Tyrone
Closure/Closeout Plan
Earthwork Cost Estimate
Summary Report

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1.0 INTRODUCTION

1.1 Purpose & Summary

As part of the 2007 Tyrone Closure Closeout Plan (CCP) update, an earthwork reclamation cost estimate for financial assurance has been developed for the Tyrone Mine based on a template created by the New Mexico Mining and Minerals Division (MMD). This estimate is based on the configuration of facilities as described in the end-of-year (EOY) 2007 mine plan. Additionally, facilities where reclamation has been completed or facilities that are currently undergoing reclamation and projected to be completed by the Permit renewal date (April 2008) are not included in this estimate. This includes: the No. 1 stockpile: the 1, 1A, 2, 3 and 3X tailing impoundments and tailings repositories; mill and concentrator area; Burro Mountain tailing impoundment; tailing launder; several surface impoundments; the 7A stockpile outslopes; and regrading of the 1X tailing impoundment. The former footprint of the 1C stockpile and the majority of the 1C stockpile outslope (all but a small section located adjacent to the 1A stockpile) are projected to be fully reclaimed by April 2008. Engineering take-offs and costs for the remaining section are included with the take-offs and costs for the 1A stockpile. Additionally, the estimate also includes the proposed 9A stockpile. Although costs for reclaiming the proposed 9A stockpile are included in this estimate, these costs will not be included in the financial assurance submittal. The purpose of this document is to present the estimate along with a concise explanation of the underlying assumptions and references to the supporting documentation. This work was completed in coordination with Golder Associates Inc. (Golder), who provided overall project management and technical review, and MWH who developed the reclamation designs and many of the quantity take-offs. Telesto developed the unit costs and compiled the cost estimate.

This document is organized into several major sections. Section 1 provides an introduction and a listing of assumptions that are common throughout the financial assurance cost estimate. Sections 2 through 5 describe the assumptions specific to each type of facility. A summary of the estimate is included in Table 1. Table 2 provides a

more detailed breakdown of the estimate by individual facility. Unit cost bases for fuel, labor and equipment costs are summarized in Table 3. Miscellaneous unit cost bases are provided in Table 4 and equipment production factors are provide in Table 5. Appendices A-F to this document provide the spreadsheets used to develop the cost estimates discussed in this document as well as copies of the supporting documentation. The spreadsheets containing the cost estimates are provided electronically in Appendix G.

The original MMD cost estimating spreadsheet templates were modified slightly to provide flexibility for evaluating each type of facility independently. The four original linked spreadsheets were combined for each facility type, thus eliminating the possibility of the sheets referencing the wrong spreadsheet file. The formulas and organization of the individual sheets remained unchanged with a few minor exceptions: 1) truck trip time and dozer production rate data that were previously entered manually from the Caterpillar Handbook charts were replaced with equivalent formulas (Appendix E) derived from the Caterpillar Handbook charts, 2) "Other items" specific to a particular facility were retained with each associated facility (e.g., ditch construction for a particular facility).

1.2 Financial Assurance Cost Estimate Assumptions

Several working assumptions that are used in each of the cost estimates include:

- **Labor Rates**: With the exception of the truck driver rate all labor rates were developed based on the New Mexico Department of Labor (DOL) Type H (Heavy Engineering) labor rates effective July 22, 2006. These rates include the base, fringe benefit and apprenticeship contribution rates. The following were added to the labor rates to obtain the total per hour labor rate: FICA (6.2%), Medicare (1.45%), Federal un-employment (0.8% on first $7,000), State un-employment (2% on first $18,600) and Workman's Compensation Insurance. (Table 3/Appendix E)

- **Truck Driver Labor Rate**: Per MMD request, the truck driver labor rate is based on labor rate information obtained from a local 3rd party contractor (James Hamilton Construction). Based on this information, the base labor rate for a truck driver (Group II Journeymen) is ~90% of the base labor rate of an operator (Group II Journeymen). Using this information, the base truck driver labor rate for truck drivers was assumed to be 90% of the New Mexico DOL

base operator labor rate. Added to the base rate were fringe benefits, apprenticeship contributions, taxes and insurance. (Appendix E)

- **Equipment Rates**: The equipment rates were taken from EquipmentWatch Custom Cost Evaluator. (Penton Media, Inc. August 9th, 2007). (Appendix E)

- **Fuel Costs**: The off-road diesel fuel cost of $2.4102/gal is based on a quote obtained from Porter Oil Co., Inc. located in Bayard, New Mexico. (Appendix E)

- **Revegetation Unit Costs**: The revegetation unit cost is based on a quote obtained from Rocky Mountain Reclamation. (Appendix E)

- **Rip Rap Production**: The rip rap unit cost is based on a bid received by the Tyrone Mine for on-site rip rap production. (Appendix E)

- **Well Abandonment and Installation**: The well abandonment and installation unit costs are based on a proposal received by the Tyrone Mine from Water Development Corporation (WDC) Exploration and Wells. (Appendix E)

- **Indirect Costs**: Total indirect costs of 39.6% were applied to the direct costs. The indirect costs are comprised of: Mobilization and Demobilization (1.1%), Contingencies (2.0%), Engineering Redesign Fee (4.5%), Contractor Profit and Overhead (25.0%), Project Management Fee (5.0%), State Procurement Cost (2.0%). Contractor Profit and Overhead includes: 1) Profit and Office Overhead (10%), and 2) Project Overhead (15%). Project Overhead usually consists of the following except when it is a direct item: Salaried and Admin Personal, Field Office, Shop and Facilities, Temporary Utilities, Fees and Insurance except those applicable to labor and equipment, MSHA and Site Specific Training, Performance and Payment Bonds, Quality Assurance/Quality Control, Safety, Surveying, Construction Equipment General (salaried pickups, buses, ambulance, etc.).

- **Haul Distances**: Haul distances are calculated along a preferred route as shown on the attached figures, and assumed to originate at the approximate centroid of the cover borrow source and terminate at the approximate centroid of the reclamation area. A maximum of three segments are used for each haul route.

- **Borrow Areas**: Borrow areas will be left in a condition such that they can be directly revegetated and will require no cover to be hauled from other sources.

- **Dozer Push Distances**: Dozer push distances represent the distance from the centroid of the cut block to the centroid of the fill block.

- **Miscellaneous Unit Costs**: Miscellaneous unit costs were taken from several sources including R.S. Means Heavy Construction Cost Data Edition 27

(2007). All costs taken from R.S. Means and were adjusted using the location factor for Las Cruces (84.3%). Miscellaneous unit costs are summarized in Table 4.

- **Equipment Production Factors**: Productions factors for each type of equipment are presented in Table 5.

- **Material Swell**: Swell of stockpile, tailing and cover material adds 15% to volume (Table 5).

- **Pullback Operations**: All pull back operations will be completed using a Hitachi 5300-3 hydraulic shovel and Komatsu 530M mechanical rear dump truck.

2.0 TAILING IMPOUNDMENTS

A substantial amount of reclamation work has been completed on the tailing impoundments, and ongoing reclamation work will result in the majority of the facilities being fully reclaimed prior to the renewal of DP-1341 in April 2008. As such, the following cost estimate addresses only to those facilities that will not be fully reclaimed by April 2008. The primary facility that will remain to be closed in April 2008 is the 1X tailing impoundment and the adjacent surface water catchments/impoundments. Reclamation for the 2, 3, 3X, and Burro Mountain tailing impoundments is complete, therefore, costs for these facilities are not included in this estimate. Reclamation for the 1 and 1A tailings impoundments is projected to be complete by the Permit renewal date (April 2008), therefore, costs for these facilities also are not included in this estimate. The main activities that will occur in closing the 1X tailing impoundment and surface water catchments/impoundments include:

- Regrading surface catchment areas;
- Hauling and grading cover material;
- Ripping and revegetation of covered areas; and
- Completing surface water channels to route storm water from the excavation.

Assumptions for this cost estimate include:

- **Engineering**: 3.0H:1V interbench slopes, 23-foot wide benches, 100-foot maximum interbench slope length, 0.5%-5.0% top surface slope, 2.0% cross-bench slope, 2.0% longitudinal bench slope;
- **Regrading**: Dozers perform all regrading with push distances less than ~500 ft. Loaders with dozer assist and trucks are used to haul material where the push distance would be greater than ~500 ft;
- **Cover**: 24" cover – tops and outslopes;
- **Cover Placement**: Loaders with dozer assist and trucks perform loading and hauling all cover. Scrapers perform all cover grading;

- **Ripping:** Scarifying of the final surface is performed at the same time as the revegetation; and,

- **Dust Suppression/Road Maintenance:** Full time water truck and motor grader during reclamation.

Erosion control and revegetation maintenance costs are also included for all tailing impoundments:

- **Erosion Maintenance:** 75 days/year at $5,351.01/day for years 1 and 2. 45 days/year at $5,351.01/day for years 3, 4 and 5. Note: These costs are in addition to the 30 days/year of erosion maintenance costs that are included in the O&M costs for years 3, 4 and 5.

- **Revegetation Maintenance**: 5% failure every year for 12 years.

The final cost for closure of the 1X tailing impoundment and surface water catchments are included in Tables 1 and 2. The erosion control and revegetation maintenance costs are also included in Tables 1 and 2. Calculations and a summary of material quantities and other engineering take-offs including supporting figures and engineering take-offs are provided in Appendix A of the CCP update and Appendix F of this cost estimate, respectively.

3.0 STOCKPILES

The conceptual designs and associated earthwork cost estimate presented in the CCP for the stockpiles are based on an overall outslope gradient of 3H:1V, 15-foot wide terrace benches, and 175-foot inter-bench slope lengths to allow for flexibility in the final design of the terrace benches and associated surface water conveyance channels. With these designs, the inter-bench slope is 2.75H:1V. Tyrone is not proposing this interbench slope, it is only a by-product of this conceptual design effort. It is anticipated that the final reclamation designs will be developed based on 2.5V:1H inter-bench slopes with uninterrupted slope lengths of no greater than 175 feet consistent with the design criteria referenced in Section 6 the CCP update. Precise designs for each logical reclamation unit will be prepared and submitted to the agencies at final design and may alter the 3H:1V overall slope in this conceptual design.

Stockpile surfaces targeted for reclamation under this plan include all top surfaces and outslopes of leach and waste stockpiles that are located outside the surface water containment zone (SWCZ). The SWCZ is defined as the area adjacent to the open pits where surface water cannot feasibly flow out to the perimeter of the Mine/Stockpile Unit due to existing topographic or regrade constraints, according to the drainage plans compiled by MWH in October 2007 (Plate 3 of the CCP). Under this plan, areas located within the SWCZ will be not be reclaimed.

The leach stockpiles located inside the SWCZ include: the 6B (former East Main); and interior slopes of the 1B, 2A, 2B, 2C, 4A, 4B, and 7B stockpiles. The waste rock stockpiles located inside the SWCZ include the 8C, and the interior slopes of the 3B and 5A (overburden) stockpiles.

The leach stockpiles located outside the SWCZ include: the No. 1, 1A, 3A, 4C, 6C, and Copper Mountain stockpiles; and all but the interior slopes of the 1B, 2A, 2B, 2C, 4A, 4B,

and 7B stockpiles. The waste rock stockpiles located outside the SWCZ include the 1C, 2B, 7A, 7C, and proposed 9A stockpiles; and all but the interior slopes of the 3B and 5A (overburden) stockpiles. .

The 1C and 7A waste rock stockpiles, and the No. 1 leach stockpile are currently under various stages of reclamation. The 1C stockpile has been graded and covered, but still requires construction of surface water conveyance structures and seeding. The 7A stockpile outslopes have been graded and covered, but the top surfaces still need to be covered, surface water conveyance structures need to be constructed, and the entire stockpile needs to be seeded. The No. 1 leach stockpile is currently being graded. The former footprint of the 1C stockpile and the majority of the 1C stockpile outslope (all but a small section located adjacent to the 1A stockpile) are projected to be fully reclaimed by April 2008. Engineering take-offs and costs for the remaining section are included with the take-offs and costs for the 1A stockpile. The entire No. 1 stockpile and the 7A stockpile outslope are projected to be fully reclaimed by April 2008. The five additional wells required to be installed at the No. 1 stockpile under operational DP-896 will be installed by July 2008. Costs associated with these well installations have been included in this cost estimate.

The main activities that will occur in closing the stockpiles include:

- Regrading top surfaces and outslopes;
- Hauling and grading cover material;
- Ripping and revegetation of covered areas; and,
- Completing surface water channels to route storm water from the stockpile.

The major assumptions for this cost estimate for areas outside the SWCZ include:

- **Engineering**: 15-foot wide benches, 175-foot maximum interbench slope length, 2.5H:1V interbench slopes, 0.5% minimum top surface slope, 5.0% max cross-bench slope, 2.0% longitudinal bench slope;

- **Cover**: 24" cover thickness – tops and outslopes;
- **Pullback**: Trucks and loaders with dozer assist perform required pullback of stockpile material;
- **Cover Placement:** Trucks and loaders with dozer assist perform all cover loading and distribution. The economic optimum number of trucks per loader is used for each haul route;
- **Ripping:** Ripping (scarifying) of the final surface is performed at the same time as the revegetation and is included in the revegetation quote; and,
- **Dust Suppression/Road Maintenance:** Full time water truck and motor grader during reclamation.

The final costs for closure of the reclamation of the EOY 2007 stockpile configurations are exhibited in Tables 1 and 2. Detailed calculations and a summary of material quantities and other engineering take-offs including supporting figures are provided in Appendix A of the CCP update and Appendix F of this cost estimate, respectively.

4.0 OPEN PITS

The Open Pits at the Tyrone Mine Facility include the Main, West Main, Valencia, Gettysburg, Copper Mountain, South Rim, Savanna and San Salvador Hill pits. Previously mined and now partially or completely backfilled pits include the San Salvador Hill, Virginia Racket, West Racket, East Main, Gettysburg Entry, BA-O, and Upper Main. Of the existing open pits at the mine, the Main, West Main, Valencia, Savanna, and Gettysburg Pits are contiguous. These pits have been granted a conditional waiver (see Figure 4-2 of the CCP) from the requirement of achieving a self-sustaining ecosystem (SSE), and will not be reclaimed during mine closure. The Copper Mountain Pit has also been granted a conditional waiver from the requirement of achieving a SSE, and will not be reclaimed during mine closure. Additionally, as part of the CCP, Tyrone has identified additional areas within the interior portion of the Mine/Stockpile Unit that will be requested for a waiver from achieving a post mining land use or self-sustaining ecosystem (Figure 4-2 of the CCP). These additional areas include: 1) additional mining areas around the Main and Copper Mountain Pits; 2) interior stockpile outslopes that are extensions of the open pits associated with expansion of the interior stockpiles; and 3) approximately 62 acres of future expansion of the eastern portion of the Main Pit associated with mining the residual Gila Conglomerate borrow source for cover.

The main activities that will occur in closing the Main, Valencia, Savanna, Gettysburg, and Copper Mountain open pits under an EOY 2007 configuration include:

- Fencing and berming of the high wall to prevent access.

The major assumption for this cost estimate is:

- **Fencing:** Safety feature costs are taken from R.S. Means Heavy Construction Cost Data Edition 27 (2007). (Appendix E); and,
- **Berming:** Unit cost developed based on the Caterpillar Performance Handbook calculation for dozer production. (Appendix E).

The main activities that will occur in closing the South Rim and San Salvador open pits under an EOY 2007 configuration include:

- **Engineering**: 15-foot wide benches, 175-foot maximum interbench slope length, 0.5% minimum top surface slope, 5.0% max cross-bench slope, 2.0% longitudinal bench slope;

- **Regrade/backfill**: will be done in a manner that ensures positive drainage from areas to be covered and revegetated and eliminate, to the extent practicable, ponding on final cover surfaces; and,

- **Cover**: 24" cover on benches and roads of San Salvador Hill Pit and on regraded surfaces of South Rim Pit.

The estimated cost for closure of the open pits is displayed in Tables 1 and 2. Detailed calculations are provided in Appendix B.

5.0 SURFACE IMPOUNDMENTS

The main activities that will occur in closing surface impoundments include:

- **Cover**: 24” of cover for all impoundments;
- **Ripping:** to 17” depth; and,
- **Removal:** Contaminated soil to a depth 24” over 100% of the area is removed and disposed on-site.

A list of the impoundments to be reclaimed can be found in Appendix F.

6.0 OTHER DISTURBED AREAS

6.1 Building Demolition and Soil Removal

Demolition considers the costs to take down buildings and other miscellaneous structures upon closure. Assumptions for this cost estimate include:

- All equipment and above-grade structures will be demolished and removed from areas. 50% of areas requiring soil remediation area will be covered with 24" of borrow material to account for foundations, 100% will be ripped and revegetated;

- Any structures covered by regarding will be demolished and removed from areas. Regraded stockpile or tailing material covering the demolition site will then be covered, ripped, and revegetated.

- Contaminated soil to a depth 12" over 25% of the area is removed and disposed on-site; and,

- Salvage value for all structures is zero.

Appendix C provides the support for the demolition cost estimate.

7.0 OTHER MISCELLANEOUS COSTS

This category includes miscellaneous closure costs estimates such as abandonment of exploration holes, wildlife monitoring, reclamation of the tailing pipeline corridor and mine perimeter fencing. Appendix D provides the support for the other miscellaneous cost estimates.

The demolition, operations and maintenance and other miscellaneous cost estimates for closure are included in Tables 1 and 2.

7.1 Exploration Holes

It was assumed that there are 200 exploration holes requiring abandonment for the EOY 2007 Mine Plan. Well abandonment unit cost estimates are based on a relatively recent bid received by the Tyrone Mine from WDC Exploration and Wells. (Appendix E)

7.2 Mine Perimeter Fencing

It was assumed that entire mine perimeter will be fenced with a 3-strand barb wire fence. Signs will be posted every 500 feet. The fencing unit cost estimate is based on a value obtained from the R.S. Means Heavy Construction Cost Data Edition 21 (2007). (Appendix E)

8.0 OPERATIONS AND MAINTENANCE

Operations and maintenance costs estimates related to periodic erosion control and road maintenance have been included in a standalone calculation sheet. Assumptions for this cost estimate include:

Years 1-20
Erosion Control: 30 days/year
Road Maintenance: Monthly

Years 21-40
Erosion Control: 24 days/year
Road Maintenance: Bi-monthly

Years 41-100
Erosion Control: 15 days/year
Road Maintenance: Quarterly

Also included are erosion control and revegetation maintenance costs for all tailing impoundments:

- **Erosion Maintenance:** 75 days/year for years 1 and 2. 45 days/year for years 3, 4 and 5.
- **Revegetation Maintenance:** 5% failure every year for 12 yrs.

Appendix D provides the support for the operations and maintenance cost estimate.

Tables

Table 1 Cost Estimate Summary

	Subtotal, Direct Costs	Subtotal, Indirect Costs	GRT (%)	Total MMD Bond Amount
		39.6%	0.0%	
Earthwork				
Tailing Impoundments	$17,866,738	$7,075,228	$0	$24,941,967
Stockpiles	$98,149,124	$38,867,053	$0	$137,016,178
Open Pits	$17,907,065	$7,091,198	$0	$24,998,262
Surface Impoundments	$484,923	$192,030	$0	$676,953
Other Disturbed Areas				
Utility Reclamation	$10,800	$4,277	$0	$15,077
Access Roads	$112,300	$44,471	$0	$156,771
Repository Exclusion Area	$230,313	$91,204	$0	$321,516
Building Demolition and Soil Removal	1,994,868	$789,968	$0	$2,784,836
Other				
Abandon Exploration Holes	$458,000	$181,368	$0	$639,368
Total Earthwork	**$137,214,132**	**$54,336,796**	**$0**	**$191,550,928**
O & M				
Wildlife Monitoring	$500,000	$198,000	$0	$698,000
Road Maintenance	$7,143,317	$2,828,754	$0	$9,972,071
Erosion Control	$10,595,000	$4,195,620	$0	$14,790,620
Tailing Revegetation Maintenance	$1,354,163	$536,249	$0	$1,890,412
Tailing Erosion Maintenance	$1,525,038	$603,915	$0	$2,128,953
Total O&M	**$21,117,518**	**$8,362,537**	**$0**	**$29,480,055**

Table 2 Detailed Cost Estimate Summary

	Subtotal, Direct Costs	Subtotal, Indirect Costs	GRT (%)	Total MMD Bond Amount
		39.6%	0.0%	
Tailing Impoundments				
Tailings	$11,463,196	$4,539,426	$0	$16,002,622
Surface Catchments	$6,403,542	$2,535,803	$0	$8,939,345
Total	**$17,866,738**	**$7,075,228**	**$0**	**$24,941,967**
Stockpiles				
1A[(1)] and 1B Leach Stockpile	$12,627,569	$5,000,517	$0	$17,628,086
1 Stockpile (DP-896 wells)	$198,595	$78,644	$0	$277,239
2A Leach and 2B Waste	$12,452,306	$4,931,113	$0	$17,383,419
3A Stockpile	$32,831,102	$13,001,117	$0	$45,832,219
5A Stockpile	$12,127,996	$4,802,686	$0	$16,930,682
4C Stockpile	$6,105,118	$2,417,627	$0	$8,522,745
2C, 4A, 7B[(2)], 4B Stockpiles	$9,374,634	$3,712,355	$0	$13,086,989
6C Stockpile[(3)]	$2,714,712	$1,075,026	$0	$3,789,738
7A Stockpile	$1,563,664	$619,211	$0	$2,182,874
Prop. 9A Stockpile	$2,874,328	$1,138,234	$0	$4,012,561
3B Stockpile	$5,279,101	$2,090,524	$0	$7,369,625
Total	**$98,149,124**	**$38,867,053**	**$0**	**$137,016,178**
Pits				
San Salvador Pit	$10,171,329	$4,027,846	$0	$14,199,175
South Rim Pit	$5,918,944	$2,343,902	$0	$8,262,845
Main, Gettysburg, Savanna, and Copper Mountain open pits	$1,816,792	$719,450	$0	$2,536,242
Total	**$17,907,065**	**$7,091,198**	**$0**	**$24,998,262**
Surface Impoundments Total	**$484,923**	**$192,030**	**$0**	**$676,953**
Other Disturbed Areas				
Utility Reclamation	$10,800	$4,277	$0	$15,077
Access Roads	$112,300	$44,471	$0	$156,771
Repository Exclusion Area	$230,313	$91,204	$0	$321,516
Total	**$353,413**	**$139,951**	**$0**	**$493,364**
Demolition				
Buildings	$1,979,546	$783,900	$0	$2,763,447
Soil Removal	$1,874	$742	$0	$2,616
Cover	$5,799	$2,296	$0	$8,095
Rip & Revegetation	$7,650	$3,029	$0	$10,679
Total	**$1,994,868**	**$789,968**	**$0**	**$2,784,836**

(1) The former footprint of the 1C stockpile and the majority of the 1C stockpile outslope (all but a small section located adjacent to the 1A stockpile) are projected to be fully reclaimed by April 2008. Engineering take-offs and costs for the remaining section are included with the take-offs and costs for the 1A stockpile.
(2) The 7B Stockpile is the former "Gettysburg Out-pit Leach Stockpile".
(3) The 6C Stockpile is the former "Gettysburg In-pit Leach Stockpile".

Table 2 Detailed Cost Estimate Summary (cont.)

	Subtotal, Direct Costs	Subtotal, Indirect Costs	GRT (%)	Total MMD Bond Amount
Other				
Abandon Exploration Holes	$458,000	$181,368	$0	$639,368
Total	**$137,214,132**	**$54,336,796**	**$0**	**$191,550,928**
Total Capital Cost				**$191,550,928**
O&M				
Wildlife Monitoring	$500,000	$198,000	$0	$698,000
Road Maintenance	$7,143,317	$2,828,754	$0	$9,972,071
Erosion Controls	$10,595,000	$4,195,620	$0	$14,790,620
Tailing Revegetation Maintenance	$1,354,163	$536,249	$0	$1,890,412
Tailing Erosion Maintenance	$1,525,038	$603,915	$0	$2,128,953
Total	**$21,117,518**	**$8,362,537**	**$0**	**$29,480,055**

Table 3 Fuel, Labor and Equipment Unit Costs

Parameter	Value	Comment
Revegetation	$1027.75/acre	Rocky Mountain Reclamation Quote
Fuel	2.4102/gal	Porter Oil Fuel Quote 5/9/07
Dozer Operator	$31.42/hr	Based on NM DOL Rates
Excavator Operator	$31.75/hr	Based on NM DOL Rates
Mechanic Operator	$29.63/hr	Based on NM DOL Rates
Truck Operator	$24.99/hr	Base Rate 90% x Dozer Operator Base Rate
Loader Operator	$31.55/hr	Based on NM DOL Rates
Oilier	$30.46	Based on NM DOL Rates
Caterpillar D11R	$408.17/hr	Standard Crawler Dozer
Caterpillar D11R Ripper	$439.59/hr	With Ripper
Caterpillar D7R LGP	$109.92/hr	Lgp Crawler Dozer
Caterpillar D6R LGP	$81.50/hr	Lgp Crawler Dozer
Caterpillar D6R Ripper	$88.69/hr	With Ripper
Caterpillar D9R	$174.29/hr	Standard Crawler Dozer
Caterpillar D9R Ripper	$198.77/hr	With Ripper
Caterpillar 623F	$169.16/hr	Elevating Scraper
Caterpillar 631G	$216.01/hr	Conventional Scraper
Caterpillar 740	$127.03/hr	Articulated Rear Dump
Caterpillar 777D	$211.99/hr	Mechanical Rear Dump
Caterpillar 345CL	$167.80/hr	Crawler Excavator
Caterpillar 992G	$338.28/hr	4-WD Articulated Loader
Caterpillar 980H	$109.65/hr	4-WD Articulated Loader
Caterpillar 16H	$124.40/hr	Articulated Frame Grader
Off-Highway Water Tanker Truck	$158.53/hr	10,000 Gallon
On-Highway Light Duty Trucks	$13.75/hr	1 ton, 4x4, 195 hp
Hitachi EX 3500-3	$795.86/hr	Hydraulic Shovel
Komatsu 530M	$307.70	Mechanical Rear Dump

Description Notes: [(1)] Sales Tax = 7.125%, Fuel = $2.4102/gal, Annual Use Hours increased as shown to correct for 50 min work hour.

Table 4 Miscellaneous Unit Costs

Activity	Base Unit Cost $/unit	Units	Scaled Cost Las Cruces 84.3%	Means Line Item	Means Page	Reference
Erosion Control Crew	6347.58	day	5351.01	Crew B-13A	449	1 Foreman, 2 laborers, 2 equip. operators, 2 truck drivers, 1 crane (75 ton), 1 FE loader (4 cy), 2 dump trucks (12 ton)
Spillway Riprap (Processed)	15.32	cy	-	-	-	2007 August Production - McCain Springs Quarry
Chain link fence, Pits perimeter	28.50	ft	24.03	323113.2-0800	261	Fence, chain link industrial, schedule 40, 6 ga. wire, 6' high,
Razor wire, Pits perimeter	1.35	ft	1.14	323126.20-0500	265	Helical razor ribbon, stainless steel, 18" dia. X 18" spacing
Pedestrian gates, Pits perimeter	293.00	ea	247.00	323113.20-1400	261	Gate for 6' high fence, 1-5/8" frame, 3' wide, galv. steel
Vehicle gates, Pits perimeter	1675.00	ea	1412.03	323113.20-5070	261	Double swing gates, incl. Posts & hardware, 6' x 20'
Spillway Cut Volume (tailings)	0.90	cy	-	-	-	D7R LGP 200 ft cross-slope dozer push. See Appendix E 11: Tailings Spillway Cost Development
Spillway Length (stockpiles)	154.32	ft	-	-	-	Excavate and waste material on slopes with D11R, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors. See attachment spillway cost
Spillway Filter	6.45	cy	5.44	321123.23	251	Base course drainage layers, Crushed 1 1/2" stone base, Compacted, 4" deep
Spillway Riprap (Processed) - Haul	8.40	cy	7.08	G1030 150 6600	411	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 4-mile RT
Terrace Channel	24.50	ft	-	-	-	Excavation…see note 1 for full description
Top/Outslope ditch	144.62	ft	-	-	-	Excavation…see note 1 for full description
ditch rip rap, haul	7.38	cy	6.22	G1030 150-7600	411	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile RT
ditch rip rap, backfill	1.38	cy	1.16	313223.14-5400	220	Gravel Backfill, 300 hp dozer & compactors, 150' haul, 6 lifts, 4 passes
Bench Grading	1.42	ft		-	-	Finish grade channel benches using D9R. Three passes per bench, 1 MPH operating speed. Grading benches 15 ft wide, 4.22 cy cut-to-fill/ft of bench
Structure Demolition 1	0.3	cy	0.25	024116.13-0100	33	Building Demolition Large Urban projects, incl 20mi. Haul, No foundation or dump fees, C.F. is vol. of building standing Mixture of Types average
Structure Demolition 2	17.45	SF Flr	14.71	133419.50-1100	137	Metal Building Systems, Pre-Engineered Steel Buildings, Clear span rigid frame, 26 ga. Colored roofing and siding 50'-100' wide, 24' eave height
Structure Demolition 3	5.35	cy	4.51	133419.50-1100	137	Building footing and foundation demolition 6" thick plain concrete
Storage Tank Demolition	1350.00	ea	1138.05	130505.75-0530	134	Storage Tanks, steel tank, single wall, above ground, not incl fdn, pumps or piping, 5,000 thru 10,000 gallon
Contaminated Soil Disposal	6.32	cy	5.33	G1030140-7600	409	Load and Haul earth 5-cy loader, 12 20-cy trailers, 4-mile RT
Pipe Removal	6.05	ft	5.10	024113.38-1900	25	Site Demo, pipe removal, sewer/water no exc., plastic pipe, 20"-36" diam
Pipe Disposal	6.29	cy	-	02220.875-5500	-	Site demolition, disposal on site updated from 2002 $5.44 to $6.29 in 2007
Utilities Demolition	1.44	ft	-	-	-	See Appendix E: 16 - Utility Reclamation Unit Cost
Channel Filter	1.90	sy	1.60	334626.1	309	Geotextile for subsurface drainage polypropylene fabric ideal conditions
Channel Reinforcement	59.50	sy	50.16	313613.1 0600	233	Gabion Boxes galvanized steel mesh mats or boxes, stone filled, 12" deep
Channel Reinforcement	80.50	sy	67.86	313613.1 0700	233	Gabion Boxes galvanized steel mesh mats or boxes, stone filled, 18" deep
Road Maintenance Crew	12762.03	month	-	-	-	Equipment Rates - Equipment Watch / Labor Rates NM DOL
Fencing, Mine Perimeter	4.26	ft	-	-	-	Barbed wire fence, complete Based on post at 10', using a 24,500 lb. 2-axle truck with a 8' x 16' flat bed and small tools 3-strand barbed wire fence, galvanized 2007 New Mexico Heavy Construction Costs, Page 262 (http://www.get-a-quote.net/QuoteEngine/costbook.asp?WCI=CostSectionFrameSet&SectionId=4594755)
Plug & Abandon Well	2,290.00	ea	-	-	-	PDTI No. 3a Stockpile Well Program, WDC cost and technical proposal, 9/6/2006 and WDC Cost reduction letter dated 1/26/07. Includes Plug & Abandon Standby, Plug & Abandon per diem
Replacement Well	20,874.09	ea	-	-	-	PDTI No. 3a Stockpile Well Program, WDC cost and technical proposal, 9/6/2006 and WDC Cost reduction letter dated 1/26/07. Includes Plug & Abandon Standby, Plug & Abandon per diem – Assumes 221' well depth
Safety berm, Pits perimeter	1.55	lf	-	-	-	Cut & fill common earth, D9R, 100' Push to excavate and build, 4 CY/LF assumes 6' high, 3:1 side slopes. Finish grade with D9R, 50' push, unit volume (ft) /perimeter length (ft) (1.5 CY/LF based on 40 perimeter) Uses dozer production factors.
Wildlife Monitoring	5000.00	yr	-	-	-	Assumed to be $5,000/yr for 100 yrs. Based on Wildlife Monitoring Plan for Post Closure of the Chino Mine, Golder Associates, Inc., 12/29/2004, Approved 2/15/2006.
Drilling and Blasting	1	cy				2007 August Production - McCain Springs Quarry
Toe Control (Seepage Collection)	344.00	ft	-	-	-	Seepage collection unit cost based on replacement costs estimated at Tyrone.
Revegetation	1027.75	acres	-	-	-	Plow; apply fertilizer, seed mix, and mulch; and crimp mulch Rocky Mountain Reclamation, Laramie WY (June, 2007). Quote includes cost for scarifying (ripping) surface. See attachments for quote.
Signs Around Pits every 500 ft	73.50	ea	61.96	101453.20 0600	130	Traffic Signs, Guide and directional signs 12" x 18" w/ reflectors

Description Notes:

1) Excavate and waste material with D11R, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors. See attachment Channel Linear Foot Cost

Table 5 Equipment Production Factors

Parameter	Value	Comment/Reference
Swell Factor Stockpiles	15% Pushdown 15% Load cover 15% Haul cover	-
Swell Factor Tailings	15% Pushdown 15% Dozer assist 15% Load cover (truck) 15% Haul cover (truck) 15% Haul cover (scraper)	-
Swell Factor Tailing Pipeline Corridor	15% Load cover 15% Haul cover	-
Regrading (D11R)		
Operator Factor	0.75 Stockpile 0.75 Tailings	-
Material Factor	1.2 - Stockpile 1.2 - Tailings 1.2 - Cover	-
Work Hour	50 min Stockpile 50 min Tailings	-
Grade Factor – Tops	1.0 - Stockpile 1.0 - Tailings	-
Grade Factor - Outslopes	1.8 - Stockpile 1.6 - Tailings	1.8 – 2.5H:1V Slopes 1.6 – 3H:1V Slopes
Soil Weight	3300 lb/cy Stockpile 2900 lb/cy Tailing 2900 lb/cy GC	-
Production Method/ Blade Factor	1.2 – Slot	-
Visibility Factor	1.0	Clear
Elevation Factor	1.0	(CPH 37, 27-5)
Direct Drive Transmission	1.0	-
Material Handling		
Material Handling Multiplier	1.5 - Stockpile 1.4 - Tailing	Non-standard factor
Grading (D11R)		
Material	1.2 –Stockpile 1.2 - Tailings 1.2 - Cover	(CPH 37, 1-39 / EquipmentWatch Specs)
Grade	1.8 - Stockpile 1.6 - Tailings	(CPH 37, 1-39 / EquipmentWatch Specs)
Soil Weight (lb/cy)	3300 lb/cy Stockpile 2900 lb/cy Tailings 2900 lb/cy GC	-
Production Method/Blade	1.2	-
Effective Blade Width (feet)	20.83 D11R Universal Blade	-
Speed (miles/hr)	2.5 D11R	F/R (1st) 2.5/3.1 mph F/R (2nd) 4.4/5.5 mph F/R (3rd) 7.7/9.7 mph
Operator	0.75	-
Work Hour (min/hr)	50	-
Visibility	1	-
Elevation	1	-
Direct Drive Trans.	1	-
Ripper		
Not used	-	Included in revegetation cost

Appendix A
Cost Calculation Summary –Stockpiles and Tailing Ponds

Tyrone Mine

			Current Value
	Facility and Structure Removal[1]		$0
	Earthmoving		$81,648,136
Task Description	Revegetation	100%	$2,959,358
	Other		$48,336,977
	Subtotal, Direct Costs		**$132,944,471**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$1,462,389.19
	Contingencies (3%-5%)	2.0%	$2,658,889
	Engineering Redesign Fee (2.5%-6%)	4.5%	$5,982,501
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$33,236,118
	Project Management Fee (2%-7%)	5.0%	$6,647,224
	State Procurement Cost	2.0%	$2,658,889
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$52,646,011**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0000%	**$0**
TOTAL COST			**$185,590,482**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
   - Salaried and Admin Personal
   - Field Office, Shop and Facilities
   - Temporary Utilities
   - Fees and Insurance except those applicable to labor and equipment
   - MSHA and Site Specific Training.
   - Performance and Payment Bonds
   - QA/QC
   - Safety
   - Surveying
   - Construction Equipment General (salaried pickups, buses, ambulance, etc.)

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #17
Reclamation Summary — **8/10/2007**

			1A and 1B Leach	Stockpile 1	2A Leach and 2B Waste	3A sp	5A sp	San Salvador Pit	South Rim Pit	4C sp
DIRECT COSTS										
	Facility and Structure Removal[1]		$0	$0	$0	$0	$0	$0	$0	$0
	Earthmoving		$8,944,565	$0	$6,655,714	$26,877,592	$7,639,202	$7,848,586	$4,777,216	$2,876,594
	Revegetation	100.0%	$327,850	$0	$335,049	$339,158	$315,523	$131,548	$76,062	$178,816
	Other		$3,355,154	$198,595	$5,461,543	$5,614,353	$4,173,270	$2,191,195	$1,065,665	$3,049,708
	Subtotal, Direct Costs		**$12,627,569**	**$198,595**	**$12,452,306**	**$32,831,102**	**$12,127,996**	**$10,171,329**	**$5,918,944**	**$6,105,118**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$138,903	$2,185	$136,975	$361,142	$133,408	$111,885	$65,108	$67,156
	Contingencies (3%-5%)	2.0%	$252,551	$3,972	$249,046	$656,622	$242,560	$203,427	$118,379	$122,102
	Engineering Redesign Fee (2.5%-6%)	4.5%	$568,241	$8,937	$560,354	$1,477,400	$545,760	$457,710	$266,352	$274,730
	Contractor Profit and Overhead (15%-30%	25.0%	$3,156,892	$49,649	$3,113,076	$8,207,776	$3,031,999	$2,542,832	$1,479,736	$1,526,280
	Project Management Fee (2%-7%)	5.0%	$631,378	$9,930	$622,615	$1,641,555	$606,400	$508,566	$295,947	$305,256
	State Procurement Cost	2.0%	$252,551	$3,972	$249,046	$656,622	$242,560	$203,427	$118,379	$122,102
	Indirect Percentage Sum =	39.6%								
	Subtotal, Indirect Costs		**$5,000,517**	**$78,644**	**$4,931,113**	**$13,001,117**	**$4,802,686**	**$4,027,846**	**$2,343,902**	**$2,417,627**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0%	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
TOTAL COST PER STOCKPILE			**$17,628,086**	**$277,239**	**$17,383,419**	**$45,832,219**	**$16,930,682**	**$14,199,175**	**$8,262,845**	**$8,522,745**
TOTAL COST			**$185,590,482**							

Total Cost Calculation
New Mexico Mining and Minerals Division
Reclamation Summary

		2C, 4A, 7B, 4B	6C sp	Tailings	Prop. 9A sp	7A sp	Reservoirs	Utility Reclamation	Repository Exclusion Area	Access Roads	Tailing Ponds	3B sp	Totals
DIRECT COSTS													
	Facility and Structure Removal[1]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
	Earthmoving	$4,759,294	$1,674,408	$5,412,415	$679,569	$311,666	$155,764	$0	$197,939	$100,381	$199,867	$2,537,363	**$81,648,136**
	Revegetation	$252,839	$66,793	$493,320	$138,746	$49,338	$17,831	$0	$32,374	$11,919	$72,970	$119,221	**$2,959,358**
	Other	$4,362,501	$973,511	$5,557,461	$2,056,013	$1,202,660	$311,327	$10,800	$0	$0	$6,130,705	$2,622,517	**$48,336,977**
	Subtotal, Direct Costs	**$9,374,634**	**$2,714,712**	**$11,463,196**	**$2,874,328**	**$1,563,664**	**$484,923**	**$10,800**	**$230,313**	**$112,300**	**$6,403,542**	**$5,279,101**	**$132,944,471**
													$0
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	$103,121	$29,862	$126,095	$31,618	$17,200	$5,334	$119	$2,533	$1,235	$70,439	$58,070	**$1,462,389**
	Contingencies (3%-5%)	$187,493	$54,294	$229,264	$57,487	$31,273	$9,698	$216	$4,606	$2,246	$128,071	$105,582	**$2,658,889**
	Engineering Redesign Fee (2.5%-6%)	$421,859	$122,162	$515,844	$129,345	$70,365	$21,822	$486	$10,364	$5,054	$288,159	$237,560	**$5,982,501**
	Contractor Profit and Overhead (15%-30%	$2,343,659	$678,678	$2,865,799	$718,582	$390,916	$121,231	$2,700	$57,578	$28,075	$1,600,886	$1,319,775	**$33,236,118**
	Project Management Fee (2%-7%)	$468,732	$135,736	$573,160	$143,716	$78,183	$24,246	$540	$11,516	$5,615	$320,177	$263,955	**$6,647,224**
	State Procurement Cost	$187,493	$54,294	$229,264	$57,487	$31,273	$9,698	$216	$4,606	$2,246	$128,071	$105,582	**$2,658,889**
	Indirect Percentage Sum =												**$0**
	Subtotal, Indirect Costs	**$3,712,355**	**$1,075,026**	**$4,539,426**	**$1,138,234**	**$619,211**	**$192,030**	**$4,277**	**$91,204**	**$44,471**	**$2,535,803**	**$2,090,524**	**$52,646,011**
													$0
GROSS RECEIPTS TAX	Grant County (unincorporated areas)	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	(applied to sum of indirect and direct costs)												**$0**
													$0
TOTAL COST PER STOCKPILE		**$13,086,989**	**$3,789,738**	**$16,002,622**	**$4,012,561**	**$2,182,874**	**$676,953**	**$15,077**	**$321,516**	**$156,771**	**$8,939,345**	**$7,369,625**	**$185,590,482**
TOTAL COST													
								Q/A Check>					$185,590,482

Appendix B
Cost Calculation Summary – Open Pits

TOTAL COST CALCULATION — Tyrone Mine
New Mexico Mining and Minerals Division
Reclamation Cost Summary — 10/10/2007

Tyrone Mine			Current Value
DIRECT COSTS	Facility and Structure Removal[1]		$0
	Earthmoving		$0
	Revegetation	100%	$0
	Other		$1,816,792
	Subtotal, Direct Costs		**$1,816,792**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$19,985
	Contingencies (3%-5%)	2.0%	$36,336
	Engineering Redesign Fee (2.5%-6%)	4.5%	$81,756
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$454,198
	Project Management Fee (2%-7%)	5.0%	$90,840
	State Procurement Cost	2.0%	$36,336
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$719,450**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0000%	**$0**
TOTAL COST			**$2,536,242**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
Salaried and Admin Personal
Field Office, Shop and Facilities
Temporary Utilities
Fees and Insurance except those applicable to labor and equipment
MSHA and Site Specific Training.
Performance and Payment Bonds
QA/QC
Safety
Surveying
Construction Equipment General (salaried pickups, buses, ambulance, etc.)

Appendix C
Cost Calculation Summary –
Building Demolition and Soil Removal

Tyrone Mine

			Current Value
DIRECT COSTS	Facility and Structure Removal[1]		$1,979,546
	Soil Removal		$1,874
	Ripping & Revegetation		$7,650
	Cover		$5,799
	Subtotal, Direct Costs		**$1,994,868**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$21,944
	Contingencies (3%-5%)	2.0%	$39,897
	Engineering Redesign Fee (2.5%-6%)	4.5%	$89,769
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$498,717
	Project Management Fee (2%-7%)	5.0%	$99,743
	State Procurement Cost	2.0%	$39,897
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$789,968**
GROSS RECEIPTS TAX	Grant County (unincorporated areas)	0.0000%	**$0**
	(applied to sum of indirect and direct costs)		
TOTAL COST			**$2,784,836**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
Salaried and Admin Personal
Field Office, Shop and Facilities
Temporary Utilities
Fees and Insurance except those applicable to labor and equipment
MSHA and Site Specific Training.
Performance and Payment Bonds
QA/QC
Safety
Surveying
Construction Equipment General (salaried pickups, buses, ambulance, etc.)

Appendix D
Cost Calculation Summary – O&M & Other

Tyrone Mine

			Current Value
DIRECT COSTS	Facility and Structure Removal[1]		$0
	Earthmoving		$0
	Revegetation	100%	$0
	Other		$21,117,518
	Subtotal, Direct Costs		**$21,117,518**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$232,293
	Contingencies (3%-5%)	2.0%	$422,350
	Engineering Redesign Fee (2.5%-6%)	4.5%	$950,288
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$5,279,379
	Project Management Fee (2%-7%)	5.0%	$1,055,876
	State Procurement Cost	2.0%	$422,350
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$8,362,537**
GROSS RECEIPTS TAX	Grant County (unincorporated areas)	0.0000%	**$0**
	(applied to sum of indirect and direct costs)		
TOTAL COST			**$29,480,055**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
Salaried and Admin Personal
Field Office, Shop and Facilities
Temporary Utilities
Fees and Insurance except those applicable to labor and equipment
MSHA and Site Specific Training.
Performance and Payment Bonds
QA/QC
Safety
Surveying
Construction Equipment General (salaried pickups, buses, ambulance, etc.)

