## BONDING

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50.1-1	Post Mining Configuration For Pond Term
<u> 30.1-1</u>	Post-Mining Configuration For Bond Term
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<u>50.4-1</u>	Cut and Fill Contours
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## BONDING

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50.A Detailed Reclamation Bond Calculation

## BONDING

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REV. NUMBER REVISION DESCRIPTION DATE APPROVED

#### SECTION 50 BONDING

#### 50.1 Bond Scheme

The determination of the reclamation bond is an estimate of the maximum foreseeable reclamation cost that the Regulatory Authority would incur in the event of bond forfeiture by BHP Navajo Coal Company (BNCC) during the permit term ending in 2021. Areas bonded under this Pinabete Mine Plan permit area (permit area) bond include those areas which will be disturbed in the process of recovering coal from the permit area and those areas required to construct facilities or infrastructure that support the production activities. The reclamation costs detailed in this section and the reclamation procedures detailed in Part 5 (Reclamation Plan) apply only for determining the bond amount at year 2021 and are not necessarily meant to represent current or future operational practices. Direct costs are calculated in Worksheets 2 through 15 and are totaled in Worksheet 16 in <u>Appendix 50.A</u>. Indirect costs are applied as percentages of the direct cost in Worksheet 16 to determine a total bond cost.

#### 50.1.1 Maximum Reclamation Liability during the Permit Term

During the permit term ending 2021, the reclamation liabilities will be greatest at the end of the five-year term. BNCC will progress pit development throughout the permit term while not yet disturbing sufficient acreage to facilitate significant reclamation activities, the cumulative disturbance will reach the maximum late in the permit term. Throughout the five-year term, strip progression results in an increase in disturbed land, increased pit depths, and slight increases in pit lengths.

The amount of mining (stripping) disturbance to occur during the permit term is related to strip progression and timing, which is presented on Exhibit 50.1-1. The bond scenario presented here does not necessarily match the strip progression timing shown in the permit term disturbance exhibits. This is due to the remaining uncertainty regarding actual start dates for the mining (stripping) operations, which are ultimately a function of the timing of the coal requirements from the customer. In order to address this uncertainty and ensure that BNCC will be sufficiently bonded over the first permit term, the maximum likely amount of mining (stripping) disturbance has been considered for the bond scenario. In other words, this is a conservative bond scenario and BNCC is unlikely to disturb more than the acreage indicated in the bond scenario. The regraded area of disturbance (bond final surface configuration) is also shown on Exhibit 50.1-2.

#### 50.2 Extended-Liability Bond Areas

BNCC does not have any extended liability bond areas associated with the permit area; therefore, this section is not applicable.

#### 50.3 Bonding of Facilities Used in Common

Facilities and infrastructure (e.g., powerlines, ancillary roads, etc.) within the permit area in Area 4 North which are currently considered in BNCC Navajo Mine's bond amount (Office of Surface Mining Reclamation and Enforcement (OSM) Permit No. NM-0003F) (BNCC 2009) will be separated from the Navajo Mine bond and incorporated into the Pinabete Mine Plan permit area bond by minor revision after the approval of this permit application package.

#### **50.4 Reclamation Cost Estimate**

#### 50.4.1 Reclamation Costs

Reclamation costs are calculated as shown in <u>Appendix 50.A</u>, Worksheets 1 through 16. The methods and format used in this calculation are consistent with the guidance contained in the OSM *Handbook for Calculation of Reclamation Bond Amounts* (OSM 2000). A summary of the reclamation bond amount is presented in <u>Table 50.4-1</u>.

Reclamation liabilities attributable to the Pinabete Mine Plan during the first permit term (2016 to 2021) will occur in Area 4 North (pit development in Area 4 South will occur after the first permit term). It is assumed that the final bond pit will progress as shown in <u>Exhibit 50.1-1</u> and will be stripped to the lowest economically recoverable coal seam. Reclamation activities will consist of the following:

- 1) Facility demolition and removal,
- 2) Earthmoving primary and secondary regrade, topdressing, mitigation,
- 3) Revegetation, and
- 4) Miscellaneous

#### 50.4.1.1 Facility Demolition and Removal

Facility demolition and removal of all existing permit structures on the mine site includes electric power lines; explosive stores; coal facilities; water control ponds; transportation facilities; and miscellaneous structures. A majority of these facilities are included with the Navajo Mine Area 4 North Bond update which is located in the Navajo Mine Permit Application Package (OSM permit No. NM-0003F, Appendix 12-B) (BNCC 2009). New facilities associated with the Pinabete Mine Plan permit area that are constructed during the first permit term are two sedimentation ponds (Pond 415 and Pond 416). Removal of these ponds is included in earthmoving costs. As a result, there are no facility demolition and removal costs.

#### 50.4.1.2 Earthmoving

A post-mining "snapshot" of the mine area was projected for year 2021, as shown in the bond post-mining configuration (PMC) map, Exhibit 50.1-1.

The bond final surface configuration (BSC) selected for the initial permit term is to return the disturbed area as close as possible to the pre-mining topography. To achieve BSC (<u>Exhibit 50.1-2</u>), PMC topography in these areas was altered to create reclaimed surfaces falling as close as practical to the pre-mining topography. The BSC surfaces maintain 6.5 horizontal:1 vertical (6.5h:1v) maximum final interior slopes, 4h:1v maximum outslopes, balance cut and fill volumes, and ensure positive drainage.

The next design step was to subtract a computerized grid of the PMC from the BSC. The result is a cut-fill contours map (Exhibit 50.4-1) with the cut areas shown as red contours, and the fill areas shown as green contours. The cut and fill areas are then subdivided into polygons and the cut and fills are balanced by taking extra cut to polygons that require fill. The result is the cut-fill blocks map (Exhibit 50.4-2).

The CAD software gives the volume and centroid of each block. The centroids are used to calculate haulage distances and grades, except in the case of deep pits and ramps where haulage is assumed to be to the crest where the material can be pushed over the edge. The haulage profiles and grades are weight averaged by volume to give an average distance and grade for each equipment type.

All bond earthmoving activities are tabulated in Worksheet 3 as follows:

Worksheet 5	Dozers
Worksheet 8	Loaders
Worksheet 9	Trucks
Worksheet 11	Scrapers
Worksheet 12	Graders
Worksheet 15	Drilling and Blasting of Highwalls

Quantities from these worksheets are used as input to Worksheets 5 through 12, where equipment hours are calculated. Worksheet 13 uses these hours to calculate earthmoving costs. The earthmoving costs are totaled in Worksheet 16, Item 2. In addition to regrade activities, earthmoving includes spoil mitigation, topdressing placement, and concrete disposal.

Once regrading and/or facilities removal activities have been completed in an area, required suitable root zone mitigation and/or topdressing material is placed on these areas (<u>Exhibit 50.4-3</u>).

Suitable spoil and regolith/topdressing material (either stockpiled or in situ) are used to complete the 4-feet suitable root zone material requirements on spoil surfaces. Stockpiled and/or in-situ regolith/topdressing material is used to complete the topdressing material depth requirement on all reclaimed surfaces. Refer to Section 36 (Post-Reclamation Soil) for additional information regarding root zone material and topdressing replacement requirements.

#### 50.4.1.2.1 Equipment Selection

Large earthmoving equipment was selected assuming that a competent, qualified contractor will be doing the reclamation work using their own equipment.

#### 50.4.1.2.2 Equipment Productivity and Costs

Reclamation activities will take place with a 15-shift-per-week schedule. Equipment ownership and operating costs are tabulated in Appendix Table 50-A-23 (<u>Appendix 50.A</u>) taken from *Cost Reference Guide for Construction Equipment* (CRG-PRIMEDIA Equipment Watch 2011). Equipment operator wage rates are listed in Appendix Table 50-A-24 (<u>Appendix 50.A</u>) and were taken from the ACME Inc. Navajo Mine reclamation contract in force for 2011.

For haul routes greater than 600 feet, scrapers are more economical than dozers. For haul routes greater than 3,000 feet, dump trucks are more economical than scrapers. Dozers are assumed to work alone with no support equipment other than a lowboy for transport. Truck and scraper fleets both require load and dump dozers, and half-time water truck and grader for haul road maintenance. All fleets are assigned light plants for night work. Fuel and lube trucks are included in the fuel costs (Appendix Table 50-A-23 in Appendix 50.A).

Productivities for each particular activity are calculated in Worksheets 5 through 12 (<u>Appendix 50.A</u>), using the material properties and haulage profile pertaining to the task.

#### 50.4.1.3 Revegetation

After regrading, the bonded areas will be graded with graders and then these areas and facilities areas will be topdressed as noted in previously. After topdressing, revegetation activities will commence. This involves seeding, crimping, mulching, and irrigation as described in Section 37 (Post-Reclamation Vegetation). Costs are noted in <u>Appendix 50.A</u>, Worksheet 14.

#### 50.4.1.4 Miscellaneous

No miscellaneous costs were required for the initial permit term bond scenario.

#### 50.4.3 Indirect Reclamation Costs

Mobilization and demobilization costs are assumed to be 1% of the direct costs, since the reclamation project would be very large. Contingencies are 5% of the direct costs; the engineering redesign fee, the contractor profit and overhead, and the reclamation fee are set at 1.8%, 15.0%, and 3.9% of direct costs respectively, per agreement with OSM staff.

## 50.4.2 Total Performance Bond Cost

The total performance bond cost is the sum of the direct and indirect costs and is shown in Worksheet 16, <u>Appendix 50.A</u>.

## Personnel

Persons or organizations responsible for data collection, analysis, and preparation of this permit application package section:

Ron Van Valkenburg	Norwest Corporation
Kent Applegate	Salt Lake City, UT
Matt Owens	
BHP Navajo Coal Company	

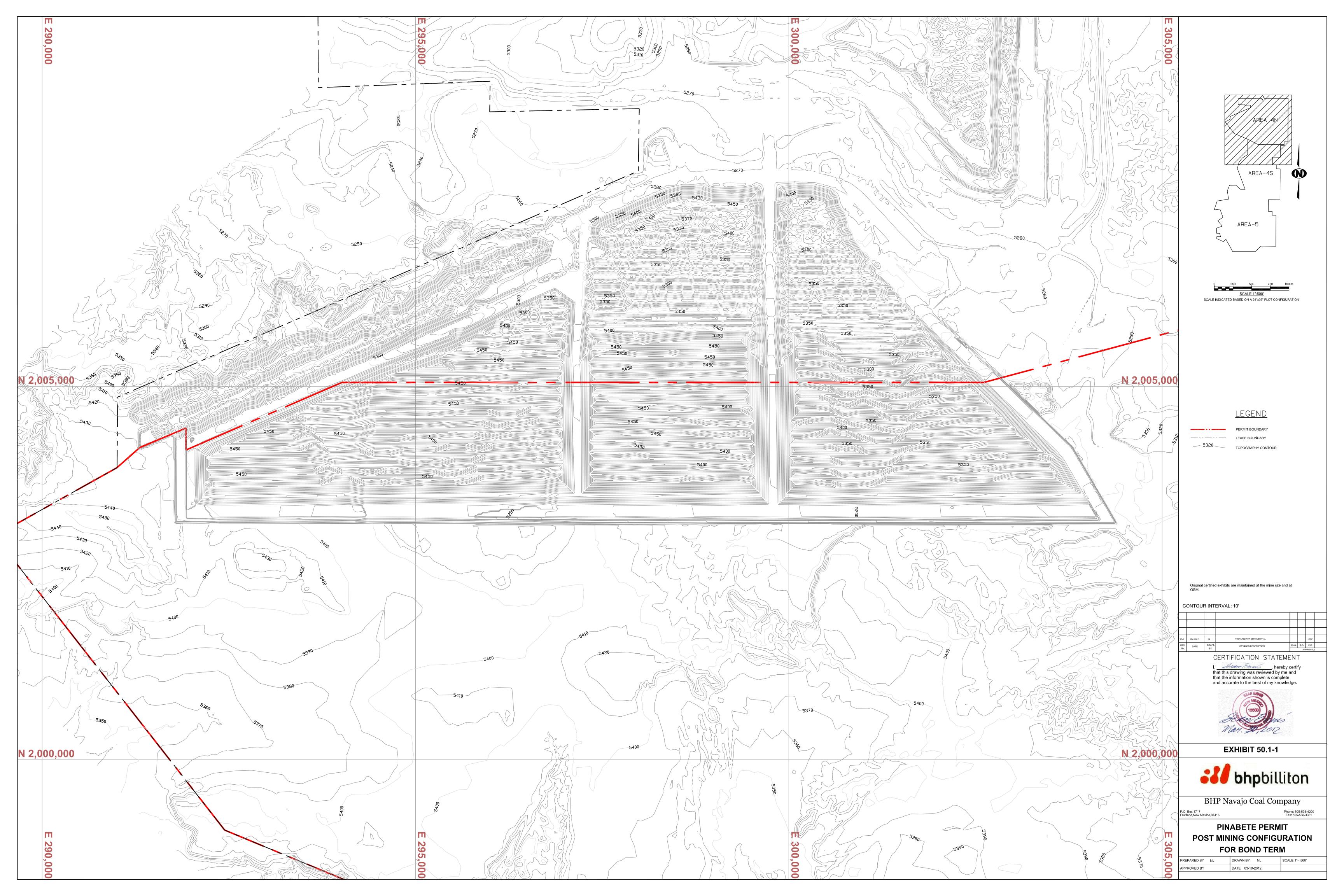
## References

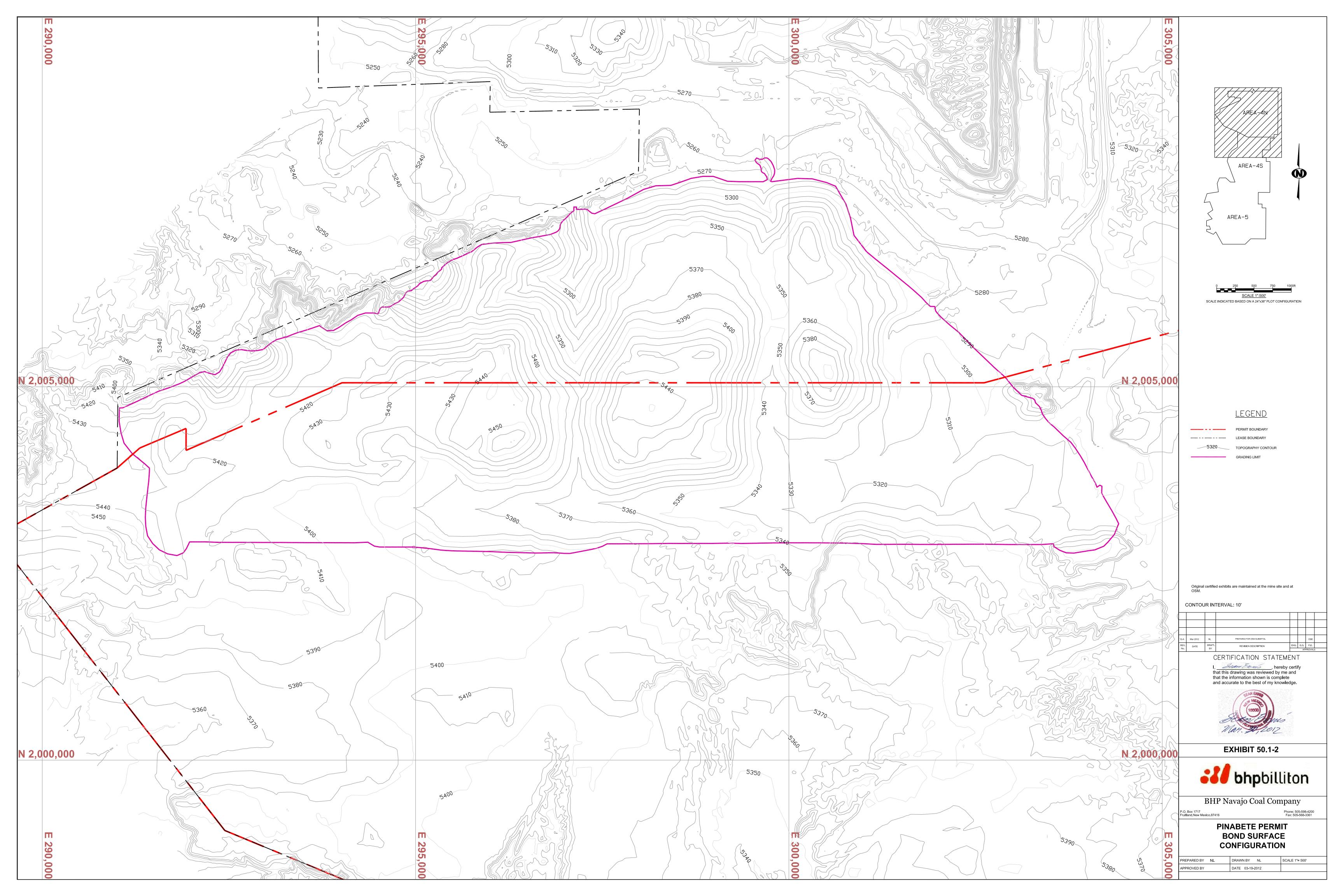
- Baker, T. and C. Babbitt (Editors). 2007 Heavy Construction Cost Data: 2008. 22<sup>nd</sup> Edition. RS Means Company, Inc. Kingston, Massachusetts.
- BHP Navajo Coal Company (BNCC). 2009. Navajo Mine Permit Application Package. OSM Permit No. NM-0003F. On file at Office of Surface Mining Reclamation and Enforcement- Western Region Technical Office. Denver, Colorado.
- CRG-PRIMEDIA Equipment Watch, Cost Reference Guide for Construction Equipment. 2011. 1<sup>st</sup> Half Edition.
- Office of Surface Mining Reclamation and Enforcement (OSM). 2000. Handbook for Calculation of Reclamation Bond Amount. U.S. Department of Interior. Washington, D.C.

