil engineering construction

 NAICS Code:
 237

 Data Type:
 AVERAGE HOURLY EARNINGS OF ALL EMPLOYEES

 Years:
 2006 to 2017

Data:

Year	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
2006			21.99	22.35	22.48	22.83	22.67	22.79	23.09	23.23	23.01	23.03	22.75	N/A	N/A
2007	22.55	22.36	22.35	22.75	22.96	23.18	23.54	23.46	23.75	23.56	23.59	23.89	23.16	1.82%	1.02
2008	23.62	23.42	23.54	23.61	23.90	23.75	24.02	24.36	24.37	24.43	24.42	24.80	24.02	3.71%	1.04
2009	24.51	24.52	24.65	24.52	24.68	24.63	24.69	24.88	24.98	25.47	25.37	25.36	24.86	3.48%	1.03
2010	25.51	25.63	25.20	25.04	25.23	25.21	25.43	25.57	25.63	25.90	25.72	25.76	25.49	2.54%	1.03
2011	25.98	26.12	25.84	25.76	25.86	26.02	26.20	26.37	26.37	26.36	26.26	26.28	26.12	2.48%	1.02
2012	26.06	26.41	26.51	26.15	26.23	26.38	26.70	26.45	26.70	26.61	26.62	26.85	26.47	1.36%	1.01
2013	26.62	26.85	26.38	26.44	26.53	26.56	26.77	26.88	27.11	27.03	26.85	27.31	26.78	1.15%	1.01
2014	27.04	27.57	27.15	27.23	27.11	27.40	27.52	27.57	28.03	28.19	28.12	28.16	27.59	3.04%	1.03
2015	28.43	28.24	28.66	28.72	28.54	28.38	28.59	28.92	28.58	29.08	28.96	29.05	28.68	3.94%	1.04
2016	28.79	28.84	29.28	29.41	29.36	29.38	29.49	29.55	29.75	30.08	29.57	29.79	29.44	2.66%	1.03
2017	29.93	29.71	30.29	29.95	30.26	30.46	30.64	30.71	31.27	30.87	30.77	30.87	30.48	3.52%	1.04
Arithmetic n Geometric m														2.70% N/A	2.70% 2.70%

PPI Commodity Data

Series Id: WPS057303 Seasonally Adjusted Fuels and related products and power No. 2 diesel fuel Group: Item: Base Date: 198200 Years: 1985 to 2017

Data:*

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
1985						80.5	78.7	78.1	79.4	80.1	82.1	84.7	80.5	N/A	N/A
1986	79.7	63.7	49.9	48.9	45.1	44.0	37.4	40.0	46.0	41.5	41.5	43.8	48.5	N/A	N/A
1987	48.1	52.9	49.9	50.7	52.8	56.1	59.9	63.6	59.3	58.7	59.1	55.0	55.5	0.15	1.15
1988	52.1	52.1	51.4	53.6	55.1	53.0	50.8	49.8	47.6	40.4	44.1	47.5	49.8	-0.10	0.90
1989	52.4	55.8	58.9	63.0	58.2	55.6	56.1	56.2	59.9	61.8	61.5	66.5	58.8	0.18	1.18
1990	85.1	61.2	62.5	62.6	60.0	56.7	55.2	75.1	86.8	95.9	91.1	88.8	73.4	0.25	1.25
1991	82.5	77.2	63.3	61.3	61.6	61.3	62.6	64.4	64.3	61.4	65.2	62.0	65.6	-0.11	0.89
1992	55.5	59.0	57.0	59.2	62.8	68.5	68.0	65.0	63.9	64.1	60.5	59.6	61.9	-0.06	0.94
1993	61.9	62.8	65.5	64.5	64.3	63.3	59.9	54.6	58.6	62.1	59.1	50.6	60.6	-0.02	0.98
1994	52.6	58.8	58.6	55.1	54.0	54.9	58.2	58.5	56.1	55.3	56.1	54.3	56.0	-0.08	0.92
1995	55.3	54.7	57.4	58.9	59.2	58.1	55.3	56.3	56.6	55.3	56.5	59.9	57.0	0.02	1.02
1996	63.8	61.0	64.8	75.9	74.6	67.2	68.4	67.3	71.4	75.8	72.4	76.1	69.9	0.23	1.23
1997	74.4	74.8	70.0	66.3	62.7	63.6	60.4	63.1	58.4	60.5	61.5	58.9	64.6	-0.08	0.92
1998	54.8	53.4	50.2	51.0	49.9	47.7	46.3	44.7	44.6	44.1	43.1	39.4	47.4	-0.27	0.73
1999	41.2	38.6	46.3	54.5	53.2	55.6	61.8	66.9	63.4	63.1	66.8	73.8	57.1	0.20	1.20
2000	80.3	89.7	92.5	84.0	82.3	87.5	90.8	90.5	104.6	102.1	105.4	107.3	93.1	0.63	1.63
2001	103.4	97.7	85.1	88.7	92.5	91.5	81.9	80.3	83.6	69.8	70.0	58.9	83.6	-0.10	0.90
2002	61.0	63.6	71.2	75.1	75.4	74.8	78.3	78.4	85.9	90.4	85.1	92.7	77.7	-0.07	0.93
2003	106.4	133.6	129.1	99.9	86.8	89.5	93.5	96.3	84.2	95.3	93.3	103.8	101.0	0.30	1.30
2004	117.1	113.1	109.3	116.0	117.3	112.8	122.8	132.7	133.1	157.2	160.2	144.7	128.0	0.27	1.27
2005	153.5	162.4	177.7	169.1	168.2	186.3	188.3	195.7	201.3	246.6	204.5	205.0	188.2	0.47	1.47
2006	213.8	215.2	208.6	224.3	234.9	240.2	233.5	243.1	194.4	189.7	194.9	209.7	216.9	0.15	1.15
2007	196.9	212.7	220.5	228.2	221.0	221.8	243.5	222.3	239.9	246.6	285.0	287.1	235.5	0.09	1.09
2008	305.0	314.3	343.4	341.9	382.5	402.9	417.3	340.6	346.8	286.1	224.3	175.9	323.4	0.37	1.37
2009	172.0	158.9	135.7	156.7	161.1	187.1	175.3	198.0	194.0	204.0	214.4	214.1	180.9	-0.44	0.56
2010	245.4	216.2	217.7	222.2	228.9	222.5	228.0	226.1	230.0	244.7	251.0	268.3	233.4	0.29	1.29
2011	286.3	298.3	313.3	318.8	322.3	337.0	341.5	301.2	315.6	310.6	329.8	319.9	316.2	0.35	1.35
2012	343.6	345.1	348.5	331.7	319.7	292.2	298.5	316.9	326.7	346.9	317.8	328.6	326.4	0.03	1.03
2013	335.0	351.9	323.2	318.6	301.7	304.5	311.0	312.5	312.4	311.2	307.9	324.4	317.9	-0.03	0.97
2014	324.0	330.9	320.3	319.0	310.3	308.5	307.2	300.3	287.9	277.1	273.1	237.0	299.6	-0.06	0.94
2015	191.8	196.8	194.5	184.0	198.6	198.5	193.6	185.2	161.3	169.6	167.9	134.8	181.4	-0.39	0.61
2016	125.2	116.5	120.2	123.7	141.6	155.2	157.3	146.6	155.3	156.1	157.5	163.8	143.3	-0.21	0.79
2017	169.2	168.0	162.5	163.0	170.2	171.3	179.2	184.9	194.5	208.7	224.4	230.9	185.6	0.30	1.30
ithmetic m	ean:													7.32%	7.32%