TOTAL COST CALCULATION
New Mexico Mining and Minerals Division
Operations & Maintenance

Tyrone
Worksheet #15a
8/10/07

Escalation Rate: 3.64%
Discount Rate: 5% years 1-12
8% years 13-100
Indirect Cost Percentage 39.6%

EROSION CONTROL [1]

	Years 1-20	Years 21-40	Years 41-100	
Base:	$7,470.01	$7,470.01	$7,470.01	$/day
Time:	30	24	15	day/yr
Annual:	$224,100.30	$179,280.24	$112,050.15	$/yr

Year	Annual Current Cost ($)	Annual Escalated Cost ($)	Annual Present Worth ($)
2008	---	---	---
2009	---	---	---
2010	224,100.30	240,712	218,333
2011	224,100.30	249,474	215,505
2012	224,100.30	258,554	212,713
2013	224,100.30	267,966	209,958
2014	224,100.30	277,720	207,239
2015	224,100.30	287,829	204,555
2016	224,100.30	298,306	201,905
2017	224,100.30	309,164	199,290
2018	224,100.30	320,418	196,709
2019	224,100.30	332,081	194,161
2020	224,100.30	344,169	136,674
2021	224,100.30	356,696	131,157
2022	224,100.30	369,680	125,862
2023	224,100.30	383,136	120,781
2024	224,100.30	397,083	115,905
2025	224,100.30	411,536	111,226
2026	224,100.30	426,516	106,735
2027	224,100.30	442,042	102,426
2028	224,100.30	458,132	98,291
2029	224,100.30	474,808	94,323
2030	179,280.24	393,673	72,412
2031	179,280.24	408,002	69,489
2032	179,280.24	422,854	66,684
2033	179,280.24	438,246	63,992
2034	179,280.24	454,198	61,408
2035	179,280.24	470,730	58,929
2036	179,280.24	487,865	56,550
2037	179,280.24	505,623	54,267
2038	179,280.24	524,028	52,077
2039	179,280.24	543,103	49,974
2040	179,280.24	562,872	47,957
2041	179,280.24	583,360	46,021
2042	179,280.24	604,594	44,163
2043	179,280.24	626,602	42,380
2044	179,280.24	649,410	40,669
2045	179,280.24	673,049	39,027
2046	179,280.24	697,547	37,452
2047	179,280.24	722,938	35,940
2048	179,280.24	749,253	34,489
2049	179,280.24	776,526	33,096
2050	112,050.15	502,995	19,850
2051	112,050.15	521,304	19,049
2052	112,050.15	540,279	18,280
2053	112,050.15	559,945	17,542
2054	112,050.15	580,327	16,834
2055	112,050.15	601,451	16,154
2056	112,050.15	623,344	15,502
2057	112,050.15	646,034	14,876
2058	112,050.15	669,549	14,276
2059	112,050.15	693,921	13,699
2060	112,050.15	719,180	13,146
2061	112,050.15	745,358	12,616
2062	112,050.15	772,489	12,106
2063	112,050.15	800,608	11,618
2064	112,050.15	829,750	11,149
2065	112,050.15	859,953	10,698
2066	112,050.15	891,255	10,267
2067	112,050.15	923,696	9,852
2068	112,050.15	957,319	9,454
2069	112,050.15	992,165	9,073
2070	112,050.15	1,028,280	8,706
2071	112,050.15	1,065,710	8,355
2072	112,050.15	1,104,502	8,018
2073	112,050.15	1,144,705	7,694
2074	112,050.15	1,186,373	7,383
2075	112,050.15	1,229,557	7,085
2076	112,050.15	1,274,312	6,799
2077	112,050.15	1,320,697	6,525
2078	112,050.15	1,368,771	6,261
2079	112,050.15	1,418,594	6,009
2080	112,050.15	1,470,231	5,766
2081	112,050.15	1,523,747	5,533
2082	112,050.15	1,579,212	5,310
2083	112,050.15	1,636,695	5,095
2084	112,050.15	1,696,271	4,890
2085	112,050.15	1,758,015	4,692
2086	112,050.15	1,822,007	4,503
2087	112,050.15	1,888,328	4,321
2088	112,050.15	1,957,063	4,147
2089	112,050.15	2,028,300	3,979
2090	112,050.15	2,102,130	3,819
2091	112,050.15	2,178,648	3,665
2092	112,050.15	2,257,950	3,517
2093	112,050.15	2,340,140	3,375
2094	112,050.15	2,425,321	3,238
2095	112,050.15	2,513,603	3,108
2096	112,050.15	2,605,098	2,982
2097	112,050.15	2,699,923	2,862
2098	112,050.15	2,798,200	2,746
2099	112,050.15	2,900,055	2,635
2100	112,050.15	3,005,617	2,529

ROAD MAINTENANCE [2]

	Years 1-20	Years 21-40	Years 41-100	
Base:	$18,466.80	$18,466.80	$18,466.80	$/month
Time:	12	6	3	months/yr
Annual:	$221,601.57	$110,800.78	$55,400.39	$/yr

Year	Annual Current Cost ($)	Annual Escalated Cost ($)	Annual Present Worth ($)
2008	---	---	---
2009	---	---	---
2010	221,601.57	238,028	215,898
2011	221,601.57	246,692	213,102
2012	221,601.57	255,672	210,342
2013	221,601.57	264,978	207,617
2014	221,601.57	274,623	204,928
2015	221,601.57	284,620	202,274
2016	221,601.57	294,980	199,654
2017	221,601.57	305,717	197,068
2018	221,601.57	316,845	194,515
2019	221,601.57	328,378	191,996
2020	221,601.57	340,331	135,150
2021	221,601.57	352,719	129,694
2022	221,601.57	365,558	124,458
2023	221,601.57	378,864	119,434
2024	221,601.57	392,655	114,612
2025	221,601.57	406,948	109,985
2026	221,601.57	421,761	105,545
2027	221,601.57	437,113	101,284
2028	221,601.57	453,024	97,195
2029	221,601.57	469,514	93,272
2030	110,800.78	243,302	44,753
2031	110,800.78	252,158	42,946
2032	110,800.78	261,337	41,213
2033	110,800.78	270,849	39,549
2034	110,800.78	280,708	37,952
2035	110,800.78	290,926	36,420
2036	110,800.78	301,516	34,950
2037	110,800.78	312,491	33,539
2038	110,800.78	323,866	32,185
2039	110,800.78	335,654	30,886
2040	110,800.78	347,872	29,639
2041	110,800.78	360,535	28,442
2042	110,800.78	373,658	27,294
2043	110,800.78	387,259	26,192
2044	110,800.78	401,356	25,135
2045	110,800.78	415,965	24,120
2046	110,800.78	431,106	23,146
2047	110,800.78	446,798	22,212
2048	110,800.78	463,062	21,315
2049	110,800.78	479,917	20,455
2050	55,400.39	248,693	9,814
2051	55,400.39	257,746	9,418
2052	55,400.39	267,128	9,038
2053	55,400.39	276,851	8,673
2054	55,400.39	286,928	8,323
2055	55,400.39	297,373	7,987
2056	55,400.39	308,197	7,665
2057	55,400.39	319,415	7,355
2058	55,400.39	331,042	7,058
2059	55,400.39	343,092	6,773
2060	55,400.39	355,580	6,500
2061	55,400.39	368,524	6,237
2062	55,400.39	381,938	5,986
2063	55,400.39	395,840	5,744
2064	55,400.39	410,249	5,512
2065	55,400.39	425,182	5,290
2066	55,400.39	440,659	5,076
2067	55,400.39	456,699	4,871
2068	55,400.39	473,322	4,674
2069	55,400.39	490,551	4,486
2070	55,400.39	508,407	4,305
2071	55,400.39	526,913	4,131
2072	55,400.39	546,093	3,964
2073	55,400.39	565,971	3,804
2074	55,400.39	586,572	3,651
2075	55,400.39	607,923	3,503
2076	55,400.39	630,052	3,362
2077	55,400.39	652,986	3,226
2078	55,400.39	676,754	3,096
2079	55,400.39	701,388	2,971
2080	55,400.39	726,919	2,851
2081	55,400.39	753,379	2,736
2082	55,400.39	780,802	2,625
2083	55,400.39	809,223	2,519
2084	55,400.39	838,679	2,418
2085	55,400.39	869,207	2,320
2086	55,400.39	900,846	2,226
2087	55,400.39	933,636	2,136
2088	55,400.39	967,621	2,050
2089	55,400.39	1,002,842	1,967
2090	55,400.39	1,039,346	1,888
2091	55,400.39	1,077,178	1,812
2092	55,400.39	1,116,387	1,739
2093	55,400.39	1,157,024	1,668
2094	55,400.39	1,199,139	1,601
2095	55,400.39	1,242,788	1,536
2096	55,400.39	1,288,025	1,474
2097	55,400.39	1,334,909	1,415
2098	55,400.39	1,383,500	1,358
2099	55,400.39	1,433,860	1,303
2100	55,400.39	1,486,052	1,250

WILDLIFE MONITORING

	Years 1-20	Years 21-40	Years 41-100	
Total	$139,600	$139,600	$418,800	$/month
Years	20	20	60	months/yr
Annual:	$6,980	$6,980	$6,980	$/yr

Year	Annual Current Cost ($)	Annual Escalated Cost ($)	Annual Present Worth ($)	Total Annual Present Worth ($)
2008	---	---	---	---
2009	---	---	---	---
2010	6,980.00	7,770	6,712	440,943
2011	6,980.00	8,053	6,625	435,232
2012	6,980.00	8,346	6,540	429,595
2013	6,980.00	8,650	6,455	424,030
2014	6,980.00	8,965	6,371	418,538
2015	6,980.00	9,291	6,289	413,117
2016	6,980.00	9,629	6,207	407,766
2017	6,980.00	9,980	6,127	402,485
2018	6,980.00	10,343	6,047	397,271
2019	6,980.00	10,720	5,969	392,126
2020	6,980.00	11,110	4,085	275,909
2021	6,980.00	11,514	3,920	264,771
2022	6,980.00	11,933	3,762	254,082
2023	6,980.00	12,368	3,610	243,825
2024	6,980.00	12,818	3,464	233,981
2025	6,980.00	13,285	3,324	224,535
2026	6,980.00	13,768	3,190	215,471
2027	6,980.00	14,269	3,061	206,772
2028	6,980.00	14,789	2,938	198,425
2029	6,980.00	15,327	2,819	190,414
2030	6,980.00	15,885	2,705	119,871
2031	6,980.00	16,463	2,596	115,032
2032	6,980.00	17,062	2,491	110,388
2033	6,980.00	17,683	2,391	105,931
2034	6,980.00	18,327	2,294	101,655
2035	6,980.00	18,994	2,202	97,551
2036	6,980.00	19,686	2,113	93,613
2037	6,980.00	20,402	2,028	89,834
2038	6,980.00	21,145	1,946	86,207
2039	6,980.00	21,915	1,867	82,727
2040	6,980.00	22,712	1,792	79,387
2041	6,980.00	23,539	1,719	76,182
2042	6,980.00	24,396	1,650	73,107
2043	6,980.00	25,284	1,583	70,155
2044	6,980.00	26,204	1,519	67,323
2045	6,980.00	27,158	1,458	64,605
2046	6,980.00	28,146	1,399	61,997
2047	6,980.00	29,171	1,343	59,494
2048	6,980.00	30,233	1,289	57,093
2049	6,980.00	31,333	1,237	54,788
2050	6,980.00	32,474	1,187	30,851
2051	6,980.00	33,656	1,139	29,606
2052	6,980.00	34,881	1,093	28,411
2053	6,980.00	36,151	1,049	27,264
2054	6,980.00	37,467	1,006	26,163
2055	6,980.00	38,830	966	25,107
2056	6,980.00	40,244	927	24,093
2057	6,980.00	41,709	889	23,121
2058	6,980.00	43,227	853	22,187
2059	6,980.00	44,800	819	21,292
2060	6,980.00	46,431	786	20,432
2061	6,980.00	48,121	754	19,607
2062	6,980.00	49,873	724	18,816
2063	6,980.00	51,688	694	18,056
2064	6,980.00	53,569	666	17,327
2065	6,980.00	55,519	640	16,628
2066	6,980.00	57,540	614	15,956
2067	6,980.00	59,635	589	15,312
2068	6,980.00	61,805	565	14,694
2069	6,980.00	64,055	542	14,101
2070	6,980.00	66,387	520	13,532
2071	6,980.00	68,803	499	12,985
2072	6,980.00	71,308	479	12,461
2073	6,980.00	73,903	460	11,958
2074	6,980.00	76,593	441	11,475
2075	6,980.00	79,381	424	11,012
2076	6,980.00	82,271	406	10,567
2077	6,980.00	85,266	390	10,141
2078	6,980.00	88,369	374	9,731
2079	6,980.00	91,586	359	9,339
2080	6,980.00	94,920	345	8,962
2081	6,980.00	98,375	331	8,600
2082	6,980.00	101,956	317	8,253
2083	6,980.00	105,667	305	7,919
2084	6,980.00	109,513	292	7,600
2085	6,980.00	113,499	281	7,293
2086	6,980.00	117,631	269	6,999
2087	6,980.00	121,912	258	6,716
2088	6,980.00	126,350	248	6,445
2089	6,980.00	130,949	238	6,185
2090	6,980.00	135,716	228	5,935
2091	6,980.00	140,656	219	5,695
2092	6,980.00	145,776	210	5,465
2093	6,980.00	151,082	202	5,245
2094	6,980.00	156,581	194	5,033
2095	6,980.00	162,281	186	4,830
2096	6,980.00	168,188	178	4,635
2097	6,980.00	174,310	171	4,448
2098	6,980.00	180,655	164	4,268
2099	6,980.00	187,231	158	4,096
2100	6,980.00	194,046	151	3,931

TOTAL COST CALCULATION
New Mexico Mining and Minerals Division
Operations & Maintenance

Tyrone
Worksheet #15a
8/10/07

Escalation Rate:	3.64%	
Discount Rate:	5%	years 1-12
	8%	years 13-100
Indirect Cost Percentage	39.6%	

EROSION CONTROL [1]

	Years 1-20	Years 21-40	Years 41-100	
Base:	$7,470.01	$7,470.01	$7,470.01	$/day
Time:	30	24	15	day/yr
Annual:	$224,100.30	$179,280.24	$112,050.15	$/yr

Year	Annual Current Cost ($)	Annual Escalated Cost ($)	Annual Present Worth ($)
2101	112,050.15	3,115,021	2,427
2102	112,050.15	3,228,408	2,329
2103	112,050.15	3,345,922	2,235
2104	112,050.15	3,467,714	2,145
2105	112,050.15	3,593,939	2,058
2106	112,050.15	3,724,758	1,975
2107	112,050.15	3,860,339	1,895
2108	112,050.15	4,000,856	1,819
2109	112,050.15	4,146,487	1,745
2110	---	---	---
2111	---	---	---
2112	---	---	---
2113	---	---	---
	14,790,620	122,442,913	4,660,937
	25,460,690		

ROAD MAINTENANCE [2]

	Years 1-20	Years 21-40	Years 41-100	
Base:	$18,466.80	$18,466.80	$18,466.80	$/month
Time:	12	6	3	months/yr
Annual:	$221,601.57	$110,800.78	$55,400.39	$/yr

Year	Annual Current Cost ($)	Annual Escalated Cost ($)	Annual Present Worth ($)
2101	55,400.39	1,540,144	1,200
2102	55,400.39	1,596,206	1,151
2103	55,400.39	1,654,308	1,105
2104	55,400.39	1,714,524	1,060
2105	55,400.39	1,776,933	1,018
2106	55,400.39	1,841,613	976
2107	55,400.39	1,908,648	937
2108	55,400.39	1,978,123	899
2109	55,400.39	2,050,127	863
2110	---	---	---
2111	---	---	---
2112	---	---	---
2113	---	---	---
	9,972,071	65,349,411	4,012,964

WILDLIFE MONITORING

	Years 1-20	Years 21-40	Years 41-100	
Total	$139,600	$139,600	$418,800	$/month
Years	20	20	60	months/yr
Annual:	$6,980	$6,980	$6,980	$/yr

Year	Annual Current Cost ($)	Annual Escalated Cost ($)	Annual Present Worth ($)	Total Annual Present Worth ($)
2101	6,980.00	201,109	145	3,772
2102	6,980.00	208,429	139	3,620
2103	6,980.00	216,016	134	3,473
2104	6,980.00	223,879	128	3,333
2105	6,980.00	232,028	123	3,199
2106	6,980.00	240,474	118	3,070
2107	6,980.00	249,227	113	2,946
2108	6,980.00	258,299	109	2,827
2109	6,980.00	267,701	104	2,713
2110	---	---	---	
2111	---	---	---	
2112	---	---	---	
2113	---	---	---	
	698,000	7,408,666	162,053	8,835,954

References: Grant, Ireson, and Leavenworth; Principles of Engineering Economy (1976)

[1] Crew B-13A (1 Foreman, 2 laborers, 2 equip. operators, 2 truck drivers, 1 crane (75 ton), 1 FE loader (4 cy), 2 dump trucks (12 ton))
RS Means Heavy Construction Cost Data (21st Annual Edition 2007)
6347.58 $/day
84.30% Location Adjustment
5351.01 $/day (Adjusted)

[2] Road Maintenance Crew	Owning/ Operating Cost ($/hr)	Labor Rate ($/hr)	Subtotal ($/hr)	Subtotal ($/month)
Cat 16H Motor Grader	124.40	31.42	155.82	3376.55
10,000-gal Water Truck	158.53	24.99	183.52	3976.84
10,000-gal Water Truck	158.53	24.99	183.52	3976.84
Mech. with Truck	13.75	29.63	43.38	940.11
Oiler with Truck	13.75	30.46	44.21	958.03
TOTAL			610.45	13228.36

References: Equipment - Equipment Watch Version 2.2.5B (http://www.equipmentwatch.com). See attachments for rate development.
Labor - NM Department of Labor Type H (Heavy Engineering) labor rates. See attachments for rate development.

Tyrone Mine

			Current Value
DIRECT COSTS	Facility and Structure Removal[1]		$0
	Earthmoving		$0
	Revegetation	100%	$0
	Other		$458,000
	Subtotal, Direct Costs		**$458,000**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$5,038
	Contingencies (3%-5%)	2.0%	$9,160
	Engineering Redesign Fee (2.5%-6%)	4.5%	$20,610
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$114,500
	Project Management Fee (2%-7%)	5.0%	$22,900
	State Procurement Cost	2.0%	$9,160
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$181,368**
GROSS RECEIPTS TAX	Grant County (unincorporated areas)	0.0000%	**$0**
	(applied to sum of indirect and direct costs)		
TOTAL COST			**$639,368**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
Salaried and Admin Personal
Field Office, Shop and Facilities
Temporary Utilities
Fees and Insurance except those applicable to labor and equipment
MSHA and Site Specific Training.
Performance and Payment Bonds
QA/QC
Safety
Surveying
Construction Equipment General (salaried pickups, buses, ambulance, etc.)

Appendix E
Suporting Documentation

Appendix E-01
Labor Rates

Labor Rate Detail

Labor	Equipment	Zone	Group	Base rate	Zone Pay	Apprentice Fringes	Apprentice Rate	Apprentice Subtotal	FICA 6.200%	Medicare 1.450%	Fed Unempl.	State Unempl.	Workmens Comp	Total per Hour
Power Equipment Operator	Front End Loaders	-	VI	$ 20.99		$ 4.45	$ 0.35	$ 25.79	$ 1.60	$ 0.37	$ 0.03	$ 0.18	$3.577	$31.550
Power Equipment Operator	Dozer		IV	$ 20.84		$ 4.45	$ 0.35	$ 25.64	$ 1.59	$ 0.37	$ 0.03	$ 0.18	$3.605	$31.417
Power Equipment Operator	Scrapers		IV	$ 20.84		$ 4.45	$ 0.35	$ 25.64	$ 1.59	$ 0.37	$ 0.03	$ 0.18	$3.605	$31.417
Power Equipment Operator	Motor Grader (Rough)		IV	$ 20.84		$ 4.45	$ 0.35	$ 25.64	$ 1.59	$ 0.37	$ 0.03	$ 0.18	$3.605	$31.417
Power Equipment Operator	Excavator		VIII	$ 21.19		$ 4.45	$ 0.35	$ 25.99	$ 1.61	$ 0.38	$ 0.03	$ 0.18	$3.557	$31.745
Power Equipment Operator	Mechanic		VI	$ 20.99		$ 4.45	$ 0.35	$ 25.79	$ 1.60	$ 0.37	$ 0.03	$ 0.18	$1.660	$29.633
Teamster	Haul Trucks		III	$ 18.76		$ 1.20	$ -	$ 19.96	$ 1.24	$ 0.29	$ 0.03	$ 0.18	$3.295	$24.988
Teamster	Oiler		II	$ 20.24		$ 4.45	$ 0.35	$ 25.04	$ 1.55	$ 0.36	$ 0.03	$ 0.18	$3.295	$30.460

Federal Unemployment - 0.8% on the first $7,000		New Mexico Unemployment - 2% on the first $18,600
$ Max	$7,000	$18,600
Unemployment Tax	0.80%	2.00%
Unemployment Taxes Paid	$56.00	$372.00
Hours per Yr	2,085	2,085
Unemployment rate per Hour	$0.03	$0.18

Class	Class Code	Workmens Comp Rate / $100	Base Rate W/ Fringes & Apprentice	Base rate / $100 * Base Wage per Hour = WC/Hour	$10 /$100 of Total Payroll (Surcharge)	$3 /$100 of Total Payroll (Terrorist Tax)	Total Workmans Comp / $100
Operators							
Front End Loaders	6217	$ 12.61	$ 25.79	3.252	0.325	0.098	$3.577
Excavator	6217	$ 12.61	$ 25.64	3.233	0.323	0.097	$3.557
All Others	6217	$ 12.61	$ 25.99	3.277	0.328	0.098	$3.605
Teamster	7228	$ 15.01	$ 19.96	2.995	0.300	0.090	$3.295
Mechanic	8380	$ 5.85	$ 25.79	1.509	0.151	0.045	$1.660

Public Works

Wage Rates

New Mexico Department of LABOR

Quick Find

Type H Wage Rates PDF file

Type "H" - Heavy Engineering - Effective June 22, 2006

Effective July 21, due to a Labor Commission Hearing Ruling, the Type B (subsistence pay) and Type H (base and fringe rates) rates have changed for the Ironworkers.

Trade Classification	Base Rate	Fringe Rate	Apprenticeship Contribution Rate
Asbestos Worker - Heat & Frost Insulator	23.87	8.43	0.20
Boilermaker	18.50	3.31	0.56
Bricklayer/Blocklayer/StoneMason	20.78	4.73	0.54
Carpenter/Lather	20.46	5.61	0.35
Millwright/Piledriver	24.00	5.21	0.30
Cement Mason	22.51	0.92	0.00
Electricians			
Outside Classifications			
Groundman (Outside)	21.14	8.29	0.25
Equipment Operator (O/S)	23.96	8.29	0.25
Lineman/Tech (O/S)	24.55	8.29	0.25
Cable Splicer (Outside)	25.73	8.29	0.25
Inside Classifications			
Wireman/Tech	23.61	8.56	0.25
Cable Splicer	25.34	8.56	0.25
Sound Classifications			
Installer	0.00	0.00	0.00
Technician	0.00	0.00	0.00
Soundman	0.00	0.00	0.00
Glazier	0.00	0.00	0.00
Ironworker	24.75	8.40	0.53
Painter (Brush/Roller/Spray)	16.00	3.78	0.00
Plumber/Pipefitter	21.88	5.24	0.31
Roofer	14.55	4.78	0.23
SheetmetalWorker	22.50	6.56	0.52
Operators			
Group I	20.04	4.45	0.35
Group II	20.24	4.45	0.35
Group III	20.82	4.45	0.35
Group IV	20.84	4.45	0.35
Group V	20.84	4.45	0.35
Group VI	20.99	4.45	0.35
Group VII	21.04	4.45	0.35
Group VIII	21.19	4.45	0.35

Group IX	21.69	4.45	0.35
Group X	22.49	4.45	0.35
Laborers			
Group I	13.51	3.55	0.25
Group II	13.81	3.55	0.25
Group III	14.11	3.55	0.25
Group IV	14.68	3.55	0.25
Group V	14.93	3.55	0.25
Group VI	13.66	3.55	0.25
Group VII	13.81	3.55	0.25
Group VIII	14.06	3.55	0.25
Group IX	14.26	3.55	0.25
Group X	14.93	3.55	0.25
Truck Drivers			
Group I	14.30	1.20	$0.00
Group II	14.50	1.20	$0.00
Group III	14.70	1.20	$0.00
Group IV	14.90	1.20	$0.00

NOTE: SUBSISTENCE AND INCENTIVE PAY DO NOT APPLY TO TYPE "H" CONSTRUCTION.

TYPE "H" CONSTRUCTION

LABOR CLASSIFICATION GROUPS

GROUP I – (Unskilled):

Building and Common Laborer; Carpenter Tender; Chainman; Rodman; Stakedriver; Concrete Buggy Operator (Hand); Concrete Workers; Flagmen; Soil-Sampler Tester.

Top

GROUP II – (Semi-skilled):

Wagon, Air-Tract; Drill & Diamond Drillers' Tender (outside); Air & Power Tool Operator (not a carpenter's tool); Asbestors Remover; Asphalt Heaterman; Asphalt Jointman; Asphalt Raker; Batching Plant Scaleman; Tenderers (to Cement Mason & Plasterer); Chain Sawman; Concrete Power Buggyman Operator; Concrete Touch-Up Man; Concrete Sawman – coring machine; Curbing Machinist, Asph. Or Cement; Cutting Torchman; Metal Form Setter-Road; Grade Setter; Hod Carrier; Mortar Mixer & Mason Tender; Powderman or Blaster Helper; Sandblaster; Scaler; Vibratorman (hand-type); Vibratory Compactor (hand-type); Window Washer; Nurseryman-Gardener; Wagon, Air Tract, Drill & Diamond Driller (outside); Roadway Hardware Worker.

Top

GROUP III – (Miscellaneous):

Gunite Pumpcrete Man & Nozzleman; Multi-plate Setter; Manhole Builder; Pipelayer; Powderman-Blaster-Make-Up; Landscaper; Traffic Control Technician; Laboratory Technician.

Top

GROUP IV – (Shaft Workers):

Air Tugger Operator; Concrete Workers (incl. All cement chipping & finish, underground); Drillers; Form Setters & Handlers; Hand Muckers; Miners; Powdermen; Timbermen (wood or steel); Reinforcing Steel Setters; Tunnel Liner; Plate Setters, all Cutting & Welding Incidental to Miner's Work; Toplanders; Bottomlanders.

Top

GROUP V – (Shaft Workers):

Shifters.

Top

GROUP VI – (Tunnel Workers):

Laborers and Handmuckers.

Top

GROUP VII – (Tunnel Workers):

Chuck Tenders; Groutmen; Nippers; Trackmen.

GROUP VIII – (Tunnel Workers):

Drillers; Form Setters & Handlers; Scalers; Miners; Timbermen; Brakemen; Concrete Workers (incl. All cement chipping & finishing underground); Reinforcing Steel Setters; Timbermen (wood or steel); Tunnel Liner Plate Setters; All Cutting & Welding Incidental to Miner's Work.

Top

GROUP IX – (Tunnel Workers):

Powdermen.

Top

GROUP X - (Tunnel Workers):

Shifters.

Top

EQUIPMENT OPERATOR CLASSIFICATION GROUPS

GROUP I:

Concrete Paving Curing Machine.

Top

GROUP II:

Belt Type Conveyors (material & concrete); Broom (self-propelled); Forklift; Greases Truck Oper.; Head Oiler; Hydro Lift; Tractor (under 50 drawbar HP with or without attach.); Industrial Loco. Brakeman; Front-End Loader (2 cy or less); Fireman; Oiler; Screedman; Roller (pull-type); Mulching Machine; Roller (self-propelled).

Top

GROUP III:

Concrete Paving Form Grader; Concrete Paving Gang Vibrator; Concrete Paving Joint or Saw Machine; Concrete Paving Sub Grader; Tractor with Backhoe Attachment; Subgrade or Base Finisher; Power Plant (electric generator or welding machine).

Top

GROUP IV:

Bulldozer (including self-propelled roller with dozer attachment); Batch or Continuous Mix Plant (concrete, soil-cement, or asph.); Roller (steel wheel); Front End Loader (2 – 10 cy); Scraper Operator; Motor Grader.

Top

GROUP V:

Asphalt Distributor; Paving or Laydown Machine; Asphalt Retort Heater; Mixer, Heavy Duty, Asphalt or Soil Cement; Trenching Machine; Clam Type Shaftmucker; Backhoe, Clamshell, Dragline, Gradall, Shovel (under ¾ cy); Elevating Grader or Belt Loader; Cranes (crawler or mobile) under 20 tons; Air Compressor (300 CFM & over); Crushing Screening & Washing Plants; Drilling Machine (cable core or rotary); Mixer, Concrete (1 cy & less); Pump (6 " intake or over); Winch Truck; Hoist (1 drum); Industrial Locomotive Motorman; Lumber Stacker; Tractor (50 drawbar HP or over).

Top

GROUP VI:

Concrete Paver Mixer; Hoist (2 drums & over); Side Boom; Traveling Crane; Piledriver; Backhoe, Clamshell, Dragline, Gradall, Shovel (3/4 cy to 3 cy); Cranes (crawler or mobile) 20 – 40 ton; Front End Loader (over 10 cy); Mixer; Concrete (over 1 cy); Mechanic and/or Welder.

Top

GROUP VII:

Concrete Slip-Form Paving Machine; Concrete Paving Finishing Machine; concrete Paving Longitudinal Float; Gunite Machine; Refrigeration; Jumbo Form or Drilling; Stage; Slusher; Concrete Paving Spreader; Pumpcrete Machine; Grout Pump Operator.

Top

GROUP VIII:

Mine Hoist; Bulldozer (multiple units); Scraper (multiple units); Mucking Machine; Backhoe, Clamshell, Dragline, Gradall, Shovel (over 3 cy); Cranes (crawler or mobile) over 40 tons.

Top

GROUP IX:

Belt Loader (CMI type) Operator; Pipemobile Operator Assistant; Derrick, Cableway.

Top

GROUP X:

Pipemobile Operator; Mole Operator.

Top

TRUCK DRIVER CLASSIFICATION GROUPS

GROUP I:

Pick-up Truck (¾ ton or under); Warehouseman; Dump Truck (under 8 cy); Flatbed (1 ½ ton or under).

Top

GROUP II:

Dump Truck (8-16 cy); Tank Truck (under 6,000 gals.); Flatbed (over 1 ½ ton).

Top

GROUP III:

Spreader Box (self-propelled); Distributor (asphalt) Transit Mix; Lowboy; Light Equipment; Off-Highway Hauler; Tank Truck (over 6,000 gals.); Dump Truck (over 16 cy); Trailer Semi-Trailer Dump.

Top

GROUP IV:

Diesel-powered Transport; Lowboy; Heavy Equipment.

Top

Top
Type "A" - Street, Highway, Utility or Light Engineering
Type "B" - Genreal Building

Appendix E-02
Equipment Rates
(Equipment Watch)

www.equipmentwatch.com

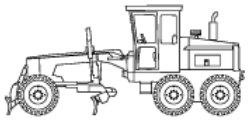
Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar 16H

Articulated Frame Graders

Size Class:
Net Hp: 250 HP & Over
Weight:
54,550 lbs



Configuration for 16H

Power Mode:	**Diesel**	Operator Protection:	**EROPS**
Moldboard Size:	**16'**	HP:	**285.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$28.96/hr	$29.58/hr	+ 2.14%
Cost of Facilities Capital (CFC)	$14.16/hr	$11.68/hr	- 17.51%
Overhead	$18.74/hr	$15.27/hr	- 18.52%
Overhaul Labor	$5.46/hr	$3.10/hr	- 43.22%
Overhaul Parts	$16.37/hr	$13.34/hr	- 18.51%
Total Hourly Ownership Cost:	**$83.69/hr**	**$72.97/hr**	**- 12.81%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,400Hrs→1,718Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$4.55/hr	$2.59/hr	- 43.08%
Field Parts	$15.87/hr	$12.93/hr	- 18.53%
Ground Engaging Component (GEC) Cost	$1.32/hr	$1.08/hr	-
Tires	$6.70/hr	$6.70/hr	-
Electric/Fuel	$24.53/hr	$21.98/hr	- 10.4%
Lube	$6.15/hr	$6.15/hr	-
Total Hourly Operating Cost:	**$59.12/hr**	**$51.43/hr**	**- 13.01%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$83.69	$72.97/hr	- 12.81%
Hourly Operating Cost	$59.12	$51.43/hr	- 13.01%
Total Hourly Cost:	**$142.81**	**$124.40/hr**	**- 12.89%**

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www.equipmentwatch.com

Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar 345C L

Crawler Mounted Hydraulic Excavators

Size Class:
Operating Weight: 40.1 - 50.0 MTons
Weight:
100,810 lbs

Equipment Notes: General Purpose bucket included in rate, unless otherwise noted.

Configuration for 345C L

Power Mode:	**Diesel**	Bucket Capacity:	**2.46 cy**
Operating Weight:	**45.7 MT**	HP:	**345.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$46.13/hr	$47.11/hr	+ 2.12%
Cost of Facilities Capital (CFC)	$16.32/hr	$13.66/hr	- 16.3%
Overhead	$13.90/hr	$11.44/hr	- 17.7%
Overhaul Labor	$13.62/hr	$7.82/hr	- 42.58%
Overhaul Parts	$19.21/hr	$15.81/hr	- 17.7%
Total Hourly Ownership Cost:	**$109.18/hr**	**$95.84/hr**	**- 12.22%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,295Hrs→1,573Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$16.74/hr	$9.61/hr	- 42.59%
Field Parts	$19.63/hr	$16.16/hr	- 17.68%
Ground Engaging Component (GEC) Cost	$3.14/hr	$2.59/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$38.98/hr	$34.92/hr	- 10.42%
Lube	$8.68/hr	$8.68/hr	-
Total Hourly Operating Cost:	**$87.17/hr**	**$71.96/hr**	**- 17.45%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$109.18	$95.84/hr	- 12.22%
Hourly Operating Cost	$87.17	$71.96/hr	- 17.45%
Total Hourly Cost:	**$196.35**	**$167.80/hr**	**- 14.54%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
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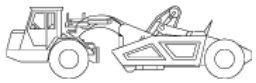
Caterpillar 623F (discontinued 2000)

Single Engine Elevating Scrapers

Size Class:
Heaped Capacity - Cubic Yds: 18 & Under 30CY
Weight:
77,800 lbs



Manufacturer Notes: C-H = Cushion-Hitch

Configuration for 623F

Power Mode:	**Diesel**	Scraper Capacity:	**18 - 23 cy**
Tractor HP:	**365.0**	Operator Protection:	**EROPS**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$30.13/hr	$30.74/hr	+ 2.02%
Cost of Facilities Capital (CFC)	$14.11/hr	$11.58/hr	- 17.93%
Overhead	$14.70/hr	$11.90/hr	- 19.05%
Overhaul Labor	$12.54/hr	$7.07/hr	- 43.62%
Overhaul Parts	$32.74/hr	$26.49/hr	- 19.09%
Total Hourly Ownership Cost:	**$104.22/hr**	**$87.78/hr**	**- 15.77%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,220Hrs→1,508Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$19.51/hr	$11.00/hr	- 43.62%
Field Parts	$29.46/hr	$23.84/hr	- 19.08%
Ground Engaging Component (GEC) Cost	$2.21/hr	$1.79/hr	-
Tires	$4.26/hr	$4.26/hr	-
Electric/Fuel	$37.31/hr	$33.43/hr	- 10.4%
Lube	$7.06/hr	$7.06/hr	-
Total Hourly Operating Cost:	**$99.81/hr**	**$81.38/hr**	**- 18.47%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$104.22	$87.78/hr	- 15.77%
Hourly Operating Cost	$99.81	$81.38/hr	- 18.47%
Total Hourly Cost:	**$204.03**	**$169.16/hr**	**- 17.09%**

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www.equipmentwatch.com

Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar 631G

Single Engine Conventional Scrapers

Size Class:
Struck Capacity - Cubic Yds: 18CY & Over
Weight:
102,460 lbs

Manufacturer Notes: C-H = Cushion-Hitch

Configuration for 631G

Power Mode:	**Diesel**	Scraper Capacity:	**24.0 - 34.0 cy**
Tractor HP:	**500.0**	Operator Protection:	**EROPS**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$40.15/hr	$40.94/hr	+ 1.97%
Cost of Facilities Capital (CFC)	$20.07/hr	$16.86/hr	- 15.99%
Overhead	$25.13/hr	$20.87/hr	- 16.95%
Overhaul Labor	$12.36/hr	$7.16/hr	- 42.07%
Overhaul Parts	$32.86/hr	$27.29/hr	- 16.95%
Total Hourly Ownership Cost:	**$130.57/hr**	**$113.12/hr**	**- 13.36%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,375Hrs→1,656Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$18.55/hr	$10.74/hr	- 42.1%
Field Parts	$32.60/hr	$27.07/hr	- 16.96%
Ground Engaging Component (GEC) Cost	$1.39/hr	$1.15/hr	-
Tires	$6.08/hr	$6.08/hr	-
Electric/Fuel	$51.11/hr	$45.79/hr	- 10.41%
Lube	$12.06/hr	$12.06/hr	-
Total Hourly Operating Cost:	**$121.79/hr**	**$102.89/hr**	**- 15.52%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$130.57	$113.12/hr	- 13.36%
Hourly Operating Cost	$121.79	$102.89/hr	- 15.52%
Total Hourly Cost:	**$252.36**	**$216.01/hr**	**- 14.4%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
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Caterpillar 740

Articulated Rear Dumps

Size Class:
Rated Tonnage Capacity: 35 MTons & Over
Weight:
72,075 lbs

Configuration for 740

Power Mode:	**Diesel**	Rated Payload:	**38.1 MT**
Body Capacity:	**22.8 - 30.0 cy**	Axle Config.:	**6 X 6**
HP:	**415.0**		

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$31.14/hr	$31.75/hr	+ 1.96%
Cost of Facilities Capital (CFC)	$11.60/hr	$11.60/hr	-
Overhead	$13.24/hr	$13.24/hr	-
Overhaul Labor	$12.64/hr	$8.81/hr	- 30.3%
Overhaul Parts	$11.36/hr	$11.36/hr	-
Total Hourly Ownership Cost:	**$79.98/hr**	**$76.76/hr**	**- 4.03%**

User Defined Adjustments: Sales Tax (5.40%→7.12%)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$9.07/hr	$6.33/hr	- 30.21%
Field Parts	$7.01/hr	$7.01/hr	-
Ground Engaging Component (GEC) Cost	$0.00/hr	$0.00/hr	-
Tires	$9.36/hr	$9.36/hr	-
Electric/Fuel	$22.33/hr	$20.00/hr	- 10.43%
Lube	$7.57/hr	$7.57/hr	-
Total Hourly Operating Cost:	**$55.34/hr**	**$50.27/hr**	**- 9.16%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$79.98	$76.76/hr	- 4.03%
Hourly Operating Cost	$55.34	$50.27/hr	- 9.16%
Total Hourly Cost:	**$135.32**	**$127.03/hr**	**- 6.13%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
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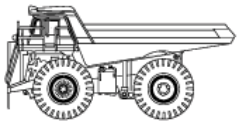
Caterpillar 777D (discontinued 2006)

Mechanical Drive Rear Dumps

Size Class:
Rated Tonnage Capacity: 90 - 104 MTons
Weight:
153,804 lbs



Configuration for 777D

Power Mode:	**Diesel**	Rated Payload:	**90.9 MT**
Body Capacity:	**60.1 - 78.6 cy**	HP:	**938.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$43.45/hr	$44.30/hr	+ 1.96%
Cost of Facilities Capital (CFC)	$16.94/hr	$16.94/hr	-
Overhead	$26.49/hr	$26.49/hr	-
Overhaul Labor	$21.14/hr	$14.73/hr	- 30.32%
Overhaul Parts	$17.37/hr	$17.37/hr	-
Total Hourly Ownership Cost:	**$125.39/hr**	**$119.83/hr**	**- 4.43%**

User Defined Adjustments: Sales Tax (5.40%→7.12%)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$12.98/hr	$9.05/hr	- 30.28%
Field Parts	$10.72/hr	$10.72/hr	-
Ground Engaging Component (GEC) Cost	$0.00/hr	$0.00/hr	-
Tires	$14.32/hr	$14.32/hr	-
Electric/Fuel	$50.46/hr	$45.21/hr	- 10.4%
Lube	$12.86/hr	$12.86/hr	-
Total Hourly Operating Cost:	**$101.34/hr**	**$92.16/hr**	**- 9.06%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$125.39	$119.83/hr	- 4.43%
Hourly Operating Cost	$101.34	$92.16/hr	- 9.06%
Total Hourly Cost:	**$226.73**	**$211.99/hr**	**- 6.5%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
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Caterpillar 980H

4-WD Articulated Wheel Loaders

Size Class:
Net Hp: 275 - 349 HP
Weight:
67,294 lbs

Equipment Notes: Includes General Purpose bucket and ROPS, unless otherwise noted.

Configuration Notes: with EROPS

Configuration for 980H

Power Mode:	**Diesel**	Bucket Capacity:	**7.5 cy**
HP:	**315.0**	Operator Protection:	**EROPS**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$25.91/hr	$26.50/hr	+ 2.28%
Cost of Facilities Capital (CFC)	$12.28/hr	$10.52/hr	- 14.33%
Overhead	$13.64/hr	$11.55/hr	- 15.32%
Overhaul Labor	$7.35/hr	$4.34/hr	- 40.95%
Overhaul Parts	$7.50/hr	$6.36/hr	- 15.2%
Total Hourly Ownership Cost:	**$66.68/hr**	**$59.27/hr**	**- 11.11%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,445Hrs→1,706Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$8.97/hr	$5.30/hr	- 40.91%
Field Parts	$8.28/hr	$7.01/hr	- 15.34%
Ground Engaging Component (GEC) Cost	$1.13/hr	$0.95/hr	-
Tires	$6.91/hr	$6.91/hr	-
Electric/Fuel	$27.12/hr	$24.29/hr	- 10.44%
Lube	$5.92/hr	$5.92/hr	-
Total Hourly Operating Cost:	**$58.33/hr**	**$50.38/hr**	**- 13.63%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$66.68	$59.27/hr	- 11.11%
Hourly Operating Cost	$58.33	$50.38/hr	- 13.63%
Total Hourly Cost:	**$125.01**	**$109.65/hr**	**- 12.29%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
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Caterpillar 992G

4-WD Articulated Wheel Loaders

Size Class:
Net Hp: 500 - 999 HP
Weight:
210,424 lbs

Equipment Notes: Includes General Purpose bucket and ROPS, unless otherwise noted.

Configuration Notes: with EROPS

Configuration for 992G

Power Mode:	**Diesel**	Bucket Capacity:	**16.00 cy**
HP:	**791.0**	Operator Protection:	**EROPS**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$95.23/hr	$97.35/hr	+ 2.23%
Cost of Facilities Capital (CFC)	$42.17/hr	$35.28/hr	- 16.34%
Overhead	$50.45/hr	$41.63/hr	- 17.48%
Overhaul Labor	$7.35/hr	$4.23/hr	- 42.45%
Overhaul Parts	$25.77/hr	$21.26/hr	- 17.5%
Total Hourly Ownership Cost:	**$220.97/hr**	**$199.75/hr**	**- 9.6%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,445Hrs→1,751Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$8.97/hr	$5.16/hr	- 42.47%
Field Parts	$28.43/hr	$23.46/hr	- 17.48%
Ground Engaging Component (GEC) Cost	$3.87/hr	$3.19/hr	-
Tires	$27.90/hr	$27.90/hr	-
Electric/Fuel	$68.09/hr	$61.00/hr	- 10.41%
Lube	$17.82/hr	$17.82/hr	-
Total Hourly Operating Cost:	**$155.08/hr**	**$138.53/hr**	**- 10.67%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$220.97	$199.75/hr	- 9.6%
Hourly Operating Cost	$155.08	$138.53/hr	- 10.67%
Total Hourly Cost:	**$376.05**	**$338.28/hr**	**- 10.04%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Off-Highway Water Tanker Trucks

Miscellaneous Models

Equipment Notes: Rates include off-highway prime mover complete with a semi-trailer water tanker, hydraulic drive centrifugal pump and rear spraybar.

Configuration for Off-Highway Water Tanker Trucks

Power Mode:	**Diesel**	Tank Capacity:	**10,000 gal**
HP:	**450.0**		

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$33.78/hr	$34.51/hr	+ 2.16%
Cost of Facilities Capital (CFC)	$12.96/hr	$12.96/hr	-
Overhead	$10.74/hr	$10.74/hr	-
Overhaul Labor	$9.35/hr	$6.52/hr	- 30.27%
Overhaul Parts	$8.13/hr	$8.13/hr	-
Total Hourly Ownership Cost:	**$74.96/hr**	**$72.86/hr**	**- 2.8%**

User Defined Adjustments: Sales Tax (5.40%→7.12%)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$22.67/hr	$15.80/hr	- 30.3%
Field Parts	$15.70/hr	$15.70/hr	-
Ground Engaging Component (GEC) Cost	$0.00/hr	$0.00/hr	-
Tires	$9.44/hr	$9.44/hr	-
Electric/Fuel	$41.28/hr	$36.98/hr	- 10.42%
Lube	$7.75/hr	$7.75/hr	-
Total Hourly Operating Cost:	**$96.84/hr**	**$85.67/hr**	**- 11.53%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$74.96	$72.86/hr	- 2.8%
Hourly Operating Cost	$96.84	$85.67/hr	- 11.53%
Total Hourly Cost:	**$171.80**	**$158.53/hr**	**- 7.72%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Crawler Tractor Multi-Shank Rippers

Miscellaneous Models

Configuration for Crawler Tractor Multi-Shank Rippers

Engine HP:	**130 - 189**	Number of Shanks:	**3**
Ripper Type:	**Parallelogram**		

Hourly Ownership Costs	**Standard Value**	**User Adjusted Value**	**Variance**
Depreciation	$2.50/hr	$2.54/hr	+ 1.6%
Cost of Facilities Capital (CFC)	$0.54/hr	$0.45/hr	- 16.67%
Overhead	$0.63/hr	$0.50/hr	- 20.63%
Overhaul Labor	$0.79/hr	$0.45/hr	- 43.04%
Overhaul Parts	$0.90/hr	$0.72/hr	- 20.0%
Total Hourly Ownership Cost:	**$5.36/hr**	**$4.66/hr**	**- 13.06%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,285Hrs→1,597Hrs)

Hourly Operating Costs	**Standard Value**	**User Adjusted Value**	**Variance**
Field Labor	$1.32/hr	$0.74/hr	- 43.94%
Field Parts	$1.12/hr	$0.90/hr	- 19.64%
Ground Engaging Component (GEC) Cost	$0.93/hr	$0.75/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$0.00/hr	$0.00/hr	-
Lube	$0.14/hr	$0.14/hr	-
Total Hourly Operating Cost:	**$3.51/hr**	**$2.53/hr**	**- 27.92%**

User Defined Adjustments: Mechanics Wage ($42.50→$29.63)

Total	**Standard Value**	**User Adjusted Value**	**Variance**
Hourly Ownership Cost	$5.36	$4.66/hr	- 13.06%
Hourly Operating Cost	$3.51	$2.53/hr	- 27.92%
Total Hourly Cost:	**$8.87**	**$7.19/hr**	**- 18.94%**

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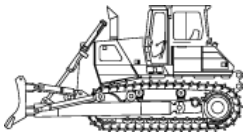
Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar D6R LGP SERIES II (discontinued 2005)

Lgp Crawler Dozers

Size Class:
Net Hp: 160 - 189 HP
Weight:
45,086 lbs



Equipment Notes: Includes dozer blade and operator protection as listed.

Configuration for D6R LGP SERIES II

Power Mode:	**Diesel**	Dozer Type:	**Straight**
Operator Protection:	**EROPS**	HP:	**185.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$15.30/hr	$15.66/hr	+ 2.35%
Cost of Facilities Capital (CFC)	$7.75/hr	$6.31/hr	- 18.58%
Overhead	$8.90/hr	$7.16/hr	- 19.55%
Overhaul Labor	$7.11/hr	$3.99/hr	- 43.88%
Overhaul Parts	$13.55/hr	$10.90/hr	- 19.56%
Total Hourly Ownership Cost:	**$52.61/hr**	**$44.02/hr**	**- 16.33%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,285Hrs→1,597Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$8.76/hr	$4.92/hr	- 43.84%
Field Parts	$11.98/hr	$9.64/hr	- 19.53%
Ground Engaging Component (GEC) Cost	$2.30/hr	$1.85/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$19.41/hr	$17.39/hr	- 10.41%
Lube	$3.68/hr	$3.68/hr	-
Total Hourly Operating Cost:	**$46.13/hr**	**$37.48/hr**	**- 18.75%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$52.61	$44.02/hr	- 16.33%
Hourly Operating Cost	$46.13	$37.48/hr	- 18.75%
Total Hourly Cost:	**$98.74**	**$81.50/hr**	**- 17.46%**

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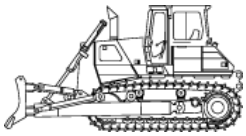
Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar D7R LGP SERIES II (discontinued 2005)

Lgp Crawler Dozers

Size Class:
Net Hp: 190 - 259 HP
Weight:
59,289 lbs



Equipment Notes: Includes dozer blade and operator protection as listed.

Configuration for D7R LGP SERIES II

Power Mode:	**Diesel**	Dozer Type:	**Straight**
Operator Protection:	**EROPS**	HP:	**238.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$23.47/hr	$23.98/hr	+ 2.17%
Cost of Facilities Capital (CFC)	$10.54/hr	$8.61/hr	- 18.31%
Overhead	$11.94/hr	$9.61/hr	- 19.51%
Overhaul Labor	$7.11/hr	$3.99/hr	- 43.88%
Overhaul Parts	$19.06/hr	$15.34/hr	- 19.52%
Total Hourly Ownership Cost:	**$72.12/hr**	**$61.53/hr**	**- 14.68%**

User Defined Adjustments: Sales Tax (5.40%➔7.12%), Annual Use Hours (1,285Hrs➔1,597Hrs)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$8.76/hr	$4.92/hr	- 43.84%
Field Parts	$16.85/hr	$13.56/hr	- 19.53%
Ground Engaging Component (GEC) Cost	$3.23/hr	$2.60/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$24.97/hr	$22.37/hr	- 10.41%
Lube	$4.94/hr	$4.94/hr	-
Total Hourly Operating Cost:	**$58.75/hr**	**$48.39/hr**	**- 17.63%**

User Defined Adjustments: Fuel Cost ($2.69➔$2.41), Mechanics Wage ($42.50➔$29.63)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$72.12	$61.53/hr	- 14.68%
Hourly Operating Cost	$58.75	$48.39/hr	- 17.63%
Total Hourly Cost:	**$130.87**	**$109.92/hr**	**- 16.01%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Crawler Tractor Single Shank Rippers

Miscellaneous Models

Configuration for Crawler Tractor Single Shank Rippers

Engine HP:	**360 - 519**	Shank Type:	**Standard**
Max. Digging Depth:	**52 in**		

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$9.53/hr	$9.70/hr	+ 1.78%
Cost of Facilities Capital (CFC)	$1.58/hr	$1.32/hr	- 16.46%
Overhead	$1.75/hr	$1.41/hr	- 19.43%
Overhaul Labor	$2.98/hr	$1.67/hr	- 43.96%
Overhaul Parts	$3.73/hr	$3.00/hr	- 19.57%
Total Hourly Ownership Cost:	**$19.57/hr**	**$17.10/hr**	**- 12.62%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,285Hrs→1,597Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$3.64/hr	$2.04/hr	- 43.96%
Field Parts	$3.36/hr	$2.70/hr	- 19.64%
Ground Engaging Component (GEC) Cost	$2.80/hr	$2.25/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$0.00/hr	$0.00/hr	-
Lube	$0.39/hr	$0.39/hr	-
Total Hourly Operating Cost:	**$10.19/hr**	**$7.38/hr**	**- 27.58%**

User Defined Adjustments: Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$19.57	$17.10/hr	- 12.62%
Hourly Operating Cost	$10.19	$7.38/hr	- 27.58%
Total Hourly Cost:	**$29.76**	**$24.48/hr**	**- 17.74%**

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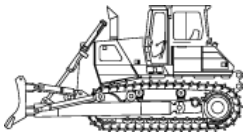
Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar D9R (discontinued 2005)

Standard Crawler Dozers

Size Class:
Net Hp: 360 - 519 HP
Weight:
90,234 lbs



Equipment Notes: Includes dozer blade and operator protection as listed.

Configuration for D9R

Power Mode:	**Diesel**	Dozer:	**Semi-U**
Operator Protection:	**EROPS**	HP:	**410.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$31.18/hr	$31.80/hr	+ 1.99%
Cost of Facilities Capital (CFC)	$14.14/hr	$11.92/hr	- 15.7%
Overhead	$22.37/hr	$18.65/hr	- 16.63%
Overhaul Labor	$12.45/hr	$7.24/hr	- 41.85%
Overhaul Parts	$30.11/hr	$25.11/hr	- 16.61%
Total Hourly Ownership Cost:	**$110.25/hr**	**$94.72/hr**	**- 14.09%**

User Defined Adjustments: Sales Tax (5.40%➔7.12%), Annual Use Hours (1,400Hrs➔1,679Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$14.57/hr	$8.47/hr	- 41.87%
Field Parts	$29.33/hr	$24.45/hr	- 16.64%
Ground Engaging Component (GEC) Cost	$4.50/hr	$3.75/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$38.60/hr	$34.58/hr	- 10.41%
Lube	$8.32/hr	$8.32/hr	-
Total Hourly Operating Cost:	**$95.32/hr**	**$79.57/hr**	**- 16.52%**

User Defined Adjustments: Fuel Cost ($2.69➔$2.41), Mechanics Wage ($42.50➔$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$110.25	$94.72/hr	- 14.09%
Hourly Operating Cost	$95.32	$79.57/hr	- 16.52%
Total Hourly Cost:	**$205.57**	**$174.29/hr**	**- 15.22%**

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Crawler Tractor Single Shank Rippers

Miscellaneous Models

Configuration for Crawler Tractor Single Shank Rippers

Engine HP:	**520 - 699**	Shank Type:	**Standard**
Max. Digging Depth:	**53 in**		

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$12.72/hr	$12.94/hr	+ 1.73%
Cost of Facilities Capital (CFC)	$2.11/hr	$1.77/hr	- 16.11%
Overhead	$2.34/hr	$1.88/hr	- 19.66%
Overhaul Labor	$2.98/hr	$1.67/hr	- 43.96%
Overhaul Parts	$4.98/hr	$4.00/hr	- 19.68%
Total Hourly Ownership Cost:	**$25.13/hr**	**$22.26/hr**	**- 11.42%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,285Hrs→1,597Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$3.64/hr	$2.04/hr	- 43.96%
Field Parts	$4.48/hr	$3.60/hr	- 19.64%
Ground Engaging Component (GEC) Cost	$3.73/hr	$3.00/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$0.00/hr	$0.00/hr	-
Lube	$0.52/hr	$0.52/hr	-
Total Hourly Operating Cost:	**$12.37/hr**	**$9.16/hr**	**- 25.95%**

User Defined Adjustments: Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$25.13	$22.26/hr	- 11.42%
Hourly Operating Cost	$12.37	$9.16/hr	- 25.95%
Total Hourly Cost:	**$37.50**	**$31.42/hr**	**- 16.21%**

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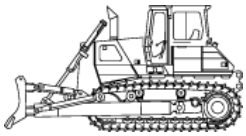
Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Caterpillar D11R (discontinued 2006)

Standard Crawler Dozers

Size Class:
Net Hp: 520 HP & Over
Weight:
202,847 lbs



Equipment Notes: Includes dozer blade and operator protection as listed.