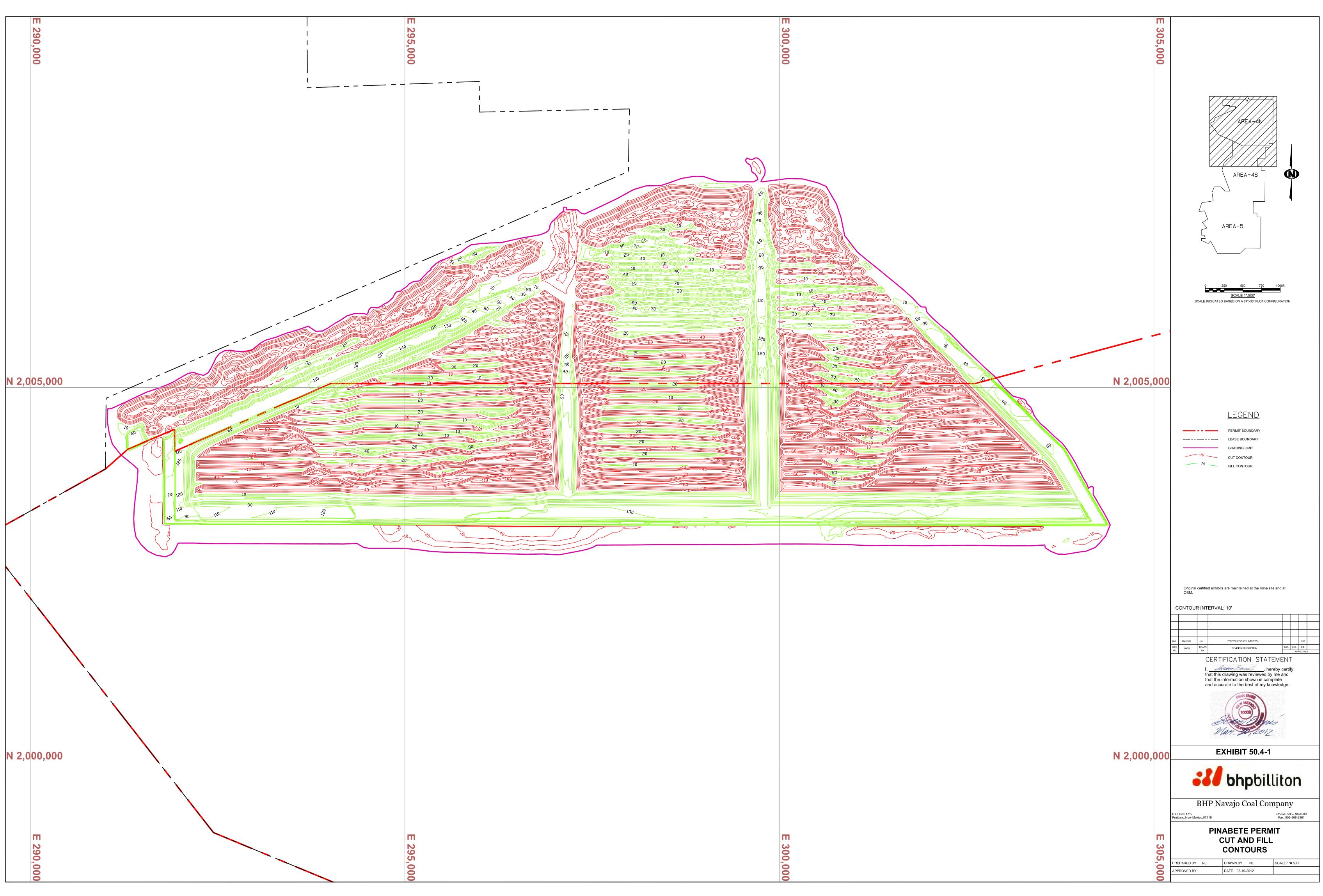
		2012	Estim	nate
1	Total facility and structure removal costs	\$ 0		
2	Total earthmoving costs	\$ 23,039,465		
3	Total revegetation costs	\$ 2,488,535		
4	Total other reclamation activities costs	\$ 265,011		
5	Subtotal: Total Direct Costs		\$	25,793,011
6	Mobilization and demobilization (at 1.0% of Item 5)	1.0%	\$	257,930
7	Contingencies (at 5.0% of item 5)	5.0%	\$	1,289,651
8	Engineering redesign fee (at 1.8 of Item 5)	1.8%	\$	464,274
9	Contractor profit and overhead (at 15.0% of Item 5)	15.0%	\$	3,868,952
10	Reclamation management fee (at 3.9% of Item 5)	3.9%	\$	1,005,927
	Total Bond Amount			32,679,745
	LESS Navajo Mine Area 4 North Bond Amount <sup>1</sup>		\$	16,459,152
	Total Pinabete Permit Area Bond Amount			16,220,593

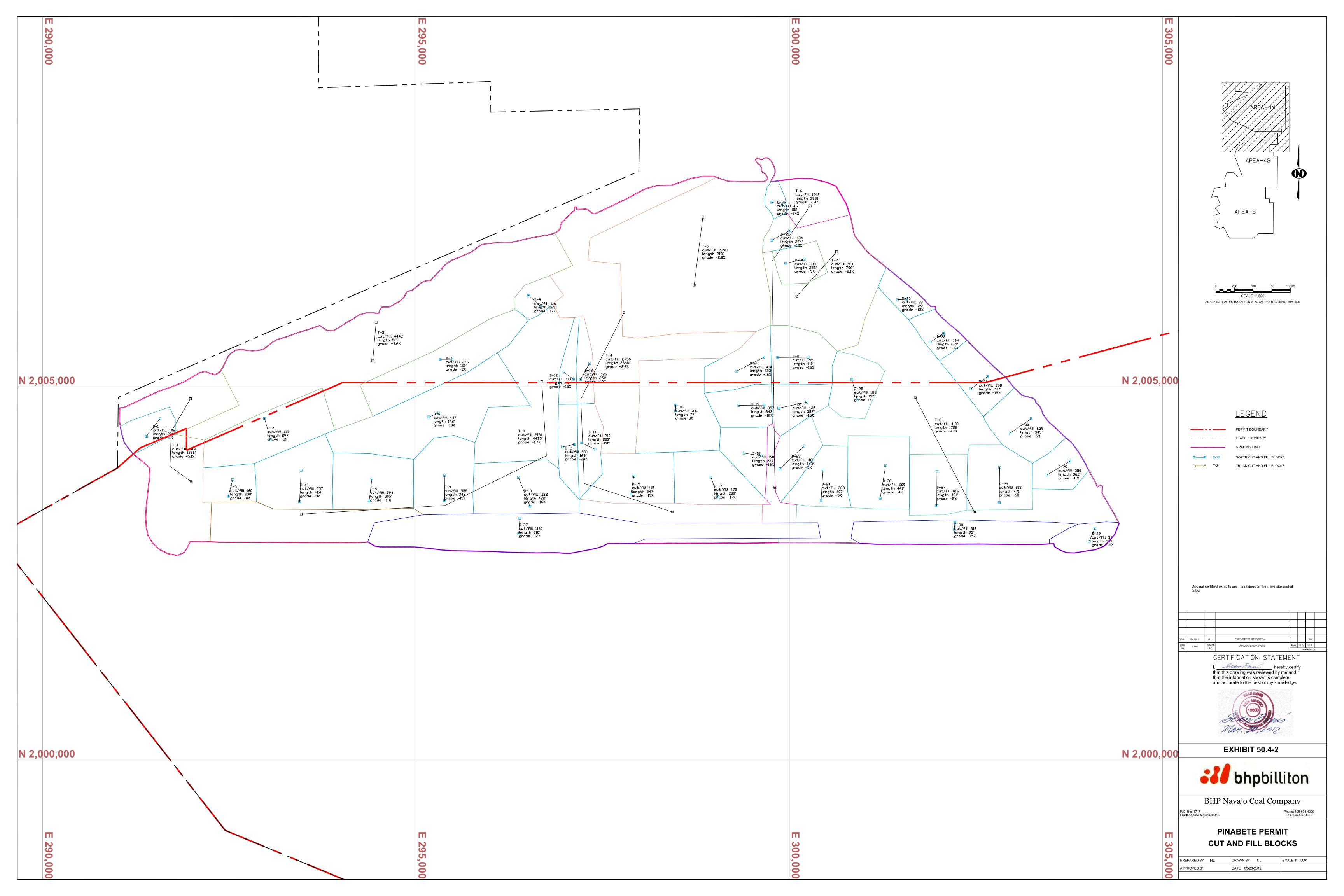
#### Table 50.4-1 Summary of Pinabete Permit Area Reclamation Bond Amount

<sup>1</sup> Reclamation bond amount to reclaim portions of Area 4 North included within the Navajo Mine permit area (OSM Permit No. NM-0003F).











## Appendix 50.A

Detailed Reclamation Bond Calculation

	LEGEND
XXX	Data From A Link
XXX	Data Calculated From A Link
XXX	User Input Data
XXX	Calculated Data To A Link
XXX	Calculated Data
XXX	Requires Updating
XXX	Newly Updated

	Figure 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	🚭 🚭 尔 🔌 🗀 🗄 🐯 👼 👰 🖕
D12	- £
A	Trace Dependents C

TABLE 50-A-23 HISTORICAL EQUIPMENT OWNERSHIP AND OPERATING COSTS														
Ownership Costs (\$/hr)		Overhaul C	Costs (\$/hr)						Fie	d Repair and	Fuel Costs (\$	/hr)		
Depreciation Adjusted	Labor	Labor	Adjusted	O/H Parts	Labor	Labor	Adjusted	Parts	Fuel	Fuel	Adjusted	Lube		

		Owne	ership Costs	(\$/hr	)			Overhaul (	Costs (\$	i/hr)									Fiel	ld Repair and	I Fue	l Costs (\$	i/hr)								Escalated
Equipment Model	Depr	eciation	Depreciation Multiplier		djusted preciatio	L	abor	Labor Multiplier	Adjus Lab		O/H Parts	5	Labor	Labor Multiplier	djusted Labor	Ρ	arts	F	Fuel	Fuel Multiplier		djusted Fuel	Lube		Tires	Tire M	ultiplier	Adjuste Tires	<sup>1</sup> G	EC (2)	Total (\$/hr)
D9R Dozer Semi-U Blad	\$	24.39	0.83	\$	20.33	\$	6.88	0.870	\$	5.98	\$ 18.3	<b>B</b> \$	8.06	0.870	\$ 7.01	\$	17.90	\$	21.67	1.728	\$	37.46	\$ 6.6	3 \$	-	\$	1.73	\$ -	\$	2.98	126.20
D10R Dozer Semi-U Blad	\$	34.24	0.83	\$	28.53	\$	6.88	0.870	\$	5.98	\$ 25.5	3 \$	8.06	0.870	\$ 7.01	\$	24.87	\$	30.12	1.728	\$	52.06	\$ 9.2	1 \$	-	\$	1.73	<b>\$</b> -	\$	4.14	170.63
D11R Dozer U Blade	\$	55.27	0.83	\$	46.06	\$	6.88	0.870	\$	5.98	\$ 41.2	2 \$	8.06	0.870	\$ 7.01	\$	40.15	\$	44.92	1.728	\$	77.64	\$ 14.4	<b>9</b> \$	-	\$	1.73	<b>\$</b> -	\$	6.69	260.64
637G Scraper	\$	25.01	0.83	\$	20.84	\$	6.72	0.870	\$	5.84	\$ 18.3	3 \$	10.07	0.870	\$ 8.76	\$	18.19	\$	28.12	1.728	\$	48.60	\$ 8.7	7 \$	5.21	\$	1.73	\$ 5.2	1 \$	0.77	144.95
992G Loader	\$	67.59	0.83	\$	56.33	\$	4.20	0.870	\$	3.65	\$ 14.2	6 \$	5.12	0.870	\$ 4.45	\$	15.73	\$	38.66	1.728	\$	66.82	\$ 12.7	7 \$	22.57	\$	1.73	\$ 22.5	7 \$	2.14	213.30
777D Truck	\$	42.09	0.83	\$	35.08	\$	16.06	0.870	\$ 1	13.97	\$ 14.5	в \$	9.86	0.870	\$ 8.57	\$	9.00	\$	27.20	1.728	\$	47.01	\$ 10.5	\$	13.72	\$	1.73	\$ 13.7	2 \$	-	162.43
16H Grader	\$	18.42	0.83	\$	15.35	\$	3.02	0.870	\$	2.63	\$ 8.5	7 \$	2.52	0.870	\$ 2.19	\$	8.31	\$	13.29	1.728	\$	22.97	\$ 4.2	5 \$	5.29	\$	1.73	\$ 5.2	9 \$	0.69	75.60
Water Truck 10,000 gal	\$	28.40	0.83	\$	23.67	\$	5.76	0.870	\$	5.01	\$ 5.7	1 \$	13.97	0.870	\$ 12.15	\$	11.01	\$	22.25	1.728	\$	38.46	\$ 5.8	1 \$	9.32	\$	1.73	\$ 9.3	2 \$	-	117.79
Small Backh(Cat 446B	\$	6.11	0.83	\$	5.09	\$	2.10	0.870	\$	1.83	\$ 2.2	5 \$	2.77	0.870	\$ 2.41	\$	1.99	\$	5.99	1.728	\$	10.35	\$ 1.5	2 \$	1.62	\$	1.73	\$ 1.6	2 \$	0.28	28.94
16H Grader, ripping	\$	19.21	0.83	\$	16.01	\$	3.05	0.870	\$	2.65	\$ 8.7	B \$	2.72	0.870	\$ 2.37	\$	8.67	\$	13.29	1.728	\$	22.97	\$ 4.3	2 \$	5.29	\$	1.73	\$ 5.2	9 \$	0.92	77.55
Pickup Truck	\$	2.40	0.83	\$	2.00	\$	0.47	0.870	\$	0.41	\$ 0.4	в \$	0.59	0.870	\$ 0.51	\$	0.47	\$	3.88	1.728	\$	6.71	\$ 0.5	2 \$	0.36	\$	1.73	\$ 0.3	6 \$	-	11.96
Mechanic truck	\$	3.19	0.83	\$	2.66	\$	0.47	0.870	\$	0.41	\$ 0.6	4 \$	0.59	0.870	\$ 0.51	\$	0.62	\$	2.26	1.728	\$	3.91	\$ 0.4	1 \$	0.48	\$	1.73	\$ 0.4	8 \$	-	10.26

The Total \$/hr are used in Worksheet 13

1) CRG - PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction Equipment," 2004 edition.

2) GEC - Ground Engaging Components

Multipliers are calculated as follows:

Depreciation: Ass	sume two shifts per day		
Ass	sume 90% availability on all equipm	ent 0.83	
Labor - Heavy E	quipment Mechanic: Field Repair a	ind Fuel Costs	
((0.08)(CRG Wa	ges) + Local Wages) / CRG Wages		
CF	G Wages	\$35.46 /hr	
Loc	cal Wages	\$28.00 /hr	
		0.87	
Parts:	No adjustment	1	
Fuel (Diesel): CF	G Cost	\$1.51 /gal	
Loc	cal Cost	\$2.61 /gal	
Fue	el Multiplier	1.73	
Lube:	No adjustment	1	
Tires:	XXX 2004 costs	1	
GEC:	No adjustment	1	
Inflation:		0.144	

TABLE 50-A		те					
	Reference Nu		ID	Item	Unit	2008 Bare Costs (1)	2008 Unit Costs
02 41	16.13	0012		Large urban buildings, steel	CF	\$0.22	\$0.22
02 41	16.13	5000	1a	Large urban buildings, steel, no interior walls reduce by 50%	CF	\$0.11	\$0.11
02 41	16.13	0050	2	Large urban buildings, concrete	CF	\$0.30	\$0.30
02 41	16.13	5000	2a	Large urban buildings, concrete, no interior walls reduce by 5	CF	\$0.15	\$0.15
02 41	16.13	0080	3	Large Urban buildings, masonry	CF	\$0.23	\$0.23
02 41	16.13	5000	3a	Large Urban buildings, masonry, no interior walls reduce by 5	CF	\$0.12	\$0.12
02 41	16.13	0100	4	Large urban buildings, mixture of types	CF	\$0.23	\$0.23
02 41	16.13	0500	5	Small urban buildings, steel	CF	\$0.23	\$0.23
02 41	16.13	5000	5a	Small urban buildings, steel, no interior walls reduce by 50%	CF	\$0.12	\$0.12
02 41	16.13	0600	6	Small urban buildings, concrete	CF	\$0.30	\$0.30
02 41	16.13	5000	6a	Small urban buildings, concrete, no interior walls reduce by 5	CF	\$0.15	\$0.1
02 41	16.13	0650	7	Small Urban buildings, masonry	CF	\$0.23	\$0.23
02 41	16.13	5000	7a	Small Urban buildings, masonry, no interior walls reduce by 5	CF	\$0.12	\$0.12
02 41	16.17	0240	8	Floor, 4" concrete slab, plain	SF	\$2.69	\$2.89
02 41	16.17	0280	8a	Floor, 4" concrete slab, mesh reinforced	SF	\$2.86	\$3.0
02 41	16.17	0300	8b	Floor, 4" concrete slab, mesh reinforced, rods	SF	\$3.37	\$3.5
02 41	16.17	0400	9	Floor, 6" concrete slab, plain	SF	\$3.59	\$3.8
02 41	16.17	0420	9a	Floor, 6" concrete slab, mesh reinforced	SF	\$3.96	\$4.2
02 41	16.17	0440	9b	Floor, 6" concrete slab, mesh reinforced, rods	SF	\$4.49	\$4.7
02 41	16.17	0420	10	Floor, 8"concrete slab, mesh reinforced	SF	\$5.28	\$5.6
02 41	16.17	0440	10a	Floor, 8"concrete slab, mesh reinforced, rods	SF	\$5.99	\$6.3
02 41	16.17	0440	11	Floor, 12"concrete slab, mesh reinforces rods	SF	\$8.98	\$9.5
02 41	16.17	1000	12	Footings, concrete, 1' x 2'	LF	\$9.33	\$10.50
02 41	16.17	2600	12a	Footings, concrete, 1' x 2', average reinforcing + 10%	LF	\$10.26	\$11.4
02 41	16.17	1080	13	Footings, concrete, 1.5' x 2'	LF	\$11.16	\$12.9
02 41	16.17	2600	13a	Footings, concrete, 1.5' x 2', average reinforcing + 10%	LF	\$12.28	\$14.0
02 41	16.17	1120	14	Footings, concrete 1.5' x 3'	LF	\$13.95	\$16.5
02 41	16.17	2600	14a	Footings, concrete, 1.5' x 3', average reinforcing + 10%	LF	\$15.35	\$17.9
02 41	16.17	1140	15	Footings, concrete, 2' x 3'	LF	\$15.95	\$19.4
02 41	16.17	2600	15a	Footings, concrete, 2' x 3', average reinforcing + 10%	LF	\$17.55	\$21.0
02 41	16.17	1140	16	Footings, concrete, 2' x 6'	LF	\$31.90	\$38.9
02 41	16.17	2600	16a	Footings, concrete, 2' x 6', average reinforcing + 10%	LF	\$35.09	\$42.1
02 41	16.18	1140	51	Footings, concrete, 2' x 6', average reinforcing + 10%	LF	\$102.08	\$120.8
02 41	16.17	2400	17	Walls, concrete, 3.5" thick	SF	\$4.92	\$5.0
02 41	16.17	2400	18	Walls, concrete, 6" thick	SF	\$8.43	\$8.7
02 41	16.17	2600	18a	Walls, concrete, 6" thick, Average reinforcing + 10%	SF	\$9.27	\$9.5
02 41	16.17	2420	19	Walls, concrete, 8" thick	SF	\$9.64	\$10.0
02 41	16.17	2600	19a	Walls, concrete, 8" thick, Average reinforcing + 10%	SF	\$10.60	\$10.9
02 41	16.17	2440	49	Walls, concrete, 10" thick	SF	\$11.20	\$11.6
02 41	16.17	2600	49a	Walls, concrete, 10" thick, Average reinforcing + 10%	SF	\$12.32	\$12.8
02 41	16.17	2500	50	Walls, concrete, 12" thick	SF	\$13.45	\$14.0
02 41	16.17	2600	50a	Walls, concrete, 12" thick, Average reinforcing + 10%	SF	\$14.80	\$15.3
02 41	16.17	2500	20	Walls, concrete, 18" thick, Average reinforcing + 10%	SF	\$23.86	\$24.7
02 41	16.17	2500	21	Walls, concrete, 2' thick, Average reinforcing + 10%	SF	\$31.81	\$32.9