Geometric mean:

N/A 4.43%

P : Preliminary. All indexes are subject to revision four months after original publication.
* : Data is regularly evaluated per revised seasonal factor every year

PPI Commodity Data

Series Id: WPU112D Not Seasonally Adjusted

 Group:
 Machinery and equipment

 Item:
 Off-highway, equipment, ex. parts

 Base Date:
 199912

 Years: 2000 to 2017

Data:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	%	Convert to
														Change	Positive
1982	97.8	98.2	98.8	99.4	100.1	100.5 102	100.3	100.6	100.9	100.8	101.2 103.1	101.4	100	N/A	N/A
1983	101.2	101.2	101.6 103.1	101.4	101.8	102	102.6	102.8	103	102.9 103.7	103.1	103.1 103.9	102.2	2.22%	1.02
1984	102.9	103 104.4	103.1	103.2 104.5	103.1 104.4	103.4	103.5 104.2	103.6 104.3	103.7 104.3	103.7	103.8	103.9	103.4	1.16%	1.01
1985	104.3												104.4	0.91%	1.01
1986	104.3 105.6	104.4 105.8	104.6 105.9	104.8 106	104.8 107.5	104.4	104.3 106.8	104.3 106.8	104.4 107.5	104.6 107.6	106.5 107.9	106.7 108.1	104.8 106.9	0.47%	1.00
1987	105.6	105.8	105.9	110.4	107.5	1107.1	106.8	106.8	107.5	107.8	107.9	114.6	106.9	1.95% 4.62%	1.02 1.05
1988		110.2	109.9	110.4	110.7	122.7	112.8	112.9	113.4	113.8	114.1	114.0	111.8	4.62%	1.05
1989	116.7 134.9	134.8	134.9	135.3	135.5	135.7	136	121.0	121.9	136.8	122.5	122.8	120.3	12.97%	
1994 1995	134.9	134.8	134.9	135.3	135.5	135.7	130	130.3	136.4	130.8	137.1	137.2	135.9	2.34%	1.13 1.02
1995	140.4	138.5	138.4	130.4	141.8	143.1	143.2	143.5	139.5	139.0	140.1	140.9	139.1	2.34%	1.02
1996	140.4	141.8	141.7	141.7	141.8	145.1	145.2	145.5	143.8	144.1	144.4	144.7	142.9	2.39%	1.03
1997	148.7	148.7	149.4	149.1	149.4	149.7	149.9	150.3	150.6	150.9	151.1	151.7	150.0	2.53%	1.02
1999	150.1	151.3	151.2	152.3	152.6	152.9	153.1	153.4	153.7	154	154.3	154.6	152.8	1.89%	1.02
1999			es per note		102.0	102.7	100.1	100.1	100.7	101	101.0	101.0	102.0	1.0770	1.02
2000	101.2	101.3	101.3	101.4	101.4	101.4	101.4	101.4	101.4	101.4	101.4	101.4	101.4	1.37%	1.01
2001	101.6	101.6	101.6	101.7	101.7	101.7	101.7	101.7	101.7	102.2	102.3	102.4	101.8	0.45%	1.00
2002	102.9	102.9	102.9	102.9	102.9	102.9	102.9	103.1	103.1	103.1	103.3	103.3	103.0	1.17%	1.01
2003	104.2	104.2	104	104	104.1	104.1	104.1	104.1	104.1	104.1	104.5	104.6	104.2	1.12%	1.01
2004	105.4	105.7	105.8	106.7	106.8	107	108.7	108.8	108.8	108.1	108.1	107.9	107.3	3.02%	1.03
2005	109.9	109.7	109.7	109.7	111.6	113.1	113.1	113.1	113.1	113.5	113.7	114	112.0	4.38%	1.04
2006	115.9	116.1	116.2	116.2	115.9	116	116	116	116.4	116.7	116.7	116.6	116.2	3.76%	1.04
2007	117.7	117.7	117.4	117.5	117.5	117.5	117.5	117.6	117	117.9	118.2	118.4	117.7	1.23%	1.01
2008	118.3	119.7	119.9	121.6	121.6	122	122.3	122.7	122.8	122.6	123.7	124.9	121.8	3.56%	1.04
2009	124.6	125.5	126.5	127.6	128.6	129.7	129.9	129.2	127.9	127.1	128.3	131.1	128.0	5.05%	1.05
2010	129.1	129.6	130	128.5	128.8	129.1	129.9	130.1	133.7	130.1	129.2	131.5	130.0	1.54%	1.02
2011	131.1	130.8	132.2	132	132.8	134.3	135.5	137.5	137.4	139	138.7	137.2	134.9	3.78%	1.04
2012	143.9	147.6	145.7	146.9	147.7	146	146.1	149.4	145.6	149.3	148.4	150.6	147.3	9.19%	1.09
2013	151.8	151.8	149.1	150.8	151.4	153	152.8	152.8	152.8	153	153.1	153.1	152.1	3.30%	1.03
2014	155.6	155.6	155.6	155.1	155.1	155.1	153.3	153.3	153.3	153.7	154.8	154.8	154.6	1.63%	1.02
2015	157.3	157.3	157.3	157	157	157	157.2	157.2	157.2	157.3	157.3	157.4	157.2	1.68%	1.02
2016	159.8	160.1	159.3	159	159	159	159.1	159.1	159.1	159.1	159.1	159.1	159.2	1.29%	1.01
2017	160.1	160.1	160.1	159.9	160	160	159.5	159.5	159.5	159.8	160	160	159.9	0.40%	1.00
A rithmatin														2.04.04	2.04.94
Arithmetic n Geometric n														2.96% N/A	2.96% 2.92%
Geometric I	ileall:													IN/A	2.72%

P : Preliminary. All indexes are subject to revision four months after original publication. *: WPS1129 was discontinued on 1999. WPU112D is the closest report to the old WPS1129 report.