Configuration for D11R

Power Mode:	**Diesel**	Dozer:	**U Blade**
Operator Protection:	**EROPS**	HP:	**850.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$87.05/hr	$88.78/hr	+ 1.99%
Cost of Facilities Capital (CFC)	$38.96/hr	$32.86/hr	- 15.66%
Overhead	$46.29/hr	$38.59/hr	- 16.63%
Overhaul Labor	$12.45/hr	$7.24/hr	- 41.85%
Overhaul Parts	$78.92/hr	$65.81/hr	- 16.61%
Total Hourly Ownership Cost:	**$263.67/hr**	**$233.28/hr**	**- 11.53%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,400Hrs→1,679Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$14.57/hr	$8.47/hr	- 41.87%
Field Parts	$76.87/hr	$64.09/hr	- 16.63%
Ground Engaging Component (GEC) Cost	$12.40/hr	$10.34/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electric/Fuel	$80.03/hr	$71.70/hr	- 10.41%
Lube	$20.29/hr	$20.29/hr	-
Total Hourly Operating Cost:	**$204.16/hr**	**$174.89/hr**	**- 14.34%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$263.67	$233.28/hr	- 11.53%
Hourly Operating Cost	$204.16	$174.89/hr	- 14.34%
Total Hourly Cost:	**$467.83**	**$408.17/hr**	**- 12.75%**

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Thursday, Aug 9, 2007

On-Highway Light Duty Trucks
Miscellaneous Models

Configuration for On-Highway Light Duty Trucks

Power Mode:	**Diesel**	Cab Type:	**Conventional**
Axle Config.:	**4X4**	Ton Rating:	**1**
HP:	**195.0**		

Adjust Costs

Default Settings

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$3.23/hr	$3.30/hr	+ 2.17%
Cost of Facilities Capital (CFC)	$0.57/hr	$0.57/hr	-
Overhead	$0.52/hr	$0.52/hr	-
Overhaul Labor	$0.57/hr	$0.40/hr	- 29.82%
Overhaul Parts	$0.75/hr	$0.75/hr	-
Total Hourly Ownership Cost:	$5.64/hr	$5.54/hr	- 1.77%

User Defined Adjustments:
Sales Tax (5.40%➟7.12%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$0.72/hr	$0.50/hr	- 30.56%
Field Parts	$0.72/hr	$0.72/hr	-
Ground Engaging Component (GEC) Cost	$0.00/hr	$0.00/hr	-
Tires	$0.52/hr	$0.52/hr	-
Electrical/Fuel	$6.29/hr	$5.64/hr	- 10.33%
Lube	$0.83/hr	$0.83/hr	-
Total Hourly Operating Cost:	$9.08/hr	$8.21/hr	- 9.58%

User Defined Adjustments:
Fuel Cost ($2.69➟$2.41), Mechanics Wage ($42.50➟$29.63)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$5.64/hr	$5.54/hr	- 1.77%
Hourly Operating Cost	$9.08/hr	$8.21/hr	- 9.58%
Total Hourly Cost:	$14.72/hr	$13.75/hr	- 6.59%

Adjust Costs

Default Settings

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Version: 2.2.3B

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Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Thursday, Aug 9, 2007

Single Deck Portable Screening Plants

Miscellaneous Models

Equipment Notes: Operating costs for electric powered models do not include electricity costs.

Configuration for Single Deck Portable Screening Plants

Power Mode:	**Diesel**	Conveyor Size:	**42" X 60'**
Screen Size:	**5' X 16'**	HP:	**110.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$8.74/hr	$8.90/hr	+ 1.83%
Cost of Facilities Capital (CFC)	$2.93/hr	$2.41/hr	- 17.75%
Overhead	$2.52/hr	$2.03/hr	- 19.44%
Overhaul Labor	$8.70/hr	$5.06/hr	- 41.84%
Overhaul Parts	$6.42/hr	$5.17/hr	- 19.47%
Total Hourly Ownership Cost:	**$29.31/hr**	**$23.57/hr**	**- 19.58%**

User Defined Adjustments: Sales Tax (5.40%→7.12%), Annual Use Hours (1,250Hrs→1,553Hrs)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$9.84/hr	$5.72/hr	- 41.87%
Field Parts	$5.97/hr	$4.80/hr	- 19.6%
Ground Engaging Component (GEC) Cost	$0.00/hr	$0.00/hr	-
Tires	$0.33/hr	$0.33/hr	-
Electric/Fuel	$14.02/hr	$11.69/hr	- 16.62%
Lube	$2.06/hr	$2.06/hr	-
Total Hourly Operating Cost:	**$32.22/hr**	**$24.60/hr**	**- 23.65%**

User Defined Adjustments: Fuel Cost ($2.89→$2.41), Mechanics Wage ($41.02→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$29.31	$23.57/hr	- 19.58%
Hourly Operating Cost	$32.22	$24.60/hr	- 23.65%
Total Hourly Cost:	**$61.53**	**$48.17/hr**	**- 21.71%**

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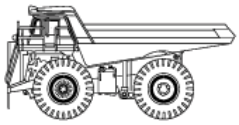
Custom Cost Evaluator (Ownership & Operating Costs)

Date:
Tuesday, Sep 4, 2007

Komatsu 530M (discontinued 2000)

Mechanical Drive Rear Dumps

Size Class:
Rated Tonnage Capacity: 140 - 169 MTons
Weight:
220,440 lbs



Configuration for 530M

Power Mode:	**Diesel**	Rated Payload:	**150.0 MT**
Body Capacity:	**71.0 - 102.0 cy**	HP:	**1,377.0**

Hourly Ownership Costs	Standard Value	User Adjusted Value	Variance
Depreciation	$68.35/hr	$69.69/hr	+ 1.96%
Cost of Facilities Capital (CFC)	$29.13/hr	$29.13/hr	-
Overhead	$16.16/hr	$16.16/hr	-
Overhaul Labor	$25.84/hr	$18.02/hr	- 30.26%
Overhaul Parts	$32.40/hr	$32.40/hr	-
Total Hourly Ownership Cost:	**$171.88/hr**	**$165.40/hr**	**- 3.77%**

User Defined Adjustments: Sales Tax (5.40%→7.12%)

Hourly Operating Costs	Standard Value	User Adjusted Value	Variance
Field Labor	$14.93/hr	$10.41/hr	- 30.27%
Field Parts	$14.84/hr	$14.84/hr	-
Ground Engaging Component (GEC) Cost	$0.00/hr	$0.00/hr	-
Tires	$29.73/hr	$29.73/hr	-
Electric/Fuel	$74.08/hr	$66.37/hr	- 10.41%
Lube	$20.95/hr	$20.95/hr	-
Total Hourly Operating Cost:	**$154.53/hr**	**$142.30/hr**	**- 7.91%**

User Defined Adjustments: Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$171.88	$165.40/hr	- 3.77%
Hourly Operating Cost	$154.53	$142.30/hr	- 7.91%
Total Hourly Cost:	**$326.41**	**$307.70/hr**	**- 5.73%**

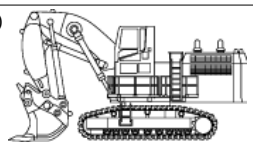
Back to Custom Cost Evaluator (Ownership & Operating Costs) Results Print Page Start a New Search

EQUIPMENT WATCH

Tuesday, Sep 4, 2007

Hitachi EX3500-3 (discontinued 2001)
Hydraulic Shovels

Size Class:
Operating Weight: 150.1 MTons & Over
Weight:
736,000 lbs.



Compare Similar Models

Configuration for EX3500-3

Power Mode:	**Diesel**	Bucket Capacity:	**23.5 cy**
Operating Weight:	**334.0 MT**	HP:	**1,634.0**

Equipment Notes: Bucket included in rate, unless otherwise noted.

Adjust Costs

Default Settings

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$150.10/hr	$152.94/hr	+ 1.89%
Cost of Facilities Capital (CFC)	$66.44/hr	$66.44/hr	-
Overhead	$34.77/hr	$34.77/hr	-
Overhaul Labor	$22.05/hr	$15.38/hr	- 30.25%
Overhaul Parts	$125.97/hr	$125.97/hr	-
Total Hourly Ownership Cost:	$399.33/hr	$395.50/hr	- 0.96%

User Defined Adjustments:
Sales Tax (5.40%→7.12%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$29.29/hr	$20.42/hr	- 30.28%
Field Parts	$137.93/hr	$137.93/hr	-
Ground Engaging Component (GEC) Cost	$18.91/hr	$18.91/hr	-
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$193.40/hr	$173.27/hr	- 10.41%
Lube	$49.83/hr	$49.83/hr	-
Total Hourly Operating Cost:	$429.36/hr	$400.36/hr	- 6.75%

User Defined Adjustments:
Fuel Cost ($2.69→$2.41), Mechanics Wage ($42.50→$29.63)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$399.33/hr	$395.50/hr	- 0.96%
Hourly Operating Cost	$429.36/hr	$400.36/hr	- 6.75%
Total Hourly Cost:	$828.69/hr	$795.86/hr	- 3.96%

Adjust Costs

Default Settings

Email : info@equipmentwatch.com Phone: (800) 669-3282
Version: 2.2.3B

Appendix E-03
Fuel Quote

May 9, 2007

Re: Fuel cost proposal for Chino Mines Reclamation

Mr. Larry Larsen
Telesco, Inc.

Mr. Larson,

As requested:

Off-road diesel fuel delivered to Chino Mines, Santa Rita, New Mexico.

Via tank transport truck with 7,600 gallon capacity:
El Paso refinery rack cost plus $.25.
E.g..today's rack @ $2.1602 + $.25 = $2.4102/gallon.

Via bob-tail tank truck with 1,500 gallons to 2100 gallons capacity:
Published delivery price at time of delivery.
E.g. today's delivered price is $2.541

Prices stated are not static and subject to change as market volatility dictates.

If you have any questions please feel to call me.

Sincerely,

J.P. Jones
Porter Oil Co., Inc.
P.O. Box 100
Bayard, N. M. 88023
505-537-3376

Appendix E-04
Revegetation Quote

Revegetation/Reclamation
Rangeland Rehabilitation
Fencing
Hydroseeding
Environmental Consulting

ROCKY MOUNTAIN RECLAMATION

Phone (307) 745-5235
Fax (307) 745-5230

P.O. Box 1695
Laramie, WY 82073

June 15, 2007

Attn: Mr. Terry Fairbanks
Phelps Dodge Corporation
Tyrone Mining, LLC
PO Box 7
Hurley, NM 88043

RE: Phelps Dodge -Tyrone Mining, LLC - Silver City, New Mexico Area
2007 Price Estimates for Revegetation Services for Bonding and Engineer's Estimates

Dear Terry:

Thank you for the opportunity to submit the following prices for use in determining bonding requirements and in preparing Engineer's estimates for revegetation tasks for your Phelps Dodge Tyrone Mine near Silver City, New Mexico. Prices are based on large acreages in contiguous pieces.

Revegetation techniques priced in the following table are those currently utilized by Rocky Mountain Reclamation on your mine. Other state of the art techniques are available and would potentially prove successful at similar or reduced costs. Please note that seed prices will vary each seeding season depending on current market conditions and seed availability. Fuel costs are an unknown and will affect our prices for both materials and services. Hay mulch is another important material for successful revegetation and the price for this material fluctuates seasonally. Prices have been high due to the recent droughts. We do not see any moderation in material costs as fuel and freight costs continue to rise and as suppliers adjust their prices to catch up with the rapidly rising costs of their imputs.

As you may already know, Rocky Mountain Reclamation is an industry leader in new and innovative reclamation and revegetation technology in the western USA. We are also one of the largest revegetation companies in the Rocky Mountain region and have completed thousands of projects on literally tens of thousands of acres in the past nearly 30 years. Our experience ranges from South Carolina to Nevada and from Montana to Mexico and from simple seeding techniques to more complex vegetation establishment on acid mine drainage, tailings piles, sodic and saline sites, and other phytotoxic environments. Our areas of focus are in New Mexico, Colorado, Arizona, Wyoming, Utah, and Montana, although we have provided revegetation services in many states throughout the USA.

Please contact me if you have any questions or need more information. After talking to you today, I decided to go ahead and add some paragraphs to further describe the procedures rather than just submit a table with pricing. Techniques are thereby described in more detail, minimizing the potential for future misinterpretation of information we have provided.

Sincerely,

Ron Schreibeis
Vice President
Rocky Mountain Reclamation

Enc.: Price Estimates for Revegetation Services for Bonding and Engineer's Estimates

PHELPS DODGE CORPORATION
TYRONE MINE
SILVER CITY, NEW MEXICO

PRICE ESTIMATES FOR REVEGETATION SERVICES FOR BONDING AND ENGINEER'S ESTIMATES

June, 2007

Prepared June 15, 2007 by:

ROCKY MOUNTAIN RECLAMATION
P.O. Box 1695
Laramie, Wyoming 82073

307-745-5235
(Fax 307-745-5230)

PHELPS DODGE
TYRONE MINE
SILVER CITY, NEW MEXICO

PRICE ESTIMATES FOR REVEGETATION SERVICES FOR BONDING AND ENGINEER'S ESTIMATES

June, 2007

In the following price estimates table, Rocky Mountain Reclamation has priced providing all labor, supervision, and equipment necessary to perform reclamation and revegetation services as described. Large acreages are assumed to be reclaimed each season.

GENERAL APPROACH

General Approach: Rocky Mountain Reclamation specializes in revegetation of drastically disturbed lands and our focus and expertise are in our abilities to revegetate disturbed lands utilizing a wide range of techniques and equipment.

Task and Safety Training: All operators for Rocky Mountain Reclamation are MSHA trained and certified annually. We have our own in-house task and safety training. Most of our operators have the 40 hour HazMat training and several are certified as HazMat Superintendents. Most operators are also certified for confined spaces.

Company Background: Rocky Mountain Reclamation is the largest revegetation and environmental consulting company in the state of Wyoming and one of the largest in the Rocky Mountain area. We have been providing environmental consulting, reclamation planning, vegetation bond release studies, and reclamation, erosion control, and revegetation services to the mining industry for over 25 years.

Specialty Equipment: Rocky Mountain Reclamation is well equipped with a full line of revegetation and erosion control equipment. Most of our equipment has been designed and engineered specifically for severe reclamation/revegetation conditions. Many years of experience and modifications to existing equipment allow us to provide superior equipment and personnel, both specializing is revegetation of disturbed areas exhibiting more difficult than average conditions. Rocky Mountain Reclamation specializes in revegetation of unique and difficult sites and has the personnel with the knowledge and experience to know what works and how to make it work.

RECLAMATION TECHNIQUES

A number of different reclamation steps are generally required to adequately reseed mine sites.

The procedures we have priced for you and which are most frequently utilized on successful revegetation projects, based on past experience with mine soils and ground conditions, include: (1) scarifying, (2) discing, (3) drill seeding, (4) hay mulching, and (5) crimping for most areas. Other successful techniques are available and can be more appropriate under certain situations.

Scarifying loosens the subsoil and roughens the soil surface and can help key in topsoil. Our custom designed and built reclamation discs are specially designed to emphasize the surface roughness coefficient while preparing a mellow seedbed for drill seeding. Rocky Mountain Reclamation utilizes Rangeland drills capable of applying different types of seed including small and fluffy seed. Hay mulching is used to mitigate erosion potential, reduce rainfall surface compaction, enhance moisture perculation,

provide protection and shade for germinating seedlings, mitigate extreme soil temperatures, and provide many other beneficial uses.

Seedbed preparation: Scarifying to an 8 to 12 inch depth, followed immediately by discing to an approximate 6 to 8 inch depth (or as requested) are often the primary techniques utilized for seedbed preparation. These operations should be completed on the contour for sloping areas and perpendicular to the prevailing winds for the larger, flat areas.

Rocky Mountain Reclamation utilizes special equipment, custom designed and built specifically for reclamation and revegetation of mines and similar disturbances in the western United States.

Seeding: Drill seeding should be accomplished on the contour. Rocky Mountain Reclamation utilizes a modified rangeland drill with depth control bands, packer wheels, agitators and augers, picker wheels, and a chain or similar to cover exposed seed.

Seed Mixtures: The Seed Mixture is assumed in the pricing to be provided by Rocky Mountain Reclamation. Species composition may vary, depending on seed availability and prices may vary, depending on market conditions.

Fertilizing: No fertilizing is requested.

Hay Mulching: The hay mulch should be uniformly spread over the designated areas at the rate of 2.0 tons per acre.

Long-stem, native, noxious weed-free grass hay mulch should be utilized for this project. Native hay mulch will be provided Rocky Mountain Reclamation. We often utilize a special mulch consisting primarily of species not competitive in the desert southwest upland dryland environment. Smooth brome, timothy, orchard grass, crested wheatgrass, intermediate wheatgrass, and other introduced species are not in this hay. To minimize potential competition problems from non-native species, Rocky Mountain Reclamation utilizes special native hay that does not provide unwanted competition with the species in the seed mixture.

The mulch material will be spread with leading edge, technologically advanced mulching equipment specially designed for mulching operations and will not pulverize or excessively break down the original size of the individual stems of the mulch. Tub grinders and similar machines are considered unacceptable and should not be utilized.

Crimping: After the mulch has been spread, it should be anchored in the soil by means of straight coulter discs as part of a special mulch crimping implement. Lightweight discs and implements that disc the mulch into the soil rather than crimp are considered unacceptable and will not be used. The mulch will generally be pushed into the topsoil material three or four inches by coulters aligned parallel to the movement of the implement. These implements will have spacing of approximately 6.0 between coulters. Crimping operations should be done, to the extent possible, on the contour on slopes and perpendicular to the prevailing winds on flat areas. Crimping depth will be dependent on soil physical characteristics, moisture content, and degree of traffic over the surface following discing and seedbed preparation.

Crimping should immediately follow mulching operations to eliminate the occurrence of wind blowing the mulch prior to crimping.

Hay Mulch: Rocky Mountain Reclamation will be able to provide native grass hay mulch for this project if we can contract with your company before known mulch material is sold to others. Please note that our hay mulch will be certified noxious weed free. The hay mulch will be comprised of native species and will not contain introduced dryland or tame meadow species.

General: Work will be performed on the contour where possible and as requested by your personnel. Acreage's can be determined utilizing our drill acre meter (or as measured by your survey crew prior to seeding if you so desire). We recommend viewing the calibration process to verify accuracy of the drill acre meter.

Project Completion Schedule: Rocky Mountain Reclamation plans to coordinate revegetation activities with your company.

We offer your company the opportunity to have the largest reclamation / revegetation fleet of four-wheel drive reclamation tractors in the western United States available for your mine. Our ability to provide this equipment during the short seeding seasons can be a significant advantage to you.

ROCKY MOUNTAIN RECLAMATION

PHELPS DODGE - TYRONE MINE
PRICE ESTIMATES FOR REVEGETATION SERVICES FOR
BONDING AND ENGINEER'S ESTIMATES

Table 1 -Phelps Dodge, Tyrone Mine, Silver City, New Mexico -Price Estimates for Revegetation Services for Bonding and Engineer's Estimates, prepared June 15, 2007.

	REVEGETATION OPERATION	ESTIMATED QUANTITY	UNITS	2007 Prices/Unit	TOTAL COST
I.	**OPERATIONS:**				
1	**SCARIFYING**	1000	Acres	$77.50	$77,500.00
2	**DISCING**	1000	Acres	$55.00	$55,000.00
3	**DRILL SEEDING (special Rangeland Drill)**	1000	Acres	$103.00	$103,000.00
4	**MULCHING**	1000	Acres	$115.00	$115,000.00
5	**CRIMPING**	1000	Acres	$44.00	$44,000.00
6	**MOBILIZATION**	3	Each	$4,750.00	$14,250.00
	Subtotal				**$408,750.00**
II.	**MATERIALS:**				
1	**SEED** at 8.9 PLS/acre	1000	Acres	$190.00	$190,000.00
3	**HAY MULCH** -(fuel at $3.00)	2200	Tons	$195.00	$429,000.00
	Subtotal				**$619,000.00**
	TOTAL ESTIMATED REVEGETATION COST BEFORE TAX				**$1,027,750.00**
	New Mexico Gross Receipts Tax	0	%		**$0.00**
	ESTIMATED REVEGETATION COST PER ACRE:			**$1,027.75**	
	TOTAL ESTIMATED REVEGETATION COST				**$1,027,750.00**
III.	**OPTIONAL:**				
1	**TACKIYING*** (incl. installation only)	$227.00		$275.00	
2	**TACKIFIER MATERIALS**	??		$450.00	
3	**TACKIFIER EQUIP. MOBILIZATION**	$2,425.00		$3,300.00	
	NOTE: New Mexico Gross Receipts Taxes are NOT included in the above prices.				

Appendix E-05
Unit Costs
(RS Means)

$136.95 per copy (in United States).
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0167

RSMeans

Heavy Construction Cost Data

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	02 41 13.34 Selective Demolition, Utility Materials	Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**SELECTIVE DEMOLITION, UTILITY MATERIALS** R024119-10									
0020	See other utility items in 02 41 13.33 0010									
0100	Fire Hydrant extensions	B-20	14	1.714	Ea.		55.50		55.50	86.50
0200	Precast Utility boxes up to 8'x14'x7'	B-13	2	28			880	370	1,250	1,750
0300	Handholes and meter pits	B-6	2	12			375	122	497	715
0400	Utility valves 4"-12"	B-20	4	6			195		195	305
0500	14"-24"	B-21	2	14			470	82	552	815
	02 41 13.36 Selective Demolition, Utility Valves and Accessories									
0010	**SELECTIVE DEMOLITION, UTILITY VALVES & ACCESSORIES**									
0015	Excludes excavation									
0100	Utility valves 4"-12" dia	B-20	4	6	Ea.		195		195	305
0200	14"-24" dia	B-21	2	14			470	82	552	815
0300	Crosses 4"-12"	B-20	8	3			97.50		97.50	152
0400	14"-24"	B-21	4	7			235	41	276	410
0500	Utility cut-in valves 4"-12" dia	B-20	20	1.200			39		39	60.50
0600	Curb boxes	"	20	1.200			39		39	60.50
	02 41 13.38 Selective Demo., Water & Sewer Piping & Fittings									
0010	**SELECTIVE DEMOLITION, WATER & SEWER PIPING AND FITTINGS**									
0015	Excludes excavation									
0020	See other utility items in 02 41 13.33									
0090	Concrete pipe 4"-10" diameter	B-6	250	.096	L.F.		3.02	.97	3.99	5.70
0100	42"-48" diameter	B-13B	96	.583			18.30	11.05	29.35	40
0200	60"-84" diameter	"	80	.700			22	13.25	35.25	48.50
0300	96" diameter	B-13C	80	.700			22	21.50	43.50	57.50
0400	108"-144" diameter	"	64	.875			27.50	27	54.50	72
0450	Concrete fittings 12" diameter	B-6	24	1	Ea.		31.50	10.15	41.65	59.50
0480	Concrete end pieces 12" diameter		200	.120	L.F.		3.77	1.22	4.99	7.15
0485	15" diameter		150	.160			5.05	1.62	6.67	9.55
0490	18" diameter		150	.160			5.05	1.62	6.67	9.55
0500	24" -36" diameter		100	.240			7.55	2.43	9.98	14.30
0600	Concrete fittings 24"-36" diameter		12	2	Ea.		63	20.50	83.50	119
0700	48"-84" diameter	B-13B	12	4.667			146	88.50	234.50	320
0800	96" diameter	"	8	7			219	133	352	485
0900	108"-144" diameter	B-13C	4	14			440	430	870	1,150
1000	Ductile iron pipe 4" diameter	B-21B	200	.200	L.F.		6.25	3.62	9.87	13.70
1100	6"-12" diameter		175	.229			7.15	4.14	11.29	15.60
1200	14"-24" diameter		120	.333			10.45	6.05	16.50	23
1300	Ductile iron fittings 4"-12" diametrer		24	1.667	Ea.		52.50	30	82.50	114
1400	14"-16" diameter		18	2.222			69.50	40	109.50	152
1500	18"-24" diameter		12	3.333			105	60.50	165.50	228
1600	Plastic pipe 3/4"-4" diameter	B-20	700	.034	L.F.		1.11		1.11	1.74
1700	6"-8" diameter		500	.048			1.56		1.56	2.43
1800	10"-18" diameter		300	.080			2.60		2.60	4.05
1900	20"-36" diameter		200	.120			3.90		3.90	6.05
1910	42"-48" diameter		180	.133			4.33		4.33	6.75
1920	54"-60" diameter		160	.150			4.88		4.88	7.60
2000	Plastic fittings 4"- 8" diameter	B-6	75	.320	Ea.		10.05	3.24	13.29	19
2100	10"-14" diameter		50	.480			15.10	4.87	19.97	28.50
2200	16"-24" diameter		20	1.200			37.50	12.15	49.65	71.50
2210	30"-36" diameter		15	1.600			50.50	16.20	66.70	95.50
2220	42 "- 48" diameter		12	2			63	20.50	83.50	119
2300	Copper pipe 3/4"-2" diameter	Q-1	500	.032	L.F.		1.29		1.29	1.94

	02 41 13.78 Selective Demolition, Radio Towers	Crew	Daily Output	Labor-Hours	Unit	Material	2007 Bare Costs Labor	Equipment	Total	Total Incl O&P
0600	400′	K-2	.30	80	Ea.		3,025	620	3,645	5,950
0700	Self supported, 60′		.90	26.667			1,000	206	1,206	1,975
0800	120′		.80	30			1,125	232	1,357	2,225
0900	190′		.40	60			2,275	465	2,740	4,450
	02 41 13.80 Selective Demolition, Utility Poles and Cross Arms									
0010	**SELECTIVE DEMOLITION, UTILITY POLES & CROSS ARMS**									
0100	Utility poles, wood, 20′ - 30′ high	R-3	6	3.333	Ea.		144	27	171	245
0200	35′ - 45′ high	"	5	4			173	32.50	205.50	294
0300	Cross arms, wood,4′ - 6′ long	1 Elec	5	1.600			70		70	105
	02 41 13.82 Selective Removal, Pavement Lines and Markings									
0010	**SELECTIVE REMOVAL, PAVEMENT LINES & MARKINGS**									
0015	Does not include traffic control costs									
0020	See other items in 32 17 33.13									
0100	Remove painted traffic lines and markings permanent	B-78A	500	.016	C.L.F.		.59	1.72	2.31	2.78
0200	Temporary traffic line tape	2 Clab	1500	.011	L.F.		.31		.31	.48
0300	Thermoplastic traffic lines and markings	B-79A	500	.024	C.L.F.		.88	2.54	3.42	4.12
0400	Painted pavement markings	B-78B	500	.036	S.F.		1.07	.54	1.61	2.24
	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.		.77		.77	1.19
0200	Tree grates	"	50	.160	Ea.		4.60		4.60	7.15
0300	Walks, limestone pavers	2 Clab	150	.107	S.F.		3.07		3.07	4.71
0400	Redwood sections		600	.027			.77		.77	1.19
0500	Redwood planks		480	.033			.96		.96	1.49
0600	Shale paver		300	.053			1.53		1.53	2.39
0700	Tile thinset paver		675	.024			.68		.68	1.06
0800	Wood round	B-1	350	.069	Ea.		2.02		2.02	3.14
0900	Asphalt block	2 Clab	450	.036	S.F.		1.02		1.02	1.59
1000	Bluestone		450	.036			1.02		1.02	1.59
1100	Slate, 1" or thinner		675	.024			.68		.68	1.06
1200	Granite blocks		300	.053			1.53		1.53	2.39
1300	Precast patio blocks		450	.036			1.02		1.02	1.59
1400	Planter blocks		600	.027			.77		.77	1.19
1500	Brick paving, dry set		300	.053			1.53		1.53	2.39
1600	Mortar set		180	.089			2.56		2.56	3.98
1700	Dry set on edge		240	.067			1.92		1.92	2.98
1800	Steps, brick		200	.080	L.F.		2.30		2.30	3.58
1900	Railroad tie		150	.107			3.07		3.07	4.77
2000	Bluestone		180	.089			2.56		2.56	3.98
2100	Wood/steel edging for steps		1000	.016			.46		.46	.72
2200	Timber or railroad tie edging for steps		400	.040			1.15		1.15	1.79
	02 41 13.86 Selective Demolition, Athletic Surfaces									
0010	**SELECTIVE DEMOLITION, ATHLETIC SURFACES**									
0100	Synthetic grass	2 Clab	2000	.008	S.F.		.23		.23	.36
0200	Surface coat latex rubber	"	2000	.008	"		.23		.23	.36
0300	Tennis court posts	B-11C	16	1	Ea.		33.50	15.20	48.70	68.50
	02 41 13.88 Selective Demolition, Lawn Sprinkler Systems									
0010	**SELECTIVE DEMOLITION, LAWN SPRINKLER SYSTEMS**									
0100	Golf course sprinkler system, 9 hole	4 Skwk	.10	320	Ea.		12,200		12,200	18,900
0200	Sprinkler system, 24′ diam. @ 15′ O.C., per head	B-20	110	.218	Head		7.10		7.10	11.05
0300	60′ diam. @ 24′ O.C., per head	"	52	.462	"		15		15	23.50

02 41 Demolition

02 41 13 – Selective Site Demolition

	02 41 13.88 Selective Demolition, Lawn Sprinkler Systems	Crew	Daily Output	Labor-Hours	Unit	Material	2007 Bare Costs Labor	Equipment	Total	Total Incl O&P
0400	Sprinkler heads, plastic	2 Skwk	150	.107	Ea.		4.05		4.05	6.30
0500	Impact circle pattern, 28-76' diam.		75	.213			8.10		8.10	12.60
0600	Pop-up, 42'-76' diam.		50	.320			12.15		12.15	18.95
0700	39'-99' diameter		50	.320			12.15		12.15	18.95
0800	Sprinkler valves		40	.400			15.20		15.20	23.50
0900	Valve boxes		40	.400			15.20		15.20	23.50
1000	Controls		2	8			305		305	475
1100	Backflow preventer		4	4			152		152	237
1200	Vacuum breaker		4	4			152		152	237
	02 41 13.90 Selective Demolition, Retaining Walls									
0010	**SELECTIVE DEMOLITION, RETAINING WALLS**									
0020	See other retaining wall items in 02 41 13.33									
0100	Concrete retaining wall, 6' high, no reinforcing	B-9	12.70	3.150	L.F.		92	14.15	106.15	159
0200	8' high		10	4			117	18	135	202
0300	10' high		7.80	5.128			149	23	172	259
0400	With reinforcing, 6' high		11.50	3.478			101	15.65	116.65	175
0500	8' high		9	4.444			130	20	150	224
0600	10' high		7	5.714			167	25.50	192.50	287
0700	20' high		4	10			292	45	337	505
0800	Concrete cribbing, 12' high, open/closed face		126	.317	S.F.		9.25	1.43	10.68	15.95
0900	Interlocking segmental retaining wall	B-62	800	.030			.94	.15	1.09	1.62
1000	Wall caps	"	600	.040			1.26	.20	1.46	2.15
1100	Metal bin retaining wall, 10' wide, 4-12' high	B-13	1200	.047			1.46	.62	2.08	2.93
1200	10' wide, 16-28' high		1000	.056			1.76	.74	2.50	3.51
1300	Stone gabions, 6' x 3' x 1', stone filled		170	.329	Ea.		10.35	4.35	14.70	20.50
1400	6' x 3' x 1'-6"		75	.747			23.50	9.85	33.35	47
1500	6' x 3' x 3'		25	2.240			70	29.50	99.50	141
1600	9' x 3' x 1'		75	.747			23.50	9.85	33.35	47
1700	9' x 3' x 1'-6"		33	1.697			53	22.50	75.50	107
1800	9' x 3' x 3'		12	4.667			146	61.50	207.50	293
1900	12' x 3' x 1'		42	1.333			42	17.60	59.60	84
2000	12' x 3' x 1'-6"		20	2.800			88	37	125	176
2100	12' x 3' x 3'		6	9.333			293	123	416	585
	02 41 13.92 Selective Demolition, Parking Appurtenances									
0010	**SELECTIVE DEMOLITION, PARKING APPURTENANCES**									
0100	Bumper rails, garage, 6" wide	B-6	300	.080	L.F.		2.52	.81	3.33	4.76
0200	12" channel rail		300	.080			2.52	.81	3.33	4.76
0300	Parking bumper, timber		1000	.024			.75	.24	.99	1.43
0400	Folding, with locks	B-1	100	.240	Ea.		7.05		7.05	11
0500	Flexible fixed garage stanchion	B-6	150	.160			5.05	1.62	6.67	9.55
0600	Wheel stops, precast concrete		120	.200			6.30	2.03	8.33	11.90
0700	Thermoplastic		120	.200			6.30	2.03	8.33	11.90
0800	Pipe bollards, 6" - 12" dia		80	.300			9.45	3.04	12.49	17.85

02 41 16 – Structure Demolition

02 41 16.13 Building Demolition

0010	**BUILDING DEMOLITION** Large urban projects, incl. 20 mi. haul R024119-10									
0011	No foundation or dump fees, C.F. is vol. of building standing									
0012	Steel	B-8	21500	.003	C.F.		.10	.12	.22	.28
0050	Concrete		15300	.004			.13	.17	.30	.40
0080	Masonry		20100	.003			.10	.13	.23	.30
0100	Mixture of types, average		20100	.003			.10	.13	.23	.30
0500	Small bldgs, or single bldgs, no salvage included, steel	B-3	14800	.003			.10	.13	.23	.29

02 41 Demolition

02 41 16 – Structure Demolition

			Crew	Daily Output	Labor-Hours	Unit	Material	2007 Bare Costs Labor	Equipment	Total	Total Incl O&P
02 41 16.13 Building Demolition											
0600	Concrete		B-3	11300	.004	C.F.		.13	.17	.30	.38
0650	Masonry			14800	.003			.10	.13	.23	.29
0700	Wood			14800	.003			.10	.13	.23	.29
1000	Single family, one story house, wood, minimum					Ea.				3,200	3,520
1020	Maximum									5,500	6,050
1200	Two family, two story house, wood, minimum									4,200	4,620
1220	Maximum									8,000	8,800
1300	Three family, three story house, wood, minimum									5,500	6,050
1320	Maximum									9,700	10,670
5000	For buildings with no interior walls, deduct									50%	
02 41 16.15 Explosive/Implosive Demolition											
0010	**EXPLOSIVE/IMPLOSIVE DEMOLITION** Large projects,	R024119-10									
0020	no disposal fee based on building volume, steel building		B-5B	16900	.003	C.F.		.10	.13	.23	.29
0100	Concrete building			16900	.003			.10	.13	.23	.29
0200	Masonry building			16900	.003			.10	.13	.23	.29
0400	Disposal of material, minimum		B-3	445	.108	C.Y.		3.34	4.26	7.60	9.85
0500	Maximum		"	365	.132	"		4.07	5.20	9.27	12
02 41 16.17 Bldg. Footings and Foundations Demolition											
0010	**BLDG. FOOTINGS AND FOUNDATIONS DEMOLITION**	R024119-10									
0200	Floors, concrete slab on grade,										
0240	4" thick, plain concrete		B-9C	500	.080	S.F.		2.33	.36	2.69	4.03
0280	Reinforced, wire mesh			470	.085			2.48	.38	2.86	4.28
0300	Rods			400	.100			2.92	.45	3.37	5.05
0400	6" thick, plain concrete			375	.107			3.11	.48	3.59	5.35
0420	Reinforced, wire mesh			340	.118			3.43	.53	3.96	5.95
0440	Rods			300	.133			3.89	.60	4.49	6.70
1000	Footings, concrete, 1' thick, 2' wide		B-5	300	.187	L.F.		5.95	3.38	9.33	12.85
1080	1'-6" thick, 2' wide			250	.224			7.10	4.06	11.16	15.40
1120	3' wide			200	.280			8.90	5.05	13.95	19.30
1140	2' thick, 3' wide			175	.320			10.15	5.80	15.95	22
1200	Average reinforcing, add									10%	10%
1220	Heavy reinforcing, add									20%	20%
2000	Walls, block, 4" thick		1 Clab	180	.044	S.F.		1.28		1.28	1.99
2040	6" thick			170	.047			1.35		1.35	2.11
2080	8" thick			150	.053			1.53		1.53	2.39
2100	12" thick			150	.053			1.53		1.53	2.39
2200	For horizontal reinforcing, add									10%	10%
2220	For vertical reinforcing, add									20%	20%
2400	Concrete, plain concrete, 6" thick		B-9	160	.250			7.30	1.13	8.43	12.60
2420	8" thick			140	.286			8.35	1.29	9.64	14.35
2440	10" thick			120	.333			9.70	1.50	11.20	16.80
2500	12" thick			100	.400			11.65	1.80	13.45	20
2600	For average reinforcing, add									10%	10%
2620	For heavy reinforcing, add									20%	20%
4000	For congested sites or small quantities, add up to									200%	200%
4200	Add for disposal, on site		B-11A	232	.069	C.Y.		2.32	4.26	6.58	8.25
4250	To five miles		B-30	220	.109	"		3.55	8.35	11.90	14.60
02 41 16.33 Bridge Demolition											
0010	**BRIDGE DEMOLITION**										
0100	Bridges, pedestrian, precast, 60'-150' long		B-21C	250	.224	S.F.		7	6.85	13.85	18.35
0200	Steel, 50'-160' long, 8-10' wide		"	500	.112			3.51	3.42	6.93	9.15
0300	Laminated wood, 80' - 130' long		C-12	300	.160			5.80	2.41	8.21	11.60

10 14 Signage

10 14 53 – Traffic Signage

10 14 53.20 Traffic Signs

		Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**TRAFFIC SIGNS**	B-80	70	.457	Ea.	59.50	14.30	8	81.80	96.50
0012	Stock, 24" x 24", no posts, .080" alum. reflectorized		70	.457		59.50	14.30	8	81.80	96.50
0100	High intensity		70	.457		121	14.30	8	143.30	164
0300	30" x 30", reflectorized		70	.457		121	14.30	8	143.30	164
0400	High intensity		70	.457		38.50	14.30	8	60.80	73.50
0600	Guide and directional signs, 12" x 18", reflectorized		70	.457		37	14.30	8	59.30	71.50
0700	High intensity		70	.457		43	14.30	8	65.30	78.50
0900	18" x 24", stock signs, reflectorized		70	.457		43	14.30	8	65.30	78.50
1000	High intensity		70	.457		53.50	14.30	8	75.80	90
1200	24" x 24", stock signs, reflectorized		70	.457		53.50	14.30	8	75.80	90
1300	High intensity		200	.160		19.30	5	2.80	27.10	32
1500	Add to above for steel posts, galvanized, 10'-0" upright, bolted		140	.229		25.50	7.15	4	36.65	43.50
1600	12'-0" upright, bolted		350	.091	S.F.	24.50	2.86	1.60	28.96	33
1800	Highway road signs, aluminum, over 20 S. F., reflectorized		350	.091		24.50	2.86	1.60	28.96	33
2000	High intensity		165	.194		24.50	6.05	3.40	33.95	40
2200	Highway, suspended over road, 80 S.F. min., reflectorized		165	.194		24.50	6.05	3.40	33.95	40
2300	High intensity		500	.064	Ea.	24.50	2	1.12	27.62	31.50
2350	Roadway delineators and reference markers		500	.064		7.80	2	1.12	10.92	12.90
2360	Delineator post only, 6'								24,600	26,800
2400	Highway sign bridge structure, 45' to 80'								20%	
2410	Cantilever structure, add									
5000	Removal of signs, including supports	B-80B	16	2	Ea.		61.50	17	78.50	114
5020	To 10 S.F.	"	5	6.400			197	54.50	251.50	365
5030	11 S.F. to 20 S.F.	B-14	1.80	26.667			810	135	945	1,400
5040	21 S.F. to 40 S.F.	B-13	1.30	43.077			1,350	570	1,920	2,700
5050	41 S.F. to 100 S.F.									
5200	Remove and relocate signs, including supports	B-80B	5	6.400	Ea.	291	197	54.50	542.50	685
5210	Remove and relocate signs, to 10 S.F.	"	1.70	18.824		650	580	160	1,390	1,775
5220	11 S.F. to 20 S.F.	B-14	.56	85.714		685	2,600	435	3,720	5,250
5230	21 S.F. to 40 S.F.	B-13	.32	175		1,125	5,475	2,300	8,900	12,200
5240	41 S.F. to 100 S.F.	B-6	100	.240			7.55	2.43	9.98	14.30
5300	Remove traffic posts to 12'-0" high									
8000	For temporary barricades and lights, see div. 01 56 23.10									

13 31 Fabric Structures

13 31 23 – Tensioned Fabric Structures

	13 31 23.50 Tension Structures	Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**TENSION STRUCTURES** Rigid steel/alum. frame, vyl. coated poly									
0100	fabric shell, 60' clear span, not incl. foundations or floors									
0200	6,000 S.F.	B-41	1000	.044	SF Flr.	11.55	1.31	.25	13.11	15
0300	12,000 S.F.		1100	.040		10.10	1.19	.23	11.52	13.25
0400	80' clear span, 20,800 S.F.		1220	.036		10.30	1.08	.20	11.58	13.25
0410	100' clear span, 10,000 S.F.	L-5	2175	.026		11.50	1.07	.34	12.91	14.90
0430	26,000 S.F.		2300	.024		10.50	1.01	.32	11.83	13.70
0450	36,000 S.F.		2500	.022		10.25	.93	.30	11.48	13.25
0460	120' clear span, 24,000 S.F.		3000	.019		12.40	.77	.25	13.42	15.30
0470	150' clear span, 30,000 S.F.		6000	.009		12.85	.39	.12	13.36	14.90
0480	200' clear span, 40,000 S.F.	E-6	8000	.016		15.65	.65	.23	16.53	18.60
0500	For roll-up door, 12' x 14', add	L-2	1	16	Ea.	4,450	510		4,960	5,700
0600	For personnel doors, add, minimum				SF Flr.	5%				
0700	Add, maximum					15%				
0800	For site work, simple foundation, etc., add, minimum								1.25	1.95
0900	Add, maximum								2.75	3.05

13 34 Fabricated Engineered Structures

13 34 16 – Grandstands and Bleachers

13 34 16.53 Bleachers

0010	**BLEACHERS**									
0020	Bleachers, outdoor, portable, 3 to 5 tiers, to 300' long, min	2 Sswk	120	.133	Seat	39.50	5.50		45	53
0100	Maximum, less than 15' long, prefabricated		80	.200		51.50	8.25		59.75	71.50
0200	6 to 20 tiers, minimum, up to 300' long		120	.133		47	5.50		52.50	62
0300	Max., under 15', (highly prefabricated, on wheels)		80	.200		68.50	8.25		76.75	90
0500	Permanent grandstands, wood seat, steel frame, 24" row									
0600	3 to 15 tiers, minimum	2 Sswk	60	.267	Seat	117	11.05		128.05	149
0700	Maximum		48	.333		128	13.80		141.80	166
0900	16 to 30 tiers, minimum		60	.267		135	11.05		146.05	168
0950	Average		55	.291		169	12.05		181.05	207
1000	Maximum		48	.333		202	13.80		215.80	248
1200	Seat backs only, 30" row, fiberglass		160	.100		25.50	4.14		29.64	35.50
1300	Steel and wood		160	.100		29.50	4.14		33.64	40
1400	NOTE: average seating is 1.5' in width									

13 34 19 – Metal Building Systems

13 34 19.50 Pre-Engineered Steel Buildings

0010	**PRE-ENGINEERED STEEL BUILDINGS**									
0100	Clear span rigid frame, 26 ga. colored roofing and siding									
0150	20 wide, 10' eave height	E-2	425	.132	SF Flr.	7.85	5.30	3.64	16.79	22
0160	14' eave height		350	.160		8.30	6.45	4.42	19.17	25
0170	16' eave height		320	.175		8.75	7.05	4.84	20.64	27
0180	20' eave height		275	.204		9.65	8.20	5.65	23.50	31
0190	24' eave height		240	.233		11	9.40	6.45	26.85	35.50
0200	30' to 40' wide, 10' eave height		535	.105		6.50	4.22	2.89	13.61	17.65
0300	14' eave height		450	.124		6.85	5	3.44	15.29	20
0400	16' eave height		415	.135		7.25	5.45	3.73	16.43	21.50
0500	20' eave height		360	.156		7.90	6.30	4.30	18.50	24.50
0600	24' eave height		320	.175		8.90	7.05	4.84	20.79	27.50
0700	50' to 100' wide, 10' eave height		865	.065		5.60	2.61	1.79	10	12.65
0800	14' eave height		770	.073		5.95	2.93	2.01	10.89	13.85

	13 34 19.50 Pre-Engineered Steel Buildings	Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0900	16' eave height	E-2	730	.077	SF Flr.	6.30	3.10	2.12	11.52	14.65
1000	20' eave height		660	.085		6.80	3.42	2.34	12.56	16
1100	24' eave height		605	.093		7.45	3.73	2.56	13.74	17.45
1200	Clear span tapered beam frame, 26 ga. colored roofing/siding									
1300	30' wide, 10' eave height	E-2	535	.105	SF Flr.	7.20	4.22	2.89	14.31	18.40
1400	14' eave height		450	.124		7.90	5	3.44	16.34	21
1500	16' eave height		415	.135		8.50	5.45	3.73	17.68	23
1600	20' eave height		360	.156		9.35	6.30	4.30	19.95	26
1700	40' wide, 10' eave height		600	.093		6.60	3.77	2.58	12.95	16.60
1800	14' eave height		510	.110		7.20	4.43	3.03	14.66	18.90
1900	16' eave height		475	.118		7.50	4.76	3.26	15.52	20
2000	20' eave height		415	.135		8.20	5.45	3.73	17.38	22.50
2100	50' to 80' wide, 10' eave height		770	.073		6.25	2.93	2.01	11.19	14.20
2200	14' eave height		675	.083		6.70	3.35	2.29	12.34	15.65
2300	16' eave height		635	.088		6.95	3.56	2.44	12.95	16.50
2400	20' eave height		565	.099		7.75	4	2.74	14.49	18.50
2500	Single post 2-span frame, 26 ga. colored roofing and siding									
2600	80' wide, 14' eave height	E-2	740	.076	SF Flr.	5.35	3.05	2.09	10.49	13.50
2700	16' eave height		695	.081		5.70	3.25	2.23	11.18	14.40
2800	20' eave height		625	.090		6.25	3.62	2.48	12.35	15.80
2900	24' eave height		570	.098		6.75	3.96	2.71	13.42	17.25
3000	100' wide, 14' eave height		835	.067		5.20	2.71	1.85	9.76	12.50
3100	16' eave height		795	.070		5.15	2.84	1.95	9.94	12.70
3200	20' eave height		730	.077		6	3.10	2.12	11.22	14.30
3300	24' eave height		670	.084		6.50	3.37	2.31	12.18	15.55
3400	120' wide, 14' eave height		870	.064		5.15	2.60	1.78	9.53	12.15
3500	16' eave height		830	.067		5.40	2.72	1.86	9.98	12.65
3600	20' eave height		765	.073		5.85	2.95	2.02	10.82	13.70
3700	24' eave height		705	.079		6.35	3.21	2.19	11.75	14.95
3800	Double post 3-span frame, 26 ga. colored roofing and siding									
3900	150' wide, 14' eave height	E-2	925	.061	SF Flr.	4.46	2.44	1.67	8.57	11
4000	16' eave height		890	.063		4.60	2.54	1.74	8.88	11.35
4100	20' eave height		820	.068		4.89	2.76	1.89	9.54	12.25
4200	24' eave height		765	.073		5.75	2.95	2.02	10.72	13.65
4300	Triple post 4-span frame, 26 ga. colored roofing and siding									
4400	160' wide, 14' eave height	E-2	970	.058	SF Flr.	4.32	2.33	1.60	8.25	10.55
4500	16' eave height		930	.060		4.52	2.43	1.66	8.61	11
4600	20' eave height		870	.064		4.54	2.60	1.78	8.92	11.45
4700	24' eave height		815	.069		5.40	2.77	1.90	10.07	12.85
4800	200' wide, 14' eave height		1030	.054		4.16	2.19	1.50	7.85	10.05
4900	16' eave height		995	.056		4.27	2.27	1.56	8.10	10.35
5000	20' eave height		935	.060		4.63	2.42	1.65	8.70	11.10
5100	24' eave height		885	.063		5.40	2.55	1.75	9.70	12.30
5200	Accessory items: add to the basic building cost above									
5250	Eave overhang, 2' wide, 26 ga., with soffit	E-2	360	.156	L.F.	24	6.30	4.30	34.60	41.50
5300	4' wide, without soffit		300	.187		23	7.55	5.15	35.70	43.50
5350	With soffit		250	.224		32	9.05	6.20	47.25	57.50
5400	6' wide, without soffit		250	.224		30.50	9.05	6.20	45.75	56.50
5450	With soffit		200	.280		40	11.30	7.75	59.05	72
5500	Entrance canopy, incl. frame, 4' x 4'		25	2.240	Ea.	305	90.50	62	457.50	560
5550	4' x 8'		19	2.947	"	415	119	81.50	615.50	750
5600	End wall roof overhang, 4' wide, without soffit		850	.066	L.F.	15.25	2.66	1.82	19.73	23.50
5650	With soffit		500	.112	"	22.50	4.52	3.09	30.11	36