Means I	Reference Nu	mber (1)	ID	ltem	Unit	2008 Bare Costs (1)	2008 Unit Costs
02 41	16.17	4250	22	Disposal, Concrete/Masonry, Up to 5 mile haul	CY	\$11.90	\$11.9
02 41	13.60	1650		Fencing, 5-strand barbed wire	LF	\$1.64	\$1.6
02 41	13.60	1700		Fencing, chain link, posts and fabric, 8' to 10' high	LF	\$2.25	\$3.7
02 41	13.38	2700	25	Cast iron pipe, 4" diameter	LF	\$3.36	\$3.3
02 41	13.54	0200	26	Plastic conduit, 3" to 6"	LF	\$1.82	\$1.8
02 41	13.33	4200	27	Sidewalk, concrete, mesh reinforced (converted to SF)	SF	\$6.67	\$6.6
02 41	13.17	5050	28	Pavement, bituminous, 4"- 6" (converted to SF)	SF	\$0.58	\$0.8
02 41	13.17	5200	29	Driveway, concrete, 6", mesh reinforced (converted to SF)	SF	\$0.96	\$1.2
02 41	13.17	5500	30	Concrete, 7" to 2' thick, reinforced (converted to CF)	CF	\$3.41	\$4.5
02 41	16.13	0500	31	Steel Tanks, Piping & Culvert (Use small building, steel)	CF	\$0.23	\$0.2
			32	69 kV Power Lines	МІ	\$6,136.34	\$7,019.9
Jnit Costs f	rom 2004 (Se	e "2" below)	33	Conveyor	LF	\$19.89	\$22.
			34	Water Wells	EA	\$1,602.63	\$1,833.
			35	Seedbed Prep per Acre	Acre	\$348.00	\$382.
			36	Seeding, Mulching, Irrigation per Acre	Acre	\$1,165.00	\$1,281.
			37	Drill Operator	Labor Hour	\$28.00	\$28.
			38	Blast Laborer	Labor Hour	\$28.00	\$28.
			39	Blast Foremen	Labor Hour	\$28.00	\$28
02 41	13.70	0600	40	Gabions, 18-36 inches deep	SY	\$83.00	\$98
02 41	13.43	0200	41	Box Culvert 8'x12'x8'	LF	\$13.70	\$24
02 41	13.86	0100	42	Road Rug (Geotextile Lining Material use Synthetic Grass Co	SF	\$0.23	\$0.
02 41	13.33	0800		Guard Rail, corrugated steel	LF	\$1.67	\$1.
02 41	13.62	0400		Chain Link Gates,	EA	\$143.00	\$143.
02 41	13.78	0400		Communications Tower, 300', 70lb section	EA	\$2,910.00	\$2,910.
02 41	19.23	3080		Machine Loading Rubbish Truck	CY	\$13.35	\$13.
02 41	19.23	5100	45	Rubbish Haul 20 CY Truck	MI	\$0.49	\$0.
	Calculated		45	Rubbish Disposal (50 MI Haul)	CY	\$15.80	\$15
			46	Primacord	LF	\$0.09	\$0
	Unit Costs		47	ANFO	lb	\$0.14	\$0
			48	Primers	EA	\$4.05	\$4

TABLE 50-A-23																																
EQUIPMENT OV	VNERSHIP AND	OPE	ERATING	COSTS																												
			Owne	ership Costs	s (\$/h	ır)			Overhaul	Costs	s (\$/hr)								Fie	eld Repair a	nd Fu	el Costs (	\$/hr)									
Equip Moo	del	Dep	reciation	Depreciation n Multiplier		Adjusted preciatior	n	Labor	Labor Multiplier		djusted ∟abor	O/H F	Parts	Labor	Labor Multiplier	justed abor	Parts	Fu	ıel	Fuel Multiplier		djusted Fuel	Luk	e	Tires	Tir	re Multiplier	-	usted ires	GEC	2)	2008 Total [\$/hr]
D9R Dozer	Semi-U Blade	\$	24.39	0.83	\$	20.33	\$	9.27	0.80	\$	7.39	\$	21.54	\$ 10.85	0.80	\$ 8.65	\$ 20.98	\$	44.20	1.02	\$	45.21	\$	8.88	\$-		1.00	\$	-	\$	2.98	\$ 143.09
D10R Dozer	Semi-U Blade	\$	34.24	0.83	\$	28.53	\$	9.27	0.80	\$	7.39	\$	29.93	\$ 10.85	0.80	\$ 8.65	\$ 29.15	\$	61.88	1.02	\$	63.29	\$ ·	2.38	\$-		1.00	\$	-	\$	4.14	\$ 183.47
D11R Dozer	U Blade	\$	67.91	0.83	\$	56.59	\$	9.27	0.80	\$	7.39	\$	54.65	\$ 10.85	0.80	\$ 8.65	\$ 53.22	\$	91.63	1.02	\$	93.72	\$ 2	1.45	\$-		1.00	\$	-	\$	8.22	\$ 303.90
637G Scraper		\$	39.27	0.83	\$	32.73	\$	13.57	0.80	\$	10.82	\$	27.48	\$ 20.35	0.80	\$ 16.23	\$ 27.69	\$	91.64	1.02	\$	93.73	\$ ·	8.47	\$6.	48	1.00	\$	6.48	\$	1.18	\$ 234.80
992G Loader		\$	83.57	0.83	\$	69.64	\$	5.65	0.80	\$	4.51	\$	18.62	\$ 6.90	0.80	\$ 5.50	\$ 20.54	\$	77.96	1.02	\$	79.74	\$	8.81	\$ 29.	46	1.00	\$	29.46	\$	2.65	\$ 249.47
777D Truck		\$	42.09	0.83	\$	35.08	\$	20.80	0.80	\$	16.59	\$	16.72	\$ 12.78	0.80	\$ 10.19	\$ 10.32	\$	57.78	1.02	\$	59.10	\$ ·	3.60	\$ 15.	73	1.00	\$	15.73	\$	-	\$ 177.32
16H Grader		\$	23.31	0.83	\$	19.43	\$	4.07	0.80	\$	3.25	\$	11.71	\$ 3.39	0.80	\$ 2.70	\$ 11.35	\$	28.09	1.02	\$	28.73	\$	6.50	\$ 7.	23	1.00	\$	7.23	\$	0.88	\$ 91.77
Water Truck	10,000 gal	\$	31.73	0.83	\$	26.44	\$	7.46	0.80	\$	5.95	\$	6.37	\$ 18.09	0.80	\$ 14.43	\$ 12.30	\$	47.26	1.02	\$	48.34	\$	8.73	\$ 10.	41	1.00	\$	10.41	\$	-	\$ 132.96
Small Backhoe	Cat 446D	\$	7.02	0.83	\$	5.85	\$	2.83	0.80	\$	2.26	\$	2.74	\$ 3.73	0.80	\$ 2.97	\$ 2.42	\$	12.10	1.02	\$	12.38	\$	2.27	\$ 1.	97	1.00	\$	1.97	\$	0.32	\$ 33.18
Grader Ripper		\$	2.19	0.83	\$	1.83	\$	0.05	0.80	\$	0.04	\$	0.68	\$ 0.90	0.80	\$ 0.72	\$ 1.01	\$	-	1.02	\$	-	\$	0.19	\$-		1.00	\$	-	\$	0.84	\$ 5.30
16H Grader, ripp	ing	\$	25.50	0.83	\$	21.25	\$	4.12	0.80	\$	3.29	\$	12.39	\$ 4.29	0.80	\$ 3.42	\$ 12.36	\$	28.09	1.02	\$	28.73	\$	6.69	\$ 7.	23	1.00	\$	7.23	\$	1.72	\$ 97.08
Pickup Truck	1 ton 4x4	\$	3.50	0.83	\$	2.92	\$	0.68	0.80	\$	0.54	\$	0.76	\$ 0.86	0.80	\$ 0.69	\$ 0.73	\$	16.24	1.02	\$	16.61	\$	1.84	\$0.	56	1.00	\$	0.56	\$	-	\$ 24.65
Mechanic truck	1.75 ton 4x4	\$	4.92	0.83	\$	4.10	\$	0.68	0.80	\$	0.54	\$	1.06	\$ 0.86	0.80	\$ 0.69	\$ 1.03	\$	17.11	1.02	\$	17.50	\$	1.63	\$ 0.	79	1.00	\$	0.79	\$	-	\$ 27.34
DMM2 Drill		\$	42.48	0.83	\$	35.40	\$	47.57	0.80	\$	37.93	\$	23.44	\$ 88.83	0.80	\$ 70.84	\$ 40.84	\$	82.60	1.02	\$	84.48	\$	5.68	\$-		1.00	\$	-	\$	4.08	\$ 312.69

The Total \$/hr are used in Worksheet 13

1) CRG - PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction Equipment," 1st Half 2011 edition.

2) GEC - Ground Engaging Components

#### Multipliers are calculated as follows:

Depreciation:	Assume two shifts per day		
	Assume 90% availability on all equipme	ent <b>0.83</b>	
Labor - Heavy E	quipment Mechanic: Field Repair and Fu	el Costs	
((0.08)(CRG Wa	iges) + Local Wages) / CRG Wages		
	CFG Wages	\$49.37 /hr	
	Local Wages	\$35.42 /hr	
		0.80	
Parts:	No adjustment	1	
Fuel (Diesel):	CFG Cost	\$3.07 /gal	
	Local Cost	\$3.14 /gal	
	Fuel Multiplier	1.02	
Lube:	No adjustment	1	
Tires:	No adjustment	1	
GEC:	No adjustment	1	
Inflation:		11.3%	

TABLE 50-A-24								
EQUIPMENT OPERATOR WAGE RATES								
Equipment Operator	Operator Rates [\$/hr] <sup>1</sup>							
D9R Dozer	\$35.42							
D10R Dozer	\$35.42							
D11R Dozer	\$35.42							
16H Grader	\$35.42							
637G Scraper	\$35.42							
992G Loader	\$35.42							
777D Truck	\$35.42							
Water Truck	\$35.42							
Tractor	\$35.42							
Track Hoe	\$35.42							
Small Backhoe	\$35.42							
Small Dumptruck	\$35.42							
Drill Operator	\$35.42							
Blast Laborer	\$35.42							
Blast Foremen	\$35.42							
Pickup Truck	\$24.04							

1) Labor Rates including burden, excluding Profit&Overheac from ACME Inc. contract in force for 2011.

TABLE 50-A-26 BOND EQUIPMENT AVAILABILITIES									
EQUIPMENT	AVERAGE AVAILABILITY								
Front-End Loaders	90.0%								
Haul Trucks	90.0%								
Dozers	90.0%								
Scrapers	90.0%								
Drills	90.0%								
Motor Graders	90.0%								

Dozer Polygons										
	Volume	Av. Push Distance	Grade	Area	a					
<u>Poly ID</u>	yd <sup>3</sup>	ft.	%	ft <sup>2</sup>	Acres					
D-1	148,000	296	-6.0	298,185	6.8					
D-2	615,000	297	-7.9	967,949	22.2					
D-3	160,000	230	-8.2	343,771	7.9					
D-4	557,000	424	-9.1	835,263	19.2					
D-5	594,000	305	-10.8	784,394	18.0					
D-6	447,000	142	-13.4	1,627,685	37.4					
D-7	376,000	161	-2.0	1,033,351	23.7					
D-8	116,000	229	-17.3	231,796	5.3					
D-9	558,000	343	-10.3	781,331	17.9					
D-10	1,122,000	422	-16.2	884,165	20.3					
D-11	200,000	169	-23.8	290,376	6.7					
D-12	113,000	160	-15.2	205,816	4.7					
D-13	125,000	251	-9.7	219,575	5.0					
D-14	210,000	200	-19.7	347,249	8.0					
D-15	415,000	247	-18.6	705,422	16.2					
D-16	341,000	77	3.1	1,229,156	28.2					
D-17	470,000	280	-17.5	680,018	15.6					
D-18	240,000	237	-18.0	403,153	9.3					
D-19 357,000		343	-18.0	421,780	9.7					
D-20	414,000	423	-16.5	495,153	11.4					
D-21	551,000	411	-14.9	603,640	13.9					
D-22	435,000	387	-15.0	386,551	8.9					
D-23 401,000		443	-5.2	419,033	9.6					
D-24	383,000	407	-4.9	507,072	11.6					
D-25	186,000	281	1.2	479,916	11.0					
D-26	609,000	441	-4.2	802,972	18.4					
D-27	816,000	461	-5.2	619,609	14.2					
D-28	813,000	471	-5.7	708,896	16.3					
D-29	350,000	362	-11.3	392,946	9.0					
D-30	639,000	343	-9.3	692,411	15.9					
D-31	398,000	287	-14.7	539,048	12.4					
D-32	164,000	215	-15.8	289,203	6.6					
D-33	38,000	129	-12.7	276,826	6.4					
D-34	114,000	256	-8.6	303,370	7.0					
D-35	134,000	274	-12.6	174,102	4.0					
D-36	46,000	152	-23.9	109,252	2.5					
D-37	1,130,000	210	-12.0	2,392,735	54.9					
D-38	312,000	93	-15.4	1,056,409	24.3					
D-39	38,000	193	-15.7	324,081	7.4					
Total	15,135,000			23,863,663	548					
Wt A	verage	323	-11.0							

	Scraper or Truck / Loader or Scraper Polygons											
DelviD	Volume	Av. One way Distance	Grade	Cut ar	ea	Fill Area (i	Fill Area (if separate)					
Poly ID	yd <sup>3</sup>	ft.	%	ft <sup>2</sup>	Acres	ft <sup>2</sup>	Acres					
T-1	1,404,000	1326	-5.1	1,010,786	23.2	1,568,094	36.0					
T-2	4,442,000	520	-9.6	5,781,685	132.7		0.0					
T-3	2,131,000	4435	-1.7	1,598,039	36.7	1,293,090	29.7					
T-4	2,756,000	3666	-2.6	3,204,708	73.6	592,567	13.6					
T-5	2,998,000	918	-2.8	4,059,397	93.2		0.0					
T-6	1,042,000	3931	-2.4	550,815	12.6	246,147	5.7					
T-7	928,000	796	-6.1	1,699,471	39.0		0.0					
T-8	4,100,000	1722	-4.8	2,384,529	54.7	1,321,731	30.3					
TOTA	LS	WEIGHTED AVER	RAGES		тот	ALS						
Scraper	13,872,000	1061	-6.0	20,289,432	466	5,021,629	115					
Truck / Shovel	5,929,000	3989	-2.2	20,289,432	400	5,021,629						

Scrap	ers	Truck Shovel					
For Wt. Av	verage	For Wt. Average					
Distance	Grade	Distance	Grade				
1,861,704,000	-7,160,400						
2,309,840,000	-42,643,200						
		9,450,985,000	-3,622,700				
		10,103,496,000	-7,165,600				
2,752,164,000	-8,394,400						
		4,096,102,000	-2,500,800				
738,688,000	-5,660,800						
7,060,200,000	<u>-19,680,000</u>						
#############	-83,538,800	23,650,583,000	-13,289,100				

For Wt. Average

191,394,000-5,747,400473,484,000-18,176,400

175,122,000-6,831,000226,461,000-8,209,900168,345,000-6,525,000177,643,000-2,085,200

Grade

-888,000 -4,858,500

-1,312,000

-5,068,700

-6,415,200

-5,989,800

-752,000

-2,006,800

-4,760,000

-1,717,600

-1,212,500

-4,137,000

-7,719,000

1,057,100

-8,225,000

-4,320,000

-6,426,000

-1,876,700

223,200

-2,557,800

-4,243,200

-4,634,100

-3,955,000

-5,942,700

-5,850,600

-2,591,200

-482,600

-980,400

-1,688,400

-1,099,400

-4,804,800

-596,600

Distance

43,808,000

182,655,000

36,800,000 236,168,000

181,170,000

63,474,000

60,536,000

26,564,000

33,800,000

18,080,000

31,375,000

42,000,000

102,505,000

26,257,000

131,600,000

56,880,000

122,451,000

155,881,000

52,266,000

268,569,000

376,176,000

382,923,000

126,700,000

219,177,000

114,226,000

35,260,000

4,902,000

29,184,000

36,716,000

6,992,000

29,016,000

7,334,000

237,300,000 -13,560,000

4,891,194,000 -166,966,200

NOTES:

1) Cut off between scraper and truck / shovel is 2000 one way

High Wall Reclamation 1,336,000

bcy

#### Total yards go to Worksheet 3

17-May-12

Cut

Block

Area 4 Project

Total

Volume

cu. yds.