WATER MANAGEMENT ESCALATION RATE -- GEOMETRIC MEAN METHOD

Current Calculation	2017	COBRE	
Category	Rate	% of Project	% of Escalation Rate
Ponds and Tanks	2.10%	29%	0.61%
Industrial Pumps	4.45%	8%	0.34%
Pipelines	0.43%	3%	0.01%
Electrical Infrastructure:	2.32%	2%	0.04%
Machinery & Equipment	2.92%	3%	0.08%
#2 Diesel Fuel	4.43%	1%	0.04%
Electricity	3.28%	1%	0.04%
Water Management Labor	2.33%	51%	1.18%
Earthwork Labor	2.70%	3%	0.07%
	-	100.0%	2.43%
Water Management Reclamation E	2.43%		

PPI Commodity Data

 Series Id:
 WPU10720104

 Not Seasonally Adjusted

 Series Title:
 PPI Commodity data for Metals and metal products-Storage and other non-pressure tanks

 Group:
 Metals and metal products

 Item:
 Storage and other non-pressure tanks

 Base Date:
 199412

 Years:
 1994 to 2017

Data:

Year	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
1994												100.0	100.0	N/A	N/A
1995	101.2	101.2	101.2	104.2	104.7	104.7	104.7	105.1	105.1	105.5	105.5	105.5	104.1	4.05%	1.04
1996	105.5	105.5	105.8	106.2	106.2	106.2	106.2	106.2	106.6	106.7	106.7	106.6	106.2	2.07%	1.02
1997	106.6	106.6	106.6	107.2	107.2	107.6	107.6	108.6	116.0	112.5	113.6	109.0	109.1	2.72%	1.03
1998	109.5	109.5	110.5	107.3	107.5	110.7	110.8	107.9	115.7	115.7	115.2	112.4	111.1	1.80%	1.02
1999	114.7	113.8	113.8	113.8	115.6	118.0	115.7	115.7	115.7	115.3	116.9	116.9	115.5	3.99%	1.04
2000	116.0	116.1	117.5	116.7	118.4	118.3	118.3	116.6	116.6	116.6	116.6	116.6	117.0	1.33%	1.01
2001	116.6	116.6	116.6	114.3	115.7	115.7	115.9	115.9	115.9	115.9	115.9	115.9	115.9	-0.95%	0.99
2002	115.8	114.7	113.8	113.8	117.5	117.3	115.0	115.6	118.9	120.1	120.1	116.5	116.6	0.59%	1.01
2003	116.5	116.4	118.0	118.6	117.3	115.6	115.5	115.8	116.0	116.0	116.8	116.2	116.6	-0.03%	1.00
2004	117.2	117.7	121.7	122.2	123.9	127.2	129.0	132.5	137.8	148.3	151.7	150.5	131.6	12.94%	1.13
2005	152.8	153.0	153.0	151.9	150.1	150.0	150.0	152.1	153.1	153.3	152.8	155.5	152.3	15.69%	1.16
2006	155.5	156.2	156.2	156.9	156.9	155.2	155.2	153.8	153.8	152.5	153.6	159.9	155.5	2.08%	1.02
2007	159.9	162.4	162.4	163.2	163.8	163.6	163.0	161.5	161.5	162.1	162.1	160.2	162.1	4.29%	1.04
2008	160.8	162.9	164.9	166.3	167.6	163.1	168.3	173.2	173.2	174.9	174.9	172.7	168.6	3.96%	1.04
2009	173.5	173.9	173.9	167.0		169.9	169.9	169.0	169.0	171.3	170.1	168.8	170.6	1.19%	1.01
2010	168.8	166.5	166.5	168.4	168.4	167.5	167.5	164.8	164.8	168.2	168.2	166.8	167.2	-1.98%	0.98
2011	166.8	162.0	162.0	155.5	155.5	155.5	156.9	156.6	156.7	158.1	160.3	160.7	158.9	-4.97%	0.95
2012	159.7	159.7	161.7	161.7	161.8	161.8	162.8	161.8	160.5	160.2	160.0	160.5	161.0	1.34%	1.01
2013	159.5	158.6	159.0	159.1	159.1	159.1	158.6	158.6	158.6	159.2	159.2	159.5	159.0	-1.25%	0.99
2014	159.6	160.3	159.7	159.7	159.7	160.0	160.0	160.1	160.3	161.1	161.7	161.7	160.3	0.83%	1.01
2015	161.8	161.4	157.3	157.3	157.3	155.4	155.4	154.6	154.4	153.3	153.3	153.3	156.2	-2.55%	0.97
2016	153.1	152.4	153.0	153.0	153.9	155.6	155.6	155.6	155.6	155.6	156.4	156.7	154.7	-0.98%	0.99
2017	158.0	158.3	159.6	160.3	160.6	160.8	160.8	163.2	163.2	163.2	163.2	165.6	161.4	4.33%	1.04
Arithmetic m Geometric m														2.20% N/A	2.20% 2.10%

http://data.bls.gov/cgi-bin/srgate PPI Commodity Data

 Series Id:
 WPU11102

 Not Seasonally Adjusted
 Machinery and equipment

 Group:
 Machinery and equipment

 Item:
 Industrial pumps, except hydraulic fluid power pumps

 Base Date:
 198200

 Years:
 1971 to 2017

Data:

Year	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
1971	33.1	33.2	33.4	33.5	33.7	33.3	33.3	33.6	33.6	33.6	33.6	33.6	33.5	N/A	N/A
1972	33.7	34.2	34.3	34.3	33.8	34.5	34.6	34.6	34.6	34.6	34.7	34.7	34.4	2.69%	1.03
1973	34.7	35	35.1	35.3	35.3	36.2	36.1	36	36.2	36.7	37	37.2	35.9	4.36%	1.04
1974	37.4	37.6	38.9	40.2	42.3	44.7	46.9	47.6	48	49.3	51.3	51.6	44.6	24.23%	1.24
1975	52.3	53	53	52.7	52.8	52.8	53.3	53.4	53.7	53.8	54.1	54	53.2	19.28%	1.19
1976	54.2	55.1	55.5	55.7	55.4	55.5	55.6	56	56.5	56.6	56.5	57.5	55.8	4.89%	1.05
1977	58.2	58.1	58.3	58.3	58.9	59.5	60.3	60.2	60.7	61	61.5	61.6	59.7	6.99%	1.07
1978	61.9	62.3	62.5	63.6	63.8	64.6	64.9	65	65.4	65.6	66.9	67.1	64.5	8.04%	1.08
1979	67.3	67.3	68.1	68.6	69.7	69.9	70.1	70.8	71	71.8	72.3	75.7	70.2	8.84%	1.09
1980	76.9	77.6	79	80.4	81.1	81.4	82.3	82.8	83.3	85	87	88.5	82.1	16.95%	1.17
1981	89.2	90.5	91	91.2	93.6	94	95.6	96.3	95.8	96.5	97.3	97.7	94.1	14.62%	1.15
1982	98.9	99.4	99.8	100.4	100.5	100	100	100	100.2	100.1	100.4	100.5	100	6.27%	1.06
1983	101.1	101	100.2	100.2	100.2	100.2	100.3	99.2	99.3	98.7	98.8	98.9	99.8	-0.20%	1.00
1984	99	99.7	100	100.3	99.5	99.9	100	100.1	101	101.6	102.5	101.6	100.4	0.60%	1.01
1985	101.8	102.4	102.8	102	101.9	102.1	102.2	102.4	102.3	102.8	103.1	101.8	102.3	1.89%	1.02
1986	102.2	103.7	103.8	103.8	102.8	102.8	102.8	102.9	103.5	103.5	103.6	103.7	103.3	0.98%	1.01
1987	104.3	104.3	104.5	104.5	105.1	105	105	105.2	105.3	105.6	106.2	106.9	105.2	1.84%	1.02
1988	106.9	107.1	107.4	108.8	109.2	110.9	110.9	111.4	111.9	112.2	114	114.5	110.4	4.94%	1.05
1989	115.3	115.4	116.8	118.5	118.6	118.8	118.7	118.9	119.9	120	120.3	120.4	118.5	7.34%	1.07
1990	121	121.8	122.1	121.1	123.4	123.7	124	124.6	124.9	125.8	125.9	126.3	123.7	4.39%	1.04
1991	127.6	128.4	128.5	129.4	130.1	130.3	130.1	130.4	130.5	130.5	130.5	131.1	129.8	4.93%	1.05
1992	132.4	133.1	134	134.3	134.5	134.5	134.8	136.1	136.2	136.2	136.3	136.3	134.9	3.93%	1.04
1993	138	138.7	139.2	139.5	139.5	139.4	139.4	139.5	139.6	139.8	140	140	139.4	3.34%	1.03
1994	140.9	141.2	141.9	142.1	142.2	142.2	142.2	142.4	142.6	143	143	143.6	142.3	2.08%	1.02
1995	145.5	145.4	146.6	146.7	146.7	146.7	146.6	146.8	146.9	147	147.8	148.2	146.7	3.09%	1.03
1996	149.2	149	149.8	149.9	150.1	150	150.1	150.6	150.7	150.8	151	151.2	150.2	2.39%	1.02
1997	152.5	152.7	153.5	153.8	155.3	155.2	155.1	155.3	156	156.5	156.5	156.7	154.9	3.13%	1.03
1998	158.7	158.8	158.8	159	159	159	159.4	159.5	159.5	159.7	160.4	159.8	159.3	2.84%	1.03
1999	161	160.4	161.2	161.3	160.4	161.1	161.8	161.4	161.3	163.2	161.6	162	161.4	1.32%	1.01
2000	161.9	162.4	164.2	163.6	164.8	163.3	163.7	164	164.7	163.8	164.9	164.6	163.8	1.49%	1.01
2001	165.4	164.8	165.5	165.5	166.2	165.7	170.5	170.5	170.9	171	171.4	171.4	168.2	2.69%	1.03
2002	171.9	172.3	172.1	172.7	172.4	172.3	172.4	172.1	172.9	172.7	172.7	172.2	172.4	2.50%	1.02
2003	173.4	173.3	174	174.6	174	174	174.5	174.3	174.3	174.9	175	174.4	174.2	1.04%	1.01
2004	176.3	176	176.6	177.7	178.8	178.7	179.6	180.5	180.9	181.5	182.3	182	179.2	2.89%	1.03
2005	185.2	185.5	187.5	188.7	188.7	188.5	188.5	188.3	189.7	189.8	190.1	190.8	188.4	5.13%	1.05
2006	191.9	193.4	194.7	195	196.4	197	197.7	198	198	198.2	200.3	201.2	196.8	4.44%	1.04
2007	202.5	205.1	206.9	208.6	209.6	209.6	209.9	210.4	210.4	212.2	212.4	211.8	209.1	6.25%	1.06
2008	214.4	215	216.9	216.7	219	220.6	221.6	221.8	224	224.7	224.2	224.1	220.3	5.32%	1.05
2009	226.3	225.6	226.3	226.3	226.4	226.9	226.6	226.4	226.4	226.1	226.1	227.4	226.4	2.79%	1.03
2010	227.9	228.1	228.3	227.4	227.7	227.5	227.9	228.2	228.3	228.2	228.6	228.6	228.1	0.73%	1.01
2011	225.4	226.8	227.4	228.1	228.5	228.1	229.1	229.3	229.4	229.7	229.7	229.7	228.4	0.16%	1.00
2012	230.1	232.7	233.4	233.8	233.9	234.3	234.2	234.2	234.2	234.3	229.2	229.2	232.8	1.91%	1.02
2013	229.2	229.4	230.8	231.2	231.1	231.4	231.5	232.3	232.4	232.3	232.8	232.8	231.4	-0.58%	0.99
2014	235.2	235.8	235.8	236	235.9	235.8	235.9	235.9	235.9	236.3	236.7	236.8	236.0	1.97%	1.02
2015	239.3	239.6	239.7	240.4	240.3	240.3	240.5	240.5	240.5	240.5	240.5	241.7	240.3	1.83%	1.02
2016	244.3	244.6	244.3	244.3	243.2	243.2	243.1	243.1	243.1	243.1	243.1	244.1	243.6	1.38%	1.01
2017	244.5	246.7	247.9	247.9	247.9	247.9	247.9	247.9	247.9	249.5	251.6	250.8	248.2	1.88%	1.02
thmetic r ometric r														4.56% N/A	4.56% 4.45%