31 23 23 – Fill

	31 23 23.14 Backfill, Structural	Crew	Daily Output	Labor-Hours	Unit	Material	2007 Bare Costs Labor	Equipment	Total	Total Incl O&P
2000	80 H.P., 50' haul, sand & gravel	B-10L	1100	.011	L.C.Y.		.38	.32	.70	.93
2020	Common earth		975	.012			.43	.36	.79	1.06
2040	Clay		850	.014			.50	.42	.92	1.22
2200	150' haul, sand & gravel		550	.022			.77	.65	1.42	1.88
2220	Common earth		490	.024			.86	.72	1.58	2.11
2240	Clay		425	.028			.99	.84	1.83	2.43
2400	300' haul, sand & gravel		370	.032			1.14	.96	2.10	2.78
2420	Common earth		330	.036			1.28	1.08	2.36	3.12
2440	Clay		290	.041			1.46	1.22	2.68	3.56
3000	105 H.P., 50' haul, sand & gravel	B-10W	1350	.009			.31	.37	.68	.88
3020	Common earth		1225	.010			.34	.40	.74	.96
3040	Clay		1100	.011			.38	.45	.83	1.07
3200	150' haul, sand & gravel		670	.018			.63	.74	1.37	1.77
3220	Common earth		610	.020			.69	.81	1.50	1.94
3240	Clay		550	.022			.77	.90	1.67	2.16
3300	300' haul, sand & gravel		465	.026			.91	1.06	1.97	2.55
3320	Common earth		415	.029			1.02	1.19	2.21	2.86
3340	Clay		370	.032			1.14	1.34	2.48	3.20
4000	200 H.P., 50' haul, sand & gravel	B-10B	2500	.005			.17	.40	.57	.69
4020	Common earth		2200	.005			.19	.45	.64	.78
4040	Clay		1950	.006			.22	.51	.73	.89
4200	150' haul, sand & gravel		1225	.010			.34	.81	1.15	1.41
4220	Common earth		1100	.011			.38	.90	1.28	1.57
4240	Clay		975	.012			.43	1.01	1.44	1.78
4400	300' haul, sand & gravel		805	.015			.52	1.23	1.75	2.15
4420	Common earth		735	.016			.57	1.35	1.92	2.35
4440	Clay		660	.018			.64	1.50	2.14	2.62
5000	300 H.P., 50' haul, sand & gravel	B-10M	3170	.004			.13	.41	.54	.65
5020	Common earth		2900	.004			.15	.45	.60	.71
5040	Clay		2700	.004			.16	.48	.64	.77
5200	150' haul, sand & gravel		2200	.005			.19	.59	.78	.94
5220	Common earth		1950	.006			.22	.67	.89	1.06
5240	Clay		1700	.007			.25	.77	1.02	1.22
5400	300' haul, sand & gravel		1500	.008			.28	.87	1.15	1.38
5420	Common earth		1350	.009			.31	.96	1.27	1.54
5440	Clay		1225	.010			.34	1.06	1.40	1.69
6000	For compaction, see div. 31 23 23.23									
6010	For trench backfill, see div. 31 23 16.13 & 31 23 16.14									
	31 23 23.15 Borrow, Loading And/Or Spreading									
0010	**BORROW, LOADING AND/OR SPREADING**									
4000	Common earth, shovel, 1 C.Y. bucket	B-12N	840	.019	B.C.Y.	8.10	.65	1.24	9.99	11.25
4010	1-1/2 C.Y. bucket	B-12O	1135	.014		8.10	.48	.94	9.52	10.65
4020	3 C.Y. bucket	B-12T	1800	.009		8.10	.30	.82	9.22	10.25
4030	Front end loader, wheel mounted									
4050	3/4 C.Y. bucket	B-10R	550	.022	B.C.Y.	8.10	.77	.38	9.25	10.50
4060	1-1/2 C.Y. bucket	B-10S	970	.012		8.10	.44	.29	8.83	9.85
4070	3 C.Y. bucket	B-10T	1575	.008		8.10	.27	.22	8.59	9.55
4080	5 C.Y. bucket	B-10U	2600	.005		8.10	.16	.29	8.55	9.45
5000	Select granular fill, shovel, 1 C.Y. bucket	B-12N	925	.017		9.45	.59	1.13	11.17	12.55
5010	1-1/2 C.Y. bucket	B-12O	1250	.013		9.45	.44	.85	10.74	12
5020	3 C.Y. bucket	B-12T	1980	.008		9.45	.28	.75	10.48	11.65
5030	Front end loader, wheel mounted									

31 36 Gabions

31 36 13 – Gabion Boxes

31 36 13.10 Gabion Boxes		Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**GABION BOXES**									
0400	Gabions, galvanized steel mesh mats or boxes, stone filled, 6" deep	B-13	200	.280	S.Y.	20.50	8.80	3.70	33	40
0500	9" deep		163	.344		31.50	10.75	4.54	46.79	56.50
0600	12" deep		153	.366		33	11.45	4.84	49.29	59.50
0700	18" deep		102	.549		41.50	17.20	7.25	65.95	80.50
0800	36" deep	↓	60	.933	↓	70	29.50	12.35	111.85	136

31 37 Riprap

31 37 13 – Machined Riprap

31 37 13.10 Rip-Rap and Rock Lining

0010	**RIP-RAP AND ROCK LINING,** Random, broken stone									
0100	Machine placed for slope protection	B-126	62	.258	L.C.Y.	25.50	8.85	9.85	44.20	52.50
0110	3/8 to 1/4 C.Y. pieces, grouted	B-13	80	.700	S.Y.	60.50	22	9.25	91.75	111
0200	18" minimum thickness, not grouted	"	53	1.057	"	15.85	33	13.95	62.80	84
0300	Dumped, 50 lb. average	B-11A	800	.020	Ton	23	.67	1.24	24.91	28
0350	100 lb. average		700	.023		33	.77	1.41	35.18	38.50
0370	300 lb. average	↓	600	.027	↓	38.50	.90	1.65	41.05	45

31 41 Shoring

31 41 13 – Timber Shoring

31 41 13.10 Shoring

0010	**SHORING**									
0020	Shoring, existing building, with timber, no salvage allowance	B-51	2.20	21.818	M.B.F.	715	635	64.50	1,414.50	1,850
1000	On cribbing with 35 ton screw jacks, per box and jack	"	3.60	13.333	Jack	52	385	39.50	476.50	700
3100	Masonry openings in walls, see div. 02 41 19.16									

31 41 16 – Sheet Piling

31 41 16.10 Sheet Piling

0010	**SHEET PILING**									
0020	Sheet piling steel, not incl. wales, 22 psf, 15' excav., left in place	B-40	10.81	5.920	Ton	1,000	218	275	1,493	1,750
0100	Drive, extract & salvage		6	10.667		450	395	495	1,340	1,675
0200	20' deep excavation, 27 psf, left in place		12.95	4.942		1,000	182	230	1,412	1,650
0400	Drive, extract & salvage		6.55	9.771		450	360	455	1,265	1,575
0600	25' deep excavation, 38 psf, left in place		19	3.368		1,000	124	157	1,281	1,475
0700	Drive, extract & salvage		10.50	6.095		450	225	284	959	1,150
0900	40' deep excavation, 38 psf, left in place		21.20	3.019		1,000	111	140	1,251	1,425
1000	Drive, extract & salvage		12.25	5.224	↓	450	193	243	886	1,075
1200	15' deep excavation, 22 psf, left in place		983	.065	S.F.	11.75	2.40	3.03	17.18	20
1300	Drive, extract & salvage		545	.117		5.05	4.33	5.45	14.83	18.40
1500	20' deep excavation, 27 psf, left in place		960	.067		14.75	2.46	3.10	20.31	23.50
1600	Drive, extract & salvage		485	.132		6.55	4.87	6.15	17.57	21.50
1800	25' deep excavation, 38 psf, left in place		1000	.064		21.50	2.36	2.98	26.84	31
1900	Drive, extract & salvage	↓	553	.116	↓	8.95	4.27	5.40	18.62	22.50
2100	Rent steel sheet piling and wales, first month				Ton	240			240	264
2200	Per added month					24			24	26.50
2300	Rental piling left in place, add to rental					800			800	880
2500	Wales, connections & struts, 2/3 salvage					245			245	269
2700	High strength piling, 50,000 psi, add					54.50			54.50	60
2800	55,000 psi, add					57.50			57.50	63.50
3000	Tie rod, not upset, 1-1/2" to 4" diameter with turnbuckle				↓	1,775			1,775	1,975

32 06 Schedules for Exterior Improvements

32 06 10 – Schedules for Bases, Ballasts, and Paving

	32 06 10.10 Sidewalks, Driveways and Patios	Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
2160	300' haul	B-62	12	2	C.Y.		63	10.15	73.15	108
2170	Shale paver, 2-1/4" thick	D-1	200	.080	S.F.	2.90	2.67		5.57	7.25
2200	Coarse washed sand bed, 1"	B-62	1350	.018	S.Y.	1.27	.56	.09	1.92	2.36
2250	Stone dust, 4" thick	"	900	.027	"	3.08	.84	.14	4.06	4.83
2300	Tile thinset pavers, 3/8" thick	D-1	300	.053	S.F.	3.18	1.78		4.96	6.20
2350	3/4" thick	"	280	.057	"	5.05	1.91		6.96	8.50
2400	Wood rounds, cypress	B-1	175	.137	Ea.	9.55	4.03		13.58	16.80
8000	For temporary barricades, see div. 01 56 23.10									

32 06 10.20 Steps

0010	**STEPS** Incl. excav., borrow & concrete base, where applicable									
0100	Brick steps	B-24	35	.686	LF Riser	11.15	23		34.15	47.50
0200	Railroad ties	2 Clab	25	.640		3.19	18.40		21.59	32
0300	Bluestone treads, 12" x 2" or 12" x 1-1/2"	B-24	30	.800		25.50	27		52.50	69
0500	Concrete, cast in place, see Division 03 30 53.40									
0600	Precast concrete, see Division 03 41 23.50									

32 11 Base Courses

32 11 23 – Aggregate Base Courses

32 11 23.23 Base Course Drainage Layers

0010	**BASE COURSE DRAINAGE LAYERS**									
0050	Crushed 3/4" stone base, compacted, 3" deep	B-36C	5200	.008	S.Y.	3.09	.27	.56	3.92	4.42
0100	6" deep		5000	.008		6.20	.28	.58	7.06	7.85
0200	9" deep		4600	.009		9.30	.31	.63	10.24	11.35
0300	12" deep		4200	.010		12.40	.33	.69	13.42	14.85
0301	Crushed 1-1/2" stone base, compacted to 4" deep	B-36B	6000	.011		4.81	.36	.55	5.72	6.45
0302	6" deep		5400	.012		7.20	.40	.61	8.21	9.25
0303	8" deep		4500	.014		9.60	.48	.73	10.81	12.15
0304	12" deep		3800	.017		14.45	.57	.87	15.89	17.65
0350	Bank run gravel, spread and compacted									
0370	6" deep	B-32	6000	.005	S.Y.	4.15	.19	.28	4.62	5.15
0390	9" deep		4900	.007		6.25	.24	.35	6.84	7.60
0400	12" deep		4200	.008		8.30	.27	.41	8.98	10
0600	Cold laid asphalt pavement, see div. 32 12 16.19									
1500	Alternate method to figure base course									
1510	Crushed stone, 3/4" , compacted, 3" deep	B-36C	435	.092	E.C.Y.	32	3.23	6.65	41.88	47
1511	6" deep	B-36B	835	.077		32	2.60	3.94	38.54	43.50
1512	9" deep		1150	.056		32	1.89	2.86	36.75	41
1513	12" deep		1400	.046		32	1.55	2.35	35.90	40
1520	Crushed stone, 1-1/2" , compacted 4" deep		665	.096		32	3.27	4.94	40.21	45.50
1521	6" deep		900	.071		32	2.41	3.65	38.06	42.50
1522	8" deep		1000	.064		32	2.17	3.29	37.46	42
1523	12" deep		1265	.051		32	1.72	2.60	36.32	40.50
1530	Gravel, bank run, compacted, 6" deep	B-36C	835	.048		21.50	1.68	3.46	26.64	30
1531	9" deep		1150	.035		21.50	1.22	2.51	25.23	28
1532	12" deep		1400	.029		21.50	1	2.06	24.56	27.50
2010	Crushed stone, 3/4" maximum size, 3" deep	B-36	540	.074	Ton	19.20	2.45	2.28	23.93	27.50
2011	6" deep		1625	.025		19.20	.81	.76	20.77	23
2012	9" deep		1785	.022		19.20	.74	.69	20.63	23
2013	12" deep		1950	.021		19.20	.68	.63	20.51	22.50
2020	Crushed stone, 1-1/2" maximum size, 4" deep		720	.056		19.20	1.83	1.71	22.74	25.50
2021	6" deep		815	.049		19.20	1.62	1.51	22.33	25

32 18 Athletic and Recreational Surfacing

32 18 23 – Athletic Surfacing

	32 18 23.33 Running Track Surfacing	Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**RUNNING TRACK SURFACING**									
0020	Running track, asphalt, incl base, 3" thick	B-37	300	.160	S.Y.	16.60	4.87	.41	21.88	26.50
0100	Surface, latex rubber system, 3/8" thick, black	B-20	125	.192		7.45	6.25		13.70	17.90
0150	Colors		125	.192		13.25	6.25		19.50	24.50
0300	Urethane rubber system, 3/8" thick, black		120	.200		19.90	6.50		26.40	32
0400	Color coating		115	.209		23.50	6.80		30.30	36.50

32 31 Fences and Gates

32 31 13 – Chain Link Fences and Gates

32 31 13.20 Fence, Chain Link Industrial

0010	**FENCE, CHAIN LINK INDUSTRIAL**, schedule 40									
0020	3 strands barb wire, 2" post @ 10' O.C., set in concrete, 6' H									
0200	9 ga. wire, galv. steel	B-80C	240	.100	L.F.	14	2.87	.61	17.48	20.50
0300	Aluminized steel		240	.100		17.95	2.87	.61	21.43	25
0500	6 ga. wire, galv. steel		240	.100		22	2.87	.61	25.48	29
0600	Aluminized steel		240	.100		25	2.87	.61	28.48	32.50
0800	6 ga. wire, 6' high but omit barbed wire, galv. steel		250	.096		21	2.75	.59	24.34	28.50 ←
0900	Aluminized steel		250	.096		29.50	2.75	.59	32.84	37.50
0920	8' H, 6 ga. wire, 2-1/2" line post, galv. steel		180	.133		34	3.82	.82	38.64	44
0940	Aluminized steel		180	.133		41.50	3.82	.82	46.14	52.50
1400	Gate for 6' high fence, 1-5/8" frame, 3' wide, galv. steel		10	2.400	Ea.	154	69	14.75	237.75	293 ←
1500	Aluminized steel		10	2.400	"	190	69	14.75	273.75	330
2000	5'-0" high fence, 9 ga., no barbed wire, 2" line post,									
2010	10' O.C., 1-5/8" top rail									
2100	Galvanized steel	B-80C	300	.080	L.F.	12.20	2.29	.49	14.98	17.50
2200	Aluminized steel		300	.080	"	14.30	2.29	.49	17.08	19.85
2400	Gate, 4' wide, 5' high, 2" frame, galv. steel		10	2.400	Ea.	176	69	14.75	259.75	315
2500	Aluminized steel		10	2.400	"	197	69	14.75	280.75	340
3100	Overhead slide gate, chain link, 6' high, to 18' wide		38	.632	L.F.	155	18.10	3.88	176.98	202
3105	8' high	B-80	30	1.067		155	33.50	18.70	207.20	242
3108	10' high		24	1.333		157	41.50	23.50	222	263
3110	Cantilever type		48	.667		66.50	21	11.65	99.15	118
3120	8' high		24	1.333		96.50	41.50	23.50	161.50	196
3130	10' high		18	1.778		114	55.50	31	200.50	246
5000	Double swing gates, incl. posts & hardware									
5010	5' high, 12' opening	B-80C	3.40	7.059	Opng.	470	202	43.50	715.50	885
5020	20' opening		2.80	8.571		640	246	52.50	938.50	1,150
5060	6' high, 12' opening		3.20	7.500		795	215	46	1,056	1,250
5070	20' opening		2.60	9.231		1,100	265	56.50	1,421.50	1,675 ←
5080	8' high, 12' opening	B-80	2.13	15.002		1,225	470	263	1,958	2,350
5090	20' opening		1.45	22.069		1,625	690	385	2,700	3,250
5100	10' high, 12' opening		1.31	24.427		1,400	765	430	2,595	3,200
5110	20' opening		1.03	31.068		2,100	970	545	3,615	4,425
5120	12' high, 12' opening		1.05	30.476		2,050	950	535	3,535	4,300
5130	20' opening		.85	37.647		2,625	1,175	660	4,460	5,425
5190	For aluminized steel add					20%				
7055	Braces, galv. steel	B-80A	960	.025	L.F.	1.95	.72	.19	2.86	3.48
7056	Aluminized steel	"	960	.025	"	2.34	.72	.19	3.25	3.91

32 31 13.25 Fence, Chain Link Residential

0010	**FENCE, CHAIN LINK RESIDENTIAL**, sch. 20, 11 ga. wire, 1-5/8" post									
0020	10' O.C., 1-3/8" top rail, 2" corner post, galv. stl. 3' high	B-80C	500	.048	L.F.	4.21	1.38	.29	5.88	7.10

32 31 Fences and Gates

32 31 26 – Wire Fences and Gates

32 31 26.20 Wire Fencing, General

		Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0020	Standard, 12-3/4 ga.				M.L.F.	42.50			42.50	46.50
0210	Barbless wire, 2-strand galvanized, 12-1/2 ga.				↓	42.50			42.50	46.50
0500	Helical razor ribbon, stainless steel, 18" dia x 18" spacing				C.L.F.	123			123	135 ←
0600	Hardware cloth galv., 1/4" mesh, 23 ga., 2' wide				C.S.F.	55			55	60.50
0700	3' wide					53.50			53.50	59
0900	1/2" mesh, 19 ga., 2' wide					48.50			48.50	53.50
1000	4' wide					48			48	52.50
1200	Chain link fabric, steel, 2" mesh, 6 ga, galvanized					182			182	201
1300	9 ga, galvanized					90			90	99
1350	Vinyl coated					75.50			75.50	83
1360	Aluminized					117			117	129
1400	2-1/4" mesh, 11.5 ga, galvanized					61			61	67
1600	1-3/4" mesh (tennis courts), 11.5 ga (core), vinyl coated					86			86	95
1700	9 ga, galvanized					77.50			77.50	85.50
2100	Welded wire fabric, galvanized, 1" x 2", 14 ga.					51.50			51.50	57
2200	2" x 4", 12-1/2 ga.				↓	17.60			17.60	19.40

32 31 29 – Wood Fences and Gates

32 31 29.10 Fence, Wood

0010	**FENCE, WOOD** Basket weave, 3/8" x 4" boards, 2" x 4"									
0020	stringers on spreaders, 4" x 4" posts									
0050	No. 1 cedar, 6' high	B-80C	160	.150	L.F.	8.85	4.30	.92	14.07	17.45
0070	Treated pine, 6' high	"	150	.160	"	10.75	4.59	.98	16.32	20
0200	Board fence, 1" x 4" boards, 2" x 4" rails, 4" x 4" post									
0220	Preservative treated, 2 rail, 3' high	B-80C	145	.166	L.F.	6.60	4.75	1.02	12.37	15.70
0240	4' high		135	.178		7.25	5.10	1.09	13.44	17.05
0260	3 rail, 5' high		130	.185		8.15	5.30	1.13	14.58	18.40
0300	6' high		125	.192		9.35	5.50	1.18	16.03	20
0320	No. 2 grade western cedar, 2 rail, 3' high		145	.166		7.20	4.75	1.02	12.97	16.35
0340	4' high		135	.178		8.50	5.10	1.09	14.69	18.45
0360	3 rail, 5' high		130	.185		9.80	5.30	1.13	16.23	20.50
0400	6' high		125	.192		10.75	5.50	1.18	17.43	21.50
0420	No. 1 grade cedar, 2 rail, 3' high		145	.166		10.80	4.75	1.02	16.57	20.50
0440	4' high		135	.178		12.25	5.10	1.09	18.44	22.50
0460	3 rail, 5' high		130	.185		14.20	5.30	1.13	20.63	25
0500	6' high		125	.192		15.80	5.50	1.18	22.48	27.50
0860	Open rail fence, split rails, 2 rail 3' high, no. 1 cedar		160	.150		5.95	4.30	.92	11.17	14.25
0870	No. 2 cedar		160	.150		4.64	4.30	.92	9.86	12.80
0880	3 rail, 4' high, no. 1 cedar		150	.160		8.05	4.59	.98	13.62	17.05
0890	No. 2 cedar		150	.160		5.30	4.59	.98	10.87	14
0920	Rustic rails, 2 rail 3' high, no. 1 cedar		160	.150		3.72	4.30	.92	8.94	11.80
0930	No. 2 cedar		160	.150		3.57	4.30	.92	8.79	11.65
0940	3 rail, 4' high		150	.160		4.99	4.59	.98	10.56	13.70
0950	No. 2 cedar		150	.160		3.77	4.59	.98	9.34	12.35
1240	Stockade fence, no. 1 cedar, 3-1/4" rails, 6' high		160	.150		10.80	4.30	.92	16.02	19.60
1260	8' high		155	.155	↓	14	4.44	.95	19.39	23.50
1270	Gate, 3'-6" wide		9	2.667	Ea.	183	76.50	16.35	275.85	340
1300	No. 2 cedar, treated wood rails, 6' high		160	.150	L.F.	10.80	4.30	.92	16.02	19.60
1320	Gate, 3'-6" wide		8	3	Ea.	63.50	86	18.40	167.90	225
1360	Treated pine, treated rails, 6' high		160	.150	L.F.	10.55	4.30	.92	15.77	19.35
1400	8' high		150	.160	"	15.90	4.59	.98	21.47	25.50
1420	Gate, 3'-6" wide	↓	9	2.667	Ea.	70	76.50	16.35	162.85	214

33 46 Subdrainage

33 46 16 – Subdrainage Piping

	33 46 16.35 Piping, Subdrain., Corr. Plas. Tubing, Perf. or Plain	Crew	Daily Output	Labor-Hours	Unit	2007 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0550	5" diameter	1 Clab	32	.250	Ea.	5.95	7.20		13.15	17.70
0560	6" diameter		32	.250		8	7.20		15.20	20
0580	8" diameter		32	.250		14.80	7.20		22	27.50
0590	Heavy duty highway type, add					10%				
0660	Reducer, 6" to 4"	1 Clab	32	.250		10.25	7.20		17.45	22.50
0680	8" to 6"		32	.250		16.40	7.20		23.60	29.50
0730	"Y" fitting, 3" diameter		27	.296		18	8.50		26.50	33
0740	4" diameter		27	.296		20.50	8.50		29	36.50
0750	5" diameter		27	.296		26	8.50		34.50	42
0760	6" diameter		27	.296		31.50	8.50		40	48
0780	8" diameter		27	.296		38.50	8.50		47	56
0860	Silt sock only for above tubing, 6" dia.				L.F.	.85			.85	.94
0880	8" diameter				"	1.40			1.40	1.54

33 46 26 – Geotextile Subsurface Drainage Filtration

33 46 26.10 Geotextiles for Subsurface Drainage

0010	**GEOTEXTILES FOR SUBSURFACE DRAINAGE**									
0100	Fabric, laid in trench, polypropylene, ideal conditions	2 Clab	2400	.007	S.Y.	1.45	.19		1.64	1.90
0110	Adverse conditions		1600	.010	"	1.45	.29		1.74	2.05
0170	Fabric ply bonded to 3 dimen. nylon mat, .4" thk, ideal conditions		2000	.008	S.F.	.25	.23		.48	.63
0180	Adverse conditions		1200	.013	"	.31	.38		.69	.94
0185	Soil drainage mat on vertical wall, 0.44" thick		265	.060	S.Y.	1.85	1.74		3.59	4.74
0188	0.25" thick		300	.053	"	1.29	1.53		2.82	3.81
0190	0.8" thick, ideal conditions		2400	.007	S.F.	.19	.19		.38	.51
0200	Adverse conditions		1600	.010	"	.31	.29		.60	.79
0300	Drainage material, 3/4" gravel fill in trench	B-6	260	.092	C.Y.	23	2.90	.94	26.84	31
0400	Pea stone	"	260	.092	"	23	2.90	.94	26.84	31

33 47 Ponds and Reservoirs

33 47 13 – Pond and Reservoir Liners

33 47 13.53 Reservoir Liners

0010	**RESERVOIR LINERS**									
1100	30 mil thick	3 Skwk	1850	.013	S.F.	.32	.49		.81	1.12
1200	60 mil thick		1600	.015		.60	.57		1.17	1.55
1300	120 mil thick		1440	.017		1.37	.63		2	2.50

33 49 Storm Drainage Structures

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

33 49 13.10 Storm Drainage Manholes, Frames and Covers

0010	**STORM DRAINAGE MANHOLES, FRAMES & COVERS** not including									
0020	footing, excavation, backfill (See line items for frame & cover)									
0050	Brick, 4' inside diameter, 4' deep	D-1	1	16	Ea.	390	535		925	1,250
0100	6' deep		.70	22.857		545	760		1,305	1,750
0150	8' deep		.50	32		695	1,075		1,770	2,400
0200	For depths over 8', add		4	4	V.L.F.	184	133		317	405
0400	Concrete blocks (radial), 4' I.D., 4' deep		1.50	10.667	Ea.	330	355		685	905
0500	6' deep		1	16		435	535		970	1,300
0600	8' deep		.70	22.857		540	760		1,300	1,750
0700	For depths over 8', add		5.50	2.909	V.L.F.	54	97		151	207
0800	Concrete, cast in place, 4' x 4', 8" thick, 4' deep	C-14H	2	24	Ea.	475	870	10.80	1,355.80	1,875

G1030 Site Earthwork

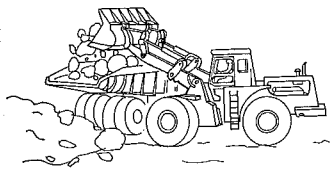
The Loading and Hauling of Common Earth System balances the productivity of loading equipment to hauling equipment. It is assumed that the hauling equipment will encounter light traffic and will move up no considerable grades on the haul route.

The Expanded System Listing shows Loading and Hauling systems that use either a track or wheel front–end loader. Track loaders indicated range from 1-1/2 Cubic Yards capacity to 4-1/2 Cubic Yards capacity. Wheel loaders range from 1-1/2 Cubic Yards to 5 Cubic Yards. Trucks for hauling range from 6 Cubic Yards capacity to 20 Cubic Yards capacity. Each system lists the number of trucks involved and the distance (round trip) that each must travel.

System Components	QUANTITY	UNIT	COST PER C.Y. EQUIP.	LABOR	TOTAL
SYSTEM G1030 140 1000					
LOAD & HAUL COMMON EARTH, 1-1/2 CY LOADER, SIX 6 CY TRUCKS, 1 MRT					
Excavating bulk, F.E. loader track mtd., 1.5 C.Y.	1.000	C.Y.	.49	.85	1.34
1 mile round trip, 3.3 loads/hr	1.000	C.Y.	3.90	3.51	7.41
Spotter at earth fill dump or in cut	.010	Hr.		.45	.45
TOTAL			4.39	4.81	9.20

G1030 140	Load & Haul Common Earth	COST PER C.Y. EQUIP.	LABOR	TOTAL
1000	Load&haul common earth,1-1/2 C.Y. tr. loader,six 6C.Y. trucks,1MRT	4.39	4.81	9.20
1200	Four 12 C.Y. dump trucks, 2 mile round trip	4.60	3.76	8.36
1400	Three 16 C.Y. dump trailers, 2 mile round trip	3.27	3.26	6.53
1600	Four 16 C.Y. dump trailers, 4 mile round trip	4.11	3.89	8
2000	2-1/2 C.Y. track loader, six 12 C.Y. dump trucks, 3 mile round trip	5.05	3.82	8.87
2200	Four 16 C.Y. dump trailers, 2 mile round trip	3.44	2.97	6.41
2400	Five 16 C.Y. dump trailers, 4 mile round trip	4.32	3.63	7.95
2600	Three 20 C.Y. dump trailers, 1 mile round trip	2.60	2.25	4.85
3000	3-1/2 C.Y. track loader, six 12 C.Y. dump trucks, 1 mile round trip	3.54	2.54	6.08
3200	Seven 16 C.Y. dump trailers, 4 mile round trip	4.32	3.51	7.83
3400	Four 20 C.Y. dump trailers, 1 mile round trip	2.64	2.04	4.68
3600	Six 20 C.Y. dump trailers, 4 mile round trip	4.01	3.21	7.22
4000	4-1/2 C.Y. track loader, eight 12 C.Y. dump trucks, 1 mile round trip	3.56	2.36	5.92
4200	Six 16 C.Y. dump trailers, 1 mile round trip	2.94	2.24	5.18
4400	Six 20 C.Y. dump trailers, 2 mile round trip	3.23	2.39	5.62
4600	Eight 20 C.Y. dump trailers, 4 mile round trip	4.03	2.98	7.01
5000	1-1/2 C.Y. wheel loader, eight 6 C.Y. dump trucks, 2 mile round trip	5.45	5.80	11.25
5200	Four 12 C.Y. dump trucks, 1 mile round trip	3.17	2.75	5.92
5400	Six 12 C.Y. dump trucks, 3 mile round trip	4.64	3.82	8.46
5600	Five 16 C.Y. dump trailers, 4 mile round trip	3.91	3.63	7.54
6000	3 C.Y. wheel loader, eight 12 C.Y. dump trucks, 2 mile round trip	4.25	3.15	7.40
6200	Five 16 C.Y. dump trailers, 1 mile round trip	2.37	2.09	4.46
6400	Eight 16 C.Y. dump trailers, 3 mile round trip	3.34	2.89	6.23
6600	Six 20 C.Y. dump trailers, 2 mile round trip	2.59	2.27	4.86
7000	5 C.Y. wheel loader, eight 16 C.Y. dump trailers, 1 mile round trip	2.55	2.09	4.64
7200	Twelve 16 C.Y. dump trailers, 3 mile round trip	3.53	2.82	6.35
7400	Nine 20 C.Y. dump trailers, 2 mile round trip	2.77	2.16	4.93
7600	Twelve 20 C.Y. dump trailers, 4 mile round trip	3.57	2.75	6.32

G1030 Site Earthwork



The Loading and Hauling of Rock System balances the productivity of loading equipment to hauling equipment. It is assumed that the hauling equipment will encounter light traffic and will move up no considerable grades on the haul route.

The Expanded System Listing shows Loading and Hauling systems that use either a track or wheel front-end loader. Track loaders indicated range from 1-1/2 Cubic Yards capacity to 4-1/2 Cubic Yards capacity. Wheel loaders range from 1-1/2 Cubic Yards to 5 Cubic Yards. Trucks for hauling range from 6 Cubic Yards capacity to 20 Cubic Yards capacity. Each system lists the number of trucks involved and the distance (round trip) that each must travel.

System Components	QUANTITY	UNIT	COST PER C.Y. EQUIP.	LABOR	TOTAL
SYSTEM G1030 150 1000					
LOAD & HAUL ROCK, 1-1/2 C.Y. TRACK LOADER, SIX 6 C.Y. TRUCKS, 1 MRT					
Excavating bulk, F.E. loader, track mtd., 1.5 C.Y.	1.000	C.Y.	.64	1.12	1.76
Hauling, earth 6 CY dump truck, 1/4 mile round trip, 5.0 loads/hr.	1.000	C.Y.	2.79	2.51	5.30
Spotter at earth fill dump or in cut	.010	Hr.		.63	.63
TOTAL			3.43	4.26	7.69

G1030 150	Load & Haul Rock	COST PER C.Y. EQUIP.	LABOR	TOTAL
1000	Load & haul rock, 1-1/2 C.Y. track loader, six 6 C.Y.trucks, 1 MRT	3.43	4.26	7.69
1200	Nine 6 C.Y. dump trucks, 3 mile round trip	9	9.40	18.40
1400	Six 12 C.Y. dump trucks, 4 mile round trip	8.35	6.60	14.95
1600	Three 16 C.Y. dump trucks, 2 mile round trip	4.31	4.31	8.62
2000	2-1/2 C.Y. track loader, twelve 6 C.Y. dump trucks, 3 mile round trip	9.20	8.90	18.10
2200	Five 12 C.Y. dump trucks, 1 mile round trip	4.52	3.35	7.87
2400	Eight 12 C.Y. dump trucks, 4 mile round trip	8.55	6.15	14.70
2600	Four 16 C.Y. dump trailers, 2 mile round trip	4.54	3.89	8.43
3000	3-1/2 C.Y. track loader, eight 12 C.Y. dump trucks, 2 mile round trip	6.25	4.34	10.59
3200	Five 16 C.Y. dump trucks, 1 mile round trip	3.75	2.95	6.70
3400	Seven 16 C.Y. dump trailers, 3 mile round trip	5.10	4.12	9.22
3600	Seven 20 C.Y. dump trailers, 4 mile round trip	5.15	4.08	9.23
4000	4-1/2 C.Y. track loader, nine 12 C.Y. dump trucks, 1 mile round trip	4.58	3.03	7.61
4200	Eight 16 C.Y. dump trailers, 2 mile round trip	4.51	3.42	7.93
4400	Eleven 16 C.Y. dump trailers, 4 mile round trip	5.60	4.22	9.82
4600	Seven 20 C.Y. dump trailers, 2 mile round trip	4.11	3.05	7.16
5000	1-1/2 C.Y. wheel loader, nine 6 C.Y. dump trucks, 2 mile round trip	7.15	7.50	14.65
5200	Four 12 C.Y. dump trucks, 1 mile round trip	4.18	3.59	7.77
5400	Seven 12 C.Y. dump trucks, 4 mile round trip	8.15	6.35	14.50
5600	Five 16 C.Y. dump trailers, 4 mile round trip	5.15	4.77	9.92
6000	3 C.Y. wheel loader, eight 12 C.Y. dump trucks, 2 mile round trip	5.60	4.16	9.76
6200	Five 16 C.Y. dump trailers, 1 mile round trip	3.13	2.76	5.89
6400	Seven 16 C.Y. dump trailers, 3 mile round trip	4.44	3.93	8.37
6600	Seven 20 C.Y. dump trailers, 4 mile round trip	4.51	3.89	8.40
7000	5 C.Y. wheel loader, twelve 12 C.Y. dump trucks, 1 mile round trip	4.14	2.83	6.97
7200	Nine 16 C.Y. dump trailers, 1 mile round trip	3.31	2.67	5.98
7400	Eight 20 C.Y. dump trailers, 1 mile round trip	2.97	2.36	5.33
7600	Twelve 20 C.Y. dump trailers, 3 mile round trip	4.16	3.22	7.38

G1030 Site Earthwork

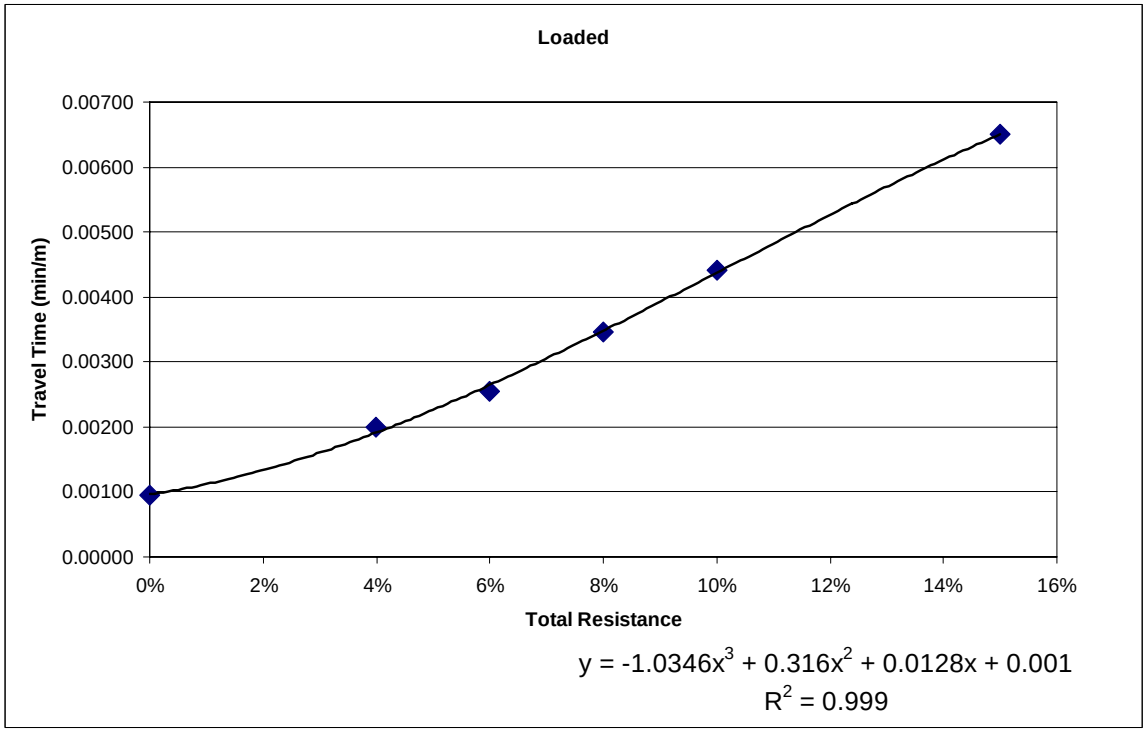
G1030 805	Trenching Common Earth	COST PER L.F.		
		EQUIP.	LABOR	TOTAL
2300	4' wide, 2' deep, 3/8 C.Y. bucket	1.52	3.75	5.27
2310	3' deep, 3/8 C.Y. bucket	2.18	6.20	8.38
2320	4' deep, 1/2 C.Y. bucket	2.64	7.55	10.19
2340	6' deep, 1/2 C.Y. bucket	5	14.10	19.10
2360	8' deep, 1/2 C.Y. bucket	9.70	20.50	30.20
2380	10' deep, 1 C.Y. bucket	13.35	29	42.35
2400	12' deep, 1 C.Y. bucket	17.65	39.50	57.15
2430	15' deep, 1-1/2 C.Y. bucket	19.45	42.50	61.95
2460	18' deep, 2-1/2 C.Y. bucket	34	65	99
2840	6' wide, 6' deep, 5/8 C.Y. bucket w/trench box	9.80	17.55	27.35
2860	8' deep, 3/4 C.Y. bucket	14.15	26.50	40.65
2880	10' deep, 1 C.Y. bucket	13.75	27	40.75
2900	12' deep, 1-1/2 C.Y. bucket	17.50	35	52.50
2940	16' deep, 2-1/2 C.Y. bucket	28.50	50.50	79
2980	20' deep, 3-1/2 C.Y. bucket	44.50	69.50	114
3020	24' deep, 3-1/2 C.Y. bucket	63.50	95	158.50
3100	8' wide, 12' deep, 1-1/2 C.Y. bucket w/trench box	21.50	40	61.50
3120	15' deep, 1-1/2 C.Y. bucket	31.50	58	89.50
3140	18' deep, 2-1/2 C.Y. bucket	39	68	107
3180	24' deep, 3-1/2 C.Y. bucket	71	104	175
3270	10' wide, 20' deep, 3-1/2 C.Y. bucket w/trench box	44	80	124
3280	24' deep, 3-1/2 C.Y. bucket	78	114	192
3370	12' wide, 20' deep, 3-1/2 C.Y. bucket w/ trench box	66	93	159
3380	25' deep, 3-1/2 C.Y. bucket	91.50	133	224.50
3500	1 to 1 slope, 2' wide, 2' deep, 3/8 C.Y. bucket	.95	3	3.95
3520	3' deep, 3/8 C.Y. bucket	3.12	6.95	10.07
3540	4' deep, 3/8 C.Y. bucket	2.58	9	11.58
3560	6' deep, 3/8 C.Y. bucket	2.95	9.70	12.65
3580	8' deep, 1/2 C.Y. bucket	5.75	19.35	25.10
3600	10' deep, 1 C.Y. bucket	15.60	37	52.60
3800	4' wide, 2' deep, 3/8 C.Y. bucket	1.72	4.49	6.21
3820	3' deep, 3/8 C.Y. bucket	2.64	7.85	10.49
3840	4' deep, 1/2 C.Y. bucket	3.39	10.15	13.54
3860	6' deep, 1/2 C.Y. bucket	7	20.50	27.50
3880	8' deep, 1/2 C.Y. bucket	14.40	31	45.40
3900	10' deep, 1 C.Y. bucket	20.50	45.50	66
3920	12' deep, 1 C.Y. bucket	30.50	66	96.50
3940	15' deep, 1-1/2 C.Y. bucket	32	70.50	102.50
3960	18' deep, 2-1/2 C.Y. bucket	46.50	89.50	136
4030	6' wide, 6' deep, 5/8 C.Y. bucket w/trench box	12.85	23.50	36.35
4040	8' deep, 3/4 C.Y. bucket	18.50	32.50	51
4050	10' deep, 1 C.Y. bucket	19.85	39.50	59.35
4060	12' deep, 1-1/2 C.Y. bucket	26.50	53.50	80
4070	16' deep, 2-1/2 C.Y. bucket	44.50	80	124.50
4080	20' deep, 3-1/2 C.Y. bucket	72	113	185
4090	24' deep, 3-1/2 C.Y. bucket	105	159	264
4500	8' wide, 12' deep, 1-1/2 C.Y. bucket w/trench box	30.50	58	88.50
4550	15' deep, 1-1/2 C.Y. bucket	46	87.50	133.50
4600	18' deep, 2-1/2 C.Y. bucket	59.50	105	164.50
4650	24' deep, 3-1/2 C.Y. bucket	113	168	281
4800	10' wide, 20' deep, 3-1/2 C.Y. bucket w/trench box	65.50	122	187.50
4850	24' deep, 3-1/2 C.Y. bucket	120	178	298
4950	12' wide, 20' deep, 3-1/2 C.Y. bucket w/ trench box	95	137	232
4980	25' deep, 3-1/2 C.Y. bucket	136	201	337

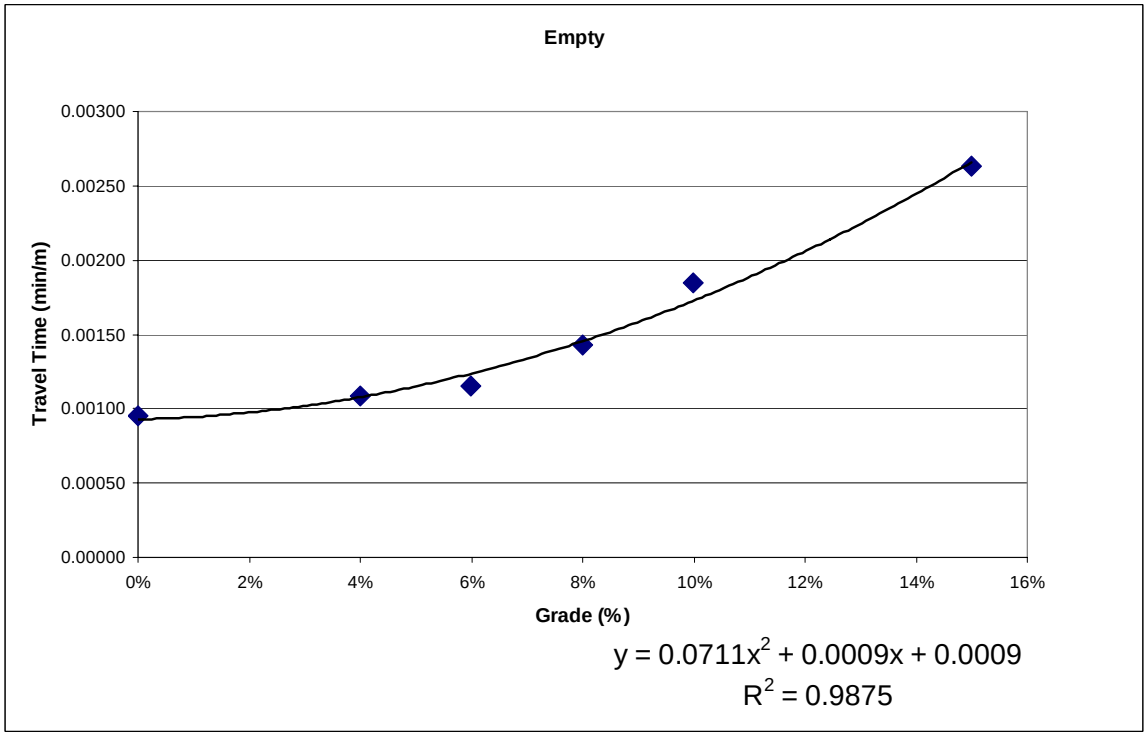
Crew No.	Bare Costs		Incl. Subs O & P		Cost Per Labor-Hour	
Crew B-12G	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 15 Ton		576.65		634.32		
1 Clamshell Bucket, .5 C.Y.		34.20		37.62	38.18	42.00
16 L.H., Daily Totals		$1159.25		$1509.93	$72.45	$94.37
Crew B-12H	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 25 Ton		983.00		1081.30		
1 Clamshell Bucket, 1 C.Y.		44.80		49.28	64.24	70.66
16 L.H., Daily Totals		$1576.20		$1968.58	$98.51	$123.04
Crew B-12I	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 20 Ton		737.50		811.25		
1 Dragline Bucket, .75 C.Y.		19.40		21.34	47.31	52.04
16 L.H., Daily Totals		$1305.30		$1670.59	$81.58	$104.41
Crew B-12J	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Gradall, 5/8 C.Y.		905.80		996.38	56.61	62.27
16 L.H., Daily Totals		$1454.20		$1834.38	$90.89	$114.65
Crew B-12K	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Gradall, 3 Ton, 1 C.Y.		1026.00		1128.60	64.13	70.54
16 L.H., Daily Totals		$1574.40		$1966.60	$98.40	$122.91
Crew B-12L	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 15 Ton		576.65		634.32		
1 F.E. Attachment, .5 C.Y.		49.20		54.12	39.12	43.03
16 L.H., Daily Totals		$1174.25		$1526.43	$73.39	$95.40
Crew B-12M	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 20 Ton		737.50		811.25		
1 F.E. Attachment, .75 C.Y.		53.60		58.96	49.44	54.39
16 L.H., Daily Totals		$1339.50		$1708.21	$83.72	$106.76
Crew B-12N	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 25 Ton		983.00		1081.30		
1 F.E. Attachment, 1 C.Y.		60.40		66.44	65.21	71.73
16 L.H., Daily Totals		$1591.80		$1985.74	$99.49	$124.11
Crew B-12O	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 40 Ton		994.60		1094.06		
1 F.E. Attachment, 1.5 C.Y.		69.60		76.56	66.51	73.16
16 L.H., Daily Totals		$1612.60		$2008.62	$100.79	$125.54

Crew No.	Bare Costs		Incl. Subs O & P		Cost Per Labor-Hour	
Crew B-12P	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 40 Ton		994.60		1094.06		
1 Dragline Bucket, 1.5 C.Y.		31.00		34.10	64.10	70.51
16 L.H., Daily Totals		$1574.00		$1966.16	$98.38	$122.89
Crew B-12Q	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Hyd. Excavator, 5/8 C.Y.		462.20		508.42	28.89	31.78
16 L.H., Daily Totals		$1010.60		$1346.42	$63.16	$84.15
Crew B-12R	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Hyd. Excavator, 1.5 C.Y.		775.60		853.16	48.48	53.32
16 L.H., Daily Totals		$1324.00		$1691.16	$82.75	$105.70
Crew B-12S	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Hyd. Excavator, 2.5 C.Y.		1333.00		1466.30	83.31	91.64
16 L.H., Daily Totals		$1881.40		$2304.30	$117.59	$144.02
Crew B-12T	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 75 Ton		1384.00		1522.40		
1 F.E. Attachment, 3 C.Y.		93.00		102.30	92.31	101.54
16 L.H., Daily Totals		$2025.40		$2462.70	$126.59	$153.92
Crew B-12V	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$39.80	$318.40	$60.00	$480.00	$34.27	$52.38
1 Laborer	28.75	230.00	44.75	358.00		
1 Crawler Crane, 75 Ton		1384.00		1522.40		
1 Dragline Bucket, 3 C.Y.		48.80		53.68	89.55	98.50
16 L.H., Daily Totals		$1981.20		$2414.08	$123.83	$150.88
Crew B-13	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$30.75	$246.00	$47.90	$383.20	$31.35	$48.29
4 Laborers	28.75	920.00	44.75	1432.00		
1 Equip. Oper. (crane)	39.80	318.40	60.00	480.00		
1 Equip. Oper. Oiler	33.90	271.20	51.10	408.80		
1 Hyd. Crane, 25 Ton		739.60		813.56	13.21	14.53
56 L.H., Daily Totals		$2495.20		$3517.56	$44.56	$62.81
Crew B-13A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Foreman	$30.75	$246.00	$47.90	$383.20	$32.02	$49.20
2 Laborers	28.75	460.00	44.75	716.00		
2 Equipment Operators	38.40	614.40	57.85	925.60		
2 Truck Drivers (heavy)	29.55	472.80	45.65	730.40		
1 Crawler Crane, 75 Ton		1384.00		1522.40		
1 Crawler Loader, 4 C.Y.		1145.00		1259.50		
2 Dump Trucks, 12 Ton, 8 C.Y.		736.80		810.48	58.32	64.15
56 L.H., Daily Totals		$5059.00		$6347.58	$90.34	$113.35

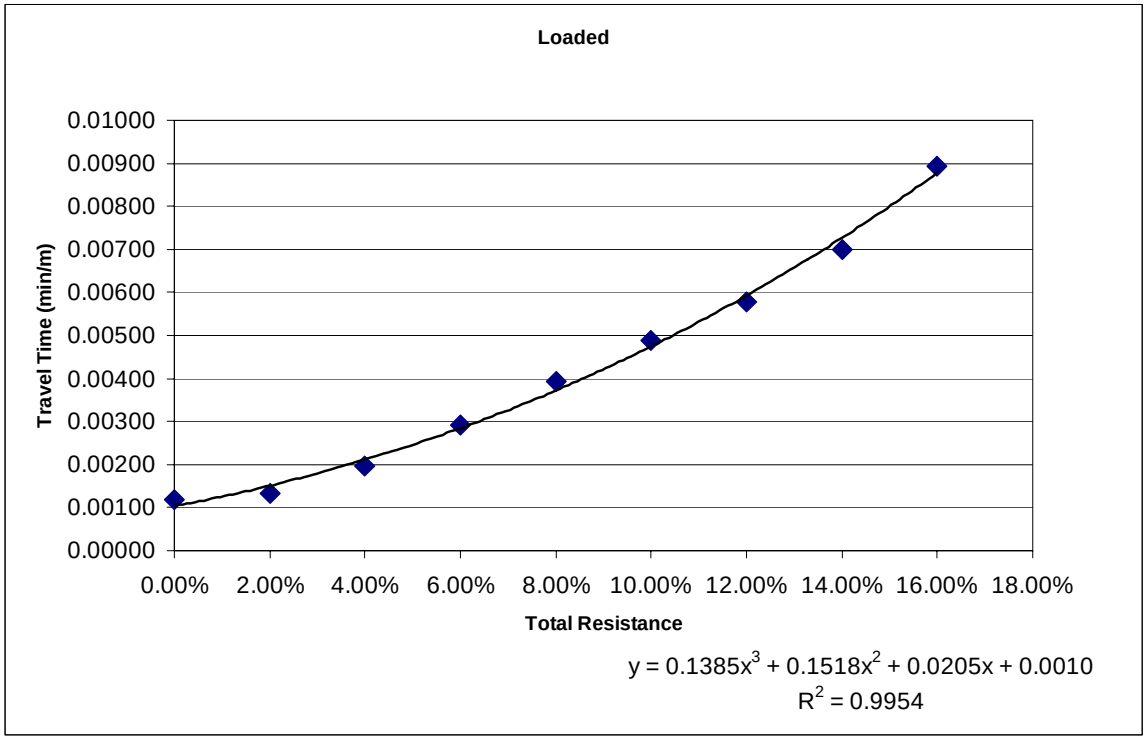
Appendix E-06
Equipment Productivity
Curve Fits