Permanent

Program

%

Permanent

Volume

cu. yds.

Fill

Block

D-19	357,000	100%	357,000	D-19	343	343			-18	Straight or Radial Push
D-20	414,000	100%	414,000	D-20	423	423			-16.5	Straight or Radial Push
D-21	551,000	100%	551,000	D-21	411	411			-14.9	Straight or Radial Push
D-22	435,000	100%	435,000	D-22	387	387			-15	Straight or Radial Push
D-23	401,000	100%	401,000	D-23	443	443			-5.2	Straight or Radial Push
D-24	383,000	100%	383,000	D-24	407	407			-4.9	Straight or Radial Push
D-25	186,000	100%	186,000	D-25	281	281			1.2	Straight or Radial Push
D-26	609,000	100%	609,000	D-26	441	441			-4.2	Straight or Radial Push
D-27	816,000	100%	816,000	D-27	461	461			-5.2	Straight or Radial Push
D-28	813,000	100%	813,000	D-28	471	471			-5.7	Straight or Radial Push
D-29	350,000	100%	350,000	D-29	362	362			-11.3	Straight or Radial Push
D-30	639,000	100%	639,000	D-30	343	343			-9.3	Straight or Radial Push
D-31	398,000	100%	398,000	D-31	287	287			-14.7	Straight or Radial Push
D-32	164,000	100%	164,000	D-32	215	215			-15.8	Straight or Radial Push
D-33	38,000	100%	38,000	D-33	129	129			-12.7	Straight or Radial Push
D-34	114,000	100%	114,000	D-34	256	256			-8.6	Straight or Radial Push
D-35	134,000	100%	134,000	D-35	274	274			-12.6	Straight or Radial Push
D-36	46,000	100%	46,000	D-36	152	152			-23.9	Straight or Radial Push
D-37	1,130,000	100%	1,130,000	D-37	210	210			-12	Straight or Radial Push
D-38	312,000	100%	312,000	D-38	93	93			-15.4	Straight or Radial Push
D-39	38,000	100%	38,000	D-39	193	193			-15.7	Straight or Radial Push
	Tota	-		Weighted Average						
Area 4 Project	15,135,000	100%	15,135,000		323	323			-11.0	
GRAND TOTAL	15,135,000		15,135,000							

# TABLE 50-A-7 AREA 4 BOND REGRADE EARTHMOVING DOZERS

Planned

Adj. Distance

ft.

Cut Elev.

ft

Fill Elev.

ft

Grade

%

Comments

Centroid

Distance

ft.

Area 4 Project										
D-1	148,000	100%	148,000	D-1	296	296			-6	Straight or Radial Push
D-2	615,000	100%	615,000	D-2	297	297			-7.9	Straight or Radial Push
D-3	160,000	100%	160,000	D-3	230	230			-8.2	Straight or Radial Push
D-4	557,000	100%	557,000	D-4	424	424			-9.1	Straight or Radial Push
D-5	594,000	100%	594,000	D-5	305	305			-10.8	Straight or Radial Push
D-6	447,000	100%	447,000	D-6	142	142			-13.4	Straight or Radial Push
D-7	376,000	100%	376,000	D-7	161	161			-2	Straight or Radial Push
D-8	116,000	100%	116,000	D-8	229	229			-17.3	Straight or Radial Push
D-9	558,000	100%	558,000	D-9	343	343			-10.3	Straight or Radial Push
D-10	1,122,000	100%	1,122,000	D-10	422	422			-16.2	Straight or Radial Push
D-11	200,000	100%	200,000	D-11	169	169			-23.8	Straight or Radial Push
D-12	113,000	100%	113,000	D-12	160	160			-15.2	Straight or Radial Push
D-13	125,000	100%	125,000	D-13	251	251			-9.7	Straight or Radial Push
D-14	210,000	100%	210,000	D-14	200	200			-19.7	Straight or Radial Push
D-15	415,000	100%	415,000	D-15	247	247			-18.6	Straight or Radial Push
D-16	341,000	100%	341,000	D-16	77	77			3.1	Straight or Radial Push
D-17	470,000	100%	470,000	D-17	280	280			-17.5	Straight or Radial Push
D-18	240,000	100%	240,000	D-18	237	237			-18	Straight or Radial Push
D-19	357,000	100%	357,000	D-19	343	343			-18	Straight or Radial Push
D-20	414,000	100%	414,000	D-20	423	423			-16.5	Straight or Radial Push
D-21	551,000	100%	551,000	D-21	411	411			-14.9	Straight or Radial Push
D-22	435,000	100%	435,000	D-22	387	387			-15	Straight or Radial Push
D-23	401,000	100%	401,000	D-23	443	443			-5.2	Straight or Radial Push
D-24	383,000	100%	383,000	D-24	407	407			-4.9	Straight or Radial Push
D-25	186,000	100%	186,000	D-25	281	281			1.2	Straight or Radial Push
D-26	609,000	100%	609,000	D-26	441	441			-4.2	Straight or Radial Push
D-27	816,000	100%	816,000	D-27	461	461			-5.2	Straight or Radial Push
D-28	813,000	100%	813,000	D-28	471	471			-5.7	Straight or Radial Push
D-29	350,000	100%	350,000	D-29	362	362			-11.3	Straight or Radial Push
D-30	639,000	100%	639,000	D-30	343	343			-9.3	Straight or Radial Push
D-31	398,000	100%	398,000	D-31	287	287			-14.7	Straight or Radial Push
D-32	164,000	100%	164,000	D-32	215	215			-15.8	Straight or Radial Push
D-33	38,000	100%	38,000	D-33	129	129			-12.7	Straight or Radial Push
D-34	114,000	100%	114,000	D-34	256	256			-8.6	Straight or Radial Push
D-35	134,000	100%	134,000	D-35	274	274			-12.6	Straight or Radial Push
D-36	46,000	100%	46,000	D-36	152	152			-23.9	Straight or Radial Push
D-37	1,130,000	100%	1,130,000	D-37	210	210			-12	Straight or Radial Push
D-38	312,000	100%	312,000	D-38	93	93			-15.4	Straight or Radial Push
D-39	38,000	100%	38,000	D-39	193	193			-15.7	Straight or Radial Push
	Tota	als		Weighted Average						
Area 4 Project	15,135,000	100%	15,135,000		323	323			-11.0	
GRAND TOTAL	15,135,000		15,135,000							

#### TABLE 50-A-10 AREA 4 BOND REGRADE EARTHMOVING TRUCKS AND LOADER

Total Permanent Permanent Centroid Planned Cut Volume Program Distance Adj. Distance Cut Elev. Fill Elev. Grade Comments Volume Fill Block % Block ft. ft. % cu. yds. cu. yds. ft ft Area 4 Project Adj. Dist. reflects haul route 2,131,000 2,131,000 4,435 T-3 100% -1.7 T-4 2,756,000 2,756,000 -2.6 Adj. Dist. reflects haul route 100% 3,666 T-6 1,042,000 3,931 -2.4 Adj. Dist. reflects haul route 1,042,000 100% Weighted Average Totals Area 4 Project 5,929,000 100% 5,929,000 3,989 -2.2 **GRAND TOTAL** 5,929,000 5,929,000

Total yards go to Worksheet 3

17-May-12

### TABLE 50-A-18 AREA 4 BOND REGRADE EARTHMOVING SCRAPERS

Total Permanent Permanent Centroid Planned Adj. Distance Cut Elev. Fill Elev. Program Distance Grade Comments Cut Volume Volume Fill % ft. ft. % Block cu. yds. cu. yds. Block ft ft Area 4 Project T-1 1,404,000 100% 1,404,000 1,326 -5.1 Adj. Dist. reflects haul route T-2 4,442,000 100% 4,442,000 520 -9.6 Adj. Dist. reflects haul route T-5 2,998,000 100% 2,998,000 -2.8 Adj. Dist. reflects haul route 918 T-7 928,000 100% 928,000 796 -6.1 Adj. Dist. reflects haul route 4,100,000 100% 4,100,000 1,722 -4.8 Adj. Dist. reflects haul route T-8 Totals Weighted Average 100% 13,872,000 13,872,000 1,061 Area 4 Project -6.0 13,872,000 13,872,000 **GRAND TOTAL** 

Total yards go to Worksheet 3

17-May-12

## TABLE 50-A-13 AREA 4 BOND REGRADE TOPSOILING TRUCKS AND LOADER

17-May-12

	Total		Perm. Topsoil	Root Zone		Centroid	Planned				
Cut	Volume	Area	Volume	Volume	Fill	Distance	Adj. Distance	Cut Elev.	Fill Elev.	Grade	Comments
Block	cu. yds.	acres	cu. yds.	cu. yds.	Block	ft.	ft.	ft	ft	%	
Area 4 Project	865,111	1,128.9	865,111		Area 4 Project		2,970			4.00%	Adj. Dist. reflects haul route
TOTAL	865,111	1,128.9	865,111		Weighted Average	e:	2,970			4.00%	

Total yards and acres go to Worksheet 3

Assumption:

0.48 feet topsoil replacement depth Area 4

Used Marston's weighted average of 2970 feet haul for topsoil on Area 4 North

#### TABLE 50-A-16 AREA 4 BOND REGRADE MITIGATION TRUCKS AND LOADER

17-May-12

	Total		Topsoil	Perm. Root Zone		Centroid	Planned				
Cut	Volume	Area	Volume	Volume	Fill	Distance	Adj. Distance	Cut Elev.	Fill Elev.	Grade	Comments
Block	cu. yds.	acres	cu. yds.	cu. yds.	Block	ft.	ft.	ft	ft	%	
Area 4 Project	693,364	1,128.9		693,364	Area 4 Project		8,372			4.00%	Adj. Dist. reflects haul route
TOTAL	693,364	1,129		693,364	Weighted Average		8,372			4.00%	

Total yards go to Worksheet 3

Assumptions:

10.8% of all reclaim acres require mitigation 4 feet total of mitigation and topsoil



3.5 feet of mitigation "suitable" materials Area 40.5 feet topsoil replacement depth Area 4

#### TABLE 50-A-22 AREA BOND REGRADE MITIGATION SCRAPERS

17-May-12

	Total		Topsoil	Root Zone		Centroid	Planned				
Cut	Volume	Area	Volume	Volume	Fill	Distance	Adj. Distance	Cut Elev.	Fill Elev.	Grade	Comments
Block	cu. yds.	acres	cu. yds.	cu. yds.	Block	ft.	ft.	ft	ft	%	
Area 4 Project					Area 4 Project						Adj. Dist. reflects haul route
TOTAL	-	-		-	Weighted Average						

Total yards go to Worksheet 3

Assumptions:

10.8% of all reclaim acres require mitigation

4.0 feet total of mitigation and topsoil

Assume that all mitigation suitable materials will be found an average of 2000 one way feet away from location of need Analysis of mine plan drawing shows that this should be possible.

#### TABLE 50-A-21 AREA 4 BOND REGRADE TOPSOILING SCRAPERS

Total Topsoil Perm. Topsoil Root Zone Centroid Planned Volume Adj. Distance Cut Elev. Volume Area Volume Fill Distance Fill Elev. Grade Comments Cut cu. yds. Block ft. ft ft % cu. yds. acres cu. yds. ft. Block Adj. Dist. reflects haul route Area 4 Project Area 4 Project Weighted Average: TOTAL ---

Total yards and acres go to Worksheet 3

Assumption:

0.48 feet topsoil replacement depth Area 4

Used Marston's weighted average of 2970 feet haul for topsoil on Area 4 North

17-May-12

Project: Pinabete Permit Date: May-2012

TABLE 12-B-2										
CULVERT VOLUMES FOR DEMOLITION AND REMOVAL										
CULVERT ID	Diameter [in]	Length [ft]	Volume [ft <sup>3</sup> ]							
CP-189	30	318	1,561							
		Total	1,561							

	Pond Volume		Dam <sup>2</sup>					Dozer Push	Backfill
Pond	[ac-ft]	[bcy] <sup>1</sup>	Bottom [ft]	Top [ft]	Height [ft]	Length [ft]	Volume [bcy] <sup>1</sup>	Distance [ft]	Volume <sup>3</sup> [bcy] <sup>1</sup>
Pond 3	1.2	1,936	-	-	-	-	Incised	200	1,936
Pond 4	6.8	10,971	-	-	-	-	Incised	200	10,971
Pond 401	3.9	6,292	-	-	-	-	Incised	200	6,292
Pond 402	7.9	12,745	-	-	-	-	Incised	200	12,745
Pond 416	10.4	16,779	-	-	-	-	Incised	200	16,779
Pond 408	1.5	2,420	-	-	-	-	Incised	200	2,420
Pond 409-410	0.9	1,452	-	-	-	-	Incised	200	1,452
Pond 411	1.7	2,743	-	-	-	-	Incised	200	2,743
Pond 412	3.2	5,163	-	-	-	-	Incised	200	5,163
Pond 413	2.6	4,195	-	-	-	-	Incised	200	4,195
Pond 415	1.0	1,565	40	10	6	80	444	100	444
Pond 416	18.7	30,153	50	14	10	800	9,481	150	9,481
	96,413	Weighted Average Push Distance [ft				173.40	74,621		

(1) BCY = Bank cubic yards

(2) Dam volume is the trapezoidal cross-sectional area times the length.

(3) Backfill volume is the smaller of the dam volume or pond volume.

This assumes that either the pond is filled or the dam is removed and pushed into the pond.

Project: Pinabete Permit Date: May-2012

Description	Length [ft]	Width [ft]	Area [acres]	Equipment
Area 4 Project - East Pit Road	2,102	80		Cat 16G Motor Grader
Area 4 Project - Middle Pit Road	2,416	80		Cat 16G Motor Grader
Area 4 Project - West Pit Road	4,980	80		Cat 16G Motor Grader
Area 4 Project - West Loop Road	31,955	80		Cat 16G Motor Grader
Area 4 Project - East Loop Road	22,330	80		Cat 16G Motor Grader
Total			117.14	

TABLE 12-B-25			
DRILL AND BLA	ST QUANTITIES		
Area	Volume [yd <sup>3</sup> ]	Equipment	Comments
Area 4 Project	1,336,000	Ingersoll-Rand DM23	Drilling and Blasting pit highwalls
Total	1,336,000		

## NOT UPDATED - NO NEW BUILDINGS FOR THIS PLAN

Cost

Unit Cost

Footings

Length [ft] Ref

Cost

Structure							Buildings / L	Jtilitie	s / Other Stru	uctures	Floors, Su	rfaces	s & Walls	
							Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	
Area 4 North														Γ
Buildings - Above Concrete	Length (ft)	Width (ft)	Area (sf)	Height (ft)	#	Construction								Γ
							-	4	0.23	\$0				Γ
							-	1	0.22	\$0				
							-	1	0.22	\$0				
							-	1	0.22	\$0				
							-	1	0.22	\$0				
							-	1a	0.11	\$0				
							-	1	0.22	\$0				
							-	1	0.22	\$0				
								10	0.11	\$0				

								0.22	φυ						
						-	1	0.22	\$0						
						-	1	0.22	\$0						
						-	1a	0.11	\$0						
						-	1	0.22	\$0						
						-	1	0.22	\$0						
						-	1a	0.11	\$0						
						-	1	0.22	\$0						
						-	5a	0.12	\$0						
						-	1a	0.11	\$0						
						-	2a	0.15	\$0						
						-	1a	0.11	\$0 \$0						
						-	1	0.22	\$0 \$0						
							-								
Concrete - Footings	Length (ft) on	Length (ft) on		#	Construction										
Concrete - r coungs	Long Axis	(ft) on Short Axis		"	Construction										
													12a	11.43	\$0
												-			\$0 \$0
												-			\$0
												-			\$0 \$0
												_			\$0 \$0
															\$0 \$0
												-			\$0 \$0
												-			\$0 \$0
												-			\$0 \$0
												-			\$0
												-			\$0 \$0
													12a		\$0
													15a		\$0
												-			\$0
												-	12a	11.43	\$0

## NOT UPDATED - NO NEW BUILDINGS FOR THIS PLAN

Cost

Unit

Cost

## WORKSHEET NO. 2 STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY Structure Buildings / Utilities / Other Structures Floors, Surfaces & Walls Footings Volume Unit Ref Length [ft] Ref Unit Cost Cost Area [ft2] Ref Cost [ft3] Cost Length (ft) Width (ft) Area (sf) # Construction Concrete - Floors, Surfaces & Walls 8b 3.57 \$0 8b 3.57 \$0 \$0 \$0 11 9.57 9b 4.78

											-	9b	4.78	\$0			
											-	8b	3.57	\$0			
											-	8b	3.57	\$0			
											-	11	9.57	\$0			
											-	9b	4.78	\$0			
												11	9.57	\$0 \$0			
											-	10a	6.38	\$0 \$0			
											-	8b	3.57	\$0 \$0			
												11	9.57	\$0 \$0			
												8b	3.57	\$0 \$0			
												8b	3.57	\$0 \$0			
Concrete/Asphalt - Aprons & Driveways	Length (ft)	Width (ft)	Area (sf)		#	Construction						05	5.57	φ0			-
- Aprolia & Dirveways	Longin (II)	wider (It)	/1164 (31)		π	Construction						28	0.88	\$0	+		-
											_	28	0.88	\$0 \$0			
											-	28	0.88	\$0 \$0			
											-	29	1.26	\$0 \$0			
											_	11	9.57	\$0 \$0			
												9b	4.78	\$0 \$0			
											-	90	4.70	<b>4</b> 0			
											-	11	9.57	\$0			
											-	11	9.57	\$0			
											-	8b	3.57	\$0			_
Concrete - CSBF Below Grade	Height (ft)	Width (ft)	Area (sf)	Thick (ft)	#	Construction											_
											-	50a	15.38	\$0			
											-	21	32.98	\$0			
	ļ							L			-	50	14.04	\$0	$\square$		_
Utilities			Length (If)			Construction	Length (If)								$\rightarrow$		_
							-	25		\$0							
							-			\$0							
							-			\$0							
							-	26	1.82	\$0							