PPI Commodity Data

Series Id: WPU072106035

Not Seasonally Adjusted

Group:Rubber and plastic productsItem:Plastics industrial and mining pipe (Incl. chemical processing, food processing)Base Date:201112Years:2011 to 2017

Data:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
2011	0	0	0	0	0	0	0	0	0	0	0	100	100		
2012	99	103.5	106	106.8	107.2	109	104.6	102.7	106.4	106.7	107.1	106	105.417	5.42%	1.05
2013	106.2	106.6	108.1	109.1	106.2	106.3	106.2	106.6	106.1	105.7	103.3	103.6	106.167	0.71%	1.01
2014	103.2	107.9	112.6	112.4	106	104.6	105.2	107.9	107.1	108.1	107.7	106.1	107.4	1.16%	1.01
2015	105.6	105.7	105	104.9	105.2	104.6	104.7	104.3	103	102.4	102.4	105.3	104.425	-2.77%	0.97
2016	99.7	100	98.4	98.9	100	101.7	101.3	101.6	100.3	102.2	101.4	100.3	100.483	-3.77%	0.96
2017	100.7	100.8	102.3	103.4	105.2	104.4	104.2	104.4	99.2	102.9	102.4	101.2	102.592	2.10%	1.02
Arithmetic r Geometric r														0.47% N/A	0.47% 0.43%

http://data.bls.gov/cgi-bin/srgate PPI Commodity Data

Series Id: WPU117 Not Seasonally Adjusted Series Title: PT Commodity data for Machinery and equipment-Electrical machinery and equipment Rem: Electrical machinery and equipment Base Date: 192/00 Years: 194/00 2017

Data:

Data:															
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
1940	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	N/A	N/A
1941 1942	19.5 19.8	19.5 19.8	19.5 19.7	19.5 19.6	19.5 19.6	19.5	19.5 19.6	19.6 19.6	19.7 19.6	19.7 19.6	19.8 19.5	19.8 19.5	19.6 19.6	0.47%	1.00
1943	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.4	19.4	19.4	19.4	19.4	19.5	-0.85%	0.99
1944	19.4	19.4	19.4	19.4	19.4	19.1	19.0	19.0	19.0	19.0 19.4	19.0	19.0	19.2	-1.46%	0.99
1945 1946	19.0	19.0	19.0 19.6	20.5	19.2	19.3	19.3 22.5	19.3	19.3 22.8	23.3	19.5 24.4	25.3	22.0	0.30%	1.00
1947	25.5	25.6	25.7	26.0	27.3	27.5	27.4	27.5	27.6	27.5	27.5	27.6	26.9	22.05%	1.22
1948	27.4	27.3	27.3	27.3	27.2	27.3	27.9	28.8	29.1	29.2	29.4	29.5	28.1	4.65%	1.05
1949 1950	29.7	29.8	29.8	29.2	28.8	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.9	3.06%	1.03
1951	34.0	34.0	34.0	34.0	34.0	34.0	34.2	34.1	34.1	34.0	34.1	34.0	34.0	14.49%	1.14
1952 1953	33.9 33.4	34.0 33.4	33.9 33.5	33.8	33.8 34.2	33.5	33.5 34.9	33.5	33.4 35.2	33.3 35.3	33.4	33.4	33.6 34.5	-1.25%	0.99
1953	35.4	35.4	35.4	35.3	34.2	34.7	34.9	35.1	35.2	35.0	35.4	35.4	34.5	2.73%	1.03
1955	35.4	35.4	35.3	35.3	35.3	35.3	35.4	35.7	36.5	36.5	36.7	36.9	35.8	1.56%	1.02
1956 1957	37.0	37.2	37.3	37.9	38.3	38.4	38.4	38.6	39.6	40.0	40.6	40.6	38.7	7.96%	1.08
1957	40.8	41.1	41.2	41.3	41.4	41.4	41.6	41.0	42.2	42.1	42.2	42.2	41.0	2.06%	1.08
1959	42.5	42.5	42.7	42.7	43.0	43.0	43.5	43.4	43.5	43.6	43.6	43.4	43.1	1.49%	1.01
1960 1961	43.5	43.5	43.5	43.3	42.8	42.8	42.9	42.8	42.7	42.6	42.6	42.6	43.0	-0.35%	1.00
1961	41.9	41.9	41.9	41.8	41.8	41.8	41.6	41.6	41.8	42.2	41.6	41.6	42.4	-1.32%	0.98
1963	41.5	41.5	41.1	41.2	41.4	41.5	41.2	41.2	41.2	41.3	41.4	41.5	41.3	-1.02%	0.99
1964 1965	41.0	41.1	41.2	41.5	41.5	40.9	40.9	41.0	40.9	40.9	40.9	40.9	41.1	-0.67%	0.99
1965	41.2	41.5	41.7	41.8	42.0	41.9	42.0	42.0	42.1	42.2	42.7	43.1	42.0	2.31%	1.02
1967	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.1	43.1	43.0	43.1	43.4	43.2	2.76%	1.03
1968 1969	43.5	43.6	43.6	43.6	43.7	43.7	43.7	43.7	43.9	43.9	44.0	43.9	43.7	1.29%	1.01
1970	45.3	45.2	45.4	45.5	45.6	45.9	46.1	46.2	46.4	46.4	46.6	46.7	45.9	3.32%	1.03
1971	46.9	47.1	47.2	47.1	47.1	47.1	47.2	47.3	47.2	47.2	47.1	47.1	47.1	2.59%	1.03
1972 1973	47.3	47.5	47.6	47.6	47.7	47.8	47.8	47.8	47.7	47.7	47.8	47.8	47.7	1.15%	1.01
1974	49.7	50.0	50.5	51.2	52.1	53.3	54.5	55.5	56.3	57.2	58.5	59.0	54.0	11.25%	1.11
1975	59.6 62.3	59.9	60.1 62.6	60.2	60.5 62.8	60.6 63.1	60.8 63.2	60.9 63.3	61.2 64.0	61.5 64.4	61.8 64.6	61.8 64.8	60.7 63.4	12.52% 4.31%	1.13
1976 1977	65.1	62.5	65.6	62.7	66.0	66.1	66.5	66.7	67.2	67.9	68.2	68.2	66.6	5.04%	1.04
1978	69.1	69.4	69.9	70.3	70.6	71.1	71.4	71.6	71.9	72.3	73.2	73.6	71.2	6.99%	1.07
1979 1980	73.9	74.6	75.1 84.9	75.6	76.2	76.7	77.7	78.2	78.8 89.0	79.6 89.4	79.8 89.6	80.6 90.2	77.2	8.47% 12.76%	1.08
1980	91.5	92.3	93.3	93.9	93.9	94.7	95.5	96.2	96.8	97.3	97.6	98.0	95.1	9.18%	1.09
1982	98.8	99.1	99.5	100.0	99.9	100.0	100.0	100.1	100.1	100.5	100.9	101.2	100.0	5.18%	1.05
1983 1984	101.6	102.4	102.6	102.9	103.0	103.1 107.6	104.4	104.4	104.9	104.8	104.9	105.3	103.7	3.68%	1.04
1985	109.3	109.6	109.6	107.0	109.5	107.0	109.6	107.7	107.9	109.9	108.8	110.0	107.4	2.06%	1.02
1986	110.3	110.6	110.8	111.0	111.0	110.9	111.5	111.5	111.7	111.7	111.8	111.9	111.2	1.46%	1.01
1987 1988	112.3 113.7	112.4	112.3	112.2 113.8	112.3 114.4	112.2	112.7 114.4	112.9 114.7	112.7 114.8	113.1 115.1	113.2 115.2	113.4 115.4	112.6 114.5	1.27%	1.01
1989	116.2	116.6	116.7	116.8	117.0	117.5	117.9	118.0	117.9	118.4	118.3	118.4	117.5	2.64%	1.03
1990	118.9	118.6	118.9	119.0	119.0	119.2	119.5	119.4	119.5	119.6	119.8	119.9	119.3	1.53%	1.02
1991 1992	120.5	120.6 121.2	120.7 121.4	120.9 121.2	120.7 121.3	120.8 121.2	120.9 121.2	120.9	120.8 121.2	120.8 121.4	120.9 121.6	120.9	120.8	1.26%	1.01
1993	122.0	122.2	122.2	122.6	122.4	122.4	122.4	122.5	122.6	122.7	122.8	122.7	122.5	0.96%	1.01
1994 1995	123.1 123.9	123.2	123.3	123.6	123.7	123.7	123.8	123.5	123.4	123.2 124.8	123.4	123.4	123.4	0.80%	1.01
1995	123.9	124.2	124.1	124.2	124.2	124.1	124.0	124.0	124.2	124.6	124.9	124.3	124.2	-0.63%	0.99
1997	123.0	122.9	122.7	122.6	122.4	122.4	122.6	122.1	122.0	121.6	121.8	121.8	122.3	-0.92%	0.99
1998 1999	121.8	121.6 120.6	121.5 120.5	121.2 120.3	121.1 119.8	121.1 119.6	120.8 119.5	120.7	120.6	120.6	120.6	120.4	121.0 119.8	-1.08%	0.99
2000	119.0	118.8	118.6	118.7	119.8	118.8	119.0	118.9	119.2	118.7	118.6	118.1	118.7	-0.87%	0.99
2001	118.2	118.0	118.1	117.8	117.7	117.4	117.1	116.9	116.8	116.7	116.7	116.7	117.3	-1.18%	0.99
2002	116.9 115.3	116.9 115.0	117.1	116.6 115.2	116.4 115.2	116.4	116.0	116.1	116.1 114.4	115.8	115.8 114.2	115.4	116.3	-0.89%	0.99
2003	113.5	113.3	113.4	113.7	113.7	113.7	113.2	113.3	113.3	113.3	113.3	113.3	113.4	-1.13%	0.99
2005	113.4	113.4	113.3	113.3	113.1	113.0	113.1	113.2	112.9	113.0	112.6	112.3	113.1	-0.32%	1.00
2006	112.2	112.3 114.5	114.0 114.0	114.7	114.8 113.7	115.0	115.3 113.4	116.0	116.4 113.0	116.1 112.9	116.0 112.8	115.9 112.6	114.9 113.7	1.63%	1.02
2008	112.7	113.2	113.2	113.2	113.5	113.7	113.7	113.7	113.8	114.0	113.6	113.3	113.5	-0.18%	1.00
2009	113.3	113.3	113.5	113.4	113.4	113.3	113.4	113.5	113.5	113.6	113.6	113.4	113.4	-0.03%	1.00
2010	113.4 112.9	113.5 113.2	113.6 113.3	113.4 113.3	113.5 113.3	113.4	113.4 113.3	113.2	113.0 113.1	112.9 113.2	112.6	112.7	113.2 113.2	-0.19%	1.00
2012	113.4	113.5	113.5	113.5	113.7	113.5	113.4	113.3	113.1	113.1	113.0	112.8	113.3	0.10%	1.00
2013	113.4	113.4	113.4	113.6	113.8	113.8	113.9	113.9	113.8	113.9	113.8	113.9	113.7	0.35%	1.00
2014	113.8	113.8 114.1	113.7	113.6 114.0	113.6 114.1	113.6 113.9	113.7 113.9	113.7 113.7	113.8 113.6	113.8 113.5	113.8 113.5	113.8 113.5	113.7 113.8	0.01%	1.00
2016	113.3	113.2	113.3	113.2	113.2	113.1	113.2	113.1	113.0	112.8	112.7	112.7	113.1	-0.67%	0.99
2017	113.7	113.7	113.7	114.0	113.9	114.0	113.6	113.6	113.4	113.4	113.5	113.5	113.7	0.53%	1.01
Arithmetic m Geometric m P : Prelimina	ean:	exes are si	ubject to r	evision for	r months	after origir	al publica	ation						2.40% N/A	2.40% 2.32%

http://www.eia.doe.gov/cneat/electricity/epa/epa17p4.html Retail Prices of Electricity Sold by Electric Utilities Source: US Energy Information Administration