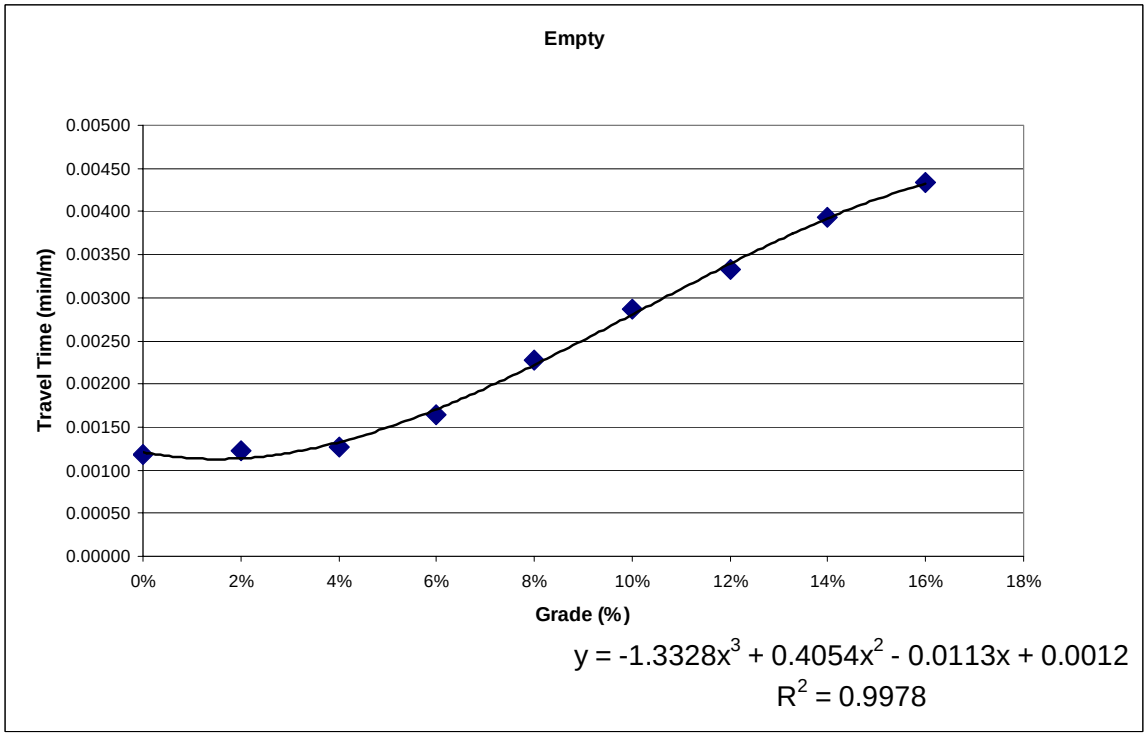
777D
Catapillar Performance Handbook Edition 36 page 9-31 Curve Fits



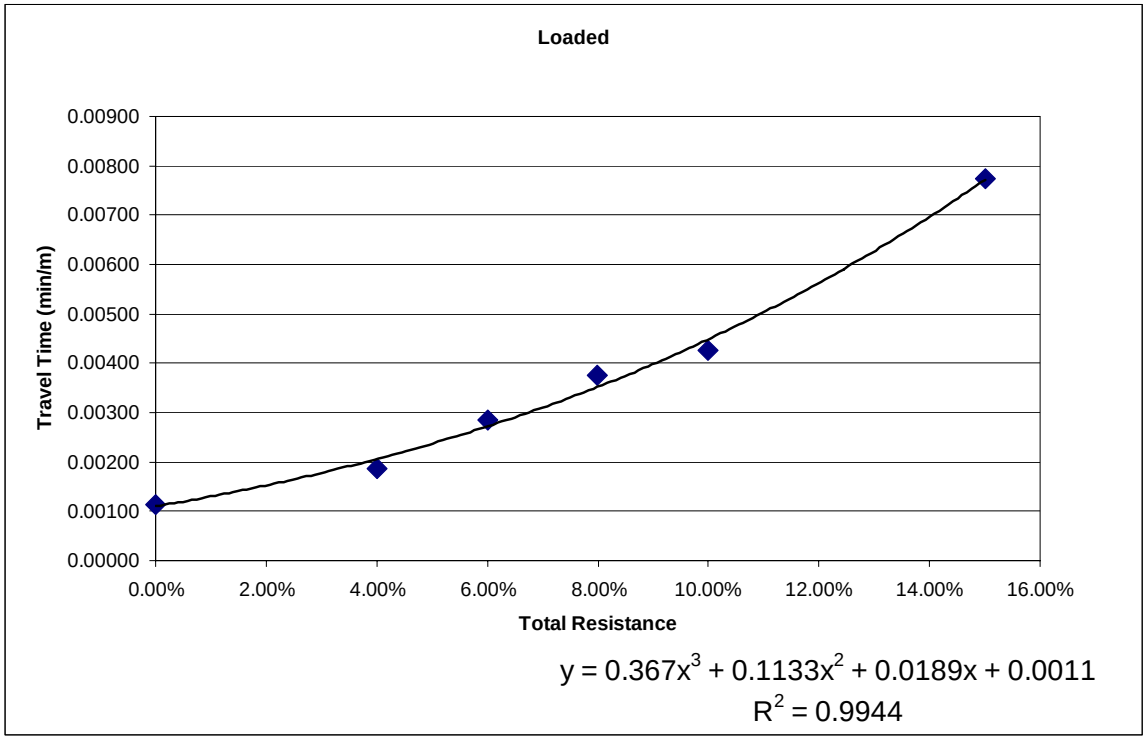


631G
Catapillar Performance Handbook Edition 37 page 8-37,38 Curve Fits



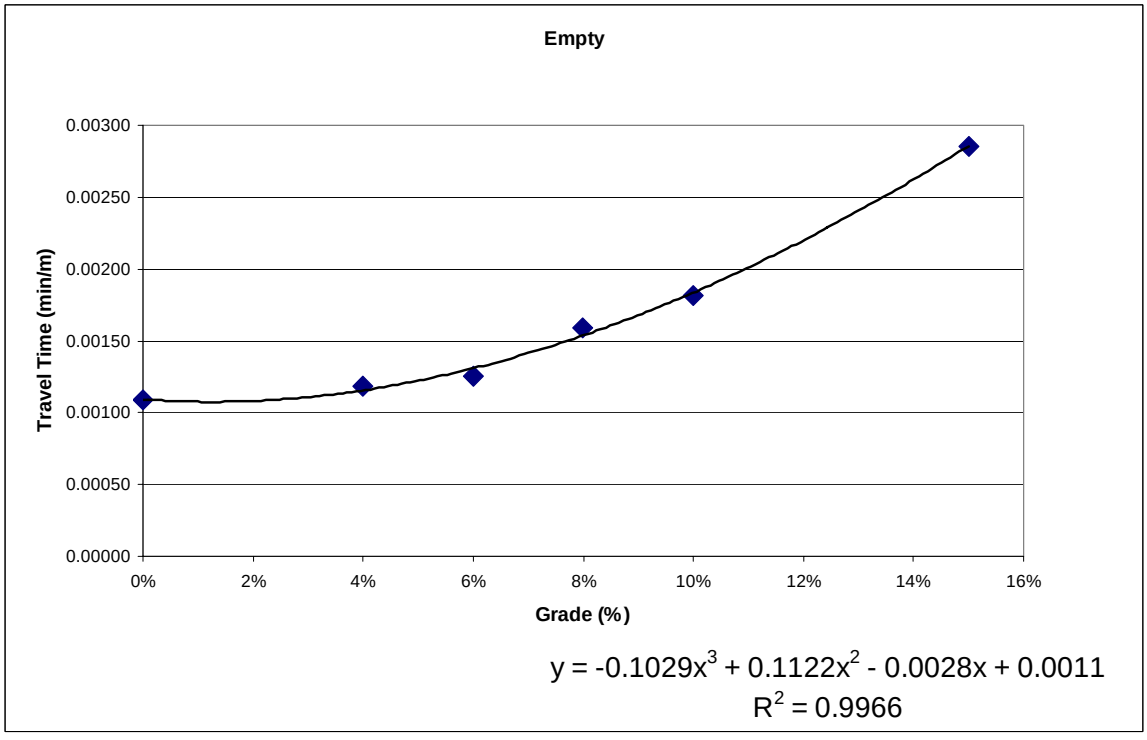


785C or 530M
Catapillar Performance Handbook Edition 37 page 9-38 Curve Fits



$y = 0.367x^3 + 0.1133x^2 + 0.0189x + 0.0011$

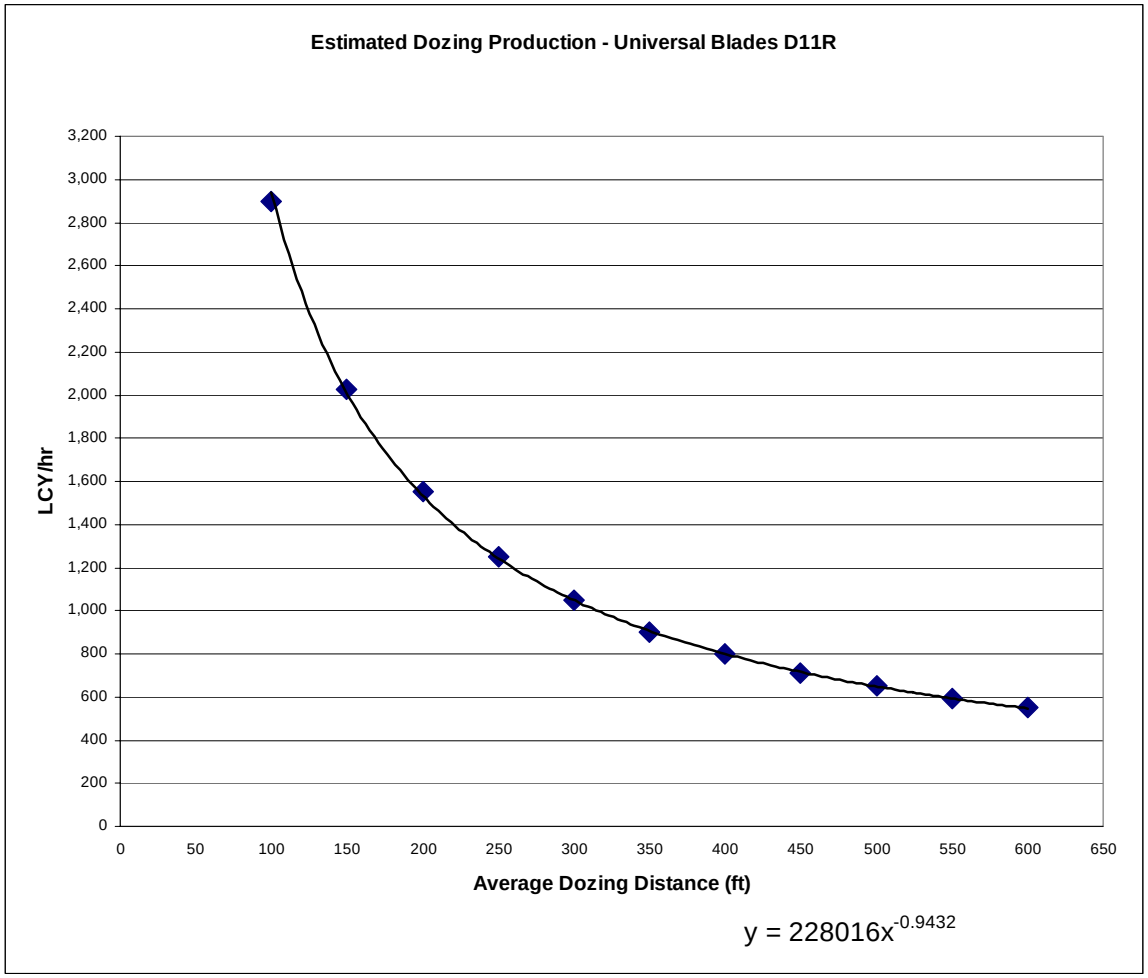
$R^2 = 0.9944$

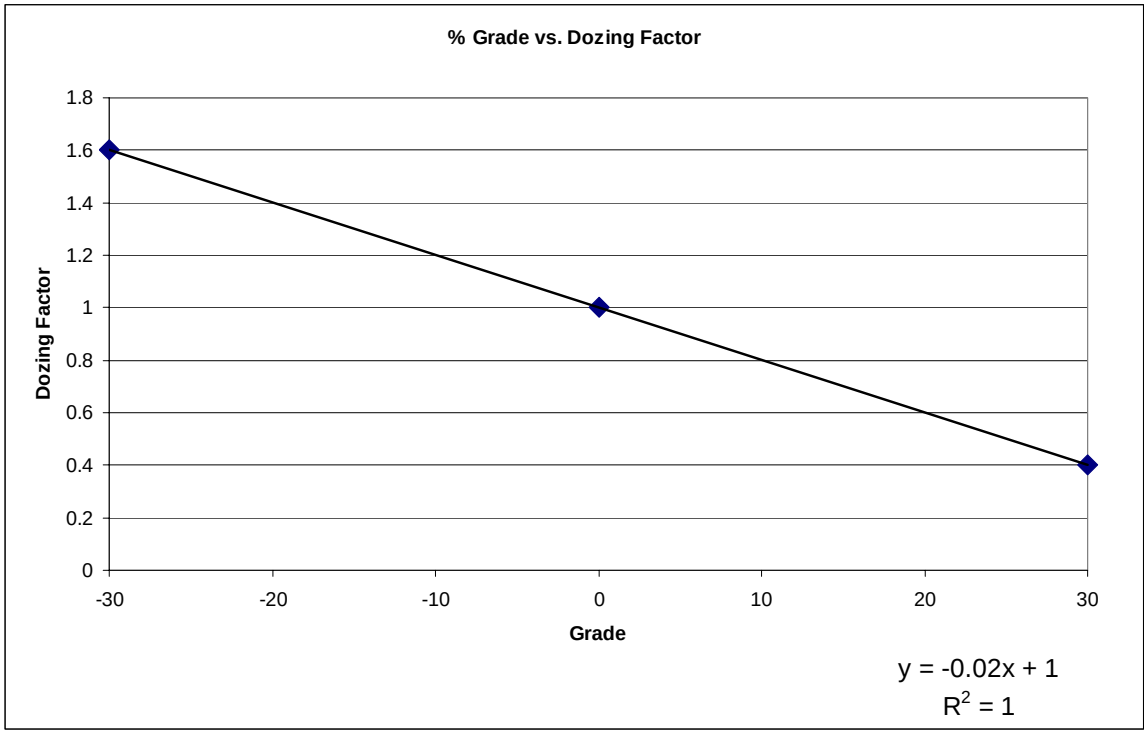


$y = -0.1029x^3 + 0.1122x^2 - 0.0028x + 0.0011$

$R^2 = 0.9966$

D11R
Catapillar Performance Handbook Edition 37 page 1-43 Curve Fits




% Grade vs. Dozing Factor
Dozing Factor
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-30
-20
-10
0
10
20
30
Grade
y = -0.02x + 1
R2 = 1

Appendix E-07
Production Calculation
QA Documentation

EQUATIONS COMMON TO TAILINGS AND STOCKPILES

Sheet #4 Earthwrk:

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

$$Loose\ Volume\ (lcy) = Bank\ Volume\ (cy) * [1 + Swell\ Factor]$$

Sheet #5 Dozer:

$$Dozer\ Material\ Handling\ Multiplier = Loose\ Volume\ (lcy) * 1.5$$

$$Normal\ Production\ (cy/hr) = 228016 * Maximum\ Push\ Distance\ (ft)^{-.9432}$$
$$(Curve\ Fit\ Cat\ Handbook\ Ed\ 37.\ 1-43)$$

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

$$Total\ Task\ Time\ (hr) = \frac{Material\ Handling\ Multiplier(cy)}{Productivity\ (cy/hr)}$$

$$Grade\ (Dozing\ Factor) = -0.02 * Cut\ to\ Fill\ Haul\ Grade + 1$$
$$(Curve\ Fit\ Cat\ Handbook\ Ed\ 37.1-46)$$

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 #13 Earth Sum:

$$Total\ Cost\ (\$) = \left[Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)\right] * TimeRequired\ (hr)$$

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

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

Sheet #14 Reveg:

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

$$Total\ Reveg\ Cost\ (\$) = \sum\ Subtotal\ Cost\ (\$)$$

$$Tailing\ Pipeline\ Corridor\ Area\ (acres) = \frac{Corridor\ Length\ (ft) * Corridor\ Width\ (ft)}{43560\ (ft^2/acre)}$$

Sheet #15 Other:

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

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

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

$$Tailings\ Spillway\ Cut\ Volume\ (cy) = \frac{Length\ (ft) * Cross\ Section\ (ft^2)}{27(ft^3/cy)}$$

Sheet #16 & 17 BondSum:

$$SubTotal\ Direct\ Cost\ (\$) = Total\ Earthmoving\ (\$) + Total\ Reveg\ (\$) + Total\ Other\ (\$)$$

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

$$Total\ Bond\ Amount\ (\$) = Sum\ Direct\ Cost\ (\$) + Indirect\ Cost\ (\$) + Gross\ Receipts\ Tax\ (\$)$$

EQUATIONS FOR TAILINGS:

Sheet #6 Grading:

$$1000\ ft\ Passes/acre = \frac{43560\ (ft^2/acre)}{(Effective\ Blade\ Width\ (ft) - Width\ of\ Overlap\ (ft)) * 1000\ (ft)}$$

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

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

Sheet #10 Loader:

$$Task\ Time\ (hr) = \frac{Scraper\ Total\ Task\ Time\ (hr)}{Number\ of\ \ Scrapers}$$

Sheet #11 Scraper:

$$Haul\ Time\ (\min) = \sum (Segments\ Travel\ Time\ Loaded\ (\min) * Distance\ (m))$$

$$Return\ Time\ (\min) = \sum (Segments\ Travel\ Time\ Empty\ (\min) * Distance\ (m))$$

$$Total\ Haul\ Distance\ (ft) = \sum Segment\ Haul\ Distance\ (ft)$$

$$Total\ Resistance\ (\%) = \sum Segment\ Rolling\ Resistance\ (\%)$$

$$Travel\ Time\ Loaded\ (min/m) =$$
$$0.1385 * Total\ Resistance\ (\%)^3 + 0.1518 * Total\ Resistance(\%)^2 + 0.0205 * Total\ Resistance(\%) + 0.001$$

$$Travel\ Time\ Empty\ (min/m) =$$
$$-1.3328 * Total\ Resistance(\%)^3 + 0.4054 * Total\ Resistance(\%)^2 - 0.0113 * Total\ Resistance(\%) + 0.0012$$
$$(Curve\ Fits\ Cat\ Handbook\ Ed\ 37, 8-37,38)$$

$$Cycle\ Time\ (\min)$$
$$= Haul\ Time\ (\min) + Return\ Time\ (\min) + Load\ \ Manuver\ Time\ (\min) + Dump\ Manuever\ Time\ (\min)$$

$$Number\ of\ \ Scrapers = \frac{Cycle\ Time\ (\min)}{Load\ \ Manuver\ Time\ (\min)}$$

$$Cycle\ Time\ 50\ \min\ hr\ (hr) = \frac{Work\ \ Hour\ (\min/hr)}{Cycle\ Time\ (\min)}$$

$$Productivity\ (cy/hr) = Cycle\ Time\ 50\ \min\ hr\ (hr) * \frac{Rated\ \ Load\ (lbs)}{Soil\ Weight\ (lbs/cy)}$$

$$Volume\ (cy) = Loose\ Volume\ Top\ (lcy) + Loose\ Volume\ Outslope\ (lcy)$$

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

EQUATIONS FOR STOCKPILES:

Sheet #6 Grading:

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

$$Normal\ Production\ (cy/hr) = 228016 * Maximum\ Push\ Distance\ (ft)^{-.9432}$$
(*Curve Fit Cat Handbook Ed* 37. 1 – 43)

$$Productivity\ (cy/hr) = Normal\ Production\ (cy/hr) * \frac{Work\ Hour\ (\min/hr)}{60\ (\min/hr)} * Operator * Material * Grade\ Factor$$
$$* \frac{2300\ (lbs/cy)}{Soil\ Weight\ (lbs/cy)} * Production\ Method * Visibility * Elevation * DriveTrans$$

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

Sheet #9 Trucks:

$$Total\ Haul\ Distance\ (ft) = \sum Segment\ Haul\ Distance\ (ft)$$

$$Haul\ Distance\ Segment\ (m) = Haul\ Distance\ (ft) * 0.3048\ (m/ft)$$

$$Haul\ Effective\ Grade\ (\%) = \left(Haul\ Grade\ (\%) + RollingResistance\ (\%)\right)(unless < 0\ then\ 0)$$

$$Return\ Effective\ Grade\ (\%) = \left(RollingResistance\ (\%) - Haul\ Grade\ (\%)\right)(unless < 0\ then\ 0)$$

$$777D\ Segment\ Travel\ Time\ Loaded\ (\min/m) =$$
$$-1.0346 * Haul\ Effective\ Grade\ Segment\ (\%)^{3} + 0.316 * Haul\ Effective\ Grade\ Segement\ (\%)^{2}$$
$$+ 0.0128 * Haul\ Effective\ Grade\ Segment\ (\%) + 0.001$$

$$777D\ Segment\ Travel\ Time\ Empty\ (\min/m) =$$
$$0.0711 * Return\ Effective\ Grade\ Segment\ (\%)^{2} + 0.0009 * Return\ Effective\ Grade\ Segement\ (\%) + 0.0009$$

(*Curve Fit Cat Handbook Ed* 36. 9 – 31)

$$530M\ Segment\ Travel\ Time\ Loaded\ (\min/m) =$$
$$0.367 * Haul\ Effective\ Grade\ Segment\ (\%)^{3} + 0.1133 * Haul\ Effective\ Grade\ Segement\ (\%)^{2}$$
$$+ 0.0189 * Haul\ Effective\ Grade\ Segment\ (\%) + 0.0011$$

$$530M\ Segment\ Travel\ Time\ Empty\ (\min/m) =$$
$$-0.1029 * Return\ Effective\ Grade\ Segment\ (\%)^{3} + 0.1122 * Return\ Effective\ Grade\ Segment\ (\%)^{2}$$
$$-0.0028 * Return\ Effective\ Grade\ Segement\ (\%) + 0.0011$$

(*Curve Fit Cat Handbook Ed* 37. 9 – 38)

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

$$Haul\ Time\ (\min) = \sum\left(Segment\ Travel\ Time\ Loaded\ (\min/m) * Segment\ Haul\ Dist\ (m)\right)$$

$$Return\ Time\ (\min) = \sum\left(Segment\ Travel\ Time\ Empty\ (\min/m) * Segment\ Haul\ Dist\ (m)\right)$$

$$Loading\ Time\ (\min) = Loader\ Cycle\ Time\ (\min) * Loader\ (cycles/truck)$$

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

$$Truck\ Cycle\ Time\ (\min) =$$
$$Haul\ Time\ (\min) + Return\ Time\ (\min) + Loading\ Time\ (\min)$$
$$+ Load\ /\ Manuever\ Time\ (\min) + Dump\ Manumver\ Time\ (\min)$$

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

Sheet #10 Loader:

$$Net\ Bucket\ Capcity\ (cy) = \frac{Heaped\ Bucket\ Capcity\ (cy)}{Bucket\ Fill\ Factor}$$

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

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

OPTIMIZATION EQUATIONS:

Productivity Sheet:

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

Time Sheet:

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

Truck Cost Sheet:

$$Truck\ Cost\ (\$) =$$
$$Time\ (hr) * Varying\ Number\ of\ Trucks * \left(Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)\right)$$

Loader Cost Sheet:

$$Loader\ Cost\ for\ Varying\ Number\ of\ Trucks\ (\$) =$$
$$Time\ (hr) * \left(Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)\right)$$

Total Cost Sheet:

$$Total\ Cost\ Varying\ Number\ of\ Trucks\ (\$) = Truck\ Cost\ (\$) + Loader\ Cost\ (\$)$$

$$Minimum\ Cost = Minimum\ (Total\ Cost\ \ for\ Varying\ Number\ of\ Trucks(\$))$$

Optimum Number of Trucks:

$$Number\ of\ Trucks =$$
$$Number\ of\ Trucks$$
$$when\ \left(Minimum\ Cost\ (\$) >= Total\ Cost\ \ for\ Varying\ Number\ of\ Trucks\right)$$
$$else\ 0$$

$$Optimum\ Number\ of\ Trucks = \sum Number\ of\ Trucks$$

Appendix E-08
Caterpillar Performance Handbook
References

CATERPILLAR® PERFORMANCE HANDBOOK

a CAT® publication by Caterpillar Inc., Peoria, Illinois, U.S.A.

OCTOBER 2004

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 Inc. nor its dealers warrant that the machines described will perform as estimated.

Materials and specifications are subject to change without notice.

Printed in U.S.A.

SEBD0345

Working Weights Bucket & Payload

Model	Boom		Stick Length		Working Weights Buckets & Payload	
5110B ME	7.6 m	**24'11"**	3.4 m 4.1 m	**11'1"** **13'5"**	21 940 kg 19 920 kg	**48,350 lb** **43,900 lb**
5110B L	9.2 m	**30'2"**	3.6 m 4.5 m 5.5 m	**11'10"** **14'9"** **18'1"**	17 995 kg 16 030 kg 13 710 kg	**39,660 lb** **35,320 lb** **30,220 lb**
5130B ME	8.0 m	**26'3"**	3.8 m 5.2 m	**12'6"** **17'1"**	30 540 kg 25 850 kg	**67,310 lb** **56,970 lb**
5230B ME	9.5 m	**31'2"**	4.5 m	**14'9"**	51 000 kg	**112,450 lb**

Bucket Selection — ME

Model	Bucket Type	Bucket Bite Width		Bucket Tip Radius		Heaped Capacity		Bucket Weight With Teeth	
		mm	in	mm	in	m^3	yd^3	kg	lb
5110B ME	Rock	2682	**105.0"**	2812	**110.0"**	7.6	**9.9**	7450	**16,420**
	Rock	2356	**93.0"**	2797	**110.0"**	6.2	**8.1**	6680	**14,730**
	Coal	3128	**123.0"**	2803	**110.0"**	10.4	**13.6**	7010	**15,450**
5110B L	Rock	2356	**93.0"**	2474	**98.0"**	4.6	**6.0**	5730	**12,630**
	Medium Duty	2540	**100.0"**	2550	**100.0"**	6.0	**7.8**	5280	**11,640**
	Medium Duty	2210	**87.0"**	2550	**100.0"**	5.0	**6.5**	4750	**10,470**
	Medium Duty	1905	**75.0"**	2550	**100.0"**	4.2	**5.5**	4350	**9590**
5130B ME	High Density	2840	**111.8"**	3065	**120.0"**	8.6	**11.2**	9750	**21,500**
	Rock	2840	**111.8"**	3053	**120.0"**	10.6	**13.9**	10 630	**23,440**
	Excavation	3290	**129.4"**	3074	**121.0"**	10.2	**13.3**	8740	**19,260**
	Coal	3500	**138.0"**	3244	**127.0"**	13.8	**18.0**	8920	**19,670**
	Coal	3680	**145.0"**	3225	**127.0"**	18.6	**24.0**	9360	**20,630**
5230B ME	Rock	3940	**156.0"**	3350	**132.0"**	16.0	**20.9**	17 085	**37,665**
	Light Material	3940	**156.0"**	3250	**128.0"**	18.0	**23.5**	18 810	**41,465**
	Coal	4350	**171.0"**	3664	**144.0"**	27.6	**36.1**	16 700	**36,815**

ESTIMATING FRONT SHOVEL CYCLE TIME

The loading cycle of the front shovel is composed of four segments:

1. Load bucket
2. Swing loaded
3. Dump bucket
4. Swing empty

Total shovel cycle time is dependent on machine size and job conditions. As conditions become more severe (tougher loading, more obstacles, etc.), the shovel slows down accordingly.

The following table breaks down what experience has shown to be typical Caterpillar Front Shovel cycle times with above average job conditions and an operator of average ability.

These times would decrease as job conditions or operator ability improved and would become slower as conditions become less favorable. For example:

Tough material . . . . . .Longer bucket fill and dump time.
Greater swing angle . . . . . .Longer swing times.
Operator ability . . . . . .Affects total cycle time.
Loading from the top down . . . . . .May improve swing time.

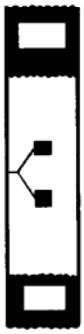
Cycle Time Estimating

MODEL		5110B ME	5130B ME	5230B ME
Bucket Size	(m^3) (yd^3)	7.6 **9.9**	10.6 **13.9**	16.0 **20.9**
Soil Type		←	Hard Clay	→
Digging Depth	(m) (ft)	—	4.0 **13**	5.0 **16**
Load Bucket	(min)	0.11	0.12	0.12
Swing Loaded	(min)	0.10	0.13	0.14
Dump Bucket	(min)	0.04	0.04	0.04
Swing Empty	(min)	0.10	0.13	0.14
Total Cycle Time	(min)	0.35	0.42	0.44

MODEL		5090B FS	5130B FS	5230B FS
Bucket Size	(m^3) (yd^3)	5.2 **6.8**	11.0 **14.4**	17.0 **22.2**
Soil Type		←	Shot Rock	→
Swing Angle		←	90°	→
Load Area		←	No Obstructions	→
Operator Ability		←	Average	→
Load Bucket	(min)	0.18	0.18	0.20
Swing Loaded	(min)	0.08	0.13	0.14
Dump Bucket	(min)	0.05	0.04	0.05
Swing Empty	(min)	0.10	0.10	0.10
Total Cycle Time	(min)	0.41	0.45	0.49

CYCLE TIME ESTIMATING CHART				
CYCLE TIME (Min)	MACHINE AND BUCKET			CYCLE TIME (Sec)
	5090B FS	5130B FS	5230B FS	
				10
0.25				15
0.30				20
0.35				
0.40				25
0.45				
0.50				30
0.60				35
				40
0.75				45
				50
				55
1.00				60

CYCLE TIME vs JOB CONDITION DESCRIPTION



Fastest Possible — Good job set-up, tight swing. Excellent operator. Well fragmented material.

Fastest Practical — Typical job conditions. Good operator. 60°–90° swing.

Typical Range — Oversized Material. Undesirable set-up. 90°–120° swing.

Slow — Poorly shot material. Bad floor conditions. New operator. 120°–180° swing.

BOTTOM DUMP BUCKET FILL FACTORS

Material	Fill Factor*
Bank Clay; Earth	100%-105%
Rock-Earth Mixture	100%-105%
Rock — Poorly Blasted	85%-95%
Rock — Well Blasted	95%-105%
Shale, Sandstone — Standing Bank	85%-100%

*Percent of heaped bucket capacity.

CYCLE TIME ESTIMATING CHART				
CYCLE TIME (Min)	MACHINE SIZE CLASS			CYCLE TIME (Sec)
	5110B ME	5130B ME	5230B ME	
0.17				10
0.25				15
0.33				20
0.42				25
0.50				30
0.58				35
0.67				40
0.75				45
0.83				50
0.92				55
1.00				60

CATERPILLAR® PERFORMANCE HANDBOOK

a Cat® publication by Caterpillar Inc., Peoria, Illinois, U.S.A.

APRIL 2006

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 Inc. 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.

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SEBD034



MODEL	775E		777D		777D	
Body Type	Dual Slope		Flat Floor		Dual Slope	
Gross Machine Weight	108 400 kg	**239,000 lb**	163 293 kg	**360,000 lb**	163 293 kg	**360,000 lb**
Chassis Weight*	32 140 kg	**70,850 lb**	50 610 kg	**111,575 lb**	51 329 kg	**113,160 lb**
Body Weight	9710 kg	**21,400 lb**	16 687 kg	**36,788 lb**	15 778 kg	**34,785 lb**
Payload without Liner	66 550 kg	**146,750 lb**	95 996 kg	**211,637 lb**	96 186 kg	**212,055 lb**
Standard Liner Weight	4450 kg	**9810 lb**	5460 kg	**12,040 lb**	5461 kg	**12,040 lb**
Target Payload**	62 100 kg	**136,940 lb**	90 536 kg	**199,597 lb**	90 725 kg	**200,015 lb**
Capacity:						
Struck (SAE)	32.7 m^3	**42.8 yd^3**	42 m^3	**54.6 yd^3**	42.1 m^3	**55 yd^3**
Heaped (2:1) (SAE)	41.2 m^3	**53.9 yd^3**	60.2 m^3	**78.6 yd^3**	60.1 m^3	**78.6 yd^3**
Distribution Empty:						
Front	**45.9%**		**41.75%**		**47%**	
Rear	**54.1%**		**58.25%**		**53%**	
Distribution Loaded:						
Front	**31.6%**		**33%**		**33%**	
Rear	**68.4%**		**67%**		**67%**	
Engine Model	**3412E**		**3508B EUI**		**3508B EUI**	
Number of Cylinders	**12**		**8**		**8**	
Bore	137 mm	**5.4"**	170 mm	**6.7"**	170 mm	**6.7"**
Stroke	152 mm	**6"**	190 mm	**7.5"**	190 mm	**7.5"**
Displacement	27 L	**1649 in^3**	34.5 L	**2105 in^3**	34.5 L	**2105 in^3**
Net Power	544 kW	**730 hp**	699 kW	**938 hp**	699 kW	**938 hp**
Gross Power	567 kW	**760 hp**	746 kW	**1000 hp**	746 kW	**1000 hp**
Standard Tires	**24.00-R35 (E4)**		**27.00R49**		**27.00R49**	
Machine Clearance Turning Circle	23.8 m	**78'9"**	28.4 m	**83'0"**	28.4 m	**83'0"**
Fuel Tank Refill Capacity	700 L	**185 U.S. gal**	1137 L	**300 U.S. gal**	1137 L	**300 U.S. gal**
Top Speed (Loaded)	65.8 km/h	**41.1 mph**	60.4 km/h	**39.9 mph**	60.4 km/h	**39.9 mph**
GENERAL DIMENSIONS (Empty):						
Height to Canopy Rock Guard Rail	4.40 m	**14'2"**	5.18 m	**17'0"**	4.91 m	**16'1"**
Wheelbase	4.19 m	**13'9"**	4.60 m	**15'0"**	4.60 m	**15'0"**
Overall Length (Operating)	9.48 m	**30'10"**	10.3 m	**33'8"**	10.3 m	**33'8"**
Overall Length (Shipping)	9.21 m	**30'3"**	9.78 m	**32'1"**	9.78 m	**32'1"**
Loading Height (Empty)	3.93 m	**12'11"**	4.57 m	**15'0"**	4.39 m	**14'5"**
Height at Full Dump	8.74 m	**28'8"**	10.0 m	**33'1"**	10.05 m	**33'0"**
Body Length (Target Length)	6.40 m	**21'0"**	6.79 m	**22'3"**	7.28 m	**23'11"**
Width (Operating)	5.08 m	**16'8"**	6.10 m	**20'0"**	6.10 m	**20'0"**
Width (Shipping)***	3.97 m	**13'0"**	3.51 m	**11'5"**	3.51 m	**11'5"**
Front Tire Tread	3.28 m	**10'9"**	4.17 m	**13'8"**	4.17 m	**13'8"**

*Weights include lubricants, coolants, 100% fuel and a debris allowance (4% of chassis).
**Refer to Caterpillar's 10/10/20 Payload Policy for Quarry & Construction Trucks.
***Disassembled.

MECHANICAL POWER TRAIN EFFICIENCIES

In selling against electric drive trucks, power train efficiency is an important consideration. To better illustrate the advantages of mechanical drive performance, grade horsepower, power train efficiency, and retarding horsepower should be compared to electric drive trucks.

Grade horsepower can be calculated by the following formula:

Metric

$$\text{grade HP} = \frac{\text{GMW (kg)} \times \text{TR} \times \text{Speed (km/h)}}{273.75}$$

English

$$= \frac{\text{GMW (lb)} \times \text{TR} \times \text{Speed (mph)}}{375}$$

where TR (total resistance) = Rolling resistance + Grade resistance (expressed as a decimal)

English example

700,000 lb GMW, 2% rolling resistance, +8% actual grade at 8.2 mph would require 1530 HP

$$\frac{700{,}000 \times (.02 + .08) \times 8.2}{375} = 1530 \text{ HP}$$

Metric example

317 520 kg GMW, 2% rolling resistance, +8% actual grade at 13.2 km/h would require 1530 HP

$$\frac{317\,520 \times (.02 + .08) \times 13.2}{273.75} = 1530 \text{ HP}$$

We then calculate power train efficiency by dividing grade horsepower by the gross horsepower produced by the engine. Most electric drive trucks run at constant maximum horsepower while under load. Mechanical drive trucks, however, lug the engine and may produce somewhat less than maximum horsepower. Engine power curves must be utilized to determine exact horsepower produced.

Example

$$\frac{\text{1530 grade horsepower}}{\text{1800 gross engine HP}} \times 100 = 85\% \text{ power train efficiency}$$

This exercise illustrates the effect of an efficient mechanical drive power train and should yield results in the 80-85% efficiency range. The same calculation for electric drive trucks would be lower (70-78% range) with a maximum efficiency of about 78% for the most common systems.

Likewise, retarding horsepower being consumed by the retarding system can be calculated by the following formula:

Metric

$$\text{retarding HP} = \frac{\text{GMW (kg)} \times \text{TR} \times \text{Speed (km/h)}}{273.75}$$

English

$$= \frac{\text{GMW (lb)} \times \text{TR} \times \text{Speed (mph)}}{375}$$

where TR (total resistance) = Rolling resistance + Grade resistance (expressed as a decimal)

English example

700,000 lb GMW, 2% rolling resistance, –8% actual grade at 14.7 mph would equate to –1646 HP

$$\frac{700{,}000 \times (.02 - .08) \times 14.7}{375} = 1646 \text{ HP}$$

Metric example

317 520 kg GMW, 2% rolling resistance, –8% actual grade at 23.6 km/h would equate to –1646 HP

$$\frac{317\,520 \times (.02 - .08) \times 23.6}{273.75} = 1646 \text{ HP}$$

This formula is intended for use in determining horsepower being consumed in the field based on field measurements. It is not intended to indicate how fast trucks should be operated on grade. Only job conditions, proper operating procedure, and good judgement should determine safe operating speeds during retarder use.

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FEBRUARY 2007
(37)

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TRAVEL SPEED

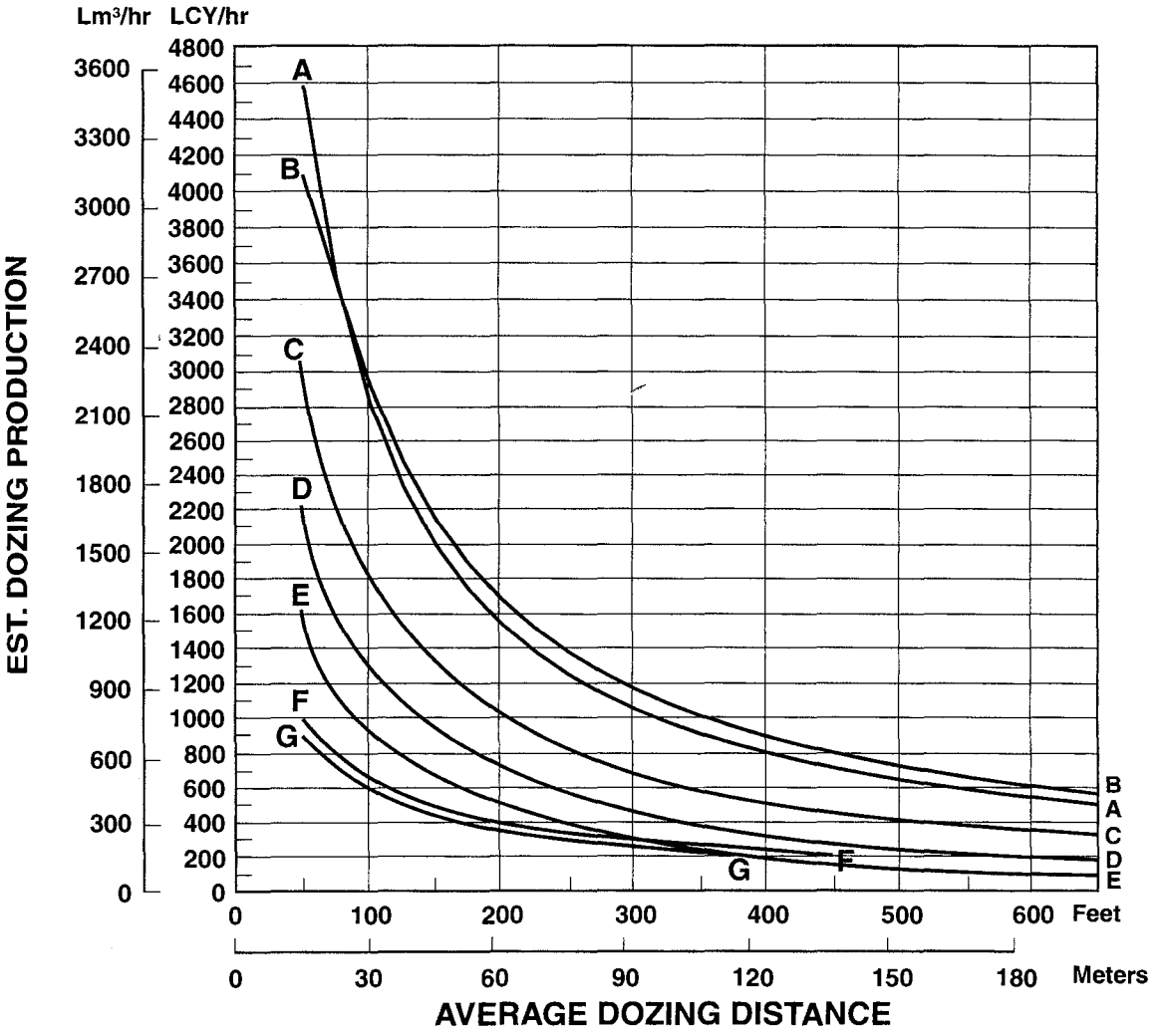
POWER SHIFT MODEL	D3G All Models		D4G All Models		D5G All Models		D5N XL/LGP		D5N LGP* PS DD		D6K All Models		D6N FTC	
FORWARD	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
1	—	—	—	—	—	—	3.1	1.9	2.8	1.7	—	—	3.3	2.0
2	—	—	—	—	—	—	5.4	3.3	5.0	3.1	—	—	5.7	3.5
3	—	—	—	—	—	—	9.1	5.6	8.7	5.4	—	—	10.0	6.2
REVERSE														
1	—	—	—	—	—	—	3.8	2.3			—	—	4.0	2.5
2	—	—	—	—	—	—	6.7	4.1	**		—	—	7.2	4.4
3	—	—	—	—	—	—	11.3	6.9			—	—	12.3	7.6
HYDROSTATIC														
FORWARD	0-9.0	0-5.6	0-9.0	0-5.6	0-9.0	0-5.6	—	—	—	—	0-10.0	0-6.2	—	—
REVERSE	0-9.6	0-6.0	0-9.6	0-6.0	0-9.6	0-6.0	—	—	—	—	0-10.0	0-6.2	—	—

POWER SHIFT MODEL	D6N D/S		D6G/ D6G Series II		D6R Series III (FTC)		Differential Steer D6R Series III		D7G/ D7G Series II		D7R Series II (FTC)		Differential Steer D7R Series II	
FORWARD	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
1	3.4	2.1	4.0	2.5	3.8	2.4	3.8	2.3	3.7	2.3	3.7	2.3	3.5	2.2
2	5.9	3.7	6.9	4.3	6.6	4.1	6.6	4.1	6.4	4.0	6.4	4.0	6.2	3.8
3	9.9	6.2	10.8	6.7	11.5	7.2	11.4	7.1	10.0	6.2	11.1	6.9	10.7	6.7
REVERSE														
1	3.8	2.4	4.8	3.0	4.9	3.0	4.8	3.0	4.5	2.8	4.8	3.0	4.6	2.9
2	7.2	4.5	8.4	5.2	8.5	5.3	8.4	5.2	7.9	4.9	8.3	5.1	8.0	5.0
3	11.7	7.3	12.9	8.0	14.7	9.1	14.5	9.0	11.9	7.4	14.3	8.9	13.8	8.6

POWER SHIFT MODEL	Differential Steer D8R		D8T		D9R		D9T		D10T		D11R/CD		D11R/CD High Altitude	
FORWARD	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
1	3.5	2.2	3.4	2.1	3.8	2.4	3.9	2.4	4.0	2.5	3.9	2.4	4.0	2.5
2	6.2	3.9	6.1	3.8	6.8	4.2	6.8	4.2	7.2	4.5	6.8	4.2	7.0	4.4
3	10.8	6.7	10.6	6.6	11.9	7.4	11.7	7.3	12.7	7.9	11.8	7.3	12.0	7.5
REVERSE														
1	4.7	2.9	4.5	2.8	4.7	2.9	4.7	2.9	5.2	3.2	4.7	2.9	4.8	3.0
2	8.1	5.0	8.0	5.0	8.4	5.2	8.4	5.2	9.0	5.6	8.2	5.1	8.3	5.2
3	13.9	8.6	14.2	8.8	14.7	9.1	14.3	8.9	15.8	9.8	14.0	8.7	14.9	9.0

*Power Shift direct drive transmission available for Japan domestic market only.
**Not available at time of printing.

ESTIMATED DOZING PRODUCTION • Universal Blades • D7G through D11R



KEY

A — D11R-11U
B — D11R CD
C — D10T-10U
D — D9R/D9T-9U
E — D8R/D8T-8U
F — D7R Series II-7U
G — D7G-7U

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

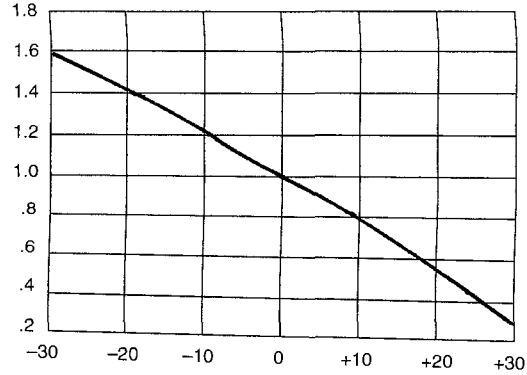
JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR	WHEEL-TYPE TRACTOR
OPERATOR —		
Excellent	1.00	1.00
Average	0.75	0.60
Poor	0.60	0.50
MATERIAL —		
Loose stockpile	1.20	1.20
Hard to cut; frozen —		
with tilt cylinder	0.80	0.75
without tilt cylinder	0.70	—
Hard to drift; "dead" (dry, non-cohesive material) or very sticky material	0.80	0.80
Rock, ripped or blasted	0.60-0.80	—
SLOT DOZING	1.20	1.20
SIDE BY SIDE DOZING	1.15-1.25	1.15-1.25
VISIBILITY —		
Dust, rain, snow, fog or darkness	0.80	0.70
JOB EFFICIENCY —		
50 min/hr	0.83	0.83
40 min/hr	0.67	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.

% Grade vs. Dozing Factor

(–) Downhill
(+) Uphill



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" material –0.80
Grade correction (from graph) .....–1.30
Slot dozing .....–1.20
Average operator .....–0.75
Job efficiency (50 min/hr) .....–0.83
Weight correction .....(2300/2650)–0.87

Production = Maximum Production × 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 Lm³/h × Factors
= 309.6 Lm³/h

TRACTOR/RIPPER	D10T				D11R		D11R	
	Adjustable Parallelogram				Adjustable Parallelogram			
Ripper Type	Single Shank		Multishank		Single Shank		CD Single Shank	
Dimensions:								
Ripper to Track								
Ripper length behind track, shank vertical, ripper up (A)								
A With Pushblock	2.08 m	**6'10"**	**N/A**		2.19 m	**7'2"**	**N/A**	
B Without Pushblock	1.76 m	**5'9"**	1.56 m	**5'1"**	1.85 m	**6'1"**	2.04 m	**6'8"**
Ripper length behind track, shank vertical, ripper down (A)								
C With Pushblock	2.48 m	**8'2"**	**N/A**		2.59 m	**8'6"**	**N/A**	
D Without Pushblock	2.16 m	**7'1"**	1.96 m	**6'5"**	2.29 m	**7'6"**	2.48 m	**8'2"**
Tip to track distance, shank vertical (A)								
E Ripper Up	730 mm	**2'4.7"**	651 mm	**2'1.6"**	622 mm	**2'0.5"**	622 mm	**2'0.5"**
F Ripper Down	1130 mm	**3'8.5"**	1050 mm	**3'5.3"**	1041 mm	**3'5"**	1041 mm	**3'5"**
Ripper Shank*								
G Maximum digging depth	1494 mm	**4'11"**	876 mm	**2'10.5"**	1612 mm	**5'3.5"**	1612 mm	**5'3.5"**
H Dig adjustment per hole	355 mm	**14"**	250 mm	**10"**	280 mm	**11"**	280 mm	**11"**
I Total dig adjustment	710 mm	**2'4"**	250 mm	**10"**	840 mm	**2'9.1"**	840 mm	**2'9.1"**
Pitch Adjustment, ripper down:								
J Forward	**15.7°**		**18°**		**15°**		**15°**	
K Backward	**23.5°**		**19.7°**		**18.3°**		**18.3°**	
L Maximum reach at ground line	1.50 m	**4'11"**	1.36 m	**4'6"**	1.73 m	**5'8"**	1.73 m	**5'8"**
M Maximum ground clearance under tooth (shank pinned in bottom hole)	1058 mm	**3'5.7"**	1045 mm	**3'5.1"**	1115 mm	**3'7.9"**	1115 mm	**3'7.9"**
N Maximum ramp angle, ripper up (shank pinned in bottom hole)	**36.9°**		**37.5°**		**33.9°**		**33.9°**	
Shank Section	100 × 400 mm 4" × **15.75"**		90 × 355 mm **3.5"** × **14"**		110 × 450 mm **4.3"** × **17.7"**		110 × 450 mm **4.3"** × **17.7"**	
Ripper Beam								
O Overall width	**N/A**		2.92 m	**9'7"**	**N/A**		**N/A**	
P Height	**N/A**		460 mm	**18.1"**	**N/A**		**N/A**	
Q Length	**N/A**		485 mm	**1'7.1"**	**N/A**		**N/A**	
Clearance under beam, shank vertical								
R Ripper Up	**N/A**		2.03 m	**6'8"**	**N/A**		**N/A**	
S Ripper Down	**N/A**		380 mm	**15"**	**N/A**		**N/A**	
Number of Pockets	1		**3**		**1**		**1**	
T Pocket Spacing	**N/A**		1320 mm	**4'4"**	**N/A**		**N/A**	
U Shank Gauge	**N/A**		2.63 m	**8'8"**	**N/A**		**N/A**	
V Track Clearance with standard shoe	97 mm	**4"**	97 mm	**4"**	141 mm	**5.6"**	141 mm	**5.6"**
W Width across widest part of lift cylinders	1.75 m	**5'9"**	1.75 m	**5'9"**	1.90 m	**6'3"**	1.90 m	**6'3"**
Installed Weights:								
Ripper with standard shank	7117 kg	**15,690 lb**	6919 kg	**15,253 lb**	9643 kg	**21,215 lb**	12 971 kg	**28,536 lb**
Each additional tooth group	**N/A**		524 kg	**1155 lb**	**N/A**		**N/A**	
Ripper Forces:**								
Penetration Force, shank vertical	205 000 N	**45,980 lb**	205 000 N	**45,980 lb**	279 860 N	**62,890 lb**	311 903 N	**70,091 lb**
Pryout Force, shank vertical	429 000 N	**96,360 lb**	429 000 N	**96,360 lb**	657 840 N	**147,830 lb**	625 577 N	**140,579 lb**

*Deep Ripping Shank is available for D10T and D11R single shank rippers. Hydraulic pin puller is standard with deep ripping shank. Deep Ripping Arrangement maximum digging depth is 1.86 m **(6'3")** for D10T and 2.18 m **(7'2")** for D11R.
**Forces are for a ripper on a tractor equipped with an EROPS, U-Dozer and performance track. Forces will vary slightly with other vehicle configurations.