## NOT UPDATED - NO NEW BUILDINGS FOR THIS PLAN

Buildings - Above Concrete

Length (ft) Width (ft)

Area (sf)

0

Height (ft)

#

Construction

Steel Building

Steel Building

\$0 \$0

0.22 0.22

1

- 1

Cost

WORKSHEET NO. 2																		
STRUCTURE DEMOLITION AND DISPOSAL CO	OST SUMMA	RY																
Structure							Buildings / L	Jtilitie	s / Other Str	uctures	Floors, Su	ırface	s & Walls		Footings			
							Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	Cost	Length [ft]	Ref	Unit Cost	
Other Structures	Length (ft)	Width (ft)	Area (sf)	Capacity (gal)	#	Construction												
							-	24	3.71	\$C	)							
							-	24	3.71	\$0	)							l
							-	20	24.74	\$C	)							l
							-	31		\$C	)							l
							-	11		\$C								l
							-	11		\$C								l
							-	11		\$C								l
							-	28										l
							-	28										l
							-	28										l
							-	28		\$0								l
							-	28 71		\$0 \$0								l
							-	31		\$C \$C								l
Conveyors	Length (ft)	Width (ft)	Area (sf)		#	Construction	-	31	0.23	φυ								<u> </u>
	Longin (it)	Widan (ity	71100 (01)		"	Construction	-	33	22.75	\$C	)				1			
							-	29		\$C								l
							-	11		\$C								l
Area 4 South	1	1		1				1			1	1		1	1			
	-		1	1		1		-			-	-	-	1		+		<u> </u>

	T SUMMA	RY																
tructure							Buildings / L	Jtilities	s / Other Stru	ctures	Floors, Su	rfaces	s & Walls		Footings			
							Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	Cost	Length [ft]	Ref	Unit Cost	Cost
oncrete - Footings	Length (ft) on Long Axis	Length (ft) on Short Axis			#	Construction												
						Concrete									-	12a	11.43	
oncrete - Floors, Surfaces & Walls	Length (ft)	Width (ft)	Area (sf)		#	Construction												
			-			Concrete MSE Wall					-	9a 20	4.25 24.74	\$0 \$0				
oncrete/Asphalt - Aprons & Driveways												20	2	<b>\$</b> 0				
oncrete - Truck Dump Below Grade	Height (ft)	Width (ft)	Area (sf)	Thick (ft)	#	Construction												
			-			Concrete					-	21	32.98	\$0				
			-			Concrete					-	11	9.57	\$0				
			-			Concrete					-	50a	15.38	\$0				
tilities			Length (If)			Construction												
Underground Piping			11,818				-	25	3.36	\$0								
Aboveground Piping			2,659				-	25	3.36	\$0								
Overhead Powerlines (69-kV max)			57,300				-	32	7,019.97	\$0								
Electrical Bulks (Conduit, Cable, Fixtures, Boxes)			112,455				-	26	1.82	\$0								
ther Structures	Length (ft)	Width (ft)	Area (sf)	Capacity (gal)	#	Construction												
Raw Water Storage Tank					1	Steel Tank	-	31	0.23	\$0								
onveyors L	Length (ft)	Width (ft)	Area (sf)		#	Construction												
CV-01 through CV-04							-	33	22.75	\$0								
Conveyor Footing Ties			0			Concrete Ties	-	29	1.26	\$0								
Transfer Point and Take-Up Tower Foundations			0			Concrete	-	11	9.57	\$0								
OTAL										\$0				\$0				

	WORKSHEET NO. 3 MATERIAL HANDLING SUMMARY SH						
	Description	Quantity	Swell Factor	Adjusted Quantity	Push/Haul Distance [ft]	Push/Haul Grade [%]	Equipment
Acty	Area 4 Project						
1	Drill & Blast Area 4 Project	1,336,000 BCY					DMM2
2	Grading - Dozer Area 4 Project	15,135,000 LCY	1	15,135,000 LCY	323	-11.0%	D11R
3	Grading - Loader/Truck Area 4 Project	5,929,000 LCY	1	5,929,000 LCY	3,989	-2.2%	992G/777D
4	Grading - Scrapers Area 4 Project	13,872,000 LCY	1	13,872,000 LCY	1,061	-6.0%	637G
5	Topsoil - Loader/Truck Area 4 Project	865,111 BCY	1.142	987,957 LCY	2,970	4.0%	992G/777D
6	Topsoil - Scrapers Area 4 Project	0 BCY	1.142	0 LCY	0	0.0%	637G
7	Mitigation - Loader/Truck Area 4 Project	693,364 BCY	1.142	791,821 LCY	8,372	4.0%	992G/777D
8	Mitigation - Scrapers Area 4 Project	0 BCY	1.142	0 LCY	0	0.0%	637G
9	Revegetation Area 4 Project	1,129 ac.					
10							
22	Other						
23	Backfill Ponds Area 4 Project	74,621 BCY	1.142	85,217 LCY	173	0.00%	D11R
24	Regrade Conveyor/Ash Haul Corridor	0 LCY	1	0 LCY	0	0.00%	992G/777D
25	Regrade Field Stockpile Area	0 LCY	1	0 LCY	0	0.00%	D11R
26	Backfill Pinabete Diversion	0 BCY	1.142	0 LCY	0	0.00%	992G/777D
27	Regrade Truck Dump Area	0 LCY	1	0 LCY	0	0.00%	992G/777D
28	Regrade Haul Roads	0 BCY	1.142	0 LCY	0	0.00%	637G
29	Road Ripping Area 4 Project	117 ac.					16H
30							
31							
32	Intentionally Left Blank	0			100	1.00%	
33	Grading Topsoil Areas	0			100	1.00%	16H
34	Revegetation Roads Area 4 Project	117 ac.					
35							
36							
37							
38							
39							
40							

Swell factor = 1.142 Weighted Average Between In-Situ and Stockpile Swells

RKSHEET NO. 5A	
ODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
thmoving Activity:	
2 Grading - Dozer Area 4 Project	
aracterization of Dozer Used (type, size, etc.) <sup>3</sup>	
Caterpillar D11R, Universal blade	
scription of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
-11.0% grade on average	
323 ft typical dozer push distance	
2,700 Loose clay and sand density [lb/yd <sup>3</sup> ]	
ductivity Calculations <sup>3</sup> :	
Operating = 0.9 * 1.0 * 0.8 * 1.2 * 0.9 * 0.9 * 1.0 * 1.1 =	0.
Adjustment operator factor material factor work hour factor grade weight visibility elevation production	0.
Factor factor factor factor factor factor	
factor	
Net Hourly = 0.8 * 990 LCY/hr = 760 LCY/hr	
Net Hourly = 0.8 * 990 LCY/hr = 760 LCY/hr Production operating adjustment Normal Hourly	
factor Production	
Hours = 15.135.000 LCY / 760 LCY/hr = 19.924.5 hrs	
Required volume to be moved <sup>1</sup> net hourly production	

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEE PRODUCTIV	T NO. 5B ITY AND HOURS REQUIRE	D FOR DOZER USE							
Earthmoving	Activity								
23	Backfill Ponds Area 4 Proje	ct							
Characterizat	ion of Dozer Used (type, size	e, etc.) <sup>3</sup>							
	Caterpillar D11R, Universal	blade							
•	f Dozer Use (origin, destination grade on average	on, grade, haul distar	ice, material, etc.)						
	ft typical dozer push distan	<b>CA</b>							
	Loose clay and sand densit								
Productivity C Operating Adjustmen Factor	t operator factor	1.0 * material factor	0.8 * work hour factor	1.0 * grade factor	0.9 weight correction factor	* 0.9 * visibility factor	1.0 elevation factor	* <u>1.1</u> production factor	= (
Net Hourly Productior		1,650 LCY/hr = Normal Hourly Production	1,037 LCY/hr						
Hours Required	00,2 20. /	1,037 LCY/hr = net hourly production	82.2 hrs						

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving	g Activity:
32	Intentionally Left Blank
haracteriza	ation of Dozer Used (type, size, etc.) <sup>3</sup>
	Caterpillar D11R, Universal blade
	of Dezer Lies (crisis destination grade haul distance material ate.)
	of Dozer Use (origin, destination, grade, haul distance, material, etc.) % grade on average
	D ft typical dozer push distance
	10 Loose clay and sand density [lb/yd <sup>3</sup> ]
roductivity	Calculations <sup>3</sup> :
Operatin	
Adjustmer Facto	
Net Hour	
Productio	

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

Earthmoving	
32	Intentionally Left Blank
02	
Characteriza	ation of Dozer Used (type, size, etc.) <sup>3</sup>
	Caterpillar D11R, Universal blade
Description	of Dezer Lise (origin destination grade haul distance material etc.)
-	of Dozer Use (origin, destination, grade, haul distance, material, etc.) % grade on average
	0 ft typical dozer push distance
2,70	00 Loose clay and sand density [lb/yd <sup>3</sup> ]
Productivity Operatir Adjustme Fact	nt operator factor material factor work hour factor grade weight visibility elevation production
Net Hou Productio	
	rs = - LCY / 1,657 LCY/hr = - hrs

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving										
32	Intentionally Left	Blank								
haracteriza	ation of Dozer Used	l (type, si	ze, etc.) <sup>3</sup>							
	Caterpillar D11R	, Univers	al blade							
escription	of Dozer Use (origi	n, destina	ation, grade, haul di	istance, material, e	etc.)					
	% grade on avera		, ,	,, -	,					
	0 ft typical dozer p		ance							
	00 Loose clay and s									
roductivity Operatir Adjustme Fact	ent operator fac	tor * _	1.0 material factor	* 0.8 * work hour factor	1.0 * grade factor	0.9 weight correction factor	* 0.9 * visibility factor	elevation factor	* 1.1 production factor	= (
	rly = 0.6	*	2,690 LCY/hr =	= 1,657 LCY/hr						
Net Hour Productio	,		Normal Hourly Production							

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEE	NO. 5F
PRODUCTIV	Y AND HOURS REQUIRED FOR DOZER USE
Forthmoving	
Earthmoving	
32	ntentionally Left Blank
Characterizat	n of Dozer Used (type, size, etc.) <sup>3</sup>
	Caterpillar D11R, Universal blade
Description o	Dozer Use (origin, destination, grade, haul distance, material, etc.)
-	grade on average
	ft typical dozer push distance
	_oose clay and sand density [lb/yd <sup>3</sup> ]
Productivity C	Iculations <sup>3</sup> :
Operating	= 0.9 * 1.0 * 0.8 * 1.0 * 0.9 * 0.9 * 1.0 * 1.1 = 0.6
Adjustmen Facto	operator factor material factor work hour factor grade weight visibility elevation production factor correction factor factor factor factor
Net Hourly Production	= 0.6 * 2,690 LCY/hr = 1,657 LCY/hr operating adjustment factor Production
Hours Required	= <u>- LCY</u> / <u>1,657 LCY/hr</u> = - hrs volume to be net hourly moved <sup>1</sup> production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEE	T NO. 5G								
PRODUCTIV	ITY AND HOURS REQUIR	ED FOR DOZER USE							
Earthmoving									
32	Intentionally Left Blank								
Characterizat	ion of Dozer Used (type, siz	ze, etc.) <sup>3</sup>							
	Caterpillar D11R, Univers	al blade							
Description o	f Dozer Use (origin, destina	ation, grade, haul distance	e, material, etc.)						
1.0%	grade on average								
100	ft typical dozer push dista	ance							
2,700	) Loose clay and sand dens	sitv [lb/vd <sup>3</sup> ]							
	-								
Productivity C	Calculations <sup>3</sup> :								
,									
Operating	9 = 0.9 *	1.0 *	0.8 *	1.0 *	0.9 *	0.9 *	1.0 *	1.1	= 0.6
Adjustmen Facto		material factor wor	k hour factor	grade factor	weight correction factor	visibility factor	elevation factor	production factor	
Net Hourly	v = 0.6 *	2,690 LCY/hr = 1	1,657 LCY/hr						
Productior	operating adjustment factor	Normal Hourly Production							
Hours	S = - LCY /	1,657 LCY/hr =	- hrs						
Required	= = = = = = = = = = = = = = = = = = = =	net hourly production	- 115						

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET N	NO. 8A				
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE					
Earthmoving Act	tivity:				
3 Gr	rading - Loader/Truck Area 4 Project				
	of Loader Used (type, size, etc.) <sup>3</sup>				
Ca	aterpillar 992G with 15 CYD Bucket				
	bader Use (origin, destination, grade, haul distance, etc.)				
	oad Caterpillar 777D Trucks ucket Fill Factor				
	ated Bucket Capacity [LCY]				
Productivity Calc	culations <sup>3</sup>				
, ,					
Cycle Time $=$	++ 0.65 min = 0.65 min				
	loaded haul empty haul time basic cycle time				
Net Bucket =	15 LCY * 0.90 = 13.5 LCY				
Capacity	<u>15 LCY</u> * <u>0.90</u> = 13.5 LCY heaped bucket bucket fill factor				
	capacity				
Net Hourly $=$	13.5 LCY / 0.65 min * 50 min/hr = 1,038 LCY/hr				
Production -	net bucket capacity cycle time work hour				
	factor				
	5,929,000 LCY / 1,038 LCY/hr = 5,709 hrs				
Required <sup>2</sup>	volume to be moved <sup>1</sup> net hourly production				
	•				

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

	IO. 8B			
PRODUCTIVITY	AND HOURS REQ		DER USE	
Earthmoving Act	-			
7 Mi	tigation - Loader/Tru	ick Area 4 Project		
		2		
	of Loader Used (typ			
Ca	aterpillar 992G with 1	15 CYD Bucket		
	,	<i>е е</i> – – – – – – – – – – – – – – – – – –		
	bader Use (origin, de		aul distance, etc.)	
	ad Caterpillar 777D	TTUCKS		
15 Ra	ated Bucket Capacity	, [LCY]		
Productivity Calc	culations			
Cycle Time <sub>=</sub>	+		+ 0.65 min =	0.65 min
	loaded haul	empty haul time	basic cycle	0.05 11111
	time		time	
Net Bucket =	15 LCY	* 1.05	= 15.8 LCY	
Capacity	heaped bucket	bucket fill factor	_	
	capacity			
Net Hourly $=$	15.8 LCY	/ 0.65 min	* 50 min/hr =	1,212 LCY/hr
Production	net bucket capacity	cycle time	work hour	
			factor	
Hours =	791,821 LCY		_ = 654 hrs	
Required <sup>2</sup>	volume to be moved <sup>1</sup>	net hourly production		
		production		

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET N	IO. 8C
	AND HOURS REQUIRED FOR LOADER USE
Earthmoving Act	ivity:
5 To	psoil - Loader/Truck Area 4 Project
Characterization	of Loader Used (type, size, etc.) <sup>3</sup>
Ca	aterpillar 992G with 15 CYD Bucket
	bader Use (origin, destination, grade, haul distance, etc.)
	ad Caterpillar 777D Trucks icket Fill Factor
	ated Bucket Capacity[LCY]
13 Ка	
Productivity Calc	sulations <sup>3</sup>
Cycle Time $=$	+ + 0.65 min = 0.65 min
-	loaded haul empty haul time basic cycle
	time time
Net Developt	
Net Bucket <sub>=</sub> Capacity <sup>-</sup>	15 LCY * 1.05 = 15.8 LCY heaped bucket bucket fill factor
	capacity
Net Hourly =	15.8 LCY / 0.65 min * 50 min/hr = 1.212 LCY/hr
Production -	net bucket capacity cycle time work hour
	factor
Hours $=$	987,957 LCY / 1,212 LCY/hr = 815 hrs
Required <sup>2</sup>	volume to be moved <sup>1</sup> net hourly production
	production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET N	
PRODUCTIVITY	Y AND HOURS REQUIRED FOR LOADER USE
Earthmoving Act	tivity:
32 Int	tentionally Left Blank
	n of Loader Used (type, size, etc.) <sup>3</sup>
Ca	aterpillar 992G with 15 CYD Bucket
Description of L	oader Use (origin, destination, grade,haul distance, etc.)
	bad Caterpillar 777D Trucks
	ucket Fill Factor
15 Ra	ated Bucket Capacity[LCY]
Productivity Calo	culations <sup>3</sup>
Cycle Time =	++ 0.65 min = 0.65 min
	loaded haul empty haul time basic cycle time time
Net Bucket =	15 LCY * 0.95 = 14.3 LCY
Capacity	heaped bucket bucket fill factor
	capacity
Net Hourly =	14.3 LCY / 0.65 min * 50 min/hr = 1,096 LCY/hr
Production	net bucket capacity cycle time work hour factor
Hours <sub>=</sub>	- LCY / 1,096 LCY/hr = 0 hrs
Required <sup>2</sup>	$\frac{-\text{ LCY}}{\text{volume to be moved}^1} / \frac{1,096 \text{ LCY/hr}}{\text{ net hourly}} = 0 \text{ hrs}$
	production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET N	IO. 8E
PRODUCTIVITY	AND HOURS REQUIRED FOR LOADER USE
E a stila sea a stila an A a t	
Earthmoving Act	
32 Int	entionally Left Blank
_	
	of Loader Used (type, size, etc.) <sup>3</sup>
Ca	aterpillar 992G with 15 CYD Bucket
Description of La	ander Lice (origin, destinction, grade houl distance, etc.)
•	bader Use (origin, destination, grade,haul distance, etc.) bad Caterpillar 777D Trucks
	icket Fill Factor
	ated Bucket Capacity[LCY]
13 6	
Productivity Calc	sulations <sup>3</sup>
FIDUUCIIVITY Calc	
Cycle Time <sub>=</sub>	+ + 0.65 min = 0.65 min
-	loaded haul empty haul time basic cycle
	time time
Net Bucket =	15 LCY * 1.05 = 15.8 LCY
Capacity -	heaped bucket bucket fill factor
	capacity
Net Hourly =	15.8 LCY / 0.65 min * 50 min/hr = 1,212 LCY/hr
Production -	net bucket capacity cycle time work hour
	factor
Hours $=$	- LCY / 1,212 LCY/hr = 0 hrs
Required <sup>2</sup>	volume to be moved <sup>1</sup> net hourly production
	production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET N	
PRODUCTIVITY	Y AND HOURS REQUIRED FOR LOADER USE
Earthmoving Act	tivity:
32 Int	tentionally Left Blank
	n of Loader Used (type, size, etc.) <sup>3</sup>
Ca	aterpillar 992G with 15 CYD Bucket
Description of Lo	oader Use (origin, destination, grade,haul distance, etc.)
Lo	bad Caterpillar 777D Trucks
1.05 Bu	ucket Fill Factor
15 Ra	ated Bucket Capacity[LCY]
Productivity Calo	culations <sup>3</sup>
o	
Cycle Time =	+ + 0.65 min = 0.65 min loaded haul empty haul time basic cycle
	loaded haul empty haul time basic cycle time time
Net Bucket =	15 LCY * 1.05 = 15.8 LCY
Capacity	heaped bucket bucket fill factor
	capacity
Net Hourly =	15.8 LCY / 0.65 min * 50 min/hr = 1,212 LCY/hr
Production	net bucket capacity cycle time work hour factor
Hours <sub>=</sub>	- LCY / 1,212 LCY/hr = 0 hrs
<b>-</b> 2 <b>-</b>	$\frac{-\text{ LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{ net hourly}} = 0 \text{ hrs}$
	production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET N	IO. 8G
PRODUCTIVITY	AND HOURS REQUIRED FOR LOADER USE
Earthmoving Act	
32 Int	entionally Left Blank
	of Loader Used (type, size, etc.) <sup>3</sup>
Ca	aterpillar 992G with 15 CYD Bucket
Description of La	ander Line (origin, doctingtion, grade houl distance, etc.)
•	pader Use (origin, destination, grade,haul distance, etc.)
	ad Caterpillar 777D Trucks Icket Fill Factor
	ated Bucket Capacity [LCY]
15 Ka	
Productivity Calc	vulations <sup>3</sup>
Productivity Calc	culations
Cycle Time <sub>=</sub>	+ + 0.65 min = 0.65 min
	loaded haul empty haul time basic cycle
	time time
Net Bucket =	15 LCY * 1.05 = 15.8 LCY
Capacity	heaped bucket bucket fill factor
	capacity
Net Hourly $=$	15.8 LCY / 0.65 min * 50 min/hr = 1,212 LCY/hr
Production -	net bucket capacity cycle time work hour
	factor
Hours =	- LCY / 1,212 LCY/hr = 0 hrs
Required <sup>2</sup>	volume to be moved <sup>1</sup> net hourly
	production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