Electricity	Industrial Secto	or Nominal	Price
Year	Price per	%	Convert to
	KWH	Change	Positive
1960	110 110	N/A 0.0%	N/A 1.00
1961	110	0.0%	1.00
1962 1963	100	-9.1%	0.91
1963	100	0.0%	1.00
1965	100	0.0%	1.00
1965	100	0.0%	1.00
1967	100	0.0%	1.00
1968	100	0.0%	1.00
1969	100	0.0%	1.00
1970	100	0.0%	1.00
1971	110	10.0%	1.10
1972	120	9.1%	1.09
1973	130	8.3%	1.08
1974	170	30.8%	1.31
1975	210	23.5%	1.24
1976	220	4.8%	1.05
1977	250	13.6%	1.14
1978	280	12.0%	1.12
1979	310	10.7%	1.11
1980	370	19.4%	1.19
1981	430 500	16.2%	1.16 1.16
1982	500	16.3% 0.0%	1.16
1983 1984	483	-3.4%	0.97
1984	403	2.9%	1.03
1985	493	-0.8%	0.99
1987	477	-3.2%	0.97
1988	470	-1.5%	0.99
1989	472	0.4%	1.00
1990	474	0.4%	1.00
1991	483	1.9%	1.02
1992	483	0.0%	1.00
1993	485	0.4%	1.00
1994	477	-1.6%	0.98
1995	466	-2.3%	0.98
1996	460	-1.3%	0.99
1997	453	-1.5%	0.98
1998	448 443	-1.1% -1.1%	0.99
1999	443	4.7%	1.05
2000 2001	505	4.7%	1.03
2001	488	-3.4%	0.97
2002	511	4.7%	1.05
2003	525	2.7%	1.03
2004	573	9.1%	1.09
2006	616	7.5%	1.08
2007	639	3.7%	1.04
2008	696	8.9%	1.09
2009	683	-1.9%	0.98
2010	677	-0.9%	0.99
2011	682	0.7%	1.01
2012	667	-2.2%	0.98
2013	689	3.3%	1.03
2014	710	3.0%	1.03
2015	691	-2.7%	0.97
2016	676	-2.2%	0.98
2017	691	2.2%	1.02
Arithmetic I	Mean:	3.51%	3.51%
Geometric	Mean:	N/A	3.28%

Employment, Hours, and Earnings from the Current Employment Statistics survey (National) Original Data Value

Series Id: CEU2023700003 Not Seasonally Adjusted

SeriesAverage hourly earnings of all employees, specialty tradeSuperConstructionIndustry:Specialty trade contractorsNAICS238Data Type:AVERAGE HOURLY EARNINGS OF ALL EMPLOYEESYears:2006 to 2017

Data:

Year	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	% Change	Convert to Positive
2006			21.34	21.28	21.27	21.37	21.54	21.56	21.70	21.81	21.85	22.20	21.59	N/A	N/A
2007	22.01	22.16	22.18	22.22	22.39	22.37	22.50	22.59	22.80	22.80	22.94	23.30	22.52	4.31%	1.04
2008	23.13	23.21	23.23	23.29	23.37	23.38	23.57	23.84	23.95	24.05	24.23	24.51	23.65	5.00%	1.05
2009	24.36	24.25	24.40	24.31	24.25	24.15	24.25	24.38	24.42	24.57	24.54	24.70	24.38	3.11%	1.03
2010	24.63	24.68	24.70	24.57	24.52	24.39	24.52	24.65	24.68	24.89	24.91	25.16	24.69	1.27%	1.01
2011	25.07	25.01	24.93	24.90	24.78	24.64	24.76	24.97	24.98	25.04	24.97	25.28	24.94	1.02%	1.01
2012	25.16	25.18	25.19	25.14	25.05	24.94	25.07	25.19	25.40	25.41	25.43	25.67	25.24	1.17%	1.01
2013	25.58	25.56	25.52	25.42	25.34	25.36	25.46	25.50	25.51	25.54	25.58	25.89	25.52	1.13%	1.01
2014	25.80	25.97	25.80	25.85	25.80	25.73	25.78	25.94	26.07	26.06	26.05	26.18	25.92	1.56%	1.02
2015	26.22	26.09	26.31	26.27	26.31	26.26	26.40	26.49	26.42	26.58	26.66	26.87	26.41	1.88%	1.02
2016	26.77	26.72	27.00	26.95	27.03	27.08	27.17	27.24	27.34	27.39	27.38	27.56	27.14	2.76%	1.03
2017	27.48	27.51	27.56	27.49	27.57	27.72	27.85	27.96	28.10	28.02	28.03	28.36	27.80	2.46%	1.02
Arithmetic Geometric														2.33% N/A	2.33% 2.33%