MODEL	D10T				D11R					
	10SU		10U		11SU		11U		11 CD	
Type	Semi-U		Universal		Semi-U		Universal		Universal	
Blade Capacities*	18.5 m^3	**24.2 yd^3**	22.0 m^3	**28.7 yd^3**	27.2 m^3	**35.5 yd^3**	34.4 m^3	**45.0 yd^3**	43.6 m^3	**57.0 yd^3**
Weight, Shipping**										
Standard Dozer	10 229 kg	**22,550 lb**	10 784 kg	**23,775 lb**	14 813 kg	**32,658 lb**	17 296 kg	**38,131 lb**	22 070 kg	**48,660 lb**
Abrasion Dozer	11 069 kg	**24,403 lb**	12 413 kg	**27,366 lb**	16 192 kg	**35,698 lb**	18 823 kg	**41,498 lb**	—	
Tractor & Dozer Dimensions:										
A Length	7.76 m	**25'5"**	8.01 m	**26'3"**	8.38 m	**27'6"**	8.83 m	**28'11"**	8.34 m	**26'8"**
Width	4.86 m	**15'11"**	5.26 m	**17'3"**	5.60 m	**18'4"**	6.35 m	**20'10"**	6.71 m	**22'0"**
Blade Dimensions:										
B Width (including std. end bits)	4.86 m	**15'11"**	5.26 m	**17'3"**	5.60 m	**18'4"**	6.35 m	**20'10"**	6.71 m	**22'0"**
C Height	2.12 m	**6'11"**	2.12 m	**6'11"**	2.37 m	**7'9"**	2.37 m	**7'9"**	3.26 m	**10'8"**
D Max. Digging Depth	674 mm	**2'2.5"**	674 mm	**2'2.5"**	766 mm	**2'6.2"**	766 mm	**2'6.2"**	766 mm	**2'6.2"**
E Ground Clearance @ Full Lift	1497 mm	**4'10.9"**	1497 mm	**4'10.9"**	1533 mm	**5'0.4"**	1533 mm	**5'0.4"**	1533 mm	**5'0.4"**
G Max. Pitch Adjustment	**+1.7° to 2.3°**		**+1.7° to 2.3°**		**+2.1° to 2.2°**		**+2.1° to 2.2°**		—	
H Max. Hydraulic Tilt	993 mm	**3'3.1"**	1074 mm	**3'6.3"**	1184 mm	**3'10.6"**	1344 mm	**4'4.9"**	1344 mm	**4'4.9"**
J Hydraulic Tilt (Manual Brace Centered)	722 mm	**2'4.4"**	782 mm	**2'6.8"**	886 mm	**2'10.9"**	1006 mm	**3'3.6"**	—	
K Push Arm Trunnion Width (to Ball Centers)	3.60 m	**11'10"**	3.60 m	**11'10"**	4.18 m	**13'9"**	4.18 m	**13'9"**	4.18 m	**13'9"**
Maximum Track Width Permitted	762 mm	**2'6"**	762 mm	**2'6"**	914 mm	**3'0"**	914 mm	**3'0"**	914 mm	**3'0"**
Dual Tilt Option					**+7.5° to 7.6°** or		**+7.5° to 7.6°** or			
G Dual Pitch Adj.	**+5.2° to 5.5°**		**+5.2° to 5.5°**		**+0° to 13°**		**+0° to 13°**		**+47.8° to 10.4°**	
H Dual Max. Hyd. Tilt	1441 mm	**4'8.7"**	1560 mm	**5'1.4"**	1706 mm	**5'7.2"**	1938 mm	**6'4.3"**	—	

*Blade capacities as determined by SAE J1265.
Notice that the capacity of the U-blade is the volume carried by a straight blade of the same dimensions plus the volume included in the "cup" of the U-blade. It is intended for **relative comparisons of dozer sizes,** and not for predicting capacities or productivities in actual field conditions.
**Shipping Weight — Total Bulldozer Arrangement includes: Blade, push arms or C-frame, braces, cylinders, lines, trunnions and lift cylinder mountings.

MOTOR GRADER/ RIPPER	120H/135H	12H/140H/143H/ 160H/163H	14H	16H	24H
Parallelogram — Rear Mounted	**Ripper**	**Ripper/Scarifier**	**Ripper**	**Ripper**	**Ripper**
Tire Size (std.) Front & Rear	**13.00-24**	**14.00-24*** **	**16.00-24**	**18.00-25**	**29.5-29**
Dimensions:					
Scarifier					
Maximum digging depth	—	411 mm **16.2"**	—	—	—
Number of pockets	—	**9**	—	—	—
Spacing	—	267 mm **10.5"**	—	—	—
Ripper Shank					
Maximum digging depth	262 mm **10.3"**	462 mm **18.2"**	401 mm **15.8"**	452 mm **17.8"**	490 mm **1'7.3"**
Maximum reach at ground line*	1034 mm **3'4.7"**	1168 mm **3'10"**	1380 mm **4'6.3"**	1500 mm **4'11"**	1165 mm **3'9.9"**
Maximum ground clearance under tip (shank pinned in bottom hole)	652 mm **2'1.6"**	521 mm **1'8.5"**	663 mm **2'2.1"**	673 mm **2'2.5"**	739 mm **2'5.1"**
Maximum ramp angle, ripper up (shank pinned in bottom hole)	**23°**	**23°**	**21°**	**21°**	**20°**
Shank Section	36 × 76 mm **1.4" × 3"**	61 × 140 mm **2.4" × 5.5"**	61 × 140 mm **2.4" × 5.5"**	76 × 178 mm **3" × 7"**	78 × 178 mm **3" × 7"**
Ripper Beam					
Overall Width	2.30 m **7'7"**	2.30 m **7'7"**	2.60 m **8'6"**	2.98 m **9'9"**	3.91 m **12'10"**
Height	152 mm **6"**	152 mm **6"**	165 mm **6.5"**	214 mm **8.4"**	216 mm **8.5"**
Length	182 mm **7.2"**	229 mm **9"**	211 mm **8.3"**	254 mm **10"**	254 mm **10"**
Number of Pockets	**5**	**5**	**7**	**7**	**7**
Pocket Spacing:					
Inside	533 mm **1'9"**	533 mm **1'9"**	472 mm **1'7"**	500 mm **1'8"**	593 mm **1'11.4"**
Middle	533 mm **1'9"**	533 mm **1'9"**	373 mm **15"**	445 mm **17.5"**	604 mm **1'11.8"**
Outside	533 mm **1'9"**	533 mm **1'9"**	373 mm **15"**	445 mm **17.5"**	604 mm **1'11.8"**
Shank Gauge	2.13 m **7'0"**	2.13 m **7'0"**	2.44 m **8'0"**	—	—
Installed weights:					
Ripper with standard shank	613 kg **1350 lb**	1060.5 kg **2336 lb**	1542 kg **3399 lb**	2177 kg **4799 lb**	2812 kg **6186 lb**
Each additional shank	11 kg **24 lb**	31 kg **68 lb**	31 kg **68 lb**	68 kg **150 lb**	68 kg **150 lb**
Ripper Forces ◄					
Penetration Force ◄	4343 kg **9566 lb**	8047 kg** **17,740 lb****	10 676 kg **23,541 lb**	10 163 kg **22,410 lb**	117 720 N **39,967 lb**
Pryout Force	2279 kg **5020 lb**	9281 kg **20,460 lb**	11 804 kg **26,028 lb**	15 323 kg **33,788 lb**	263 880 N **59,373 lb**

*Measured from mounting face on frame.
Applies to 12H, 140H and 143H. Penetration force for 160H and 163H is 8518 kg **(18,780 lb).
***12H std. tire is 13.00-24.
NOTE: See Section 1 for Ripper Tips.
◄This value may vary slightly with various vehicle configurations.

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:

$$A = S \times (L_e - L_o) \times 1000 \times E \quad \text{(Metric)}$$
$$A = S \times (L_e - L_o) \times 5280 \times E \quad \text{(English)}$$

where A: Hourly operating area (m^2/h or ft^2/h)
S: Operating speed (km/h or mph)
L_e: Effective blade length (m or ft)
L_o: Width of overlap (m or ft)
E: Job efficiency

Operating Speeds:

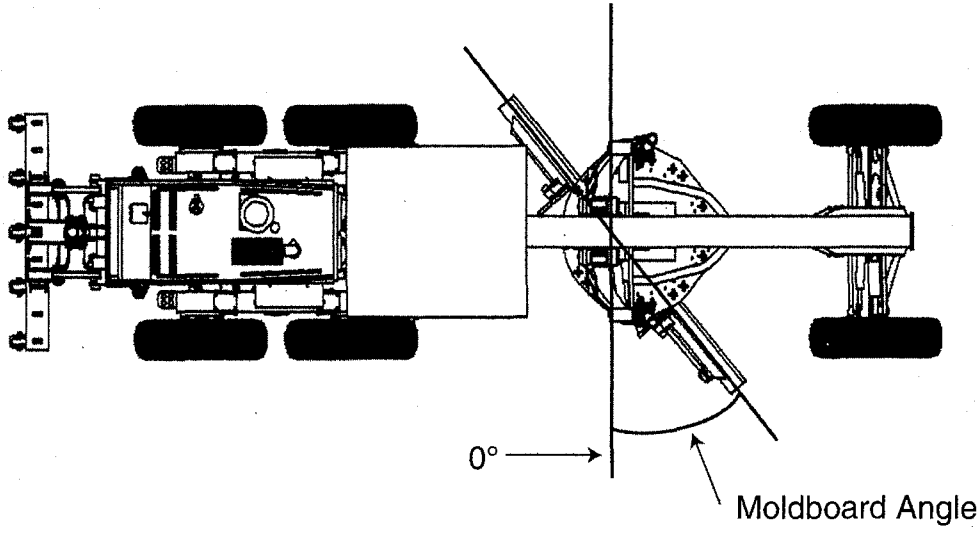
Typical operating speeds by application

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 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)
3.962 (13)	3.43 (11.3)	2.80 (9.2)
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)] × 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 140H 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 60 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 km/h × (3.17 m − 0.6 m) × 1000 × 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)**

BLADE PULL

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

Variables:

Machine weight = Wr

Traction coefficient = T (Section 26, look up the table entitled "Coefficient of Traction Factors")

Wr × T = Blade Pull

Example problem:

Calculate the blade pull for a 140H NA version machine operating in a quarry pit...

Given:

Wr = 10 501 kg

T = 0.65

10 501 × 0.65 = 6825.65

English

Wr = 23,151 lb

T = 0.65

23,151 × 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 140H NA version machine...

Given:

BA = 2565 mm FW = 4223 kg

WB = 6086 mm BD = ?

$$\frac{6086}{(6086 - 2565)} \times 4223 = 7299 \text{ kg}$$

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, however it will 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.

Caterpillar 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 m (12')		4.27 m (14')		4.88 m (16')		7.32 m (24')	
		m	ft	m	ft	m	ft	m	ft
Angle°	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
	20°	3.44	11.28	4.01	13.16	4.58	15.04	6.87	22.55
	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.

MODEL	621G		631G	
Flywheel Power	246/272 kW	**330/365 hp**	345/373 kW	**462/500 hp**
Approx. Operating Weight (Empty)◀	33 470 kg	**73,789 lb**	46 475 kg	**102,460 lb**
Scraper Capacity: Struck	12 m^3	**15.7 yd^3**	18.3 m^3	**24 yd^3**
Heaped	17 m^3	**22 yd^3**	26 m^3	**34 yd^3**
Rated Load	23 950 kg	**52,800 lb**	37 285 kg	**82,200 lb**
Weight Distribution — Empty:				
Drive		**66%**		**65%**
Rear		**34%**		**35%**
Weight Distribution — Loaded:				
Drive		**53%**		**53%**
Rear		**47%**		**47%**
Engine Model		**C15 ACERT**		**C18 ACERT**
Rated Engine RPM		**1800**		**1800**
Displacement	15.2 L	**928 in^3**	18.1 L	**1105 in^3**
Top Speed (Loaded)	51 km/h	**32 mph**	53 km/h	**33 mph**
180° Curb-to-Curb Turning Width	11.7 m	**38'5"**	12.2 m	**40'1"**
Tires — Tractor Drive		**33.25R29★★E2/E3**		**37.25R35★★E2/E3**
Scraper		**33.25R29★★E2/E3**		**37.25R35★★E2/E3**
Width of Cut	3.02 m	**9'11"**	3.51 m	**11'6"**
Maximum Depth of Cut	333 mm	**13.1"**	437 mm	**17.2"**
Maximum Depth of Spread	522 mm	**20.6"**	480 mm	**18.9"**
Fuel Tank Refill Capacity	606 L	**160 U.S. gal**	814 L	**215 U.S. gal**
GENERAL DIMENSIONS:				
Height to Top of Scraper	3.71 m	**12'2"**	4.29 m	**14'1"**
Wheelbase	7.72 m	**25'4"**	8.77 m	**28'9"**
Overall Length	12.93 m	**42'5"**	14.74 m	**48'4"**
Overall Width	3.47 m	**11'4"**	3.94 m	**12'11"**
Shipping Width (Draft Arm on Inside of Bowl)		—	3.64 m	**11'11"**
Scraper Tread	2.18 m	**7'2"**	2.46 m	**8'1"**
Tractor Tread	2.20 m	**7'3"**	2.46 m	**8'1"**

◀Operating weight includes standard machine, coolant, lubricants, full fuel tank, and operator.

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 (Section 26, look up the table entitled "Coefficient of Traction Factors")

Wr × T = Blade Pull

Example problem:

Calculate the blade pull for a 140H NA version machine operating in a quarry pit...

Metric

RW = 10 501 kg

T = 0.65

10 501 × 0.65 = 6825.65

English

RW = 23,151 lb

T = 0.65

23,151 × 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

$$\frac{\text{WB}}{\text{(WB – BA)}} \times \text{FW} = \text{BD}$$

Example problem:

Calculate the blade down pressure for a 140H NA version machine...

Metric

BA = 2565 mm FW = 4223 kg

WB = 6086 mm BD = ?

$$\frac{6086}{(6086 - 2565)} \times 4223 = 7299 \text{ kg}$$

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, however it will 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.

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

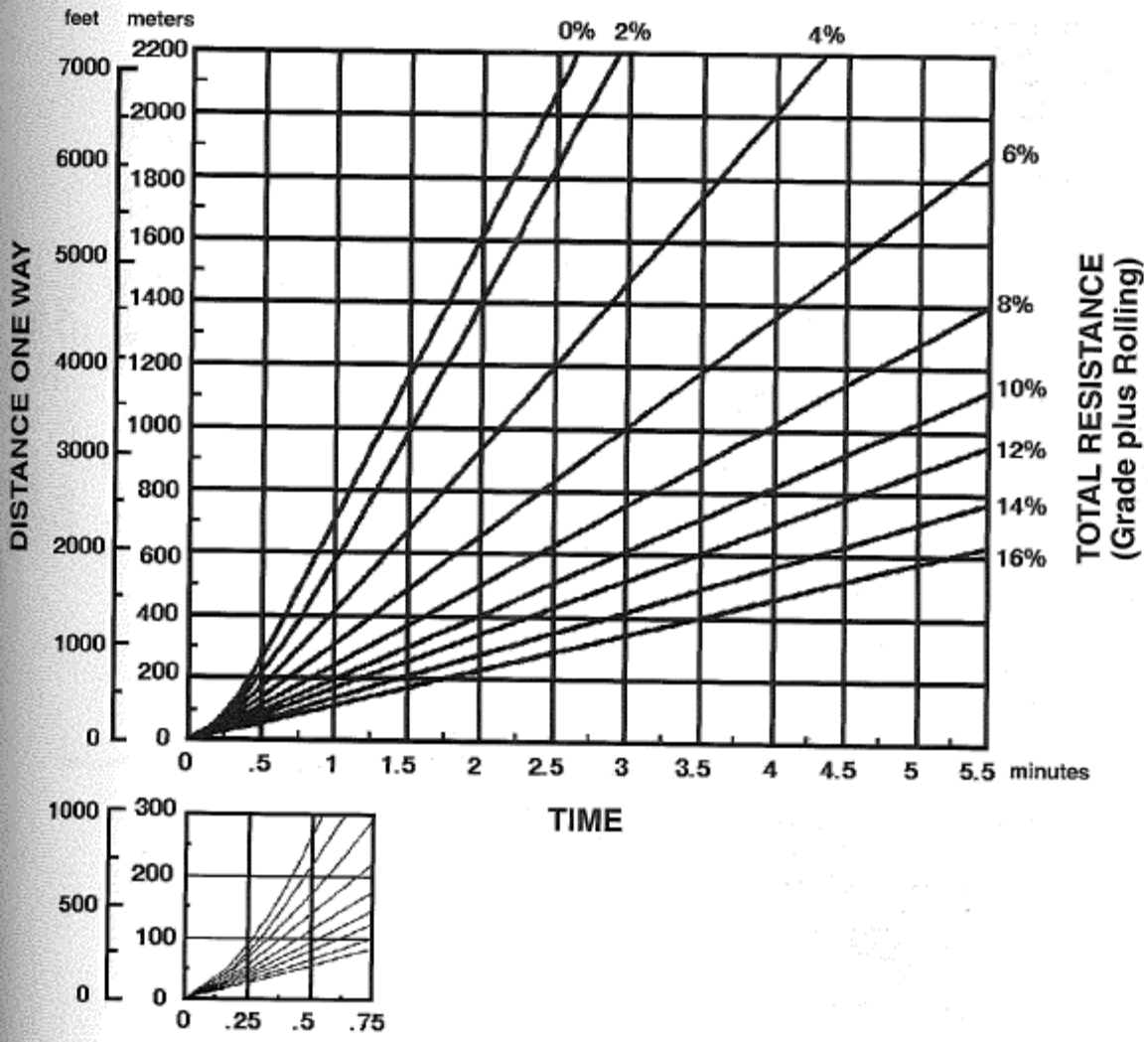
Effective Blade Length*

		Moldboard							
		3.66 m (12')		4.27 m (14')		4.88 m (16')		7.32 m (24')	
		m	ft	m	ft	m	ft	m	ft
Angle°	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
	20°	3.44	11.28	4.01	13.16	4.58	15.04	6.87	22.55
	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.

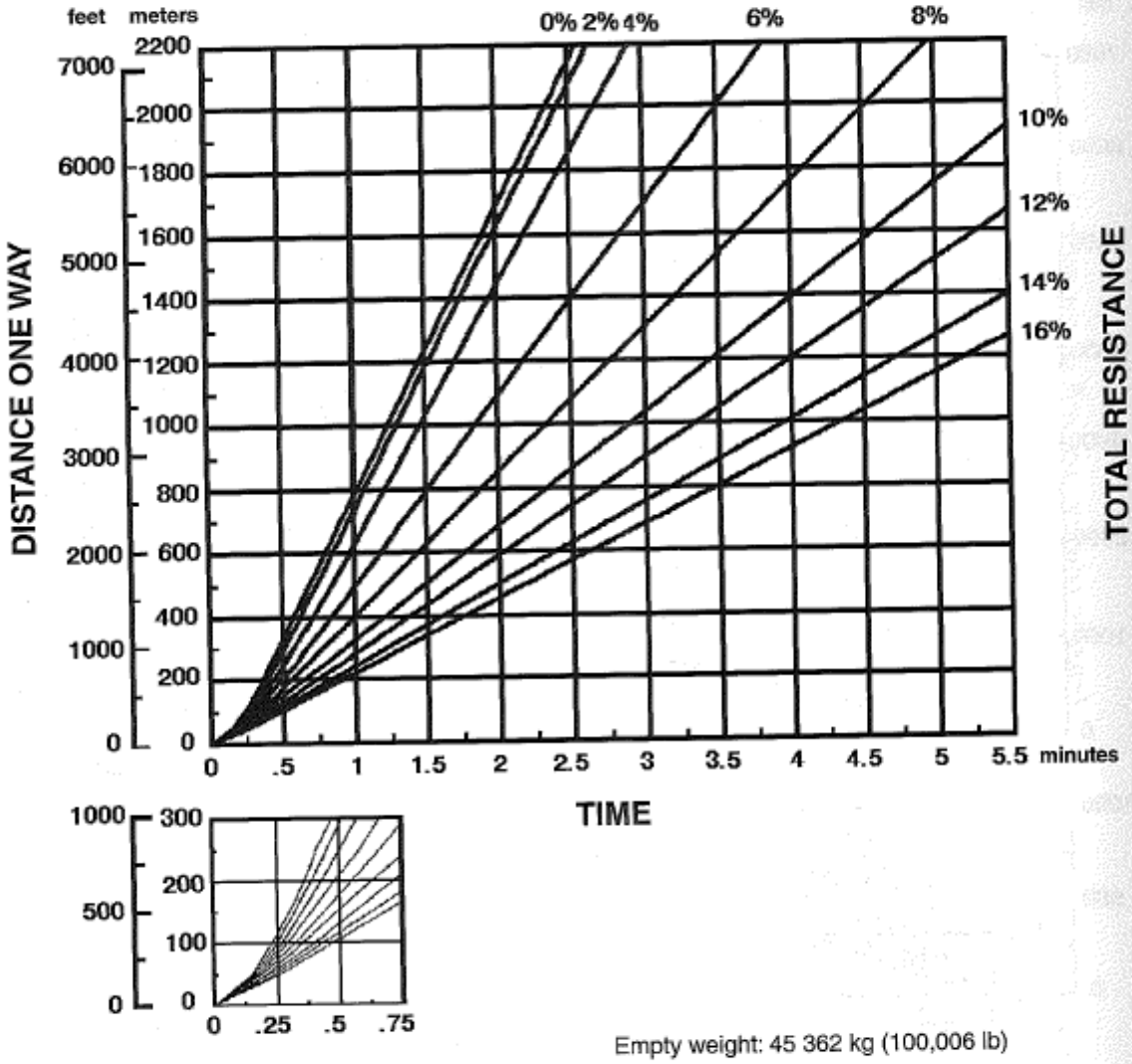
631 G Travel Time Loaded

LOADED



Empty weight: 45 362 kg (100,006 lb)
Payload: 37 285 kg (82,200 lb)

EMPTY



Empty weight: 45 362 kg (100,006 lb)

Cycle Time —

= load* + haul + maneuver & spread* + return
= 0.6 + 1.4 + 0.7 + 1.0
= 3.7 min.

*For fixed time (load, maneuver and spread) see the table below.

When cycle time and payload are known, productivity can be calculated. For a more complex example see the Earthmoving Section.

●●●

TYPICAL FIXED TIMES FOR SCRAPERS

(Times may vary depending on job conditions)

Model	Loaded By	Load Time (Min.)	Maneuver and Spread or Maneuver and Dump (Min.)
613C Series II	Self	0.9	0.7
615C Series II	Self	0.9	0.7
623G	Self	0.9	0.7
621G	One D8R	0.5	0.7
627G	One D8R	0.5	0.6
621G	One D9R	0.4	0.7
627G	One D9R	0.4	0.6
627G/PP	Self	0.9*	0.6
631G	One D9R	0.6	0.7
637G	One D9R	0.6	0.6
631G	One D10R	0.5	0.7
637G	One D10R	0.5	0.6
637G/PP	Self	1.0*	0.6
657G	One D11R	0.6	0.6
657G	Push Pull Self	1.1*	0.6
621G	Auger	0.9	0.7
627G	Auger	0.7	0.7
631G	Auger	0.9	0.7
637G	Auger	0.8	0.7

*Load time per pair, including transfer time.

NOTE: Empty Weights shown on the Wheel Tractor-Scraper charts includes ROPS Canopy. The travel times will remain within acceptable limits when applied to a non-ROPS equipped machine. When calculating TMPH loadings *any* additional weight must be considered in establishing mean tire loads.

USE OF RETARDER CURVES

The following explanation applies to retarder curves for Wheel Tractor-Scrapers and Articulated Trucks.

The speed that can be maintained (without use of service brake) when the machine is descending a grade with retarder fully on can be determined from the retarder curves in this section if gross machine weight and total effective grade are known.

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

15% favorable grade with 5% rolling resistance. Find Total Effective Grade.

Total Effective Grade = 15% Grade Assistance — 5%

Rolling Resistance = 10% Total Effective Grade Assistance.

Example problem:

A 651E with an estimated payload of 47 175 kg (104,000 lb) descends a 10% total effective grade. Find constant speed and gear range with maximum retarder effort. Find travel time if the slope is 610 m (2000 ft) long.

Empty Weight + Payload = Gross Weight
= 60 950 kg + 47 175 kg = 108 125 kg
(134,370 lb + 104,000 lb = 238,370 lb)



MODEL	775E		777D		777D	
Body Type	Dual Slope		Flat Floor		Dual Slope	
Gross Machine Weight	108 400 kg	**239,000 lb**	163 293 kg	**360,000 lb**	163 293 kg	**360,000 lb**
Chassis Weight*	32 140 kg	**70,850 lb**	50 610 kg	**111,575 lb**	51 329 kg	**113,160 lb**
Body Weight	9710 kg	**21,400 lb**	16 687 kg	**36,788 lb**	15 779 kg	**34,785 lb**
Payload without Liner	66 550 kg	**146,750 lb**	95 996 kg	**211,637 lb**	96 166 kg	**212,055 lb**
Standard Liner Weight	4450 kg	**9810 lb**	5460 kg	**12,040 lb**	5461 kg	**12,040 lb**
Target Payload**	62 100 kg	**136,940 lb**	90 536 kg	**199,597 lb**	90 725 kg	**200,015 lb**
Capacity:						
Struck (SAE)	32.7 m³	**42.8 yd³**	42 m³	**54.6 yd³**	42.1 m³	**55 yd³**
Heaped (2:1) (SAE)	41.2 m³	**53.9 yd³**	60.2 m³	**78.6 yd³**	60.1 m³	**78.6 yd³**
Distribution Empty:						
Front		**45.9%**		**41.75%**		**47%**
Rear		**54.1%**		**58.25%**		**53%**
Distribution Loaded:						
Front		**31.6%**		**33%**		**33%**
Rear		**68.4%**		**67%**		**67%**
Engine Model		**3412E**		**3508B EUI**		**3508B EUI**
Number of Cylinders		**12**		**8**		**8**
Bore	137 mm	**5.4"**	170 mm	**6.7"**	170 mm	**6.7"**
Stroke	152 mm	**6"**	190 mm	**7.5"**	190 mm	**7.5"**
Displacement	27 L	**1649 in³**	34.5 L	**2105 in³**	34.5 L	**2105 in³**
Flywheel Power	544 kW	**730 hp**	699 kW	**938 hp**	699 kW	**938 hp**
Gross Power	567 kW	**760 hp**	746 kW	**1000 hp**	746 kW	**1000 hp**
Standard Tires		**24.00-R35 (E4)**		**27.00R49**		**27.00R49**
Machine Clearance Turning Circle	23.8 m	**78'9"**	28.4 m	**93'0"**	28.4 m	**93'0"**
Fuel Tank Refill Capacity	700 L	**185 U.S. gal**	1137 L	**300 U.S. gal**	1137 L	**300 U.S. gal**
Top Speed (Loaded)	65.6 km/h	**41.1 mph**	60.4 km/h	**39.9 mph**	60.4 km/h	**39.9 mph**
GENERAL DIMENSIONS (Empty):						
Height to Canopy Rock Guard Rail	4.40 m	**14'2"**	5.18 m	**17'0"**	4.91 m	**16'1"**
Wheelbase	4.19 m	**13'9"**	4.60 m	**15'0"**	4.60 m	**15'0"**
Overall Length (Operating)	9.48 m	**30'10"**	10.3 m	**33'8"**	10.3 m	**33'8"**
Overall Length (Shipping)	9.21 m	**30'3"**	9.78 m	**32'1"**	9.78 m	**32'1"**
Loading Height (Empty)	3.93 m	**12'11"**	4.57 m	**15'0"**	4.39 m	**14'5"**
Height at Full Dump	8.74 m	**28'8"**	10.0 m	**33'1"**	10.05 m	**33'0"**
Body Length (Target Length)	6.40 m	**21'0"**	6.79 m	**22'3"**	7.28 m	**23'11"**
Width (Operating)	5.08 m	**16'8"**	6.10 m	**20'0"**	6.10 m	**20'0"**
Width (Shipping)***	3.97 m	**13'0"**	3.51 m	**11'5"**	3.51 m	**11'5"**
Front Tire Tread	3.28 m	**10'9"**	4.17 m	**13'8"**	4.17 m	**13'8"**

*Weights include lubricants, coolants, 100% fuel and a debris allowance (4% of chassis).
**Refer to Caterpillar's 10/10/30 Payload Policy for Quarry & Construction Trucks.
***Disassembled.



MODEL	785C		789C		797B	
Body Type	Dual Slope		Dual Slope		MSD II	
Target Gross Machine Weight §	249 435 kg	**550,000 lb**	317 515 kg	**700,000 lb**	623 583 kg	**1,375,000 lb**
Basic Machine Configuration*	57 047 kg	**125,788 lb**	62 641 kg	**138,124 lb**	109 318 kg	**241,047 lb**
Attachments**	8707 kg	**19,198 lb**	11 789 kg	**25,995 lb**	106 860 kg	**235,627 lb**
Body Weight without Liners***	21 296 kg	**46,958 lb**	27 045 kg	**59,625 lb**	39 950 kg	**88,075 lb**
Full Liner	7641 kg	**16,848 lb**	9453 kg	**20,840 lb**	3992 kg	**8800 lb**
Standard Sideboard	1769 kg	**3900 lb**	2068 kg	**4560 lb**	—	
Operating Machine Weight	96 459 kg	**212,692 lb**	112 990 kg	**249,144 lb**	256 128 kg	**564,749 lb**
Debris (4% of Operating Machine Weight)	3585 kg	**8508 lb**	4520 kg	**9966 lb**	10 245 kg	**22,590 lb**
Empty Operating Weight	100 317 kg	**221,200 lb**	117 510 kg	**259,110 lb**	266 373 kg	**587,339 lb**
Target Payload	136+ m tons	**150+ tons**	177+ m tons	**195+ tons**	345+ m tons	**380+ tons**
Capacity:						
Heaped (2:1) (SAE) Base Body	78 m^3	**102 yd^3**	105 m^3	**137 yd^3**	220 m^3	**290 yd^3**
Distribution Empty:						
Front	**47%**		**46.9%**		**43.5%**	
Rear	**53%**		**53.1%**		**56.5%**	
Distribution Loaded:						
Front	**33%**		**33.6%**		**33.3%**	
Rear	**67%**		**66.4%**		**66.7%**	
Engine Model	**3512B EUI**		**3516B EUI**		**3524B EUI**	
Number of Cylinders	**12**		**16**		**24**	
Bore	170 mm	**6.7"**	170 mm	**6.7"**	170 mm	**6.7"**
Stroke	190 mm	**7.5"**	190 mm	**7.5"**	215 mm	**8.5"**
Displacement	51.8 L	**3158 in^3**	69 L	**4210 in^3**	117.1 L	**7143 in^3**
Net Power	1005 kW	**1348 hp**	1320 kW	**1771 hp**	2513 kW	**3370 hp**
Gross Power	1082 kW	**1450 hp**	1417 kW	**1900 hp**	2648 kW	**3550 hp**
Standard Tires	**33.00R51**		**37.00R57**		**59/80R63**	
Machine Clearance Turning Circle	30.6 m	**100'5"**	30.2 m	**99'2"**	40.5 m	**132'10"**
Fuel Tank Refill Capacity	1893 L	**500 U.S. gal**	3222 L	**851 U.S. gal**	6814 L	**1800 U.S. gal**
Top Speed (Loaded)	54.1 km/h	**33.6 mph**	52.6 km/h	**32.7 mph**	67.6 km/h	**42 mph**
GENERAL DIMENSIONS (Empty):						
Height to Canopy Rock Guard Rail	5.77 m	**18'11"**	6.15 m	**20'2"**	7.72 m	**25'4"**
Wheelbase	5.18 m	**17'0"**	5.70 m	**18'8"**	7.20 m	**23'7"**
Overall Length (Base Body)	10.62 m	**34'10"**	11.63 m	**38'2"**	14.4 m	**47'3"**
Loading Height (Base Body)	4.97 m	**16'4"**	5.21 m	**17'1"**	7.15 m	**23'6"**
Height at Full Dump	11.21 m	**36'9"**	11.90 m	**39'1"**	15.34 m	**50'4"**
Body Length (Target Length)	7.65 m	**25'1"**	8.15 m	**26'9"**	9.90 m	**32'6"**
Width (Operating)	6.64 m	**21'4"**	7.67 m	**25'2"**	9.66 m	**31'9"**
Width (Shipping)***	3.91 m	**12'10"**	3.84 m	**12'7"**	4.19 m	**13'9"**
Front Tire Tread	4.85 m	**15'11"**	5.43 m	**17'10"**	6.51 m	**21'4"**

*See Weight Definitions on 9-9; No mandatory or optional attachments. Note: Does not include fuel tank.
**Typical selection of mandatory attachments and 100% fuel.
***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.

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.

USE OF RIMPULL-SPEED-GRADEABILITY CURVES

(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.)

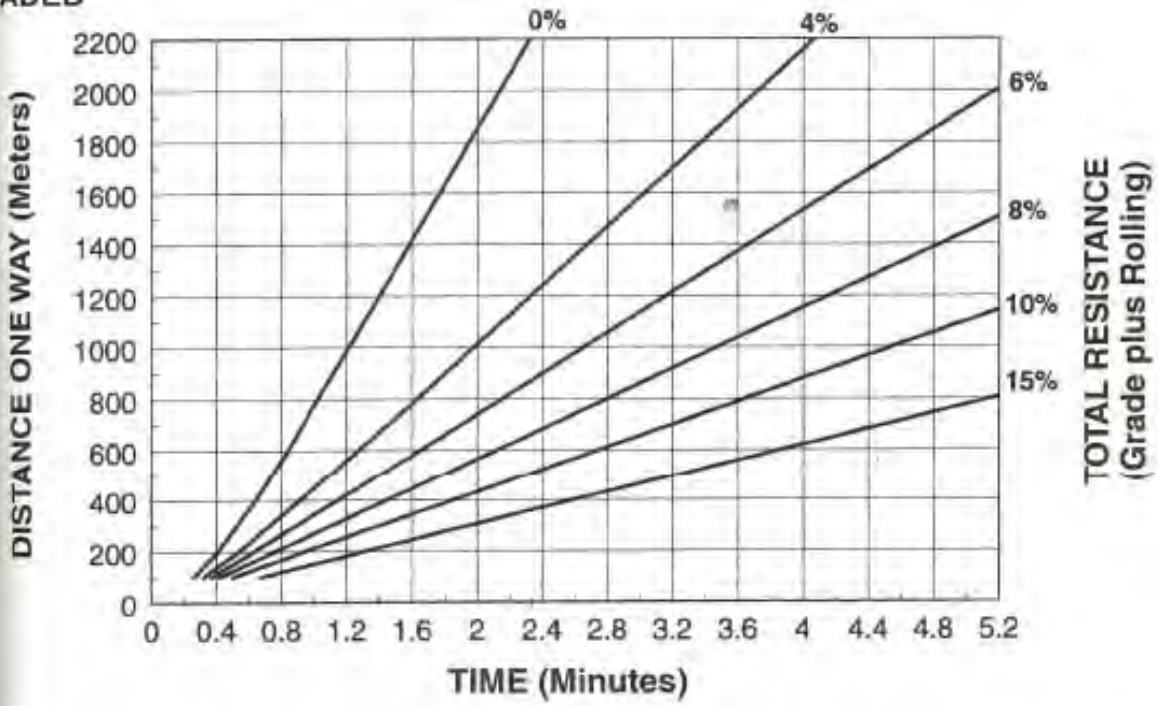
Total cycle time is the combination of:
1. The above fixed time
2. Hauling time (Loaded)
3. Return time (Empty)

Example — assume load tool spots hauler with full bucket

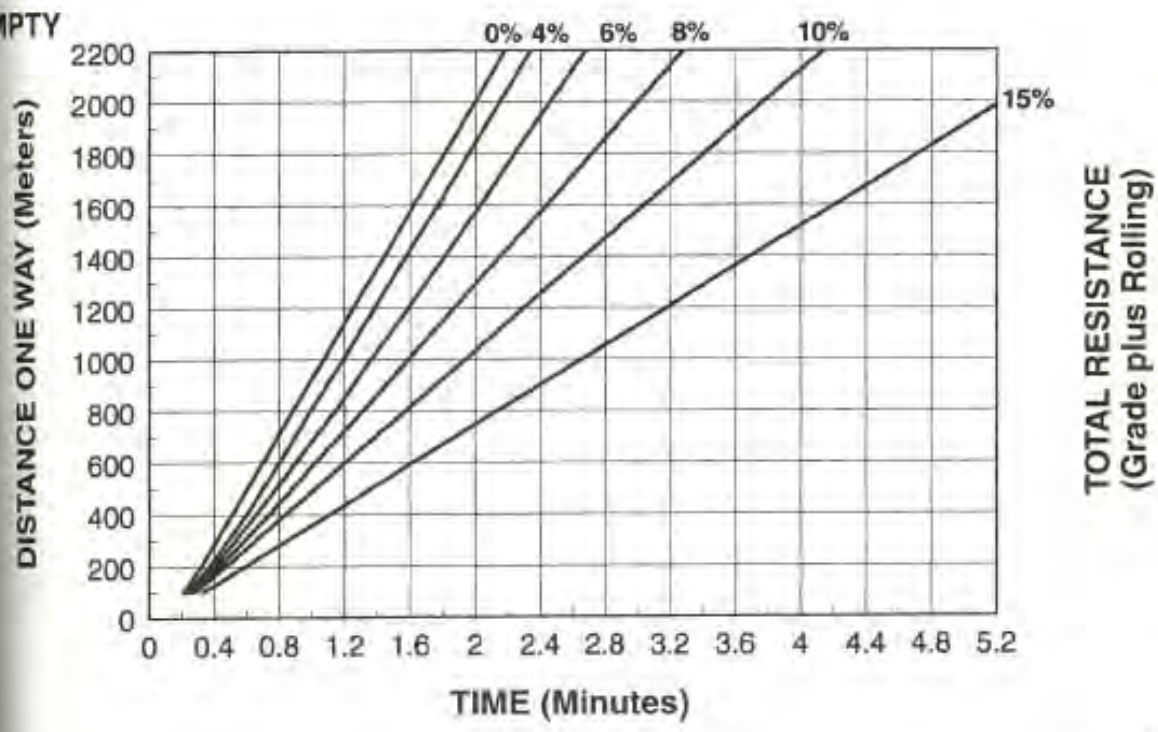
	988F	5130B
cycle times	.60	.45
First pass (dump time)	.10 min.	.05 min.
2 passes (full cycle)	.70	.50
3 passes "	1.30	.95
4 passes "	1.90	1.40
5 passes "	2.50	1.85
6 passes "	3.10	2.30
7 passes "	3.70	2.75
8 passes "	4.30	3.20
9 passes "	4.90	3.65
10 passes "	5.40	4.10

NOTE: Other sizes of loading tools will have different cycle times. See Wheel Loader section for **average** cycle times for truck loading.

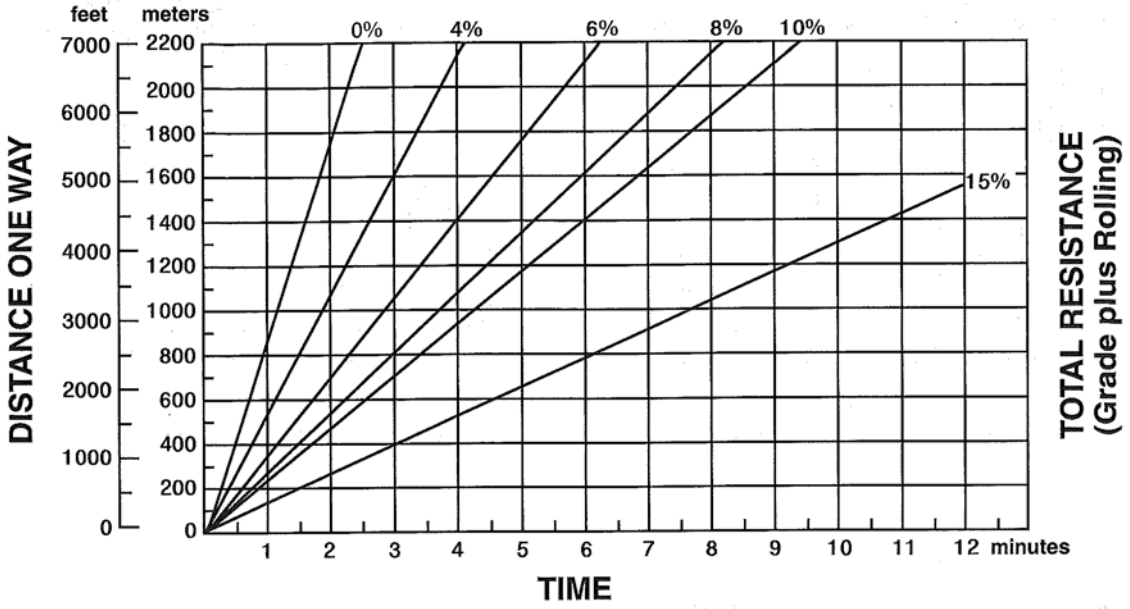
OADED


0%
4%
6%
8%
10%
15%
DISTANCE ONE WAY (Meters)
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 0.4 0.8 1.2 1.6 2 2.4 2.8 3.2 3.6 4 4.4 4.8 5.2
TIME (Minutes)
TOTAL RESISTANCE
(Grade plus Rolling)

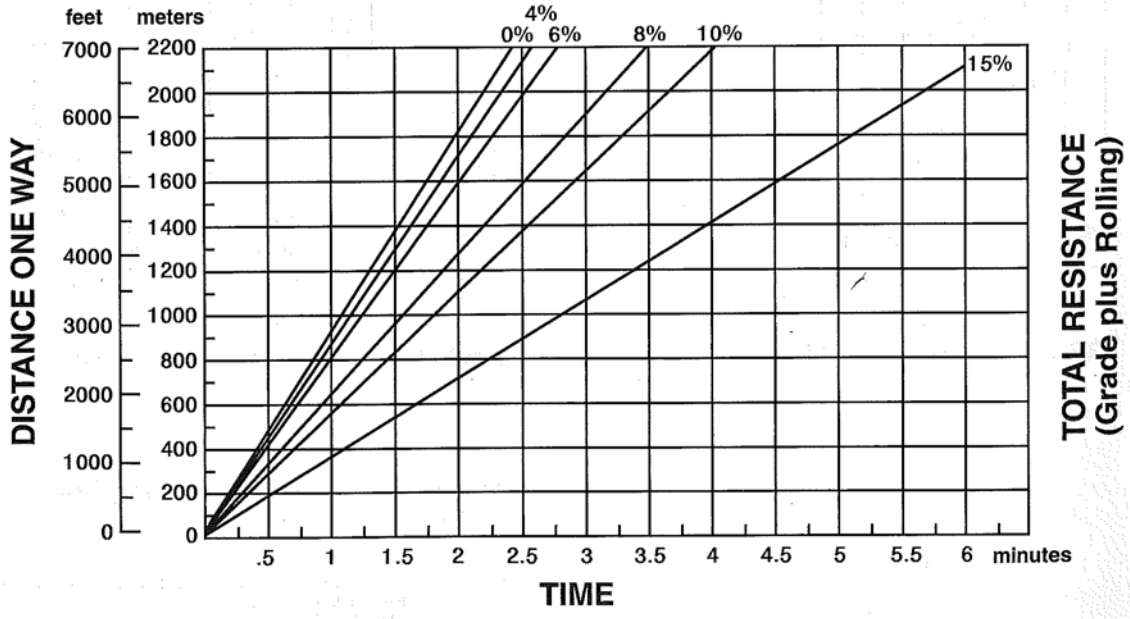
EMPTY


0% 4% 6% 8% 10%
15%
DISTANCE ONE WAY (Meters)
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 0.4 0.8 1.2 1.6 2 2.4 2.8 3.2 3.6 4 4.4 4.8 5.2
TIME (Minutes)
TOTAL RESISTANCE
(Grade plus Rolling)

LOADED



EMPTY



Rock Buckets			Standard Spade Edge		Large Standard Spade Edge		Heavy Duty Quarry		High Abrasion	
			Teeth & Segments		Teeth & Segments		Teeth & Segments		Teeth	
			Std.	Hi-Lift	Std.	Hi-Lift	Std.	Hi-Lift	Std.	Hi-Lift
Rated bucket capacity (§)		m^3	11.5	11.5	12.2	12.2	11.5	11.5	11.5	11.5
		yd^3	**15.0**	**15.0**	**16.0**	**16.0**	**15.0**	**15.0**	**15.0**	**15.0**
Struck capacity (§)		m^3	9.45	9.45	10.1	10.1	9.45	9.45	9.45	9.45
		yd^3	**12.36**	**12.36**	**13.2**	**13.2**	**12.4**	**12.4**	**12.36**	**12.36**
Bucket width (§)		mm	4824	4824	4824	4824	4824	4824	4840	4840
		ft/in	**15'10"**	**15'10"**	**15'10"**	**15'10"**	**15'10"**	**15'10"**	**15'11"**	**15'11"**
Dump clearance at full lift and 45° discharge (§)	With teeth	mm	4626	5250	4626	5250	4557	5182	4602	5227
		ft/in	**15'2"**	**17'3"**	**15'2"**	**17'3"**	**14'11"**	**17'0"**	**15'1"**	**17'2"**
	Bare	mm	4993	5607	4993	5607	4993	5607	4993	5607
		ft/in	**16'5"**	**18'5"**	**16'5"**	**18'5"**	**16'5"**	**18'5"**	**16'5"**	**18'5"**
Reach at full lift and 45° discharge (§)	With teeth	mm	2315	2304	2315	2304	2364	2354	2391	2381
		ft/in	**7'7"**	**7'7"**	**7'7"**	**7'7"**	**7'9"**	**7'9"**	**7'10"**	**7'10"**
	Bare	mm	1732	1720	1732	1720	1732	1720	1732	1720
		ft/in	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**
Reach with boom – horizontal and bucket level	With teeth	mm	5110	5590	5110	5590	5192	5673	5181	5661
		ft/in	**16'9"**	**18'4"**	**16'9"**	**18'4"**	**17'0"**	**18'7"**	**17'0"**	**18'7"**
	Bare	mm	4177	4657	4177	4657	4177	4657	4177	4657
		ft/in	**13'8"**	**15'3"**	**13'8"**	**15'3"**	**13'8"**	**15'3"**	**13'8"**	**15'3"**
Digging depth (§)		mm	165	161	165	161	180	177	155	152
		in	**6**	**6**	**6**	**6**	**7**	**7**	**6**	**6**
Overall length (§)	With teeth	mm	15 585	16 175	15 585	16 175	15 604	16 194	15 636	16 226
		ft/in	**51'2"**	**53'1"**	**51'2"**	**53'1"**	**51'2"**	**53'2"**	**51'4"**	**53'3"**
	Bare	mm	15 143	15 733	15 143	15 733	15 143	15 733	15 143	15 733
		ft/in	**49'8"**	**51'7"**	**49'8"**	**51'7"**	**49'8"**	**51'7"**	**49'8"**	**51'7"**
Overall height with bucket at full raise (§)		mm	9415	10 035	9415	10 035	9415	10 035	9415	10 035
		ft/in	**30'11"**	**32'11"**	**30'11"**	**32'11"**	**30'11"**	**32'11"**	**30'11"**	**32'11"**
Loader clearance circle with bucket in carry position (§)	With teeth	m	22.27	22.88	22.27	22.88	22.27	22.88	22.31	22.92
		ft/in	**73'1"**	**75'1"**	**73'1"**	**75'1"**	**73'1"**	**75'1"**	**73'2"**	**75'2"**
	Bare	m	21.88	22.46	21.88	22.46	21.88	22.46	21.94	22.51
		ft/in	**71'9"**	**73'8"**	**71'9"**	**73'8"**	**71'9"**	**73'8"**	**72'**	**73'10"**
Static tipping load, straight†		kg	60 292	58 693	60 091	58 488	59 226	57 552	58 164	56 620
		lb	**132,921**	**129,396**	**132,478**	**128,944**	**130,571**	**126,880**	**128,230**	**124,826**
Static tipping load, full 40° turn†		kg	52 541	50 720	52 303	50 477	51 424	49 534	50 442	48 673
		lb	**115,833**	**111,818**	**115,308**	**111,283**	**113,370**	**109,204**	**111,205**	**107,306**
Static tipping load, full 43° turn†		kg	51 392	49 538	51 149	49 289	50 267	48 346	49 297	47 494
		lb	**113,300**	**109,213**	**112,764**	**108,664**	**110,820**	**106,585**	**108,681**	**104,706**
Breakout force†† (§)		kN	615	602	612	599	595	583	591	578
		lb	**138,360**	**135,421**	**137,692**	**134,753**	**133,783**	**130,957**	**132,804**	**129,921**
Operating weight† (§)		kg	94 927	98 596	95 447	99 116	96 304	99 973	96 607	100 277
		lb	**209,278**	**217,367**	**210,424**	**218,513**	**212,314**	**220,403**	**212,982**	**221,073**

†Static tipping load and operating weight shown are based on standard machine configuration with 45/65-45, 46 PR (L-5) tires, full fuel tank, cooolant, lubricants and operator.
††Measured 102 mm **(4")** behind tip of cutting edge with bucket hinge pin as pivot point in accordance with SAE J732 JUN92.