	D HOURS REQU	JIRED FOR LOA	DEF	RUSE	
Earthmoving Activity:					
32 Intentio	nally Left Blank				
		0			
Characterization of Lo					
Caterpi	llar 992G with 1	5 CYD Bucket			
Description of Loader	Use (oriain. des	stination. grade.h	aul c	listance. etc.)	
	aterpillar 777D 1	-			
0.95 Bucket	•				
15 Rated E	Bucket Capacity	[LCY]			
Productivity Calculation	ons <sup>3</sup>				
Cycle Time =	+ led haul	empty haul time	_+_	0.65 min = basic cycle time	0.65 min
	time	ompty haar time			
Net Bucket =	15 LCY	* 0.95	=	14.3 LCY	
	eaped bucket capacity	bucket fill factor	<u>.</u>		
Duradius Cara	14.3 LCY		*	50 min/hr =	1,096 LCY/hr
net t	oucket capacity	cycle time		work hour factor	
Hours =	- LCY	/1,096LCY/h	r =	0 hrs	
Required <sup>2</sup> volum	ne to be moved <sup>1</sup>	net hourly production			

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

PRODUCTIVITY	Y AND HOURS REQUIRED FOR LOADER USE
Earthmoving Act	tivity:
32 Int	tentionally Left Blank
	· · · · · · · · · · · · · · · · · · ·
	n of Loader Used (type, size, etc.) <sup>3</sup>
Ca	aterpillar 992G with 15 CYD Bucket
Description of Lo	oader Use (origin, destination, grade,haul distance, etc.)
	bad Caterpillar 777D Trucks
0.88 Bu	ucket Fill Factor
15 Ra	ated Bucket Capacity [LCY]
Productivity Calo	culations <sup>3</sup>
Quele Time	
Cycle Time =	+ + 0.65 min = 0.65 min loaded haul empty haul time basic cycle
	time time
Net Bucket =	15 LCY * 0.88 = 13.2 LCY
Capacity	heaped bucket bucket fill factor
	capacity
Nations	
Net Hourly <sub>=</sub> Production	13.2LCY/0.65min*50min/hr=1,015LCY/hrnet bucket capacitycycle timework hour
	net bucket capacity cycle time work hour factor
Hours <sub>=</sub>	- LCY / 1,015 LCY/hr = 0 hrs
Required <sup>2</sup>	volume to be moved <sup>1</sup> net hourly
	production

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

	ET NO. 9A		
PRODUCTIV	ITY AND HOURS REQU	UIRED FOR TRUCK USE	
Earthmoving			
3	Grading - Loader/Truck	Area 4 Project	
		. 2	
Characterizat	tion of Truck Used (type,	size, etc.)	
	Caterpillar 777D		
		_CY]	
79		_CY]	
67	Adjusted Capacity (Ave	erage of Struck and Heaped) [LC	Y]
<u> </u>		ination, grade, haul distance, truc	k capacity, etc.):
	ft. average haul distanc	ce	
-2.2%	Grade (Loaded)		
3.0%	Rolling Resisance		
Productivity C	Calculation <sup>3</sup>		
Productivity C	Calculation <sup>3</sup>		
Loader	= 67 LCY /	13.5 LCY = 5.0 passes	
Loader Passes Per	= <u>67 LCY</u> /	loader bucket	Capacity loader bucket net loader passes
Loader	= <u>67 LCY</u> /		
Loader Passes Per	= <u>67 LCY</u> /	loader bucket	Capacity loader bucket net loader passes
Loader Passes Per Truck Loading	= <u>67 LCY</u> / truck capacity /	loader bucket	Capacity loader bucket net capacity per truck Truck Cycle = 2.2 min + 1.2 min + 3.2 min + 1.0 min = 7.7 m
Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} /$ $= \frac{0.65 \text{ min}}{\text{loader cycle time}}$	loader bucket net capacity 5 = 3.2 min loader passes	Capacity     Ioader bucket net capacity     Ioader passes per truck       Truck Cycle =     2.2 min +     1.2 min +     3.2 min +     1.0 min =     7.7 min +       Time     haul time     return time     Ioading time per     dump and
Loader Passes Per Truck Loading	$= \frac{67 \text{ LCY}}{\text{truck capacity}} /$ $= \frac{0.65 \text{ min}}{\text{loader cycle time}}$	loader bucket net capacity 5 = 3.2 min	Capacity     Ioader bucket net capacity     Ioader passes per truck       Truck Cycle =     2.2 min +     1.2 min +     3.2 min +     1.0 min =     7.7 min +
Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} /$ $= \frac{0.65 \text{ min}}{\text{loader cycle time}}$	loader bucket net capacity 5 = 3.2 min loader passes	Capacity     Ioader bucket net capacity     Ioader passes per truck       Truck Cycle =     2.2 min +     1.2 min +     3.2 min +     1.0 min =     7.7 min +       Time     haul time     return time     Ioading time per     dump and
Loader Passes Per Truck Loading Time Per Truck Number of	= <u>67 LCY</u> / truck capacity = <u>0.65 min</u> * loader cycle time = 7.7 min /	loader bucket net capacity 5 = 3.2 min loader passes	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       2.2 min + 1.2 min haul time       + 3.2 min + 1.0 min = 7.7 m         Time =       haul time       return time         Ioader passes
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{1}{10000000000000000000000000000000000$	loader bucket net capacity     =     3.2 min       5 loader passes per truck     =     2 trucks       3.2 min truck loading     =     2 trucks	Capacity     Ioader bucket net capacity     Ioader passes per truck       Truck Cycle =     2.2 min +     1.2 min +     3.2 min +     1.0 min =     7.7 m       Time     haul time     return time     Ioading time per truck     dump and maneuver time
Loader Passes Per Truck Loading Time Per Truck Number of	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{1}{10000000000000000000000000000000000$	loader bucket net capacity=3.2min5 loader passes per truck=3.2min3.2min=2trucks	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       2.2 min +       1.2 min +       3.2 min +       1.0 min =       7.7 min =         Time       haul time       return time       Ioading time per truck       dump and maneuver time         Production =       67 LCY / 7.7 min =       8.7 LCY/min
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{1}{10000000000000000000000000000000000$	loader bucket net capacity     =     3.2 min       5 loader passes per truck     =     2 trucks       3.2 min truck loading     =     2 trucks	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       2.2 min +       1.2 min +       3.2 min +       1.0 min =       7.7 min =         Time       haul time       return time       Ioading time per truck       dump and maneuver time         Production =       67 LCY / 7.7 min =       8.7 LCY/min
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{1}{10000000000000000000000000000000000$	loader bucket net capacity       =       3.2 min         loader passes per truck       =       2 trucks         3.2 min truck loading time       =       2 trucks (round down)	Capacity $\boxed{\text{loader bucket net}}_{capacity}$ $\boxed{\text{loader passes}}_{per truck}$ Truck Cycle = $\underbrace{2.2 \text{ min}}_{haul time} + \underbrace{1.2 \text{ min}}_{return time} + \underbrace{3.2 \text{ min}}_{loading time per truck} + \underbrace{1.0 \text{ min}}_{dump and} = 7.7 \text{ m}$ Production = $\underbrace{67 \text{ LCY}}_{ret ruck} / \underbrace{7.7 \text{ min}}_{cycle time} = 8.7 \text{ LCY/min}$
Loader Passes Per Truck Loading Time Per Truck Number of Trucks Required	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{1}{2}$ $= \frac{0.65 \text{ min}}{\text{loader cycle time}} * \frac{1}{2}$ $= \frac{7.7 \text{ min}}{\text{truck cycle time}} / \frac{1}{2}$ $f = \frac{9 \text{ LCY/min}}{2} * \frac{1}{2}$	loader bucket net capacity     =     3.2 min       5 loader passes per truck     =     2 trucks       3.2 min truck loading     =     2 trucks	Capacity $\boxed{\text{loader bucket net}}_{capacity}$ $\boxed{\text{loader passes}}_{per truck}$ Truck Cycle = $\underbrace{2.2 \text{ min}}_{haul time} + \underbrace{1.2 \text{ min}}_{return time} + \underbrace{3.2 \text{ min}}_{loading time per truck} + \underbrace{1.0 \text{ min}}_{dump and} = 7.7 \text{ m}$ Production = $\underbrace{67 \text{ LCY}}_{ret ruck} / \underbrace{7.7 \text{ min}}_{cycle time} = 8.7 \text{ LCY/min}$

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

RODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
arthmoving Activity: 7 Mitigation - Loader/Truck Area 4 Project	
7 Miligation - Loader/Truck Area 4 Project	
naracterization of Truck Used (type, size, etc.) <sup>3</sup>	
Caterpillar 777D	
55 Struck Capacity [LCY]	
79 Heaped Capacity [LCY]	
67 Adjusted Capacity (Average of Struck and Heaped)	ILCYI
,	
escription of Truck Use (origin, destination, grade, haul distance,	truck capacity, etc.):
8,372 ft. average haul distance	
4.0% Grade (Loaded)	
3.0% Rolling Resisance	
-	
oductivity Calculation <sup>3</sup>	
Loader = 67 LCY / 13.5 LCY = 5 p	asses Net Truck = 14 LCY * 5 = 67 LCY
Passes Per truck capacity loader bucket net	Capacity loader bucket net loader passes
Truck capacity	capacity per truck
Loading = 0.7 min * 5 = 3.2 m	nin Truck Cycle = 4.7 min + 2.5 min + 3.2 min + 1.0 min = 11.5 m
Time Per loader cycle time loader passes	Time haul time return time loading time per dump and
Truck per truck	truck maneuver time
Number of = $115$ min / $32$ min = $3$ tr	ucks Production = 67 LCY / 115 min = 58 LCY/min
Number of =         11.5         min         /         3.2         min         =         3         tr           Trucks         truck cycle time         truck loading         (roun)	
Required time down	net truck capacity cycle time
L La contra de la co	
Hourly = $6 \text{ LCY/min} = 50 \text{ min/hr} = 292 \text{ L}$ Production production rate	
Production production rate work hour factor	Required <sup>E</sup> volume to be hourly

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving Activity:	
5 Topsoil - Loader/Truck Area 4 Project	
naracterization of Truck Used (type, size, etc.) <sup>3</sup>	
Caterpillar 777D	
55 Struck Capacity [LCY]	
79 Heaped Capacity [LCY]	
67 Adjusted Capacity (Average of Struck and Heaped) [Lo	CY]
escription of Truck Use (origin, destination, grade, haul distance, tru	uck capacity, etc.):
2,970 ft. average haul distance	
4.0% Grade (Loaded)	
3.0% Rolling Resisance	
roductivity Calculation <sup>3</sup>	
Loader = 67 LCY / 16 LCY = 4 passes	Net Truck = 16 LCY * 4 = 63 LCY
Passes Per truck capacity loader bucket	Net Truck =     16     LCY *     4     =     63     LCY       Capacity     Ioader bucket net     Ioader passes     =     63     LCY
Passes Per truck capacity loader bucket	Capacity loader bucket net loader passes
Passes Per truck capacity loader bucket	Capacity loader bucket net capacity per truck
Dasses Per Truck     truck capacity     To Lot loader bucket net capacity       Loading =     0.7 min loader cycle time     * 4 loader passes	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       1.7 min + 0.9 min + 2.6 min + 1.0 min = 6.2 min + 0.9 min + 0.
Passes Per truck capacity loader bucket Truck truck capacity net capacity Loading = 0.7 min * 4 = 2.6 min	Capacity       loader bucket net capacity       loader passes per truck         Truck Cycle =       1.7 min + 0.9 min + 2.6 min + 1.0 min = 6.2 min
Passes Per     truck capacity     To Lot in procession       Truck     truck capacity     loader bucket net capacity       Loading =     0.7 min     *     4       Time Per     loader cycle time     *     0.00000000000000000000000000000000000	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       1.7 min + 0.9 min + 2.6 min + 1.0 min = 6.2 min + 0.9 min + 0.
Passes Per truck capacity for Lorin posses Truck for a capacity f	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       1.7 min +       0.9 min +       2.6 min +       1.0 min =       6.2 min +         Time       haul time       return time       Ioading time per truck       dump and maneuver time
Dasses Per Truck     truck capacity     Toader bucket net capacity       Loading Time Per Truck     0.7 min loader cycle time     * 4 loader passes per truck     = 2.6 min       Number of Trucks     6.2 min truck cycle time     / 2.6 min truck loading     = 2 trucks	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       1.7 min +       0.9 min +       2.6 min +       1.0 min =       6.2 min +         Time       haul time       return time       Ioading time per truck       maneuver time
Dasses Per Trucktruck capacityIce Let Ioader bucket net capacitypercent loader bucket net capacityLoading = Time Per Truck $0.7 \text{ min}$ loader cycle time* Ioader passes per truck4 loader passes per truck=2.6 minNumber of = Number of = $6.2 \text{ min}$ / $2.6 \text{ min}$ =2 trucks	Capacity       loader bucket net capacity       loader passes per truck         Truck Cycle =       1.7 min +       0.9 min +       2.6 min +       1.0 min =       6.2 min =         Time       haul time       return time       loading time per truck       1.0 min =       6.2 min =         Production =       63 LCY /       6.2 min =       10.2 LCY/min
Passes Per Truck $\frac{1}{\text{truck capacity}}$ $\frac{1}{\text{loader bucket}}$ Loading = $\frac{0.7 \text{ min}}{10 \text{ ader passes}}$ $\frac{4}{10 \text{ ader passes}}$ = 2.6 min Time Per Truck $\frac{1}{10 \text{ ader cycle time}}$ $\frac{4}{10 \text{ ader passes}}$ = 2.6 min Number of = $\frac{6.2 \text{ min}}{1 \text{ truck cycle time}}$ $\frac{2.6 \text{ min}}{1 \text{ truck loading}}$ = 2 trucks (round	Capacity       loader bucket net capacity       loader passes per truck         Truck Cycle =       1.7 min +       0.9 min +       2.6 min +       1.0 min =       6.2         Time       haul time       return time       loading time per truck       dump and maneuver time         Production =       63 LCY /       6.2 min =       10.2 LCY/min
Dasses Per Truck       Iod EV       Ioder Ducket net capacity         Loading Time Per Truck       0.7 min       *       4       =       2.6 min         Ioader cycle time Truck       Ioader passes per truck       =       2.6 min       =       2.6 min         Number of Trucks Required       =       6.2 min       /       2.6 min       =       2 trucks (round time	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       1.7 min + 0.9 min return time       + 2.6 min + 1.0 min dump and maneuver time         Time       haul time       + 0.9 min return time       + 1.0 min dump and maneuver time         Production =       63 LCY / 6.2 min returne       = 10.2 LCY/min
Passes Per Truck $\frac{1}{\text{truck capacity}}$ $\frac{1}{\text{loader bucket}}$ $\frac{1}{\text{loader bucket}}$ $\frac{1}{\text{loader bucket}}$ $\frac{1}{\text{loader bucket}}$ $\frac{1}{\text{loader bucket}}$ $\frac{1}{\text{loader capacity}}$ $\frac{1}{\text{loader capacity}}$ $\frac{1}{loader capacity$	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       1.7 min + 0.9 min return time       + 2.6 min + 1.0 min dump and maneuver time         Time       haul time       + 0.9 min return time       + 1.0 min dump and maneuver time         Production =       63 LCY / 6.2 min return time       = 10.2 LCY/min