Full Name	Value Date	YTD Total Return	Percent Change	Convert to Positive
U.S. Government/Credit	12/31/1973	2.298562	0.02298562	1.02298562
U.S. Government/Credit	12/31/1974	0.173907	0.00173907	1.00173907
U.S. Government/Credit	12/31/1975	12.291278	0.12291278	1.12291278
U.S. Government/Credit	12/31/1976	15.584238	0.15584238	1.15584238
U.S. Government/Credit	12/30/1977	2.994655	0.02994655	1.02994655
U.S. Government/Credit	12/29/1978	1.167421	0.01167421	1.01167421
U.S. Government/Credit	12/31/1979	2.279569	0.02279569	1.02279569
U.S. Government/Credit	12/31/1980	3.04756	0.0304756	1.0304756
U.S. Government/Credit	12/31/1981	7.286263	0.07286263	1.07286263
U.S. Government/Credit	12/31/1982	31.097855	0.31097855	1.31097855
U.S. Government/Credit	12/30/1983	7.987689	0.07987689	1.07987689
U.S. Government/Credit	12/31/1984	15.00544	0.1500544	1.1500544
U.S. Government/Credit	12/31/1985	21.325217	0.21325217	1.21325217
U.S. Government/Credit	12/31/1986	15.599849	0.15599849	1.15599849
U.S. Government/Credit	12/31/1987	2.303383	0.02303383	1.02303383
U.S. Government/Credit	12/30/1988	7.587892	0.07587892	1.07587892
U.S. Government/Credit	12/29/1989	14.228355	0.14228355	1.14228355
U.S. Government/Credit	12/31/1990	8.292586	0.08292586	1.08292586
U.S. Government/Credit	12/31/1991	16.125458	0.16125458	1.16125458
U.S. Government/Credit	12/31/1992	7.584939	0.07584939	1.07584939
U.S. Government/Credit	12/31/1993	11.03181	0.1103181	1.1103181
U.S. Government/Credit	12/30/1994	-3.509601	-0.03509601	0.96490399
U.S. Government/Credit	12/29/1995	19.242709	0.19242709	1.19242709
U.S. Government/Credit	12/31/1996	2.90357	0.0290357	1.0290357
U.S. Government/Credit	12/31/1997	9.757223	0.09757223	1.09757223
U.S. Government/Credit	12/31/1998	9.472479	0.09472479	1.09472479
U.S. Government/Credit	12/31/1999	-2.147122	-0.02147122	0.97852878
U.S. Government/Credit	12/29/2000	11.851169	0.11851169	1.11851169
U.S. Government/Credit	12/31/2001	8.502578	0.08502578	1.08502578
U.S. Government/Credit	12/31/2002	11.035881	0.11035881	1.11035881
U.S. Government/Credit	12/31/2003	4.668455	0.04668455	1.04668455
U.S. Government/Credit	12/31/2004	4.193423	0.04193423	1.04193423
U.S. Government/Credit	12/30/2005	2.369024	0.02369024	1.02369024
U.S. Government/Credit	12/29/2006	3.778366	0.03778366	1.03778366
U.S. Government/Credit	12/31/2007	7.226425	0.07226425	1.07226425
U.S. Government/Credit	12/31/2008	5.704	0.05704	1.05704
U.S. Government/Credit	12/31/2009	4.521	0.04521	1.04521
U.S. Government/Credit	12/31/2010	6.593	0.06593	1.06593
U.S. Government/Credit	12/30/2011	8.737	0.08737	1.08737
U.S. Government/Credit	12/31/2012	4.816	0.04816	1.04816
U.S. Government/Credit	12/31/2013	-2.352	-0.02352	0.97648
U.S. Government/Credit	12/31/2014	6.01	0.0601	1.0601
U.S. Government/Credit	12/31/2015	0.147220363	0.001472204	1.001472204
U.S. Government/Credit	12/31/2016	3.05	0.0305	1.0305
U.S. Government/Credit	12/31/2017	4.00	0.04	1.04
		Geometric mean:		7.27%

Full Name	Value Date	YTD Total Return	Percent Change	Convert to Positive
U.S. Aggregate	12/31/1976	15.595498	0.15595498	1.15595498
U.S. Aggregate	12/30/1977	3.02538	0.0302538	1.0302538
U.S. Aggregate	12/29/1978	1.398805	0.01398805	1.01398805
U.S. Aggregate	12/31/1979	1.924445	0.01924445	1.01924445
U.S. Aggregate	12/31/1980	2.707597	0.02707597	1.02707597
U.S. Aggregate	12/31/1981	6.261099	0.06261099	1.06261099
U.S. Aggregate	12/31/1982	32.635016	0.32635016	1.32635016
U.S. Aggregate	12/30/1983	8.373009	0.08373009	1.08373009
U.S. Aggregate	12/31/1984	15.153796	0.15153796	1.15153796
U.S. Aggregate	12/31/1985	22.125676	0.22125676	1.22125676
U.S. Aggregate	12/31/1986	15.24882	0.1524882	1.1524882
U.S. Aggregate	12/31/1987	2.756946	0.02756946	1.02756946
U.S. Aggregate	12/30/1988	7.878508	0.07878508	
U.S. Aggregate	12/29/1989	14.529286	0.14529286	
U.S. Aggregate	12/31/1990	8.945261	0.08945261	1.08945261
U.S. Aggregate	12/31/1991	16.000538	0.16000538	1.16000538
U.S. Aggregate	12/31/1992	7.402604	0.07402604	
U.S. Aggregate	12/31/1993	9.749142	0.09749142	
U.S. Aggregate	12/30/1994	-2.916151	-0.02916151	0.97083849
U.S. Aggregate	12/29/1995	18.473766	0.18473766	
U.S. Aggregate	12/31/1996	3.630583	0.03630583	
U.S. Aggregate	12/31/1997	9.653966	0.09653966	
U.S. Aggregate	12/31/1998	8.686512	0.08686512	
U.S. Aggregate	12/31/1999	-0.821319	-0.00821319	0.99178681
U.S. Aggregate	12/29/2000	11.626067	0.11626067	1.11626067
U.S. Aggregate	12/31/2001	8.443473	0.08443473	
U.S. Aggregate	12/31/2002	10.25503	0.1025503	
U.S. Aggregate	12/31/2003	4.104447	0.04104447	1.04104447
U.S. Aggregate	12/31/2004	4.338787	0.04338787	1.04338787
U.S. Aggregate	12/30/2005	2.428532	0.02428532	
U.S. Aggregate	12/29/2006	4.333766	0.04333766	
U.S. Aggregate	12/31/2007	6.966623	0.06966623	1.06966623
U.S. Aggregate	12/31/2008	5.24	0.0524	1.0524
U.S. Aggregate	12/31/2009	4.521	0.04521	1.04521
U.S. Aggregate	12/31/2010	6.542	0.06542	
U.S. Aggregate	12/30/2011	7.842	0.07842	
U.S. Aggregate	12/31/2012	4.215	0.04215	
U.S. Aggregate	12/31/2013	-2.024	-0.02024	
U.S. Aggregate	12/31/2014	5.97	0.0597	
U.S. Aggregate	12/31/2015	0.549954938	0.005499549	
U.S. Aggregate	12/31/2016	2.65	0.0265	
U.S. Aggregate	12/31/2017	3.54	0.0354	
5.0.7.99109010	12,01,2017	0.04	0.0004	1.0004
		Geometric mean:		7.42%
		Geometric mean:		7.42%