NOTE: Specifications and ratings conform to all applicable standards recommended by the Society of Automotive Engineers (SAE). SAE Standards J732 JUN92 and J742 FEB85 govern loader ratings, denoted in the text by (§). Dimensions are also measured to the tip of the bucket teeth to provide accurate clearance data. SAE Standards specifies the cutting edge.

	Change in Operating Weight		Change in Articulated Static Tipping Load			
	Standard (for four tires)		Standard		High Lift	
	kg	lb	kg	lb	kg	lb
45/65-45, 46 ply L-5 Firestone	0	**0**	0	**0**	0	**0**
45/65-45, 46 ply L-5 General	+ 427	**+ 940**	+ 284	**+ 625**	+256	**+ 564**
45/65-45, 46 ply L-5 Goodyear	– 162	**– 356**	– 108	**– 238**	– 97	**– 214**
45/65 R45 1-Star L-4 (XLDD1) Michelin	–1942	**–4272**	–1290	**–2838**	–882	**–1942**
45/65 R45 1-Star L-5 (XLDD2) Michelin	– 681	**–1500**	– 452	**– 994**	–409	**– 900**
45/65 R45 1-Star L-5 (XMINED2) Michelin	+ 752	**+1656**	+ 523	**+1151**	+451	**+ 994**
45/65-45, 50PR L-5 Firestone	– 278	**– 612**	– 167	**– 367**	–167	**– 367**
45/65-45, 50PR L-5 Firestone	+ 441	**+ 972**	+ 265	**+ 583**	+265	**+ 583**

12

	Minutes added (+) or Subtracted (–) From Basic Cycle
Machine	
— Material handler	–.05
Materials	
— Mixed	+.02
— Up to 3 mm (1/8 in)	+.02
— 3 mm (1/8 in) to 20 mm (3/4 in)	–.02
— 20 mm (3/4 in) to 150 mm (6 in)	.00
— 150 mm (6 in) and over	+.03 and Up
— Bank or broken	+.04 and Up
Pile	
— Conveyor or Dozer piled 3 m (10 ft) and up	.00
— Conveyor or Dozer piled 3 m (10 ft) or less	+.01
— Dumped by truck	+.02
Miscellaneous	
— Common ownership of trucks and loaders	Up to –.04
— Independently owned trucks	Up to +.04
— Constant operation	Up to –.04
— Inconsistent operation	Up to +.04
— Small target	Up to +.04
— Fragile target	Up to +.05

Using actual job conditions and the above factors, total cycle time can be estimated. Convert total cycle time to cycles per hour.

$$\textit{Cycles per hour at 100\% Efficiency} = \frac{60\ \textit{min}}{\textit{Total Cycle Time in Minutes}}$$

Job efficiency is an important factor in machine selection. Efficiency is the actual number of minutes worked during an hour. Job efficiency accounts for bathroom breaks and other work interruptions.

$$\text{Cycles per hour at 50 minutes per hour (83\% efficiency)} = \text{Cycles per hour at 100\% efficiency} \times \frac{\text{50 min actual work time}}{\text{60 min hour}}$$

TRUCK LOADING

Average loader cycle times

914G-962H	0.45-0.50 min
966H-980H	0.50-0.55 min
988H-990H	0.55-0.60 min
992G-994F	0.60-0.70 min

3. Required Payload Per Cycle

Required payload per cycle is determined by dividing required hourly production by the number of cycles per hour.

4. Bucket Selection

After required payload per cycle has been calculated, the payload should be divided by the loose cubic yard (meter) material weight to determine number of loose cubic yards (meters) required per cycle.

The bulk of material handled does not weigh 1800 kg/m³ (3000 lb/yd³), so a reasonable knowledge of material weight is necessary for accurate production estimates. The Tables Section has average weight for certain materials when actual weights are not known.

The percentage of rated capacity a bucket carries in various materials is estimated below. The bucket size required to handle the required volume per cycle is found with the aid of the percentage of rated bucket capacity called "Bucket Fill Factor."

The bucket size needed is determined by dividing loose cubic meters (or yards) required per cycle by the bucket fill factor.

$$\textit{Bucket size} = \frac{\textit{Volume Required/Cycle}}{\textit{Bucket Fill Factor}}$$

BUCKET FILL FACTORS

The following indicates the approximate amounts of material as a percent of rated bucket capacity which will actually be delivered per bucket per cycle. This is known as "Bucket Fill Factor."

Loose Material	Fill factor
Mixed moist aggregates	95-100%
Uniform aggregates up to 3 mm (1/8 in)	95-100
3 mm (1/8 in) to 9 mm (3/8 in)	90-95
12 mm (1/2 in) to 20 mm (3/4 in)	85-90
24 mm (1.0 in) and over	85-90

Blasted Rock

Well blasted	80-95%
Average	75-90
Poor	60-75

Other

Rock dirt mixtures	100-120%
Moist loam	100-110
Soil, boulders, roots	80-100
Cemented materials	85-95

NOTE: Fill factors on wheel loaders are affected by bucket penetration, breakout force, rackback angle, bucket profile and ground engaging tools such as bucket teeth or bolt-on replaceable cutting edges.

Example:

12 mm (1/2 in) material and 3 m^3 (4 yd^3) bucket.
.90 × 3 m^3 = 2.75 Loose m^3 delivered per cycle.
.90 × 4 yd^3 = 3.6 Loose yd^3 delivered per cycle.

NOTE: Check the static tipping load on the specific machine to determine if bucket load is in fact a safe operating load.

Bucket Selection

$$\textit{Tons Required/Cycle} = \frac{\textit{Tons Required/Hour}}{\textit{CyclesHour}}$$

$$\textit{Kg (Pounds) Required/Cycle} = \textit{Tons Required/Cycle} \times \textit{907 kg (2000 lb)}$$

$$\textit{Volume Required/Cycle} = \frac{\textit{kg (Pounds) Cycle}}{\textit{Material Weight kg/m}^3\textit{ (lb/yd}^3\textit{)}}$$

Always select a machine with a greater capacity than the calculated required operating capacity. For most applications, payload above recommended and excessive counterweight can hinder machine performance and reduce dynamic stability and machine life.

For optimum performance in fast cycling situations such as truck loading, operating loads should not exceed the recommended capacity. To provide extra stability, calcium chloride ($CaCl_2$) ballast may be desired when operating at recommended operating load, see SAE Loader rating pages in this section. For specific stability data and optional tire sizes, see the "Performance Data" pages in this section.

When selecting special application buckets, such as multi-purpose and side dump the additional bucket weight must be deducted from recommended capacity.

Specific circumstances may involve other conditions which would also affect loader capacity. Because of the greatly varied applications and conditions, your Caterpillar dealer should be contacted for guidance.

Example problem:

JOB CONDITIONS

Application	Truck loading
Production Required	450 metric ton (496 Tons) per hour
Material	9 mm (3/8") gravel in 6 m (20 ft) high stockpile
Density	1660 kg/m^3 (2800 lb/yd^3)

Trucks are 6-9 m^3 (8-12 yd^3) capacity and are owned by three contractors. Loading is constant. Hard level surface for loader maneuvering.

1. *PRODUCTION REQUIRED:* Given

2. *CYCLE TIME:* Assume loader size between 914G and 962H for initial choice of basic cycle.
(Refer to Cycle Time Factors in this section)

Independent trucks	.04 min
Basic Cycle	.50 min
Material	–.02 min
Independent trucks	+.04 min
Constant operation	–.02 min
Total Cycle	.50 min

NOTE: Load and carry times not required in total cycle.

$$\text{Cycles/hr at 83\% efficiency} = 120 \text{ cycles/hr} \times \frac{\text{50 min actual work time}}{\text{60 min per hr}}$$

$$= 100 \text{ cycles/hr}$$

3. *VOLUME REQUIRED PER CYCLE*
(Density in tons)
Density in this example was given. When not given, refer to Tables Section to obtain an estimated density for the material being handled.

$$\textit{Metric:}\ \frac{1660 \text{ kg/m}^3}{1000 \text{ kg/ton}} = 1.66 \text{ ton/m}^3$$

$$\textit{English:}\ \frac{2800 \text{ lb/yd}^3}{2000 \text{ lb/ton}} = 1.4 \text{ tons/yd}^3$$

ALTITUDE DERATION

PERCENT FLYWHEEL HORSEPOWER AVAILABLE AT SPECIFIED ALTITUDES

MODEL	0-760 m (0-2500')	760-1500 m (2500-5000')	1500-2300 m (5000-7500')	2300-3000 m (7500-10,000')	3000-3800 m (10,000-12,500')	3800-4600 m (12,500-15,000')
D3G XL	100	100	100	100	96	88
D3G LGP	100	100	100	100	96	88
D4G XL	100	100	100	97	88	81
D4G LGP	100	100	100	97	88	81
D5G XL	100	100	100	100	**	**
D5G LGP	100	100	100	100	**	**
D5N XL & LGP	100	100	100	100	100	100
D6K XL & LGP	100	100	100	100	N/A	N/A
D6N XL & LGP	100	100	100	100	N/A	N/A
D6N XL & LGP**	100	100	100	100	100	100
D6G	100	100	100	100	94	87
D6R Series III (All)	100	100	100	100	92	84
D7G	100*	100*	100*	94	86	80
D7R Series II (All)	100	100	100	100	100	96
D8R	100	100	100	93	85	77
D8T	100	100	100	100	100	93
D9R	100	100	100	93	85	77
D9T	100	100	100	100	100	93
D10T	100	100	100	100	97	89
D11R/D11R CD	100	100	100	93	85	77
120H STD	100	100	100	100	100	100
120H Global	100	100	100	100	96	93
135H STD	100	100	100	100	100	98
135H Global	100	100	100	100	96	93
12H STD	100	89	83	77	71	65
12H Global	100	100	100	100	96	93
140H STD	100	100	100	100	97	89
140H Global	100	100	100	100	96	93
143H Global	100	100	100	100	96	93
160H STD	100	100	100	97	89	82
160H Global	100	100	100	100	96	93
163H Global	100	100	100	100	98	96
14H Global	100	100	100	100	98	96
16H Global	100	100	100	100	98	96
24H Global	100	100	100	100	93	85

*Refer to "Captive Vehicle Engine Fuel Specifications" microfiche at your local dealer.
**Information not available at time of printing.

Appendix E-09
Well Abandon & Drilling Costs

Extraction well construction	Linear Foot	based on current design	1353.6	$82.00	$110,995.20	
Decon & mobilization between well installation sites	Each	based on current design	3	$1,400.00	$4,200.00	
Well development	Hour	based on current design	24	$165.00	$3,960.00	
					$88.03	$/lf
					$451.20	ft/well - avg
					$39,718.40	$/well
Plug & Abandon Standby	Hour	estimated at 2 hours per well	2	$485.00	$970.00	
Plug & Abandon per diem	Day	estimated at 4 days per well	4	$330.00	$1,320.00	
					$2,290.00	$/well

Average depth 451 ft (665+214.6+484)/3=451ft

SECTION 4.0

Category	Unit	Quantities	Notes on Quantities		
Well P&A					
Perched zone well P&A	Linear Foot	14947	based on well logs	$ 12.00	$ 179,364.00
Regional well P&A	Linear Foot	2354	based on well logs	$ 16.00	$ 37,664.00
Decon & mobilization between well P&A sites	Each	131	total number of wells	$ 210.00	$ 27,510.00
P&A Standby	Hour	60	estimated	$ 210.00	$ 12,600.00
P&A per diem	Day	66	estimated at 0.5 day per well	$ 220.00	$ 14,410.00
Well construction					
Monitor well construction	Linear Foot	7307	based on current design	$ 81.00	$ 591,867.00
Extraction well construction	Linear Foot	5092	based on current design	$ 90.00	$ 458,280.00
Decon & mobilization between well installation sites	Each	59	based on current design	$ 1,400.00	$ 82,600.00
Well development	Hour	472	based on current design	$ 165.00	$ 77,880.00
P&A Standby	Hour	118	estimated at 2 hours per well	$ 485.00	$ 57,230.00
P&A per diem	Day	236	estimated at 4 days per well	$ 330.00	$ 77,880.00
Aquifer Test					
Support per tests (equipment, personnel, etc.)	Each	3	proposed number of tests	$ 14,800.00	$ 44,400.00
P&A Standby	Hour	8	estimated	$ 185.00	$ 1,480.00
P&A per diem	Day	9	3 72-hour tests	$ 220.00	$ 1,980.00
Equipment					
Drill rig mob/demob	Each	7	estimated	$ 9,600.00	$ 67,200.00
Pump rig mob/demob	Each	2	estimated	$ 1,850.00	$ 3,700.00
Pipe truck mob/demob	Each	3	estimated	Included	$ -
Support truck mob/demob	Each	4	estimated	Included	$ -
					$ 1,736,045.00

January 26, 2007

Phelps Dodge, Tyrone Mine
Silver City, NM

Attention: Mr. Richard J. Thornburg

RE: Cost Reduction

Dear Mr. Thornburg:

Thank you for inviting WDC to work at the Tyrone Mine. WDC Exploration & Wells is pleased to offer Phelps Dodge these additional line items to our current drilling contract.

Drilling DAR - Furnish & Install 4" PVC Monitor Well $69.00/Ft
Drilling DAR – Furnish & Install 5" PVC Extraction Well $82.00/Ft

These new line items will result in a cost savings of $7.00/FT on the 4" wells and $9.00/FT on the 5" wells. The savings are realized due to WDC combining Air Rotary Casing Hammer through the soft, unstable, upper portion of the borehole, with Direct Air Rotary through the more competent lower portion. This method has allowed us to achieve a greater production rate resulting in lower cost per foot, while decreasing the schedule in a safe and efficient manner.

PROJECT TECHNICAL PROPOSAL

No. 3A Stockpile Well Program
Phelps Dodge – Tyrone, Inc.

September 6, 2006

EXPLORATION & WELLS
WDC

New Mexico District

3621 Highway 47 | Peralta, New Mexico 87042

Telephone 800.914.7506 | 505.865.5222

Facsimile 505.865.5151

WDCEXPLORATION.COM

6 September 2006

Mr. Richard J. Thornburg
Senior Project Engineer
Phelps Dodge Tyrone, Inc.
P.O. Box 571
Tyrone, NM 88065

Re: No. 3A Stockpile Well Program

Dear Mr. Thornburg:

Please find attached a cost and technical proposal for the above referenced project. The data is based on the statement of work and information provided on the site visit.

If you have any questions, require additional information and/or would like to schedule a seminar please contact me at 800-914-7506 or by email at bryannydoske@wdcexploration.com.

Thank you,

WDC Exploration and Wells

Bryan Nydoske
New Mexico District Manager

Solutions/Approach for Successful Performance

SECTION 1.0

A. Introduction

The scope of work consists of well abandonment (131 wells), monitor well installations (31 wells), regional aquifer extraction well completions (23 wells), well development and aquifer testing (3 – 72 hour tests). The well installations and abandonments will be performed in accordance to both NMED regulatory guidelines and Phelps Dodge Tyrone, Inc. (PDTI) standard operating procedures.

B. Health and Safety

The work will be performed under a site specific health and safety plan (HASP). The HASP will comply with the MSHA act of 1977 and the plan will be present at the site at all times. Daily tailgate safety meetings will occur at the start of each day and at any change in work, personnel and/or risk type. Documentation of the tailgate meetings are a project deliverable and will be available for review at all times.

All WDC Exploration and Wells (WDC) employees will be current on MSHA, Hazwoper and site specific training prior to performing any work for this project. Copies of all training documents will be provided to PDTI prior to mobilization and will also be available for inspection at the project location. Additionally all WDC employees pass a pre-employment physical abilities test and drug screen.

Proper PPE will be provided to all WDC employees for the work. Utility clearances (Blue Stake, provided by PDTI) and hot work permits will be "in hand" prior to the start of any activities. Finally, Food, drinks and trash will be removed from the site each day to alleviate the potential contact with coyotes, bears, mountain lions and/or other wildlife.

C. Well Plugging and Abandonment

A total of 131 wells are scheduled for abandonment. The well screen and casing is 2", 4" or 6" PVC and range in depths from 22' bgs to 498' bgs. Wells are considered essential or non-essential and shall be abandoned under two mobilizations as detailed in the statement of work (SOW).

The abandonment activities shall be performed in accordance with NMED specifications and the PDTI SOP. An attempt will be made to remove the well casing by pulling from the surface, if the casing cannot be removed, the casing shall be ripped or perforated along its entire length. The well will then be pressure grouted from the total depth to the ground surface using a tremie pipe. No attempt will be made to pull the casing from regional wells.

The following equipment will be utilized during the well abandonment phase of the work:

Model 2003 or newer Pulstar P12000 Development Rig
- Support Trailer with Waste Water Tank
- PVC Casing Perforating/Ripping Tooling
- 500'+ Steel Tremie Pipe
- Generator
- Welder
- Test Pumps/Flow Meters
- Airlift Pumping Equipment
- High Pressure Washer – Steam Cleaner

ChemGrout Model 50-500 Geoloop Grout System
- Integral Mixing Tank and Pump
- Hydraulic Activated Hose Reel with 500' of 1.25" Dia. Grout Tubing
- Mud Balance

C1. Means and Methods for Well Abandonment

Table 1a Perched Zone Wells will be abandoned as follows:

1. Obtain permits.
2. Rig up Pulstar rig over well.
3. Run steel tremie pipe to the bottom of the well.
4. Attempt to pull casing.
5. Entire well screen and casing moves.
    a. Remove tremie pipe from well.
    b. Remove entire well string.
    c. Re-install casing to bottom of open hole.
    d. Pump grout through tremie to surface as tremie is being withdrawn.
    e. Remove surface completion, place and compact fill.
6. Well screen and/or casing fails.
    a. Attempt to break bottom cap of well with tremie pipe.
    b. Pump grout through tremie pipe to surface as tremie is being withdrawn.
7. Move to next well location and repeat process.
8. For wells with steel surface casing, the surface casing will be left in place and the space between the between the steel surface casing and well casing will be filled with grout.

Table 1b Regional Aquifer Wells will be abandoned as follows:

1. Rig up Pulstar rig over well.
2. Rip/perforate casing.
3. Rig down Pulstar rig and move to next well.
4. Rig up ChemGrout unit.
5. Run 1.25″ flexible tubing to bottom of the well on hydraulic reel.
6. Mix and pump grout through tubing to surface as tubing is withdrawn.
7. Cut steel riser at well pad and leave well pad in place.

D. Monitor Well Installations

Approximately 36 monitor wells will be installed. The screen and casing will consist of 4″ diameter, schedule 40 PVC screen and casing with o-rings. Installation of the wells will be performed in accordance with NMED guidelines. The monitor wells will be completed to depths ranging from 157′ to 249′ as detailed in Table 2 of the SOW.

WDC proposes to use a Speedstar 50K drill rig or equivalent equipped for Stratex casing advance drilling for this project. The air compressor required to efficiently clean cuttings from the boreholes at the required depths is a 1,050 cfm x 350 psi located on the rig (an auxiliary air compressor may also be utilized). The rig will be a 2000 year model or newer. The following support equipment will also be mobilized to the site:

1. Flatwater Fleet support truck with integral water tank
2. Auxiliary air compressor (950 cfm x 350 psi).
3. Welder/Generator
4. High-pressure hot-water cleaner (steam cleaner)
5. Ford F-350 support truck
6. Four wheel drive forklift
7. 3 cubic yard self dumping hoppers
8. 20′ dovetail trailer
9. Stratex casing advance system with 9 5/8″, steel flush threaded drive casing.
10. Hydraulic casing jacks for 9 5/8″ drive casing - pulling capacity from 300,000 lbs to 700,000 lbs
11. Auxiliary air compressor (if required) either 900/350 or 1170/350

D1. Means and Methods for Well Completion

Each borehole will be advanced to total depth using the Stratex casing advance system with 9 5/8″ diameter drive casing. The 9 5/8″ drive casing, steel/flush threaded, is of sufficient diameter to allow for the construction of the well as specified and permits the free passage of annular materials during well construction.

Drill cuttings will be discharged through the cyclone and into 3 cubic yard self-dumping hoppers. The material will then be dumped onto the ground near the well location.

The following generalized steps will be used for drilling and well completion.

i. Mobilize to well location/rig up drilling equipment.
ii. Drill and advance 9 5/8″ drive casing to the depth specified in Table 2.
iii. Install screen and riser inside of drive casing.
    1. 2′ – 5′ sump with end cap
    2. 30′ – 0.020″ slotted screen
    3. Centralizers above and below screen
    4. Blank casing to the surface
iv. Install filter pack through tremie pipe as the drive casing is removed from the hole. Swab filter pack to consolidate.
v. Emplace bentonite chip seal 50′ – 100′ and hydrate.
vi. Install annular grout 10′ – 20′ through tremie pipe as drive casing is being removed from the bore hole.
vii. Repeat steps v. and vi. to the ground surface.
viii. Rig down and decon drill rig.
    1. Bailing and pumping – per SOW
ix. Develop well with Pulstar 12000.
    1. High pressure rinse, detergent wash, high pressure rinse per SOW
x. Construct well pad/surface completion

E. Regional Aquifer Extraction Well Installations

Approximately 23 extraction wells will be installed. The blank casing will consist of 5″ diameter, schedule 80 PVC screen and casing with o-rings. The well screen will consist of 50′ of 316 stainless steel wire wrapped screen with a slot opening of 0.050″. Installation of the wells will be performed in accordance with NMED guidelines. The extraction wells will be completed to depths ranging from 180′ to 268′ as detailed in Table 3 of the SOW.

WDC proposes to use a Speedstar 50K drill rig or equivalent equipped for Stratex casing advance drilling for this project. The air compressor required to efficiently clean cuttings from the boreholes at the required depths is a 1,050 cfm x 350 psi located on the rig (an auxiliary air compressor may also be utilized). The rig will be a 2000 year model or newer. The following support equipment will also be mobilized to the site:

A. Flatwater Fleet support truck with integral water tank
B. Auxiliary air compressor (950 cfm x 350 psi).
C. Welder/Generator
D. High-pressure hot-water cleaner (steam cleaner)
E. Ford F-350 support truck
F. Four wheel drive forklift
G. 3 cubic yard self dumping hoppers
H. 20′ dovetail trailer
I. Stratex casing advance system with 9 5/8″, steel flush threaded drive casing.
J. Hydraulic casing jacks for 9 5/8″ drive casing - pulling capacity from 300,000 lbs to 700,000 lbs
K. Auxiliary air compressor (if required) either 900/350 or 1170/350

E1. Means and Methods for Aquifer Extraction Well Completion

Each borehole will be advanced to total depth using the Stratex casing advance system with 9 5/8″ diameter drive casing. The 9 5/8″ drive casing, steel/flush threaded, is of sufficient diameter to allow for the construction of the well as specified and permits the free passage of annular materials during well construction.

Drill cuttings will be discharged through the cyclone and into 3 cubic yard self-dumping hoppers. The material will then be dumped onto the ground near the well location.

The following generalized steps will be used for drilling and well completion.

i. Mobilize to well location/rig up drilling equipment.
ii. Drill and advance 9 5/8″ drive casing to the depth specified in Table 2.
iii. Install screen and riser inside of drive casing.
    1. 2′ – 5′ sump with end cap
    2. 50′ – 0.050″ stainless steel wire wrapped screen
    3. Centralizers above and below screen
    4. Blank casing to the surface

iv. Install filter pack through tremie pipe as the drive casing is removed from the hole. Swab filter pack to consolidate.
v. Emplace bentonite chip seal 50′ – 100′ and hydrate.
vi. Install annular grout 10′ – 20′ through tremie pipe as drive casing is being removed from the bore hole.
vii. Repeat steps v. and vi. to the ground surface.
viii. Rig down and decon drill rig.
    1. Bailing and pumping – per SOW
ix. Develop well with Pulstar 12000.
    1. High pressure rinse, detergent wash, high pressure rinse per SOW
x. Construct well pad/surface completion

F. Aquifer Testing

Three, seventy-two aquifer tests will be performed on extraction wells. The pump tests will be performed using the following equipment:

Model 2003 Pulstar P12000 Development Rig
Support Trailer with Waste Water Tank
PVC Casing Perforating/Ripping Tooling
500′ Steel Tremie Pipe
Generator
Welder
Test Pumps/Flow Meters
Check Valve(s)
Stilling Tubes
Airlift Pumping Equipment
High Pressure Washer – Steam Cleaner

The test pump rates are anticipated to be approximately 20 gallons per minute. Two pumping systems will be provided such that one system can be left in the well during the recovery period while the second system can be used to initiate the aquifer testing on the second well. PDTI will provide 4″ HDPE for test water conveyance and DBS&A will provide water level probes and transducers to monitor water levels in the extraction and monitor wells.

Schedule

WDC Exploration and Wells has the ability to provide multiple drill rigs/development rigs if required in order to meet the schedule of PDTI. (WDC typically can provide a drill rig within 7 days of notice to proceed, and a well development rig within 2 days of notice to proceed)

A generalized schedule is detailed below:

Start Drilling of extraction wells about ten days after notice to proceed. The wells that require 72 hour testing will be started first.

Start 72 hour aquifer tests as soon as the extraction wells have been installed and developed (about 2-3 days per well).

Start P&A of non-essential wells as soon as aquifer testing is complete.

Mobilize second development rig for monitor/extraction well development about 1 November 2006. The mobilization of the second rig can be adjusted to meet the project requirements or as required by field activities.

Review schedule on 15 December 2006 to determine if an additional drill rig(s) are required to complete all extraction/monitor wells by 28 February 2007.

Corporate Resources

SECTION 3.0

History & Organizational Structure
WDC Exploration & Wells was formed in 1949 to service the needs of the expanding agricultural and municipal markets in Northern California. In the mid-Seventies WDC changed it's focus to the environmental market and has drilled at virtually every Superfund Site in the Western United States since then. In 1995 WDC opened a regional office to support the Southern California area and in 1997 opened our Arizona facility. In 2003/2004, WDC expanded operational facilities to Elko-Nevada, Houston-Texas and Albuquerque-New Mexico, Clear Water,-Minnesota, Bozeman, MT and Las Vegas,-Nevada.

Probably the most important aspect of our company is our determination to work with our clients to the point of exceeding normal expectations, producing exceptional results and establishing cooperative relationships. Our Field Operation Managers provide technical and managerial support for our projects, frequently visiting the site to ensure proper task execution. WDC Field Operations Managers also supervise our projects from cradle to grave, including all invoicing procedures. This direct line of management results in timely performance of necessary project duties and clear, timely and accurate invoicing.

WDC specializes and excels in the support and timely execution of large, multi-rig, complex projects. We offer tremendous resources (Please see attached equipment inventory table) and unsurpassed support, far exceeding that of our competitors. We offer peace of mind, which is hard to place a dollar value on, but definitely one intangible reason WDC Exploration & Wells has enjoyed over 50 years of providing quality drilling services.

Quick Facts
WDC has provided quality drilling services for over 50 years.
WDC operates regional offices in Nevada, New Mexico, Montana, Texas, Arizona, Minnesota, Southern California and Northern California.
WDC operates the LARGEST fleet of Air Rotary Casing Hammer (ARCH) / Mud Rotary Rigs in the United States.
WDC can provide multiple Year 2000-2004 Model drilling rigs for ANY project.
NO other drilling company can provide the resources to guarantee a project schedule or deadline.

Other Company Information

Nature of Business:	Environmental/Water Supply Well Drilling and Exploration
Year Established:1	949
DUNS #:	00-265-9936

Preparation and Response to Unforeseen Circumstances and Breakdowns
Most of the equipment WDC operates is new and under warranty. Parts are shipped from the manufacturer within (24) hours if breakdowns occur. Our mechanics are on-duty (24) hours per day, (7) days per week and can be onsite with a mobile shop truck within (24) hours should a major breakdown occur.

All I.D. and O.D. measurements for down hole tooling such as drill pipe, collars, subs, bits, roller reamers etc. are recorded in the event specialized fishing tools are required.

WDC maintains accounts with major oil field service companies such as Weatherford, Baker Hughes and H & H Oil Tools. Any specialized fishing tools can be delivered onsite in 24 hours.

In-situ Collection of Groundwater Samples
WDC has vast experience and knowledge of discreet, in-situ groundwater sample collection techniques. We have taken an estimated (1000+) simulprobe samples and (5000+) hydropunch samples. WDC tested the prototype simulprobe and played a key role in its development prior to commercial release. WDC is also listed on the Simulprobe web page as a recommended contractor. Simply put, no company in the Western United States has collected as many in-situ groundwater samples with as many different methods of drilling.

IDW Handling
WDC can provide self-tipping mini-hoppers for temporary containment during air and mud drilling. These hoppers hold (3) cubic yards and are moved from the drill site to roll-off bins with our 4x4 forklifts. This system of cuttings handling is standard on the vast majority of our projects. The use of drums in conjunction with cyclone discharged cuttings is not advised due to safety issues.

EQUIPMENT INVENTORY

WDC operates a virtually new fleet of drilling rigs and support equipment and offers the safest and most reliable fleet in the drilling industry. WDC operating rate exceeds 98%.

Equipment	Method Capabilities										
Rigs *Year 2000 or Newer	Air Rotary Casing Hammer	Direct Air Rotary	STRATEX®	Down Hole Hammer	Direct Mud Rotary	Dual Tube Reverse Rotary	94mm PQ-HQ NQ-BQ Coring	Large Diameter Reverse Rotary	Hollow Stem Auger	Dry Coring & Sampling	Sonic Drilling
#101 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#102 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#103 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#104 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#105 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#106 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#107 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#108 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#109 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#110 - Speedstar 30K*	•	•	•	•	•	•	•			•	
#111 - Speedstar 40K*	•	•	•	•	•	•	•			•	
#112 - Speedstar 40K*	•	•	•	•	•	•	•			•	
#111 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#112 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#113 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#114 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#115 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#116 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#117 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#118 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#119 - Speedstar 50K*	•	•	•	•	•	•	•			•	
#120 - Speedstar 90K*	•	•	•	•	•	•	•	•		•	
#121 - Speedstar 110K*	•	•	•	•	•	•	•	•		•	
#122 - Speedstar 110K*	•	•	•	•	•	•	•	•		•	
#123 - Taylor RT-4000*		•		•	•		•	•			
#124 - Taylor RT-4000*		•		•	•		•	•			
#125 - RS-400 Sonic*				•						•	•
#126 - RS-400 Sonic*				•						•	•
#127 - RS-400 Sonic*				•						•	•
#128 - RS-400 Sonic*				•						•	•
#129 - RS-400 Sonic*				•						•	•
#130 - RS-400 Sonic*				•						•	•
#131 - RS-200 Sonic*				•						•	•
#132 - Geoprobe 7730*										•	
#133 - Geoprobe 7730*										•	
#134 - CME-75*		•		•	•		•		•	•	
#135 - CME-75*		•		•	•		•		•	•	
#136 - CME-75*		•		•	•		•		•	•	
#137 - CME-85*		•		•	•		•		•	•	
#138 - CME-85*		•		•	•		•		•	•	
#139 - CME-85*		•		•	•		•		•	•	
#140 - CME-85*		•		•	•		•		•	•	
#141 - CME-85*		•		•	•		•		•	•	
#142 - CME-85*		•		•	•		•		•	•	
#143 - CME-85*		•		•	•		•		•	•	
#144 - CME-85*		•		•	•		•		•	•	
#145 - CME-95*		•		•	•		•		•	•	
#146 - CME-95		•		•	•		•		•	•	
#147 - CME-75 LAR*		•		•	•		•		•	•	

Key Personnel

SECTION 4.0

MR. BRYAN NYDOSKE, NEW MEXICO DISTRICT MANAGER

PROFESSIONAL SUMMARY

Over twenty-five years of Drilling and Project and Operations Management Experience in all phases of Drilling, Well Construction and Well Rehabilitation.
RESPONSIBILITY AREAS

Operational management and safe execution of environmental drilling projects throughout the United States; client technical and logistical consultation; management and supervision of 100 operations personnel; equipment scheduling; project contractual management; project invoicing.

PROFESSIONAL EXPERIENCE

1992 – Present	District Manager, Operations Manager, Project Manager, Auger Division Manager, Driller, Water Development Corporation, Woodland, CA
1992	Driller, All-Terrain Drilling, Roseville, CA
1990-1991	Driller, ABC Liovin Drilling, Signal Hill, CA
1989-1990	Driller, Quality Well Drillers, Atwater, CA
1983-1989	Field Superintendent, Project Manager, Foreman, Driller, Continental Drilling Company
1979-1983	Driller, US Army Corps of Engineers, Seattle, WA

AGENCY PROGRAMS STANDARDS MANAGEMENT & EXPERIENCE

United States Environmental Protection Agency
United States Bureau of Mines
United States Army Corps of Engineers
United States Bureau of Reclamation
United States Department of Defense
Private Corporations
United States Department of Energy
State Agencies
Master Water Well Driller License – TX Department of Licensing and Regulations – 54186 M

EQUIPMENT & METHOD EXPERIENCE

Hollow Stem Auger
Mud Rotary
Air Rotary Casing Hammer
STRATEX
Diamond Core
Angle Drill
Bucket Auger
Excavator
Percussion
Dual Tube Percussion
Dewatering
Reverse Circulation
Well Development
Video Logging Equipment
Nuclear Logging Equipment
Submersible Pumps
Backhoes
Cranes
Direct Air Rotary
Sonic

MR. KEVIN JONES, DRILL OPERATOR & OPERATIONS MANAGER

PROFESSIONAL EXPERIENCE

1992-Present Operations Manager, Project Manager, Driller/Supervisor, WDC Exploration & Wells, Perlata, NM
1991-1992 Pipe Fitter/Welder, Signal Metal Industries, Irving, TX
1979-1991 Toolpusher/Driller, Hughes Drilling Corp., Enid, OK
1979-1991 Drilling, Williams Water Well Service, Enid, OK

EQUIPMENT EXPERIENCE

Mud Rotary	Reverse Circulation	Air Rotary
Hydraulic Jars	Air Rotary Casing Hammer	Hydropunch
Video Logging Equipment	Downhole hammer drill	Tractor/trailer
Dual tube rotary	Submersible pumps	Backhoes
Diamond Coring Equipment	Well workover rigs	Down-hole tools
Mud Motor	Bucket Auger	Hydraulic Jars
Forklifts	Blow-out prevention equipment	Coiled Tubing

High capacity/pressure cement slurry pump equipment
Charged perforating systems

TRAINING & CERTIFICATIONS

OSHA 29-CFR-1910 Supervisor's Training, 1985
Annual eight-hour update requirements
Drilling Fluids Engineering Training and
Weighted Fluid Systems Engineering 1986
Oil Well Blow-Out Prevention 1984
LANL Site Specific Training
Water Well Driller License, TX Department of Licensing and Regulation – 50028 W

MR. JUAN AGUILAR, DRILL OPERATOR

PROFESSIONAL EXPERIENCE

2003 - Present Driller, WDC Exploration & Wells Peralta, New Mexico
1990 – 2003 Driller/Foreman, Stewart Brothers Drilling, Grants, New Mexico

EQUIPMENT EXPERIENCE

Mud Rotary	Reverse Circulation	Air Rotary
Hydraulic Jars	Air Rotary Casing Hammer	Hydropunch
Video Logging Equipment	Downhole hammer drill	Tractor/trailer
Dual tube rotary	Submersible pumps	Backhoes
Diamond Coring Equipment	Well workover rigs	Down-hole tools
Mud Motor	Bucket Auger	Hydraulic Jars
Forklifts	Blow-out prevention equipment	

High capacity/pressure cement slurry pump equipment

TRAINING & CERTIFICATIONS

OSHA 29-CFR-1910 Supervisor's Training
Annual eight-hour update requirements

MR. MARK GREEN, DRILL OPERATOR

PROFESSIONAL EXPERIENCE

1998-Present	Driller, WDC Exploration & Wells Peralta, New Mexico
1998-1997	Roughneck, Ari-Cal, Blythe, California
1996-1997	Manager Pizza Hut, Breckenridge, Texas

EQUIPMENT EXPERIENCE

Mud Rotary	Reverse Circulation	Air Rotary
Hydraulic Jars	Air Rotary Casing Hammer	Hydropunch
Video Logging Equipment	Downhole hammer drill	Tractor/trailer
Dual tube rotary	Submersible pumps	Backhoes
Diamond Coring Equipment	Well workover rigs	Down-hole tools
Mud Motor	Bucket Auger	Hydraulic Jars
Forklifts	Blow-out prevention equipment	

High capacity/pressure cement slurry pump equipment
Charged perforating systems

TRAINING & CERTIFICATIONS

OSHA 29-CFR-1910 Supervisor's Training, 1985
Annual eight-hour update requirements
Drilling Fluids Engineering Training and
Weighted Fluid Systems Engineering 1986
Driller Apprentice. TX Department of Licensing and Regulation, WWDAPP 00001033

MR. QUENTIN STEVENS, DRILL OPERATOR

PROFESSIONAL EXPERIENCE

2003 - Present	Driller, WDC Exploration & Wells Peralta, New Mexico
2002 – 2003	Driller, Beylik Drilling, Inc., La Habra, CA
2000 – 2002	Driller, Rhino Environmental Services, Albuquerque, New Mexico

EQUIPMENT EXPERIENCE

Mud Rotary	Reverse Circulation	Air Rotary
Hydraulic Jars	Air Rotary Casing Hammer	Hydropunch
Video Logging Equipment	Downhole hammer drill	Tractor/trailer
Dual tube rotary	Submersible pumps	Backhoes
Diamond Coring Equipment	Well workover rigs	Down-hole tools
Mud Motor	Bucket Auger	Hydraulic Jars
Forklifts	Blow-out prevention equipment	

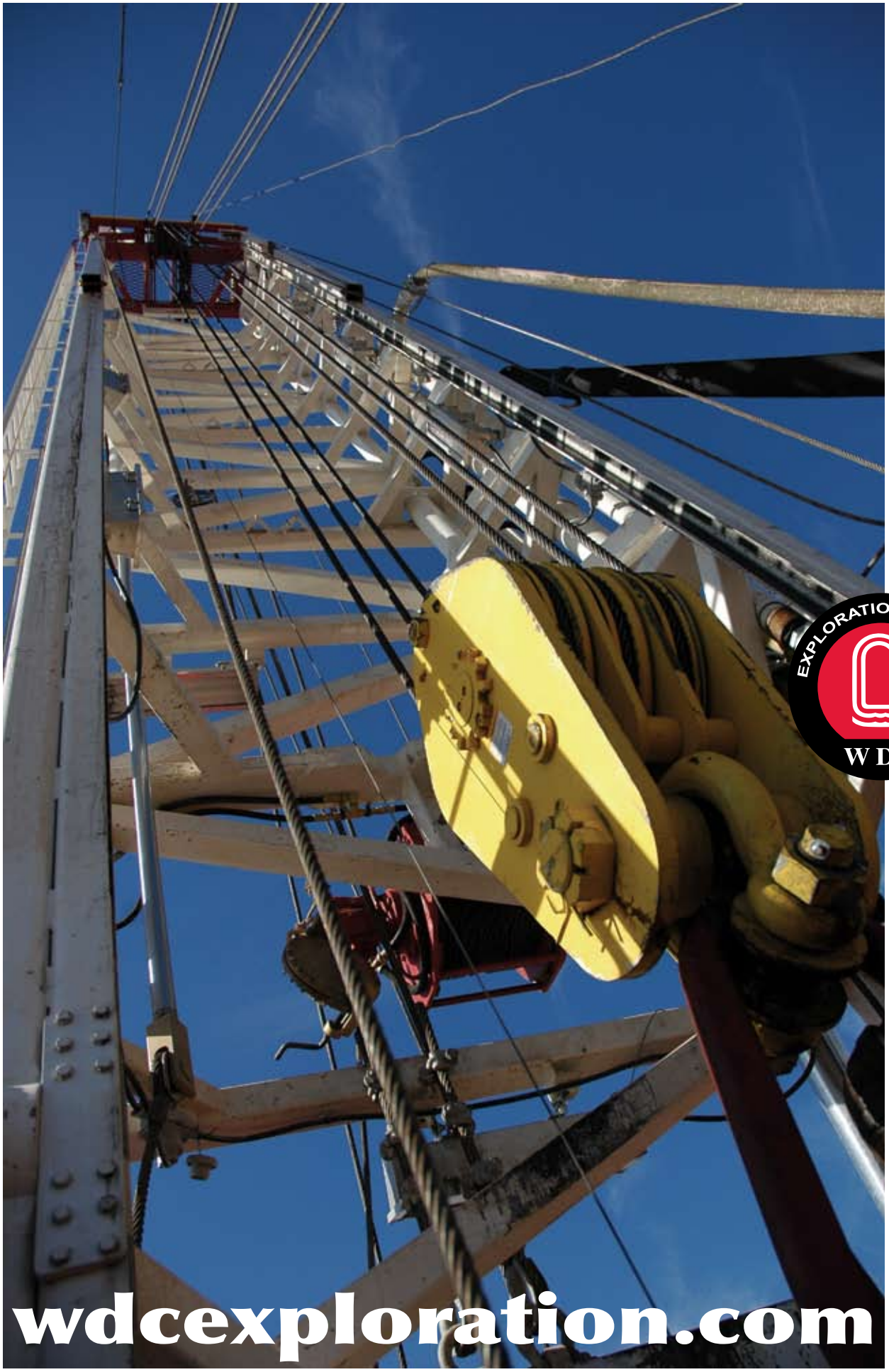
High capacity/pressure cement slurry pump equipment

TRAINING & CERTIFICATIONS

OSHA 29-CFR-1910 Supervisor's Training
Annual eight-hour update requirements

SECTION 4.0

Category	Unit	Quantities	Notes on Quantities				
Well P&A							
Perched zone well P&A	Linear Foot	14947	based on well logs	$	12.00	$	179,364.00
Regional well P&A	Linear Foot	2354	based on well logs	$	16.00	$	37,664.00
Decon & mobilization between well P&A sites	Each	131	total number of wells	$	210.00	$	27,510.00
P&A Standby	Hour	60	estimated	$	210.00	$	12,600.00
P&A per diem	Day	66	estimated at 0.5 day per well	$	220.00	$	14,410.00
Well construction							
Monitor well construction	Linear Foot	7307	based on current design	$	81.00	$	591,867.00
Extraction well construction	Linear Foot	5092	based on current design	$	90.00	$	458,280.00
Decon & mobilization between well installation sites	Each	59	based on current design	$	1,400.00	$	82,600.00
Well development	Hour	472	based on current design	$	165.00	$	77,880.00
P&A Standby	Hour	118	estimated at 2 hours per well	$	485.00	$	57,230.00
P&A per diem	Day	236	estimated at 4 days per well	$	330.00	$	77,880.00
Aquifer Test							
Support per tests (equipment, personnel, etc.)	Each	3	proposed number of tests	$	14,800.00	$	44,400.00
P&A Standby	Hour	8	estimated	$	185.00	$	1,480.00
P&A per diem	Day	9	3 72-hour tests	$	220.00	$	1,980.00
Equipment							
Drill rig mob/demob	Each	7	estimated	$	9,600.00	$	67,200.00
Pump rig mob/demob	Each	2	estimated	$	1,850.00	$	3,700.00
Pipe truck mob/demob	Each	3	estimated	Included		$	-
Support truck mob/demob	Each	4	estimated	Included		$	-
						$	1,736,045.00



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3621 Highway 47
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11757 Katy Freeway
Suite 1300
Houston, TX 77079
281.854.2026
281.854.2226 fax

January 26, 2007

Phelps Dodge, Tyrone Mine
Silver City, NM

Attention: Mr. Richard J. Thornburg

RE: Cost Reduction

Dear Mr. Thornburg:

Thank you for inviting WDC to work at the Tyrone Mine. WDC Exploration & Wells is pleased to offer Phelps Dodge these additional line items to our current drilling contract.

Drilling DAR - Furnish & Install 4" PVC Monitor Well $69.00/Ft
Drilling DAR – Furnish & Install 5" PVC Extraction Well $82.00/Ft

These new line items will result in a cost savings of $7.00/FT on the 4" wells and $9.00/FT on the 5" wells. The savings are realized due to WDC combining Air Rotary Casing Hammer through the soft, unstable, upper portion of the borehole, with Direct Air Rotary through the more competent lower portion. This method has allowed us to achieve a greater production rate resulting in lower cost per foot, while decreasing the schedule in a safe and efficient manner.

Thank you once again, if I could be of further assistance please call me at the Peralta, NM office.

Respectfully:
WDC Exploration & Wells

Bryan Nydoske
District Manager

New Mexico District: 3621 Highway 47, Peralta, NM 87042 · (800) 914-7506 · Fax (505) 865-5252
www.wdxexploration.com

New Mexico District: 3621 Highway 47, Peralta, NM 87042 · (800) 914-7506 · Fax (505) 865-5252
www.wdxexploration.com

Appendix E-10
Third Party On-site Rip-Rap Production

M3 Engineering & Technology Corp.

To: Chuck Johnson

Cc: Tom Shelley, Daniel Roth

From: Frank Van de Wille

Date: September 21, 2007

Subject: August Production – McCain Springs Quarry

M3 Engineering & Technologies is hereby transmitting the August 2007 production numbers for the McCain Springs Quarry.

The plant was approved for production on August 14th, 2007. T.G. McCauley operated the plant 7 days per week during this period. The plant was shutdown due to a belt on August 19th.

A total of 17,497 CY was pushed through the plant during this period. Output of the plant was as follows:

Size/Product	Quantity (CY)	Percent of Throughput
1" minus	7,305	42%
1"-3"	2,781	16%
3"-6"	2,753	16%
6"-12"	2,358	14%
+12"	1,745	10%

Cost per Cubic Yard of rock produced excluding drill & blast was $14.32/CY. Estimated drill & blast cost are $1.00/CY.

If you have any comments or questions, please feel free to contact me.

Encl. August Riprap Costs
Drill & Blast Cost

Frank Van de Wille
M3 Engineering
602-909-2205
fvandewille@cox.net

M3 Engineering & Technology

PROJECT NO. _____

PROJECT _____

SHEET NO. _____ OF _____ BY _____

DRAWING NO. _____

SUBJECT: August Riprap Cost DATE: 9/2017

TOTAL PLANT THROUGHPUT: 17,497 CY (Aug. 15-Aug 31)

TOTAL PRODUCTION:

1" minus	7305	+2 %
1"-3"	3781	16 %
3"-6"	2,753	16 %
6"-12"	2,358	14 %
+12"	1745	10%

TOTAL COST FOR MONTH: 137,981$

TOTAL ROCK (RIPRAP) PRODUCED: 9,637 CY

COST PER CY: $\frac{137,981\$}{9,637\ CY} = 14.32\ \$/CY$

COST EXCLUDE DRILL & BLAST

M3 Engineering & Technology

PROJECT NO. _____
PROJECT _____
SHEET NO. _____ OF _____ BY _____
DRAWING NO. _____

SUBJECT: DRILL BLAST COST DATE: 9/5/7.

46,222 CY/BLAST (BASED ON 13X15 SPACING W/ 50' DEPTH)

BLAST COST : 15,127 [17] ON 7/10/7.

DRILL COST : 177 hr @ 178 $/hr = 31,506.

TOTAL COST: 46,633 [7] $

DRILL BLAST COST ≅ 1$/CY.