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving	-						
32	Intentionally Left Blank						
naracterizat	ion of Truck Used (type, size, etc.) <sup>3</sup>						
	Caterpillar 777D						
55	Struck Capacity [LCY]						
	Heaped Capacity [LCY]						
	Adjusted Capacity (Average of Struck and Heaped) [I	_CY]					
		-					
escription o	of Truck Use (origin, destination, grade,haul distance, t	uck capacity, etc.):					
100	ft. average haul distance						
1.0%	Grade (Loaded)						
	Rolling Resisance						
oductivity (	"algulation <sup>3</sup>						
oductivity C	Calculation <sup>3</sup>						
		s Net Truck -	14 1 CV *		- 57 (C)	/	
oductivity C Loader Passes Per	= 67 LCY / 14 LCY = 4 passe	s Net Truck <sub>=</sub> Capacity <sup>—</sup>	14 LCY *	4 =	= 57 LCY	4	
Loader	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity loader bucket		14 LCY * loader bucket net capacity	4 = loader passes per truck	= 57 LCY	(	
Loader Passes Per	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity loader bucket		loader bucket net	loader passes	= 57 LCY	<i>(</i>	
Loader Passes Per Truck	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity loader bucket net capacity	Capacity -	loader bucket net capacity	loader passes per truck			37 m
Loader Passes Per Truck Loading Time Per	$= \underbrace{\begin{array}{c} 67 \text{ LCY} \\ \text{truck capacity} \end{array}}_{\text{loader bucket}} / \underbrace{\begin{array}{c} 14 \text{ LCY} \\ \text{loader bucket} \\ \text{net capacity} \end{array}}_{\text{net capacity}} = 4 \text{ passe}$ $= \underbrace{\begin{array}{c} 0.7 \text{ min} \\ \text{loader cycle time} \end{array}}_{\text{loader passes}} + \underbrace{\begin{array}{c} 4 \\ \text{loader passes} \end{array}}_{\text{loader passes}} = 2.6 \text{ min}$		loader bucket net	loader passes per truck	⊦2.6 min	+ 1.0 min =	3.7 m
Loader Passes Per Truck Loading	$= \underbrace{\begin{array}{c} 67 \text{ LCY} \\ \text{truck capacity} \end{array}}_{\text{loader bucket}} / \underbrace{\begin{array}{c} 14 \text{ LCY} \\ \text{loader bucket} \\ \text{net capacity} \end{array}}_{\text{net capacity}} = 4 \text{ passe}$ $= \underbrace{\begin{array}{c} 0.7 \text{ min} \\ \text{loader cycle time} \end{array}}_{\text{loader passes}} + \underbrace{\begin{array}{c} 4 \\ \text{loader passes} \end{array}}_{\text{loader passes}} = 2.6 \text{ min}$	Capacity -	loader bucket net capacity 0.1 min +	loader passes per truck 0.0 min +		+ 1.0 min =	3.7 m
Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity -	loader bucket net capacity 0.1 min +	loader passes per truck 0.0 min +	- 2.6 min loading time pe	+ <u>1.0 min</u> =	3.7 m
Loader Passes Per Truck Loading Time Per Truck	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity / <u>14 LCY</u> = 4 passe net capacity = <u>0.7 min</u> * <u>4</u> = 2.6 min loader cycle time per truck	Capacity -	loader bucket net capacity 0.1 min + haul time	loader passes per truck 0.0 min + return time	- 2.6 min loading time pe truck	+ <u>1.0 min</u> = dump and maneuver time	3.7 n
Loader Passes Per Truck Loading Time Per	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity / <u>14 LCY</u> = 4 passe net capacity = 2.6 min loader cycle time * <u>4</u> = 2.6 min loader passes per truck = 1 trucks	Capacity -	0.1 min + haul time 57 LCY /	loader passes per truck       0.0 min       return time       3.7 min	2.6 min loading time pe truck	+ <u>1.0 min</u> = dump and maneuver time	3.7 n
Loader Passes Per Truck Loading Time Per Truck Number of	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity / <u>14 LCY</u> = 4 passe net capacity = <u>0.7 min</u> * <u>4</u> = 2.6 min loader cycle time / <u>4</u> = 2.6 min loader passes per truck = <u>3.7 min</u> / <u>2.6 min</u> = 1 trucks (round	Capacity -	loader bucket net capacity 0.1 min + haul time	loader passes per truck 0.0 min + return time	- 2.6 min loading time pe truck	+ <u>1.0 min</u> = dump and maneuver time	3.7 m
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity / <u>14 LCY</u> = 4 passe loader bucket net capacity = 2.6 min loader cycle time * <u>4</u> = 2.6 min loader passes per truck = <u>3.7 min</u> / <u>2.6 min</u> = 1 trucks (round	Capacity -	0.1 min + haul time 57 LCY /	loader passes per truck       0.0 min       return time       3.7 min	- 2.6 min loading time pe truck	+ <u>1.0 min</u> = dump and maneuver time	3.7 n
Loader Passes Per Truck Loading Time Per Truck Number of Trucks Required	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity / <u>14 LCY</u> = 4 passe net capacity = 2.6 min loader cycle time * <u>4</u> = 2.6 min loader passes per truck = <u>3.7 min</u> / <u>2.6 min</u> = 1 trucks truck cycle time time down)	Capacity -	loader bucket net capacity         0.1 min + haul time         57 LCY / net truck capacity	loader passes per truck       0.0 min return time       3.7 min cycle time	<ul> <li>2.6 min</li> <li>loading time pe truck</li> <li>15.5 LCY</li> </ul>	+ <u>1.0 min</u> = dump and maneuver time	3.7 n
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity / <u>14 LCY</u> = 4 passe = <u>0.7 min</u> * <u>4</u> = 2.6 min loader cycle time / <u>10ader passes</u> per truck = <u>3.7 min</u> / <u>2.6 min</u> = 1 trucks (round time down) = 15 LCY/min * 50 min/hr = 773 LCY/h	Capacity -	0.1 min + haul time 57 LCY /	loader passes per truck       0.0 min       return time       3.7 min	<ul> <li>2.6 min</li> <li>loading time pe truck</li> <li>15.5 LCY</li> </ul>	+ <u>1.0 min</u> = dump and maneuver time	3.7 n

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

VORKSHEE										
RODUCTIV	ITY AND HOURS REQ	UIRED FOR TRUC	K USE							
arthmoving										
	Intentionally Left Blank									
02										
haracterizati	on of Truck Used (type,	size, etc.) <sup>3</sup>								
	Caterpillar 777D									
55	Struck Capacity [LCY]									
	Heaped Capacity [LCY	ŋ								
67	Adjusted Capacity (Ave	erage of Struck and	Heaped) [LCY]							
		-								
escription o	f Truck Use (origin, des	tination, grade,hau	l distance, truck c	apacity, etc.):						
100	ft. average haul distand	ce								
1.0%	Grade (Loaded)									
	Rolling Resisance									
	<u> </u>									
roductivity C	alculation <sup>3</sup>									
Loader	= 67 LCY /	16 LCY =	4 passes	Net Truck =	16 LCY *	4 =	= 63 LCY			
Passes Per	truck capacity	loader bucket	4 passes	Capacity	loader bucket net	loader passes	- 05 LOT			
Truck	index capacity	net capacity			capacity	per truck				
Loading	= 0.7 min *	4 =	0.C. min	Truck Cycle =	0.4 min i	0.0 min			07.	
Time Per	loader cycle time	4 =	2.6 min	Time Time	0.1 min + haul time	0.0 min return time	<ul> <li>2.6 min loading time per</li> </ul>	+ <u>1.0 min</u> = dump and	3.7 ı	п
Truck		per truck			naur time	Tetum time	truck	maneuver time		
Number of		·		Production =						
Trucks	= <u>3.7 min</u> / truck cycle time	2.6 min = truck loading	1 trucks (round down)	Rate -	63 LCY / net truck capacity	3.7 min =	= 17.1 LCY/mi	n		
Required	truck cycle time	time	(round down)		пет писк сарасну	cycle time				
-										
				F						
Hourly Production		50 min/hr =	854 LCY/hr	Hours $=$	- LCY /	854 LCY/hr =	- hrs			
FIGUUCUON	production rate	work hour factor		Required <sup>2</sup>	volume to be	hourly production				
		lacioi			moved <sup>1</sup>	production				

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving	Activity:		
32	Intentionally Left Blank		
naracterizat	ion of Truck Used (type, size, etc.) <sup>3</sup>		
	Caterpillar 777D		
	Struck Capacity [LCY]		
79	Heaped Capacity [LCY]		
67	Adjusted Capacity (Average of Struck and Heaped	d) [LCY]	
escription o	of Truck Use (origin, destination, grade,haul distance	e, truck capacity, etc.):	
100	ft. average haul distance		_
1.0%	Grade (Loaded)		
3.0%	Rolling Resisance		
oductivity C			
	Calculation <sup>3</sup>	sses Net Truck = 16 LCY * 4 = 63 LCY	
oductivity C Loader Passes Per	Calculation <sup>3</sup> = <u>67 LCY</u> / <u>16 LCY</u> = 4 pas	isses Net Truck = $16$ LCY * $4$ = $63$ LCY Capacity loader bucket net loader passes	
oductivity C Loader	Calculation <sup>3</sup> = <u>67 LCY</u> / <u>16 LCY</u> = 4 pas		
oductivity C Loader Passes Per	Calculation <sup>3</sup> = <u>67 LCY</u> / <u>16 LCY</u> = 4 pas truck capacity loader bucket	Capacity loader bucket net loader passes	
oductivity C Loader Passes Per Truck	Calculation <sup>3</sup> = <u>67 LCY</u> / <u>16 LCY</u> = 4 pas truck capacity loader bucket net capacity	Capacity loader bucket net loader passes capacity per truck	
oductivity C Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ pas}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity loader bucket net capacity loader passes per truck Truck Cycle = 0.1 min + 0.0 min + 2.6 min + 1.0 min = 3.7	r
oductivity C Loader Passes Per Truck Loading	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ pas}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity loader bucket net capacity loader passes per truck Truck Cycle = 0.1 min + 0.0 min + 2.6 min + 1.0 min = 3.7	m
oductivity C Loader Passes Per Truck Loading Time Per	$Calculation3$ $= - \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = - 4 \text{ pas}$ $= - \frac{0.7 \text{ min}}{\text{loader cycle time}} * - \frac{4}{\text{loader passes}} = - 2.6 \text{ min}$	Capacity loader bucket net capacity loader passes per truck Truck Cycle = 0.1 min + 0.0 min + 2.6 min + 1.0 min = 3.7 Time haul time return time loading time per dump and	n
oductivity C Loader Passes Per Truck Loading Time Per Truck	$\frac{\text{Calculation}^{3}}{\text{truck capacity}} = \frac{67 \text{ LCY}}{\text{loader bucket}} + \frac{16 \text{ LCY}}{\text{loader bucket}} = \frac{4 \text{ pas}}{\text{loader bucket}}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} + \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity $100 \text{ Loc} \text{ Loc}$	n
oductivity C Loader Passes Per Truck Loading Time Per	$\frac{\text{Calculation}^{3}}{\text{truck capacity}} = \frac{67 \text{ LCY}}{\text{loader bucket}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = \frac{4 \text{ pas}}{\text{net capacity}}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= 3.7 \text{ min} / 2.6 \text{ min} = 1 \text{ truck}$	Capacity $10000 \text{ Capacity}$ $1000000 \text{ Capacity}$ $1000000000000000000000000000000000000$	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of	Calculation <sup>3</sup> $= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ pass}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$	Capacity $1000 \text{ Loc} 1 $	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$\frac{\text{Calculation}^{3}}{\text{truck capacity}} = \frac{67 \text{ LCY}}{\text{loader bucket}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = \frac{4 \text{ pas}}{\text{net capacity}}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$	Capacity $10000 \text{ Capacity}$ $1000000 \text{ Capacity}$ $1000000000000000000000000000000000000$	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of Trucks Required	Calculation <sup>3</sup> $= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ pass}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truc}$ (round time)	$Capacity = \frac{1000 \text{ LCY}}{100 \text{ der passes}} = \frac{100 \text{ der passes}}{100 \text{ der passes}}$ in $Truck Cycle = \underbrace{0.1 \text{ min}}_{\text{haul time}} + \underbrace{0.0 \text{ min}}_{\text{return time}} + \underbrace{2.6 \text{ min}}_{100 \text{ der passes}} + \underbrace{1.0 \text{ min}}_{\text{dump and maneuver time}} = 3.7$ $Rate = \underbrace{63 \text{ LCY}}_{\text{net truck capacity}} / \underbrace{3.7 \text{ min}}_{\text{cycle time}} = 17.1 \text{ LCY/min}$	r
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of Trucks	Calculation <sup>3</sup> $= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ pass}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truc}$ (round time) $= \frac{17 \text{ LCY/min}}{\text{truck loading}} * 50 \text{ min/hr} = 854 \text{ LCY}$	$Capacity = \frac{1000 \text{ LCY}}{100 \text{ der passes}} = \frac{100 \text{ der passes}}{100 \text{ der passes}}$ in $Truck Cycle = \underbrace{0.1 \text{ min}}_{\text{haul time}} + \underbrace{0.0 \text{ min}}_{\text{return time}} + \underbrace{2.6 \text{ min}}_{100 \text{ der passes}} + \underbrace{1.0 \text{ min}}_{\text{dump and maneuver time}} = 3.7$ $Rate = \underbrace{63 \text{ LCY}}_{\text{net truck capacity}} / \underbrace{3.7 \text{ min}}_{\text{cycle time}} = 17.1 \text{ LCY/min}$	n

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving	Activity:								
32	Intentionally Left Blank								
naracterizat	ion of Truck Used (type, size, etc.) <sup>3</sup>								
	Caterpillar 777D								
	Struck Capacity [LCY]								
	Heaped Capacity [LCY]								
67	Adjusted Capacity (Average of Struck and Heaped) [	.CY]							
· · ·	of Truck Use (origin, destination, grade,haul distance, t	uck capacity, etc.):							
	ft. average haul distance								
1.0%	Grade (Loaded)								
3.0%	Rolling Resisance								
	5								
oductivity C	Calculation <sup>3</sup>								
oductivity C	Calculation <sup>3</sup>								
oductivity C Loader		s Net Truck =	16 LCY *	4 =	= 63	LCY			
Loader Passes Per	= <u>67 LCY</u> / <u>16 LCY</u> = 4 passe truck capacity loader bucket		16 LCY *	4 = loader passes	= 63	LCY			
Loader	= <u>67 LCY</u> / <u>16 LCY</u> = 4 passe truck capacity loader bucket				= 63	LCY			
Loader Passes Per	= <u>67 LCY</u> / <u>16 LCY</u> = 4 passe truck capacity loader bucket		loader bucket net	loader passes	= 63	LCY			
Loader Passes Per	= <u>67 LCY</u> / <u>16 LCY</u> = 4 passe truck capacity / <u>16 LCY</u> = 4 passe net capacity		loader bucket net capacity	loader passes per truck			10 min =	37	m
Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity —	loader bucket net	loader passes per truck		min +	1.0 min = dump and	3.7	r
Loader Passes Per Truck Loading	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity —	loader bucket net capacity 0.1 min +	loader passes per truck 0.0 min +	- 2.6	min +		3.7	m
Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity —	loader bucket net capacity 0.1 min +	loader passes per truck 0.0 min +	- 2.6 loading tin	min +	dump and	3.7	m
Loader Passes Per Truck Loading Time Per Truck	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity — Truck Cycle = Time —	loader bucket net capacity 0.1 min + haul time	loader passes per truck 0.0 min return time	- 2.6 loading tin truck	min + ne per	dump and	3.7	n
Loader Passes Per Truck Loading Time Per	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= 3.7 \text{ min} / 2.6 \text{ min} = 1 \text{ trucks}$	Capacity — Truck Cycle = Time — Production =	loader bucket net capacity       0.1 min + haul time       63 LCY /	loader passes per truck       0.0 min       return time       3.7 min	- 2.6 loading tin truck	min +	dump and	3.7	n
Loader Passes Per Truck Loading Time Per Truck Number of	= <u>67 LCY</u> / <u>16 LCY</u> = 4 passe loader bucket net capacity = <u>0.7 min</u> * <u>4</u> = 2.6 min loader cycle time = <u>3.7 min</u> / <u>2.6 min</u> = 1 trucks (round	Capacity — Truck Cycle = Time — Production =	loader bucket net capacity 0.1 min + haul time	loader passes per truck 0.0 min return time	- 2.6 loading tin truck	min + ne per	dump and	3.7	n
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ trucks}$	Capacity — Truck Cycle = Time — Production =	loader bucket net capacity       0.1 min + haul time       63 LCY /	loader passes per truck       0.0 min       return time       3.7 min	- 2.6 loading tin truck	min + ne per	dump and	3.7	n
Loader Passes Per Truck Loading Time Per Truck Number of Trucks Required	= <u>67 LCY</u> / <u>16 LCY</u> = 4 passe loader bucket net capacity = <u>0.7 min</u> * <u>4</u> = 2.6 min loader cycle time * <u>4</u> = 2.6 min = <u>3.7 min</u> / <u>2.6 min</u> = 1 trucks truck cycle time truck loading time down)	Capacity — Truck Cycle = Time — Production = Rate —	loader bucket net capacity 0.1 min + haul time 63 LCY / net truck capacity	loader passes per truck       0.0 min return time       3.7 min cycle time	2.6 loading tin truck	min+ he per LCY/min	dump and	3.7	n
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$= \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $= \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ trucks}$ (round down) $= 17 \text{ LCY/min} * 50 \text{ min/hr} = 854 \text{ LCY/hin}$	Capacity — Truck Cycle = Time — Production = Rate —	loader bucket net capacity       0.1 min + haul time       63 LCY /	loader passes per truck       0.0 min       return time       3.7 min	2.6 loading tin truck	min + ne per	dump and	3.7	n