Appendix E-11
Spillway and Pit Berm
Linear Foot Cost

Spillways

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11R	1,973	1.2	1.80	3,300	1.20	175	1747	0.75	50	1.00	1.00	1.00
Waste	D11R	805	1.2	1.00	3,300	1.00	200	1540	0.75	50	1.00	1.00	1.00
Finish Grade	D6R	165	1.2	1.80	3,300	1.00	175	175	0.75	50	1.00	1.00	1.00

Spillway Volume:	Excavate	198.2 CY/LF			
	Waste	198.2 CY/LF			
	Finish	2.9 CY/LF			
			Dozer Cost	Spillway Cost	
	Excavate	0.100472 HRS/LF	439.59 $/HR	44.17 $/LF	
	Waste	0.246147 HRS/LF	439.59 $/HR	108.20 $/LF	
	Finish Grade	0.01743 HRS/LF	112.02 $/HR	1.95 $/LF	
				154.32 $/LF	

Volumes based on cross-section area for excavation and waste
Volume assumes unit volume/linear foot of spillway perimeter (39 Feet * 1 Foot/27)

Pit Berm

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D9R	653	1.2	1.00	3,300	1.00	175	1250	0.75	50	1.00	1.00	1.00
Finish	D9R	1,045	1.2	1.00	3,300	1.00	175	2000	0.75	50	1.00	1.00	1.00

		Unit Volume	Units	Total Volume	Hours	Cost/Hr	Total Cost	Cost/LF	
Berm:	Excavate	4 CY/LF	44907 LF	179628	275	205.71	56551.52	1.26	
	Finish Grade	1.5 CY/LF	44907 LF	67360.5	64	205.71	13254.26	0.30	
								1.55	**$/LF**

Tailing Spillway Cost Development

Equipment	Productivity	Equipment Cost	Labor Cost	Total Cost	Spillway Volume	Total Cost	Material	Grade	Soil Weight	Production Method/ Blade	Maximum Push Distance	Normal Production	Operator	Work Hour	Visibility	Elevation	Direct Drive Trans.
	(cy/hr)	($/hr)	($/hr)	($/cy)	(cy/lf)	($/lf)			(lb/cy)		(feet)	(cy/hr)		(min/hr)			
D7R LGP	178.448276	109.92	31.42	$0.79	198.20	$156.98	1.2	1	2900	1	200	300	0.75	50	1	1	1

Cat handbook ed. 37 page 1-43

Appendix E-12
Buildings
Post Mining Land Use

Summary of Buildings/Facilities to be Demolished

Tyrone Tag No.	Description	Dimensions[1.] (LxWxH, feet)	Quantity (CF)	PMLU[3.]	Description
Mine Maintenance Facilities Area					
MM-06	Jerome Building	204 x 63 x 50	642,600	Wildlife Habitat	*To be demolished by conceptual regrading* [5.] - Large storage bays
MM-07[6.]	Plant Warehouse	250 x 100 x __	25,000		
MM-09	Electric Shop	120 x 51 x 50	306,000	Wildlife Habitat	*To be demolished by conceptual regrading* [5..] - Overhead crane (35-ton)
MM-10	Pipe Shop	145 x 41 x 40	237,800	Wildlife Habitat	
MM-11	Carpenter Shop	119 x 69 x 27	221,697	Wildlife Habitat	
MM-12	Lumber Storage	102 x 61 x 33	205,326	Wildlife Habitat	
MM-13	Shovel Repair	121 x 70 x 66	559,020	Wildlife Habitat	
MM-14	Environmental Lab	112 x 27 x 17	51,408	Wildlife Habitat	
SX/ EW Plant Area					
--	Tankhouse	150 x 465 x 30	2,092,500	Wildlife Habitat	
--	SX/EW Plant Area Shop	31 x 71 x 30	66,030	Wildlife Habitat	
--	Leach Crew Office	15 x 15 x 15	3,375	Wildlife Habitat	
--	SX/EW Warehouse	48 x 150 x 20	144,000	Wildlife Habitat	
--	Gonzales Cells	25 x 52 x 10	13,000	Wildlife Habitat	
--	Jamison Cells	35 x 44 x 10	15,400	Wildlife Habitat	
--	Organic Tanks (4 each)	2 x 32 x 16	24,115	Wildlife Habitat	
--	Mixer/Settler Tanks (8 each)	200 x 366 x 10	732,000	Wildlife Habitat	
--	Tank Farm (5 each)	92 x 370 x 10	340,400	Wildlife Habitat	
--	Water Tank	1 x 30 x 16	10,598	Wildlife Habitat	
--	Acid Tanks (2 each)	2 x 20 x 16	9,420	Wildlife Habitat	
--	MCC Building	14 x 30 x 12	5,040	Wildlife Habitat	
--	Chlorinator Room	19 x 66 x 12	50,400	Wildlife Habitat	
--	2a West Raff Tank	30 x 46 x 16	22,080	Wildlife Habitat	
--	Pump Mixer Control Room	41 x 41 x 12	20,172	Wildlife Habitat	
--	Cobalt Sulfate Tank	1 x 18 x 16	3,815	Wildlife Habitat	
--	Reagent Tanks (2 each)	25 x 36 x 12	10,800	Wildlife Habitat	
--	Diluent Storage Tank	1 x 18 x 16	3,815	Wildlife Habitat	
--	Wash Pad	45 x 68 x --	3,060	Wildlife Habitat	
--	SX/EW Changeroom	82 x 41 x 17	57,154		
--	Toolroom & Storage	60 x 70 x 12	50,400		
--	Rectifiers	20 x 24 x12	5,760		
--	Workroom	66 x 75 x 12	59,400		
--	Toolroom	8 x 32 x 12	3,072		
--	Pacesetter filter	48 x 80 x 12	46,080		
Lubrication Shop Area					
--	Prill Tanks (2 each)	2 x 20 x 16	9,420	Non Identified	20' D known, H assumed
--	Lubrication Shop	60 x 110 x 16	105,600	Non Identified	sf from CAD DWG, H assumed
--	Powder Magazines	10 x 10 x 12	1,200	Non Identified	sf from CAD DWG, H assumed
--	Storage Sheds	60 x 110 x 16	10,560	Non Identified	sf from CAD DWG, H assumed

Tyrone Tag No.	Description	Dimensions[1.] (LxWxH, feet)	Quantity (CF)	PMLU[3.]	Description
Acid Unloading Facility & Former Precipitation Area					
--	Acid Unloading Facility	20 x 10 x 16	3,200	Non Identified	sf from CAD DWG, H assumed
--	Former Precipitation Plant Building	400 x 100 x 16	640,000	Non Identified	sf from CAD DWG, H assumed
Mill and Concentrator Area					
MC-03	Analytical Lab		5,850	Not Identified	Modified based on MMD, 2004
MC-15	Mill Warehouse	235 x 101 x 33	783,255	Wildlife Habitat	
MC-21	Fuel Station	60 x 50 x --	3,000	Wildlife Habitat	
MC-22	Tire Shop	79 x 44 x 23	79,948	Wildlife Habitat	
MC-27	Inactive Diesel Tanks (2 each)	1 x 20 x 15	4,710	Wildlife Habitat	Modified based on MMD, 2004

Notes:

[1.] Facility was originally identified for Industrial PMLU. Current reclamation plan indicates that facility will be covered by stockpile regarding activities and will thus need to be demolished.

[2.] Length and width of facility determined from facility map, height of facility assumed.

[3.] Current reclamation plan indicates that facility will be covered by stockpile regarding activities and will thus need to be demolished.

1 and 3 require removal of structure, no cover required

Appendix E-13
Bench Construction Unit Cost

Outslope Bench Grading Unit Cost Development

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11R	1552.6	1.2	1.7	3300.0	1.0	175.0	1747	0.75	50.0	1.0	1.0	1.0

		Productivity (lf/hr)	Time (hrs/lf)	# passes	Material	Grade	Task Weight (lb/cy)	Blade	Width (feet)	Soil Speed (miles/hr)	Method/ Operator	Blade Hour (min/hr)	Visibility	Elevation
Finish Grade	D9R	920.0	0.0011	3	1.2	1.0	3300.0	1.0	15.25	1.0	0.75	50.0	1.0	1.0

Notes:
1. Bench width: Stockpiles 31 ft, Tailing Ponds 31 ft.

Bench Volume (excavate):	4.22 cy/lf	Dozer Cost ($/hr)	Bench Cost ($/lf)
Excavate	0.0027 hrs/lf	439.59	1.19
Finish Grade	0.0011 hrs/lf	205.71	0.22
Excavate + Finish Grade			**1.42**
Finish Grade Only			**0.22**

Appendix E-14
Channel Linear Foot Cost

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Terrace Channels													
Excavate	D11R	1,754	1.2	1.60	3,300	1.20	175	1747	0.75	50	1.00	1.00	1.00
Waste	D11R	805	1.2	1.00	3,300	1.00	200	1540	0.75	50	1.00	1.00	1.00
Finish Grade	D6R	146	1.2	1.60	3,300	1.00	175	175	0.75	50	1.00	1.00	1.00

Volume: Excavate 28.0 CY/LF
Waste 28.0 CY/LF
Finish 2.9 CY/LF

			Dozer Cost		Outslope Channel Cost	
Excavate	0.015968	HRS/LF	439.59	$/HR	7.02	$/LF
Waste	0.034774	HRS/LF	439.59	$/HR	15.29	$/LF
Finish Grade	0.019609	HRS/LF	112.02	$/HR	2.20	$/LF
					24.50	**$/LF**

Volumes based on cross-section area for excavation and waste
Volume assumes unit volume/linear foot of perimeter (39 Feet * 1 Foot/27)
Finish grading based on 1mph at 3 passes

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Channels													
Excavate	D11R	1,096	1.2	1.00	3,300	1.20	175	1747	0.75	50	1.00	1.00	1.00
Waste	D11R	805	1.2	1.00	3,300	1.00	200	1540	0.75	50	1.00	1.00	1.00
Finish Grade	D6R	91	1.2	1.00	3,300	1.00	175	175	0.75	50	1.00	1.00	1.00

Volume: Excavate 149.0 CY/LF
Waste 149.0 CY/LF
Finish 2.9 CY/LF

			Dozer Cost		Top Channel Cost	
Excavate	0.135956	HRS/LF	439.59	$/HR	59.76	$/LF
Waste	0.185045	HRS/LF	439.59	$/HR	81.34	$/LF
Finish Grade	0.031374	HRS/LF	112.02	$/HR	3.51	$/LF
					144.62	**$/LF**

Volumes based on cross-section area for excavation and waste
Volume assumes unit volume/linear foot of perimeter (39 Feet * 1 Foot/27)
Finish grading based on 1mph at 3 passes

Appendix E-15
Utility Reclamation Cost Development

North Mine Area (NMA) Demolition Cost Development

1) Plastic Pipe Demolition
   Means Page 25
   Item 02 41 13.88 1800
   Location Adjustment 84.3%
   300 LF/day
   37.5 ft/Hr
   $3.41/Lf ($4.05/Lf*84.3%)

2) With HDPE pipe, 300 ft per day is not reasonable. Crews should be able to cut pipe in lengths of 150-200 ft and drag those sections to the disposal area. Depending on the haul distance to disposal area a crew should be able to do 150 ft per hour. With that in mind, the daily output would be 1200' per day at a cost for labor of $1020 (300 Lf * $3.41/Lf / 1200 Lf = 0.85/Lf).

   In addition to labor costs, equipment should be added. Equipment may include a small dozer or loader to drag pipe. Owner operator rates for this type are $88.69/hr range (use D6 LGP). Using $88.69/hr that's $709.52/day ÷ 1200LF = $0.59/LF for equipment.

The total cost per LF of demolition of pipe would be $0.85/LF for labor, $0.59/LF for equipment, for a **Total per LF of $1.44 including O & P.**

Appendix F
Engineering Take-offs

Appendix F-01
Engineering Take-offs
MWH

CALCULATION COVER SHEET

MWH

PROJECT TITLE:	TYRONE MINE CLOSURE
PROJECT NO:	1004848
CALCULATION TITLE:	Volume Calculations

	NAME	**DATE**
PREPARED BY:	Brandon Coleman	10/10/07
CHECKED BY:	Thomas Leidich	10/10/07
REVIEWED BY:		

REVISIONS				
DATE	**PURPOSE**	**PREPARED BY**	**CHECKED BY**	**REVIEWED BY**

Volume Calculations

Truck/Shovel Pull Back

The truck/shovel pullback volumes were calculated by comparing the existing and regraded surface using Carlson software and AutoCAD. The surfaces were adjusted until the cut and fill volumes were balanced. The haul distances were determined using the isopachs which show the approximate centroids of the cuts and fills.

Dozer Rough Grade

The dozer rough grade were developed using cross-sections to develop balanced cut/fills slopes. The regraded slopes developed from the cross-sections were then transferred to plan view and the regraded surfaces were developed. The regraded surface was then compared to the existing surface to determine the cut/fill volumes. The regraded surface was then adjusted to balance the cut/fill volumes. Dozer push distance and grade was determined using the centroids of the cuts and fills shown in the cross-sectional view.

The volume for the top surface regrade was determined using the area of the top and average cut thickness. The average cut thickness was determined by measuring the average distance from the center of the top to the outside edge and multiplying it by the proposed final grade of .5 %. The average cut should be half this thickness, however we used the total thickness to be conservative.

Truck/Shovel Bench Regrade

The truck/shovel rough bench regrade volume was determined by using a typical cross-section of the 50 foot benches and determining a cut/fill volume per foot of bench and converting that to a cut/fill volume per acre, and then multiplying that by the area of the slope being regraded.

Terrace Bench, Terrace Channel, Down Drain Construction, Drainage Construction

All these items are described as a length. This length is the distance of terrace that must be constructed. These lengths were measured in AutoCAD using the drawings that were created for each area.

Cover Placement Volume

The volume of material was calculated based off the area and a cover thickness of 2’ over the entire area. All areas were measured in AutoCAD using the drawings that were created for each area.

Cover Placement (Haul) (Placement)

Cover will be delivered to each area using a truck loader operation. For each site a route was determined and was measured in AutoCAD. The routes are shown on the Haul Routes Map.

A dozer will be used to place the cover. For slopes less than 600 feet in length we assumed the material will be place at the crest and pushed down. For slope greater we assumed the cover will be placed on a bench midway down the slope. For the top surface we assumed the cover will be placed within a 100 feet of where it needs to go.

Terrace Gravel Placement, Down Drain Riprap and Bedding Layer Placement, and Drainage Riprap and Bedding Placement

All these volumes were determined by multiplying a typical cross-sectional area by the length of the channel. The gravel placement for the terrace channels was calculated on a per length basis. These lengths were measured in AutoCAD using the drawings that were created for each area.

Revegetation

The revegetation areas were calculated by measuring the areas of each stockpile using AutoCAD.

TYRONE MINE STOCKPILE CONCEPTUAL RECLAMATION PLAN
Quantities

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work Distance (ft)	Haul Leg 1 Distance (ft)	Haul Leg 1 Grade (%)	Haul Leg 2 Distance (ft)	Haul Leg 2 Grade (%)	Haul Leg 3 Distance (ft)	Haul Leg 3 Grade (%)
		Truck/Shovel Pull Back		4,100,000			3,000	-				
		Dozer Rough Grade		550,000		200						
		Truck/Shovel Bench Regrade		571,100	119	90						
		Terrace Bench Construction	36,600									
		Cover Placement (Haul)		771,200	239		3,500	2	1,900	10	3,000	(2)
		Cover Placement (Placement)		771,200	239	600						
		Terrace Channel Construction	36,600									
1A and 1B Leach	Exterior Slope	Terrace Gravel Placement		14,600								
		Down Drain Construction	2,239									
		Down Drain Riprap Placement		9,200								
		Down Drain Bedding Layer		1,600								
		Drainage Construction	3,300									
		Drainage Riprap Placement		4,900								
		Drainage Bedding Layer		2,500								
		Revegetation			239							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back					1,300	8	1,800	10	1,700	12
		Dozer Rough Grade (Exterior Slopes)				100						
		Dozer Rough Grade (Top Area)		194,000		200						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		258,100	80		3,500	2	1,900	10	4,600	5
		Cover Placement (Placement)		258,100	80	100						
		Terrace Channel Construction	n/a									
1A and 1B Leach	Top	Terrace Gavel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	4,050									
		Drainage Riprap Placement		6,000								
		Drainage Bedding Layer		3,000								
		Revegetation			80							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade (North)		1,046,000		514						
		Dozer Rough Grade (South)		830,000		342						
		Truck/Shovel Bench Regrade		431,924	90	90						
		Terrace Bench Construction	51,700			90						
		Cover Placement (Haul)		697,000	216		3,000	(10)	4,100	(7)	9,600	8
		Cover Placement (Placement)		697,000	216	600						
		Terrace Channel Construction	51,700									
2A Leach and 2B Waste	Exterior Slope	Terrace Gravel Placement		20,700								
		Down Drain Construction	3,900									
		Down Drain Riprap Placement		16,000								
		Down Drain Bedding Layer		2,700								
		Drainage Construction	10,700									
		Drainage Riprap Placement		15,800								
		Drainage Bedding Layer		8,000								
		Revegetation			216							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		532,000		250						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		354,900	110		3,000	(10)	4,100	(7)	9,400	8
		Cover Placement (Placement)		354,900	110	100						
		Terrace Channel Construction	n/a									
2A Leach and 2B Waste	Top	Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	2,700									
		Drainage Riprap Placement		4,000								
		Drainage Bedding Layer		2,000								
		Revegetation			110							
		Infrastructure Relocation	n/a									

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work Distance (ft)	Haul Leg 1 Distance (ft)	Haul Leg 1 Grade (%)	Haul Leg 2 Distance (ft)	Haul Leg 2 Grade (%)	Haul Leg 3 Distance (ft)	Haul Leg 3 Grade (%)
1C	Exterior Slope	Ridge and Valley Construction										
		Ridge and Valley Riprap Placement										
		Revegetation										
		Truck/Shovel Pull Back		17,100,000			3,900	-				
		Dozer Rough Grade		630,000		300						
		Truck/Shovel Bench Regrade		1,185,392	247	90						
		Terrace Bench Construction	70,000			90						
		Cover Placement (Haul)		1,000,300	310		3,000	(10)	3,500	(7)	6,600	7
		Cover Placement (Placement)		1,000,300	310	600						
		Terrace Channel Construction	70,000									
3A	Exterior Slope	Terrace Gravel Placement		28,000								
		Down Drain Construction	6,600									
		Down Drain Riprap Placement		27,000								
		Down Drain Bedding Layer		4,600								
		Drainage Construction	2,500									
		Drainage Riprap placement		3,700								
		Drainage Bedding Layer		1,900								
		Revegetation			310							
		Infrastructure Relocation										

		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		48,000		250						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		64,500	20		3,000	(10)	3,500	(7)	6,600	7
		Cover Placement (Placement)		64,500	20	100						
3A	Top	Terrace Channel Construction	n/a									
		Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Drainage Construction	2,100									
		Drainage Riprap placement		3,100								
		Drainage Bedding Layer		1,600								
		Revegetation			20							
		Infrastructure Relocation	n/a									

		Truck/Shovel Pull Back					3,900	-				
		Dozer Rough Grade		1,350,000		400						
		Truck/Shovel Bench Regrade		-								
		Terrace Bench Construction	17,100									
		Cover Placement (Haul)		322,700	100		3,000	(10)	3,500	(7)	6,400	7
		Cover Placement (Placement)		322,700	100	600						
		Terrace Channel Construction	17,100									
3B	Exterior Slope	Terrace Gravel Placement		6,800								
		Down Drain Construction	550									
		Down Drain Riprap Placement		2,200								
		Down Drain Bedding Layer		400								
		Drainage Construction	9,000									
		Drainage Riprap placement		13,300								
		Drainage Bedding Layer		6,800								
		Revegetation			100							
		Infrastructure Relocation										

		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		39,000		250						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		51,600	16		3,000	(10)	3,500	(7)	6,400	7
		Cover Placement (Placement)		51,600	16	100						
3B	Top	Terrace Channel Construction	n/a									
		Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Drainage Construction	530									
		Drainage Riprap placement		800								
		Drainage Bedding Layer		400								
		Revegetation			16							
		Infrastructure Relocation	n/a		.							

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work Distance (ft)	Haul Leg 1 Distance (ft)	Haul Leg 1 Grade (%)	Haul Leg 2 Distance (ft)	Haul Leg 2 Grade (%)	Haul Leg 3 Distance (ft)	Haul Leg 3 Grade (%)
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		4,100,000		450						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	52,100									
		Cover Placement (Haul)		661,500	205		1,500	7	1,000	(10)	2,500	3
		Cover Placement (Placement)		661,500	205	600						
		Terrace Channel Construction	52,100									
5A	Exterior Slope	Terrace Gravel Placement		20,800								
		Down Drain Construction	4,000									
		Down Drain Riprap Placement		16,400								
		Down Drain Bedding Layer		2,800								
		Drainage Construction	3,625									
		Drainage Riprap placement		5,400								
		Drainage Bedding Layer		2,700								
		Revegetation			205							
		Infrastructure Relocation	7,500									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		535,000		450						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		329,100	102		1,500	7	1,000	(10)	2,500	11
		Cover Placement (Placement)		329,100	102	100						
		Terrace Channel Construction	n/a									
5A	Top	Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	3,000									
		Drainage Riprap placement		4,400								
		Drainage Bedding Layer		2,300								
		Revegetation			102							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back		2,500,000			1,300	-1				
		Dozer Rough Grade		2,100,000		500						
		Truck/Shovel Bench Regrade										
		Terrace Bench Construction	5,300									
		Cover Placement (Haul)		413,000	128		5,500	2	5,200	10	5,300	(2)
		Cover Placement (Placement)		413,000	128	150						
		Terrace Channel Construction	5,300									
San Salvador Pit		Terrace Gravel Placement		2,100								
		Down Drain Construction	1,100									
		Down Drain Riprap Placement		4,500								
		Down Drain Bedding Layer		800								
		Drainage Construction	6,200									
		Drainage Riprap placement		9,200								
		Drainage Bedding Layer		4,700								
		Revegetation			128							
		Drilling and Blasting		500,000								
		Infrastructure Relocation										
		Truck/Shovel		2,476,000			1,000	-1				
		Dozer Rough Grade		508,000		500						
		Truck/Shovel Bench Regrade										
		Terrace Bench Construction	2,000									
		Cover Placement (Haul)		238,800	74		5,500	2	5,200	10	8,300	(2)
		Cover Placement (Placement)		238,800	74	200						
		Terrace Channel Construction	2,000									
South Rim Pit		Terrace Gravel Placement		800								
		Down Drain Construction	1,200									
		Down Drain Riprap Placement		4,900								
		Down Drain Bedding Layer		800								
		Drainage Construction	3,500									
		Drainage Riprap placement		5,200								
		Drainage Bedding Layer		2,600								
		Revegetation			74							
		Drilling and Blasting										
		Infrastructure Relocation										

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work Distance (ft)	Haul Leg 1 Distance (ft)	Haul Leg 1 Grade (%)	Haul Leg 2 Distance (ft)	Haul Leg 2 Grade (%)	Haul Leg 3 Distance (ft)	Haul Leg 3 Grade (%)
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		415,000		400						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		332,300	103		5,500	2	5,200	10	5,000	1
		Cover Placement (Placement)		332,300	103	100						
		Terrace Channel Construction	n/a									
4C	Top	Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	2,600									
		Drainage Riprap Placement		3,800								
		Drainage Bedding Layer		2,000								
		Revegetation			103							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		411,000		188						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	15,000									
		Cover Placement (Haul)		229,100	71		5,500	2	5,200	10	6,000	1
		Cover Placement (Placement)		229,100	71	200						
		Terrace Channel Construction	15,000									
4C	Exterior Slopes	Terrace Gravel Placement		6,000								
		Down Drain Construction	2,000									
		Down Drain Riprap Placement		8,200								
		Down Drain Bedding Layer		1,400								
		Drainage Construction	7,600									
		Drainage Riprap Placement		11,200								
		Drainage Bedding Layer		5,700								
		Revegetation			71							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade (Slopes)		519,000		114						
		Dozer Rough Grade (Top)		1,191,000		400						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	6,300									
		Cover Placement (Haul)		793,800	246		5,500	2	5,200	10	3,200	-
		Cover Placement (Placement)		793,800	246	100						
2C, 4A, 7B, 4B		Terrace Channel Construction	6,300									
		Terrace Gravel Placement		2,500								
		Down Drain Construction	2,000									
		Down Drain Riprap Placement		8,200								
		Down Drain Bedding Layer		1,400								
		Drainage Construction	18,200									
		Drainage Riprap placement		26,900								
		Drainage Bedding Layer		13,700								
		Revegetation			246							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		686,000		420						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		209,700	65		3,500	2	5,200	2		
		Cover Placement (Placement)		209,700	65	100						
		Terrace Channel Construction	n/a									
6C	Top	Terrace Gravel Placement	n/a									
		Down Drain Construction	800									
		Down Drain Riprap Placement		3,300								
		Down Drain Bedding Layer		600								
		Drainage Construction	3,900									
		Drainage Riprap placement		5,800								
		Drainage Bedding Layer		2,900								
		Revegetation			65							
		Infrastructure Relocation	n/a									

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work Distance (ft)	Haul Leg 1 Distance (ft)	Haul Leg 1 Grade (%)	Haul Leg 2 Distance (ft)	Haul Leg 2 Grade (%)	Haul Leg 3 Distance (ft)	Haul Leg 3 Grade (%)
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		394,000		400						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)										
		Cover Placement (Placement)				100						
		Terrace Channel Construction	n/a									
9A	Top	Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	2,700									
		Drainage Riprap Placement		4,000								
		Drainage Bedding Layer		2,000								
		Revegetation			61							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade										
		Truck/Shovel Bench Regrade	n/a	355,138	74	90						
		Terrace Bench Construction	16,500									
		Cover Placement (Haul)										
		Cover Placement (Placement)				600						
		Terrace Channel Construction	16,500									
9A	Exterior Slopes	Terrace Gravel Placement		6,600								
		Down Drain Construction	3,700									
		Down Drain Riprap Placement		15,100								
		Down Drain Bedding Layer		2,600								
		Drainage Construction	n/a									
		Drainage Riprap Placement	n/a									
		Drainage Bedding Layer	n/a									
		Revegetation			74							
		Infrastructure Relocation	n/a									
		Truck/Shovel Pull Back	n/a									
		Dozer Rough Grade		100,000		100						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		154,900	48		3,500	2	5,200	2	1,700	-
		Cover Placement (Placement)		154,900	48	100						
		Terrace Channel Construction	n/a									
7A	Top	Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	6,100									
		Drainage Riprap Placement		9,000								
		Drainage Bedding Layer		4,600								
		Revegetation			48							
		Infrastructure Relocation	n/a									

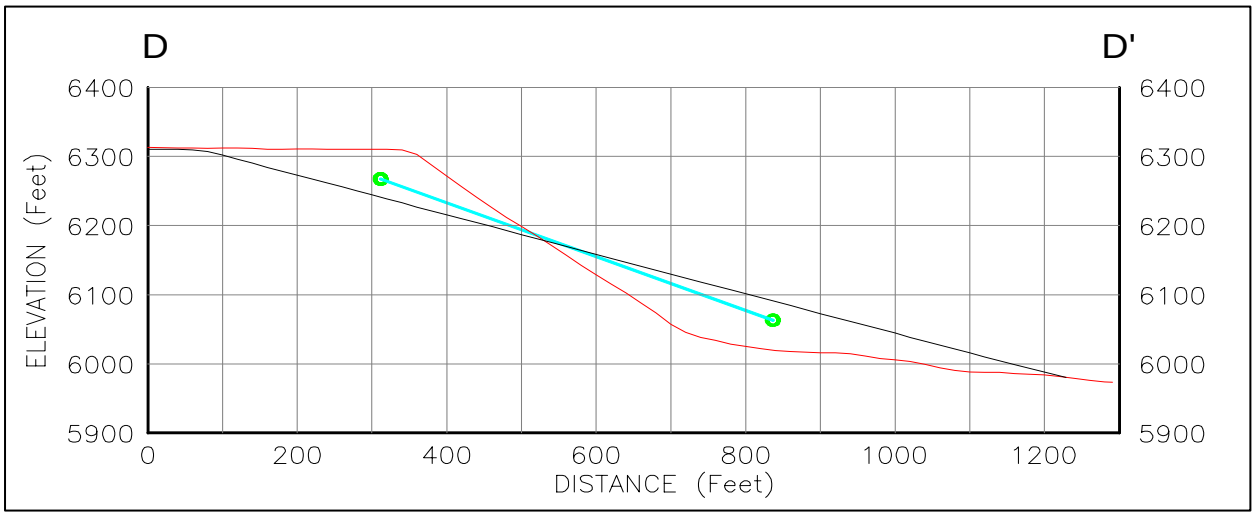
Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work Distance (ft)	Haul Leg 1 Distance (ft)	Haul Leg 1 Grade (%)	Haul Leg 2 Distance (ft)	Haul Leg 2 Grade (%)	Haul Leg 3 Distance (ft)	Haul Leg 3 Grade (%)
1 Series Tailings 1x	Slope	Truck/Shovel	n/a									
		Dozer Rough Grade	n/a									
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)		356,000			3,100	1				
		Cover Placement (Placement)		356,000		350						
		Terrace Channel Construction	16,600									
		Terrace Gravel Placement		6,500								
		Down Drain Construction	3,100									
		Down Drain Riprap Placement		12,700								
		Down Drain Bedding Layer		2,200								
		Drainage Construction	n/a									
		Drainage Riprap placement	n/a									
		Drainage Bedding Layer	n/a									
		Revegetation			40							
		Infrastructure Relocation										
1 Series Tailings 1x	Top	Truck/Shovel	4,031,000				3,000	1				
		Dozer Rough Grade	n/a									
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)	n/a									
		Cover Placement (Placement)	n/a									
		Terrace Channel Construction	n/a									
		Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	21,300									
		Drainage Riprap placement		31,500								
		Drainage Bedding Layer		16,000								
		Revegetation			440							
		Infrastructure Relocation										
1 Series Tailings	Ponds	Truck/Shovel	n/a									
		Dozer Rough Grade	300,000			600						
		Truck/Shovel Bench Regrade	n/a									
		Terrace Bench Construction	n/a									
		Cover Placement (Haul)	n/a									
		Cover Placement (Placement)	n/a									
		Terrace Channel Construction	n/a									
		Terrace Gravel Placement	n/a									
		Down Drain Construction	n/a									
		Down Drain Riprap Placement	n/a									
		Down Drain Bedding Layer	n/a									
		Drainage Construction	31,100									
		Drainage Riprap placement		46,000								
		Drainage Bedding Layer		23,300								
		Revegetation			71							
		Infrastructure Relocation										

2A leach 2B waste South Side		
Section	Push Distance (ft)	Grade (%)
A	205	30
C	396	30
D	563	30
E	205	30
Average	342	30

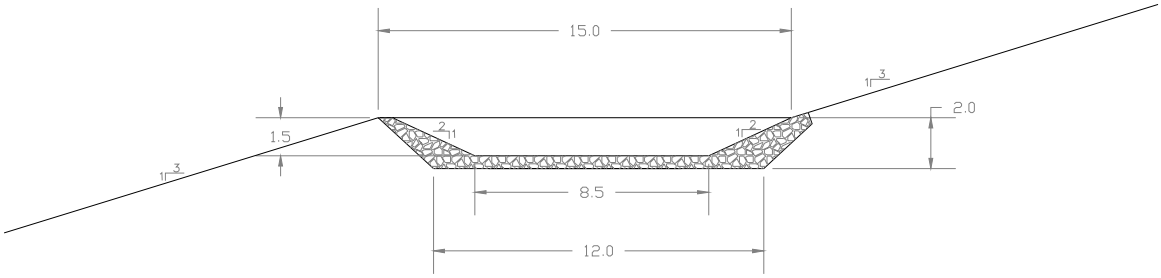
2A leach 2B waste North Side		
Section	Push Distance (ft)	Grade (%)
F	616	30
G	764	30
H	130	30
I	720	30
J	339	30
Average	514	30

3A leach		
Section	Push Distance (ft)	Grade (%)
A	282	30
C	204	30
D	256	30
E	252	30
F	268	
G	457	
H	359	
I	255	
Average	292	30

4C Leach		
Section	Push Distance (ft)	Grade (%)
A	182	30
B	184	30
C	242	30
D	213	30
E	88	30
F	283	30
G	173	30
H	182	30
I	142	30
Average	188	30



	Excavation Volume per Foot	1.04 cy/ft
Gravel Placement		
	Gravel Volume per Foot	0.40 cy/ft

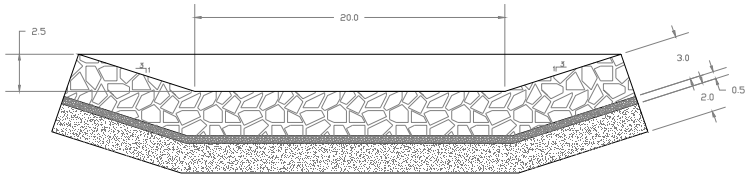


BASE CASE BENCH

Terrace Cross-Sectional Area	10.8 sf
Terrace Excavation Cross-Sectional Area	28 sf

Cover Placement		
	Cubic yards of Cover per ft	2.87 cy/ft
Riprap & Gravel Placement		
	Gravel Volume per Foot	0.70 cy/ft
	Riprap	4.09 cy/ft

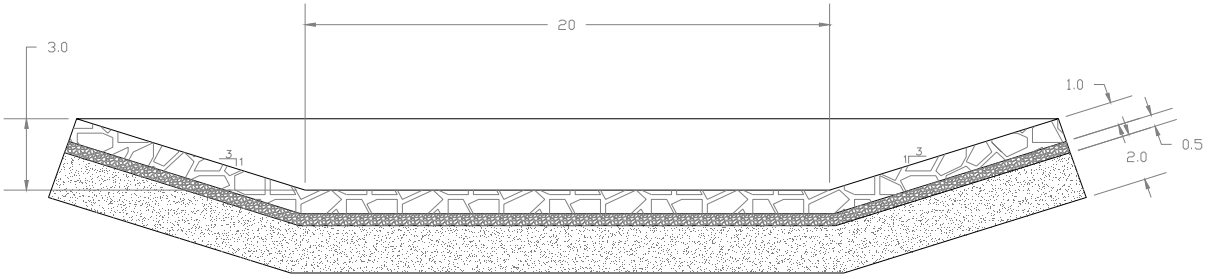
Assume use of D50=18" riprap for downdrains



TYPICAL DOWNDRAIN CROSS SECTION

Down Drain Cross-Sectional Area	68.8 sf
Down Drain Excavation Cross-Sectional Area	198.2 sf

Cover Placement		
	Cubic yards of Cover per ft	3.05 cy/ft
Riprap & Gravel Placement		
	Gravel Volume per Foot	0.75 cy/ft
	Riprap	1.48 cy/ft



TYPICAL CHANNEL CROSS SECTION

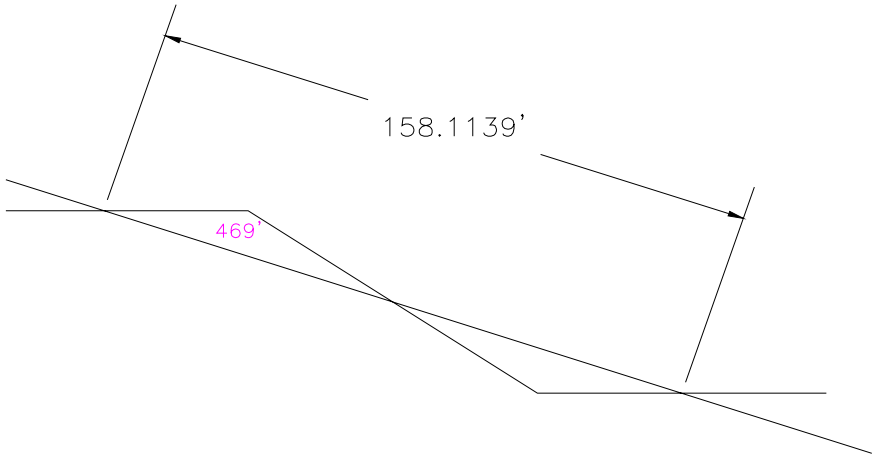
Channel Cross-Sectional Area	88.9 sf
Channel Excavation Cross-Sectional Area	149 sf

Notes:
1) For the san Salvador it 540,000 cy are from the open cut the rest is from the surrounding waste rock piles
2) For the South Rim pit the 300,000 cy is from the open cut

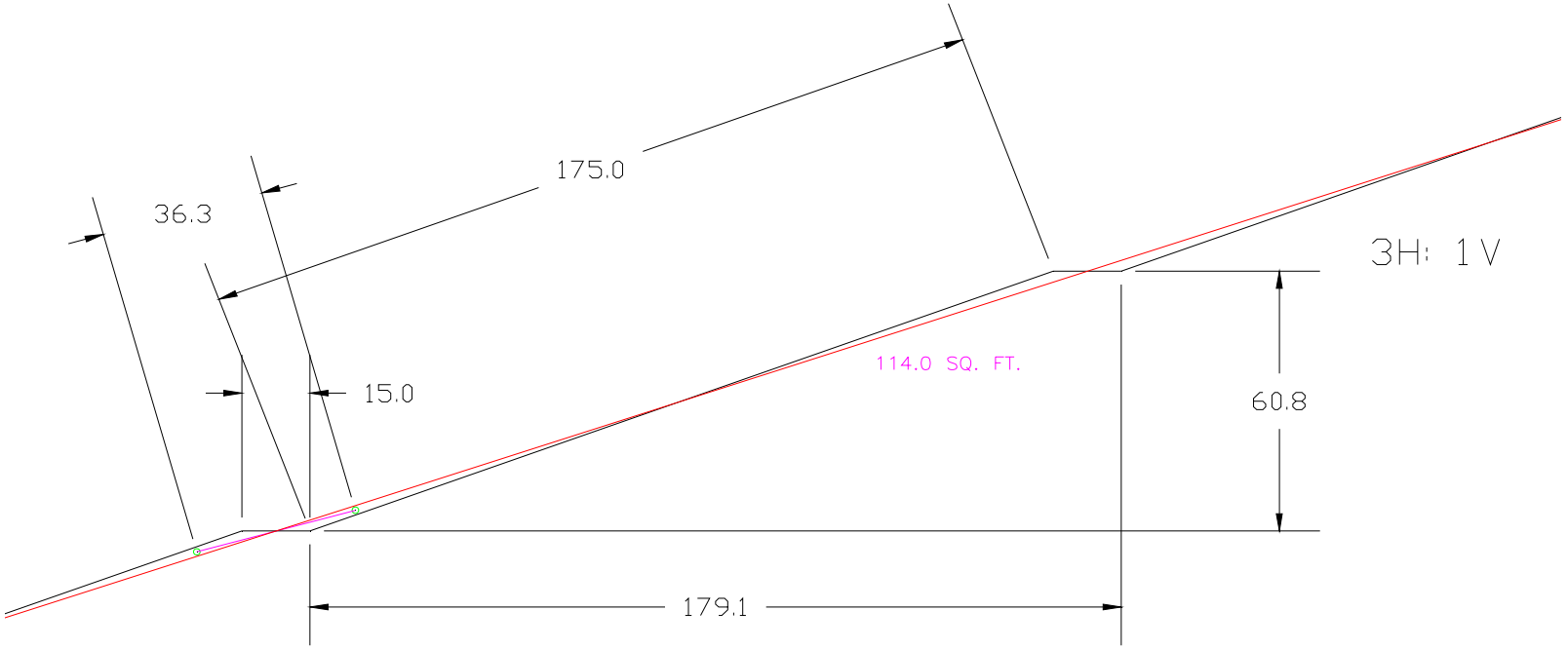
Stockpile	Area (ac)	Volume (cy)
1A and 1B	151	724673
2A and 2B	99	475116
3A	308.6	1481020

3) The Volume of regrade flowing the Truck/shovel pullback was determined by measuring the cross sectional area of a typical pullback (see below) and then calculating a volume per acre as shown below:

Cross Sectional Area	470	sqft
Surface Area (slope length * 1'	158	ft
Volume per sqft	3.0	cf/sqft
Volume per acre	4799	cy/ac



Volume per foot of Terrace	4.22 cy/ft
Dozer Push	50 ft
Grade	-35 %



Appendix F-02
Engineering Take-offs
Golder

Tyrone Well Abandonment Take Off **10/2/2007**

Well ID	Location	Type	Total Depth	Post Closure Status	DP
1B Leach					
GLD-3A	Gettysburg Leach Dump Monitor Well 3	MW	**655.0**	**Abandon/Replace**	**455**
3A Leach					
5	Thompson Well	MW	1,200.0	Abandon	
29	Fang	MW	251.5	Abandon	
286-2005-01	Monitor Well	MW	214.6	**Abandon/Replace**	**286**
286-2007-34	Monitor Well	MW	234.0	Abandon	
C10-17	No. 3 Leach Well	EXW	53.3	Abandon	
C10-18	No. 3 Leach Well	EXW	55.5	Abandon	
C10-55	No. 3 Leach Well	EXW	44.4	Abandon	
C10-58	No. 3 Leach Well	EXW	45.8	Abandon	
C10-8	No. 3 Leach Well C10-8	MW	193.0	Abandon	
C11-1	No. 3 Leach Well C11-1	MW	210.0	Abandon	
C11-11	No. 3 Leach Well	MW	51.5	Abandon	
C11-16	No. 3 Leach Well	EXW	36.0	Abandon	
C11-20	No. 3 Leach Well	MW	43.7	Abandon	
C11-6	No. 3 Leach Well	MW	37.8	Abandon	
C3-1	No. 3 Leach Well	MW	23.0	Abandon	
C7-1	No. 3 Leach Well	MW	24.0	Abandon	
C7-13	No. 3 Leach Well	MW	32.8	Abandon	
C7-14	No. 3 Leach Well	MW	30.5	Abandon	
C7-15	No. 3 Leach Well	EXW	34.5	Abandon	
C7-16	No. 3 Leach Well	MW	25.1	Abandon	
C7-2	No. 3 Leach Well	MW	24.0	Abandon	
C7-27	No. 3 Leach Well	MW	29.5	Abandon	
C7-34	No. 3 Leach Well	EXW	36.9	Abandon	
C7-8	No. 3 Leach Well C7-8	MW	125.0	Abandon	
C7-9	No. 3 Leach Well	MW	30.5	Abandon	
C8-10	No. 3 Leach Well	EXW	52.0	Abandon	
C8-11	No. 3 Leach Well	EXW	52.4	Abandon	
C8-27	No. 3 Leach Well	MW	23.0	Abandon	
C8-30	No. 3 Leach Well	MW	22.9	Abandon	
C8-33	No. 3 Leach well	EXW	36.0	Abandon	
C8-34	No. 3 Leach well	EXW	36.3	Abandon	
C8-36	No. 3 Leach Well	MW	30.0	Abandon	
C8-39	No. 3 Leach Well	MW	31.5	Abandon	
C8-43	No. 3 Leach Well	EXW	32.5	Abandon	
C8-44	No. 3 Leach Well	MW	32.5	Abandon	
C8-47	No. 3 Leach Well	MW	60.0	Abandon	
C8-48	No. 3 Leach Well	EXW	60.0	Abandon	
C8-5	No. 3 Leach Well	MW	50.0	Abandon	
C8-7	No. 3 Leach Well C8-7	MW	168.0	Abandon	
C8-8	No. 3 Leach Well	MW	46.0	Abandon	
C8-9	No. 3 Leach Well	EXW	53.0	Abandon	
C9-10	No. 3 Leach Well	MW	29.5	Abandon	
C9-3	No. 3 Leach Well	MW	52.5	Abandon	
C9-5	No. 3 Leach Well C9-5	MW	185.0	Abandon	
O-4	Well 4	MW	350.0	Abandon	
P-169	No. 3 Leach Well P-169	MW	150.0	Abandon	
P-170	No. 3 Leach Well P-170	MW	150.0	Abandon	
P-171	No. 3 Leach Well P-171	MW	150.0	Abandon	
P-172	No. 3 Leach Well P-172	MW	135.5	Abandon	
P-174	No. 3 Leach Well P-174	EXW	150.0	Abandon	
P-177	No. 3 Leach Well P-177	EXW	150.7	Abandon	

Tyrone Well Abandonment Take Off **10/2/2007**

Well ID	Location	Type	Total Depth	Post Closure Status	DP
P-178	No. 3 Leach Well P-178	EXW	205.0	Abandon	
P-179	No. 3 Leach Well P-179	MW	185.0	Abandon	
P-194	No. 3 Leach Well P-194	EXW	155.0	Abandon	
P-195	No. 3 Leach Well P-195	EXW	185.0	Abandon	
P-196	No. 3 Leach Well P-196	EXW	170.0	Abandon	
P-197	No. 3 Leach Well P-197	MW	159.0	Abandon	
P-203	No. 3 Leach Well P-203	EXW	245.0	Abandon	
P-205	No. 3 Leach Well P-205	EXW	175.0	Abandon	
P-206	No. 3 Leach Well P-206	EXW	170.0	Abandon	
P-207	No. 3 Leach Well P-207	MW	170.0	Abandon	
P-208	No. 3 Leach Well P-208	MW	140.0	Abandon	
P-209	No. 3 Leach Well P-209	EXW	164.5	Abandon	
P-210	No. 3 Leach Well P-210	EXW	169.0	Abandon	
P-211	No. 3 Leach Well P-211	EXW	167.0	Abandon	
P-212	No. 3 Leach Well P-212	EXW	164.5	Abandon	
P-213	No. 3 Leach Well P-213	MW	187.0	Abandon	
P-215	No. 3 Leach Well P-215	EXW	207.2	Abandon	
P-216	No. 3 Leach Well P-216	EXW	200.0	Abandon	
P-217	No. 3 Leach Well P-217	EXW	199.8	Abandon	
P-219	No. 3 Leach Well P-219	MW	171.0	Abandon	
P-223	No. 3 Leach Well P-223	MW	226.0	Abandon	
P-225	No. 3 Leach Well P-225	MW	221.0	Abandon	
P-227		MW	295.5	Abandon	
P-228		MW	255.0	Abandon	
P-229		MW	243.0	Abandon	
P-230		MW	235.0	Abandon	
P-234		EXW	-	Abandon	
P-236		EXW	230.0	Abandon	
P-237		EXW	230.0	Abandon	
P-238		EXW	235.0	Abandon	
P-239		EXW	244.0	Abandon	
P-240		EXW	242.0	Abandon	
P-241		EXW	260.0	Abandon	
P-4A	No. 3 Leach Well 4A	MW	288.0	Abandon	
P-8A	No. 3 Leach Well P-8A	MW	424.8	Abandon	
Total 3A Leach			**12,594.5**		
5A Waste					
34	1D Leach Monitor Well 34	MW	340.0	Abandon	
670-2005-02	Monitor Well	MW	396.4	Abandon	
MVR-4		MW	-	Abandon	
Total 5A Waste			**736.4**		
7B Leach					
2-5A	No. 2 Leach Test Well 2-5A	MW	484.0	**Abandon/Replace**	**166**

Tyrone Mine Surface Impoundments to be Closed

Pond Designation[1.]	Surface Area (acres)	Mine Use[1.]	Liner[1.]	Post Closure Status
No 2 Tailing Impoundment				
CB-2H1	0.2	Perimeter stormwater	None	Closed
CB-2H4	0.58	Perimeter stormwater	None	Closed
No. 1A Tailing Impoundment				
CB-1AA	2.12	Perimeter stormwater	None	To be closed
CB-1AB	1	Perimeter stormwater	None	To be closed
CB-1AC	11	Perimeter stormwater	None	To be closed
No. 1X Tailing Impoundment				
CB-1XA	0.05	Perimeter stormwater	None	To be closed
CB-1XB	0.06	Perimeter stormwater	None	To be closed
CB-1XC	0.12	Perimeter stormwater	None	To be closed
CB-1XD	0.09	Perimeter stormwater	None	To be closed
CB-1XE1	1.41	Perimeter stormwater	None	To be closed
CB-1XE2	0.64	Perimeter stormwater	None	To be closed
CB-1XE3	0.59	Perimeter stormwater	None	To be closed
CB-1XF	0.16	Perimeter stormwater	None	To be closed
CB-1XG	0.05	Perimeter stormwater	None	To be closed
CB-1XH	NA	Perimeter stormwater	None	To be closed
CB-1XI	NA	Perimeter stormwater	None	To be closed
CB-1XJ	NA	Perimeter stormwater	None	To be closed
CB-1XK	0.27	Perimeter stormwater	None	To be closed
CB-1XL	NA	Perimeter stormwater	None	To be closed
CB-1XM	0.7	No. 2 TDRW Pond	Clay	To be closed
CB-1XN	NA	Perimeter stormwater	None	To be closed
CB-1XO	NA	Perimeter stormwater	None	To be closed
CB-1XQ	1.33	Perimeter stormwater	None	To be closed
CB-1XR	0.88	Perimeter stormwater	None	To be closed
DP-166 No. 2 Leach System, SX/EW Plant, Open Pits				
Seep Collection DC2-1	0.02	Seep/Stormwater	Synthetic	Reclaim/Replace
Seep 8	0.005	Seep/Stormwater	Clay	PMLU
5E Pond 1	0.55	Stormwater	Synthetic	To be closed
Copper Mountain d (concrete headwall)	0.002	Seep/Stormwater	None	PMLU
Copper Mountain Pit				
Copper Mountain Pit Sump	0.44	Seep/Stormwater	None	PMLU
SX/EW Plant				
SX/EW PLS Feed Pond	0.25	PLS	Synthetic	PMLU
No. 3A Stockpile				
No. 3 PLS	1.22	PLS	Synthetic	PMLU
No. 3 PLS Overflow	0.58	PLS	Synthetic	PMLU
Crusher Pond	0.37	Stormwater	None	PMLU

Pond Designation[1.]	Surface Area (acres)	Mine Use[1.]	Liner[1.]	Post Closure Status
Land Farm and Stage Pond (2)	0.62	Stormwater	Synthetic & Concrete lined	PMLU
Niagara Stormwater	0.16	Stormwater	None	PMLU
Other Thickeners (six)	0.46	Stormwater	Synthetic & Concrete lined	PMLU
Plant Oxidation Pond (a)	0.28	Sewage Treatment	Synthetic	PMLU
Plant Oxidation Pond (b)	0.3	Sewage Treatment	Synthetic	PMLU
SPCC Pond	0.96	Stormwater	Synthetic	PMLU
No. 1A Stockpile				
No. 1A PLS Overflow Pond	0.5	PLS	Synthetic	PMLU
No. 1B Stockpile				
No. 1B Overflow Pond	0.6	PLS	Synthetic	PMLU
No. 1C Stockpile				
No. 1C Stormwater Pond	0.09	Stormwater	Synthetic	To be closed
Oak Grove Wash Sediment Basin	2.2	Stormwater	None	To be closed
No. 2A and 2B Stockpile				
No. 2A (a) Seep 5E Pond Discharge	0.1	Stormwater	None	Reclaim/Replace
No. 2A (b) (surge pond)	0.46	PLS	Synthetic	PMLU
No. 2A East PLS Overflow	0.12	PLS	Synthetic	PMLU
No. 2A West PLS	0.08	PLS Tank	Synthetic	PMLU
2B Stormwater	0.65	Stormwater	Clay	Closed
Gettysburg Pit				
Gettysburg Pit (a)	0.17	Stormwater	Synthetic	PMLU
No. 7B Stockpile				
7B PLS Sump	0.06	PLS	Synthetic	PMLU
Savannah Pit				
Savanna Pit Seepage Sump	0.07	Stormwater	Synthetic	PMLU
No. 6C Stockpile				
East Main Booster Sump	0.05	PLS	Synthetic	PMLU
No. 1 Stockpile				
No. 1 PLS Pond (4 Sump)	0.9	PLS	Clay	To be closed
Precipitation Plant Launders	0.1	Stormwater	Synthetic & Concrete lined	To be closed
No. 5A Stockpile				
Lube Shop Pond	0.09	Stormwater	None	To be closed
No. 8A/8C Stockpile				
No. 2 PLS Pond	0.46	PLS	Synthetic & Shotcrete	PMLU
No. 2C Stockpile				
North Racket Sump	0.64	PLS	None	PMLU

Appendix G
Cost Estimate (Electronic)