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

arthmoving	g Activity:	
32	Intentionally Left Blank	
naracterizat	tion of Truck Used (type, size, etc.) <sup>3</sup>	
	Caterpillar 777D	
	Struck Capacity [LCY]	
79	Heaped Capacity [LCY]	
67	Adjusted Capacity (Average of Struck and Heaped) [	[LCY]
	of Truck Use (origin, destination, grade,haul distance, t	truck capacity, etc.):
100	ft. average haul distance	
1.0%	Grade (Loaded)	
3.0%	Rolling Resisance	
oductivity (	Calculation <sup>3</sup>	
oductivity (	Calculation <sup>3</sup>	
oductivity C		es Net Truck = 14 LCY * 4 = 57 LCY
Loader Passes Per	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity loader bucket	Net Truck = <u>14 LCY</u> * <u>4</u> = 57 LCY Capacity loader bucket net loader passes
Loader	= <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity loader bucket	
Loader Passes Per	=     67 LCY     /     14 LCY     =     4 passe       truck capacity     loader bucket	Capacity loader bucket net loader passes
Loader Passes Per Truck	T = <u>67 LCY</u> / <u>14 LCY</u> = 4 passe truck capacity loader bucket net capacity	Capacity loader bucket net loader passes capacity per truck
Loader Passes Per Truck Loading Time Per	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity loader bucket net loader passes
Loader Passes Per Truck Loading	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       0.1 min +       0.0 min       +       2.6 min       +       1.0 min       =       3.7 min
Loader Passes Per Truck Loading Time Per	$\int_{C} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $\int_{C} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       0.1 min +       0.0 min +       2.6 min +       1.0 min =       3.7 min =         Time       haul time       return time       Ioading time per       dump and       3.7 min =
Loader Passes Per Truck Loading Time Per Truck	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$	Capacity       Integration       Integration       Integration         Capacity       Integration       Integration       Integration       Integration         Truck Cycle       =       0.1 min       +       0.0 min       +       2.6 min       +       1.0 min       =       3.7 min         Time       Integration       Integration       Feature       Integration       Integration       +       1.0 min       =       3.7 min         Time       Integration       Integration       Feature       Integration       Integration       +       1.0 min       =       3.7 min         Time       Integration       Integration       Feature       Integration       +       1.0 min       =       3.7 min         Time       Integration       Integration       Feature       Integration       Integration       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -
Loader Passes Per Truck Loading Time Per	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $f = 3.7 \text{ min} / 2.6 \text{ min} = 1 \text{ trucks}$	Capacity loader bucket net capacity loader passes per truck Truck Cycle = 0.1 min + 0.0 min + 2.6 min + 1.0 min = 3.7 m Time haul time return time loading time per dump and truck maneuver time truck maneuver time
Loader Passes Per Truck Loading Time Per Truck Number of	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $f = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$	Capacity       Ioader bucket net capacity       Ioader passes per truck         Truck Cycle =       0.1 min +       0.0 min +       2.6 min +       1.0 min =       3.7 min =         Time       haul time       return time       Ioader passes per truck
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $f = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$	Capacity loader bucket net capacity loader passes per truck Truck Cycle = 0.1 min + 0.0 min + 2.6 min + 1.0 min = 3.7 m Time haul time return time loading time per dump and truck maneuver time truck maneuver time
Loader Passes Per Truck Loading Time Per Truck Number of Trucks Required	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $f = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$ (round time)	Capacity $intermatrix intermatrix inclusion in the constraint of $
Loader Passes Per Truck Loading Time Per Truck Number of Trucks	$f = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passe}$ $f = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ $f = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$ $f = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ truck}$ $f = \frac{15 \text{ LCY/min}}{15 \text{ LCY/min}} \times 50 \text{ min/hr} = 773 \text{ LCY/}$	Capacity $intermatrix intermatrix inclusion in the constraint of $

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

100 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resisance Productivity Calculation <sup>3</sup> Passes Per Truck $\frac{14 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = \frac{4 \text{ passes}}{\text{net capacity}} $ Net Truck $\frac{14 \text{ LCY}}{\text{loader bucket net}} + \frac{4}{\text{loader passes}} = 57 \text{ LCY}$	PRODUCTIV							
32 Intentionally Left Blank haracterization of Truck Used (type, size, etc.) <sup>3</sup> Caterpillar 7770 55 Struck Capacity [LCY] 77 Heaped Capacity [LCY] 76 Adjusted Capacity (Average of Struck and Heaped) [LCY] 2escription of Truck Use (origin, destination, grade,haul distance, truck capacity, etc.): 100 ft. average haul distance 1.0% Grade (Loader) 3.0% Rolling Resisance roductivity Calculation <sup>3</sup> Loader = <u>67 LCY</u> / <u>14 LCY</u> = <u>4</u> passes roductivity Calculation <sup>3</sup> Loader = <u>67 LCY</u> / <u>14 LCY</u> = <u>4</u> passes roductivity Calculation <sup>3</sup> Loader grade (Loader) 10% Capacity - <u>10% Grade Founder</u> ruck capacity - <u>10% Grade Founder</u> 10% Grade founder 10% Grade fou		ITY AND HOURS REQUIRED FOR TRUCK USE						
32 Intentionally Left Blank 24 Intentionally Left Blank 25 Intentionally Left Blank 25 Intentionally Left Blank 26 Interview 1970 26 Interview 1970 27 Interview 1970 26 Interview 1970 26 Interview 1970 26 Interview 1970 27 Interview 1970 26 Interview 1970 27 Interview 1970 28 Interview 1970 29 Interview 1970 29 Interview 1970 20 Intervi								
$\frac{1}{10000000000000000000000000000000000$	-	-						
Caterpillar 777D       Caterpillar 777D         55       Struck Capacity       [LCY]         79       Heaped Capacity       [LCY]         67       Adjusted Capacity (Average of Struck and Heaped) [LCY]         Description of Truck Use (origin, destination, grade,haul distance, truck capacity, etc.):       100         100       ft. average haul distance       10% Grade (Loaded)         3.0%       Rolling Resisance         Productivity Calculation <sup>3</sup> Net Truck = 14 LCY + 10 order passes         Loader = 67 LCY       / 14 LCY = 4 passes         Passes Per       67 LCY         Truck capacity       / 10 date roucket         net capacity       et al. (Cycle = 0.1 min + 0.0 m	32	Intentionally Left Blank						
Caterpillar 777D       Caterpillar 777D         55       Struck Capacity       [LCY]         56       Adjusted Capacity       [LCY]         67       Adjusted Capacity (Average of Struck and Heaped) [LCY]         Description of Truck Use (origin, destination, grade, haul distance, truck capacity, etc.):       100         100       ft. average haul distance       10%         10%       Grade (Loaded)       3.0%         3.0%       Rolling Resisance         Passes Per       67       LCY         Truck       - 14       LCY +         Loader =       67       LCY         ruck capacity       / 14       LCY =       4         Passes       - 14       LCY +         Truck       - 67       LCY         Loading =       0.7       - 14       LCY =         Truck =       - 14       LCY +         - 10ader passes       per truck         Passes       - 10ader passes       per truck         - 10ader passes       - 10       - 10         - 10ader passes       - 57       LCY         - 10ader passes       - 10       - 10         - 10ader passes       - 10       - 10         - 10ader pass	haracterizat	ion of Truck Used (type size etc.) <sup>3</sup>						
55       Struck Capacity       [LCY]         79       Heaped Capacity       [LCY]         74       Heaped Capacity       [LCY]         75       Adjusted Capacity       [LCY]         76       Adjusted Capacity (Average of Struck and Heaped) [LCY]         Description of Truck Use (origin, destination, grade,haul distance, truck capacity, etc.):         100       ft. average haul distance         1.0%       Grade (Loaded)         3.0%       Rolling Resisance         Net Truck         Passes Per       ft. LCY         Truck       - ft. LCY         1       Ioader passes         1       It cock passes         1       Ioader passes         1       Ioader passes         1       Ioader pas	maraotonzat							
79       Heaped Capacity       [LCY]         67       Adjusted Capacity       [LCY]         Description of Truck Use (origin, destination, grade, haul distance, truck capacity, etc.):         100       ft. average haul distance         100       ft. average haul distance       100         Production <sup>3</sup> 10       11         Loading = 0.7 min       4       passes       10         Truck = 10       0.7 min       10       10       10         Truck = 0.7 min<	55							
67 Adjusted Capacity (Average of Struck and Heaped) [LCY] Description of Truck Use (origin, destination, grade, haul distance, truck capacity, etc.): 100 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resisance troductivity Calculation <sup>3</sup> Passes Per Truck $\frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passes}$ $\frac{\text{Net Truck}}{\text{Truck}} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passes}$ $\frac{\text{Net Truck}}{\text{Loader bucket}} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 2.6 \text{ min}$ $\frac{100 \text{ ft.}}{\text{Truck}} = \frac{0.7 \text{ min}}{\text{loader passes}} = 2.6 \text{ min}$ $\frac{100 \text{ ft.}}{\text{Truck}} = \frac{3.7 \text{ min}}{\text{loader passes}} / \frac{2.6 \text{ min}}{\text{menuver time}} = 1 \text{ trucks}} = \frac{11 \text{ truck capacity}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ trucks}} = \frac{57 \text{ LCY}}{(\text{round down})} = \frac{57 \text{ LCY}}{(\text{round down})} = \frac{57 \text{ LCY}}{(\text{round down})} = \frac{57 \text{ LCY}}{(\text{round town rate})} = \frac{15.5 \text{ LCY/min}}{(\text{round town rate})} = \frac{15.5 \text{ LCY/min}}{(round town r$								
Description of Truck Use (origin, destination, grade,haul distance, truck capacity, etc.): 100 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resisance Productivity Calculation <sup>3</sup> Loader = $\frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passes}$ Productivity Calculation <sup>3</sup> Loading = $\frac{0.7 \text{ min}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passes}$ Required = $\frac{0.7 \text{ min}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passes}$ Productivity Calculation <sup>3</sup> Net Truck = $\frac{14 \text{ LCY}}{\text{loader bucket}} + \frac{4}{\text{loader bucket}} = 57 \text{ LCY}$ Truck Cycle = $\frac{0.1 \text{ min}}{\text{loader cycle time}} + \frac{2.6 \text{ min}}{\text{loader passes}} = 3.7 \text{ min}$ Number of = $\frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ trucks}$ Required = $\frac{57 \text{ LCY}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading}} = 773 \text{ LCY/hr}$ Hours = $\frac{-57 \text{ LCY}}{\text{volume to be}} / \frac{773 \text{ LCY/hr}}{\text{work hour factor}} = - \text{ hrs}$			1					
$\frac{100 \text{ ft. average hall distance}}{1.0\% \text{ Grade (Loaded)}}$ $3.0\% \text{ Rolling Resisance}$ $\frac{100 \text{ ft. average hall distance}}{3.0\% \text{ Rolling Resisance}}$ $\frac{100 \text{ ft. average hall distance}}{1.0\% \text{ Grade (Loaded)}}$ $3.0\% \text{ Rolling Resisance}$ $\frac{100 \text{ ft. average hall distance}}{1.0\% \text{ Grade (Loaded)}}$ $\frac{100 \text{ ft. average hall distance}}{1.0\% \text{ Grade (Loaded)}}$ $\frac{100 \text{ ft. average hall distance}}{1.0\% \text{ Rolling Resisance}}$ $\frac{100 \text{ ft. average hall distance}}{1.0\% \text{ Grade (Loaded)}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ ft. average hall distance}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100 \text{ der passes}}$ $\frac{100 \text{ ft. average hall distance}}{100  der passes$		, , , , , , , , , , , , , , , , , , , ,						
1.0% Grade (Loaded)         3.0% Rolling Resistance         Productivity Calculation <sup>3</sup> Loader = $\frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket}} = 4 \text{ passes}$ Passes Per Truck         Loading = $0.7 \text{ min}}{\text{Truck}} * \frac{4}{\text{loader passes}} = 2.6 \text{ min}$ Time Per Truck         loader cycle time         * $\frac{4}{\text{loader passes}} = 2.6 \text{ min}$ Truck Cycle = $0.1 \text{ min} + 0.0 \text{ min} + \frac{2.6 \text{ min}}{\text{loader passes}} + \frac{1.0 \text{ min}}{\text{dump and}} = 3.7 \text{ min}$ Number of = $3.7 \text{ min} + \frac{2.6 \text{ min}}{\text{truck loading}} = 1 \text{ trucks} (round down) time         Hourly = \frac{15 \text{ LCY/min}}{\text{truck cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour}} = 773 \text{ LCY/hr} $	Description c	of Truck Use (origin, destination, grade, haul distance, truck	capacity, etc.):					
3.0% Rolling Resisance Productivity Calculation <sup>3</sup> $ \begin{array}{c} \text{Loader} = & \frac{67 \text{ LCY}}{\text{truck capacity}} & \left( \begin{array}{c} \frac{14 \text{ LCY}}{\text{loader bucket}} = & 4 \text{ passes} \\ \text{net capacity} \end{array} \right) \\ \begin{array}{c} \text{Net Truck} = & \frac{14 \text{ LCY}}{\text{loader bucket net}} & \frac{4}{\text{loader passes}} = & 57 \text{ LCY} \\ \text{Capacity} \end{array} \right) \\ \begin{array}{c} \text{Loading} = & 0.7 \text{ min} \\ \text{Time Per Truck} \end{array} \right) \\ \begin{array}{c} \text{Loading} = & 0.7 \text{ min} \\ \text{loader cycle time} \end{array} \right) \\ \begin{array}{c} \text{Ader passes} = & 2.6 \text{ min} \\ \text{loader passes} = & 2.6 \text{ min} \\ \text{Truck Cycle} = & 0.1 \text{ min} + & 0.0 \text{ min} \\ \text{Hourg} = & \frac{14 \text{ LCY}}{\text{loader passes}} \end{array} \right) \\ \begin{array}{c} \text{Truck Cycle} = & 0.1 \text{ min} + & 0.0 \text{ min} \\ \text{Hourg} = & \frac{10.7 \text{ min}}{\text{return time}} + & \frac{10 \text{ min}}{\text{loader passes}} \end{array} \right) \\ \begin{array}{c} \text{Truck Cycle time} = & 0.1 \text{ min} + & 0.0 \text{ min} \\ \text{Hourg} = & \frac{57 \text{ LCY}}{\text{return time}} \end{array} \right) \\ \begin{array}{c} \text{Production} = & \frac{57 \text{ LCY}}{\text{ruck cycle time}} \end{array} \right) \\ \begin{array}{c} \text{Production} = & \frac{57 \text{ LCY}}{\text{ruck cycle time}} \end{array} \right) \\ \begin{array}{c} \text{Production} = & \frac{57 \text{ LCY}}{\text{ruck cycle time}} \end{array} \right) \\ \begin{array}{c} \text{Production} = & \frac{57 \text{ LCY}}{\text{ruck cycle time}} \end{array} \right) \\ \begin{array}{c} \text{Production} = & \frac{57 \text{ LCY}}{\text{ruck cycle time}} \end{array} \right) \\ \begin{array}{c} \text{Hourg} = & \frac{15 \text{ LCY/min}}{\text{ruck boaring}} \end{array} \right) \\ \begin{array}{c} \text{Hourg} = & \frac{16 \text{ LCY}}{\text{ruck capacity}} \end{array} \right) \\ \begin{array}{c} \text{Hourg} = & \frac{16 \text{ LCY}}{\text{ruck capacity}} \end{array} \right) \\ \begin{array}{c} \text{Hourg} = & - \text{ hrs} \end{array} \right) \\ \end{array}$	100	ft. average haul distance						
$\frac{1}{10000000000000000000000000000000000$	1.0%	Grade (Loaded)						
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.0%	Rolling Resisance						
Passes Per Trucktruck capacityloader bucket net capacityCapacityloader bucket net capacityloader passes per truckLoading = Time Per Truck0.7 min loader cycle time* Hoder passes4 loader passes= 2.6 min2.6 min loader passesTruck Cycle = net capacity0.1 min + haul time0.0 min min + return time+ loader passes per truck1.0 min = dump and maneuver time3.7 min maneuver timeNumber of Trucks Required3.7 min truck cycle time/ 2.6 min = truck loading time1 trucks (round down)1 truck capacityProduction = net truck capacity57 LCY / S7 truck capacity3.7 min cycle time= 1.5.5 tCY/min1.0 min = dump and maneuver time3.7 min me= 1.0 min = dump and maneuver time3.7 min me= 1.0 min = dump and maneuver time= 3.7 min me3.7 min me= 1.5.5 tCY/min= 3.7 min me= 3.7 min me= 								
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Productivity C	Calculation <sup>3</sup>						
Passes Per Trucktruck capacityloader bucket net capacityCapacityloader bucket net capacityloader passes per truckLoading = Time Per Truck0.7 min loader cycle time* Hoder passes4 loader passes= 2.6 min2.6 min loader passesTruck Cycle = net capacity0.1 min + haul time0.0 min min + return time+ loader passes per truck1.0 min = dump and maneuver time3.7 min maneuver timeNumber of Trucks Required3.7 min truck cycle time/ 2.6 min = truck loading time1 trucks (round down)1 truck capacityProduction = net truck capacity57 LCY / S7 truck capacity3.7 min cycle time= 1.5.5 tCY/min1.0 min = dump and maneuver time3.7 min me= 1.0 min = dump and maneuver time3.7 min me= 1.0 min = dump and maneuver time= 3.7 min me3.7 min me= 1.5.5 tCY/min= 3.7 min me= 3.7 min me= 								
Passes Per Trucktruck capacityloader bucket net capacityCapacityloader bucket net capacityloader passes per truckLoading = Time Per Truck0.7 min loader cycle time* Hoder passes4 loader passes= 2.6 min2.6 min loader passesTruck Cycle = net capacity0.1 min + haul time0.0 min return time+ loader passes per truck2.6 min dump and maneuver timeTruck Cycle = loader passes0.1 min + haul time+ return time2.6 min loading time per truck+ 1.0 min = dump and maneuver time3.7 min maneuver time+ loading time per truck1.0 min = dump and maneuver time3.7 min maneuver time+ loading time per truck1.0 min = dump and maneuver time3.7 min maneuver time=3.7 min maneuver time=3.7 min maneuver time+1.0 min = dump and maneuver time3.7 min maneuver time=3.7 min maneuver time=1.5.5 LCY/min maneuver time <td>Loader</td> <td>= 67 LCY / 14 LCY <math>=</math> 4 passes</td> <td>Net Truck =</td> <td>14 LCY *</td> <td>4 =</td> <td>57 LC</td> <td>Y</td> <td></td>	Loader	= 67 LCY / 14 LCY $=$ 4 passes	Net Truck =	14 LCY *	4 =	57 LC	Y	
$\frac{\text{Loading}}{\text{Time Per}} = \frac{0.7 \text{ min}}{\text{Ioader cycle time}} * \frac{4}{\text{Ioader passes}} = 2.6 \text{ min}$ $\frac{\text{Truck Cycle}}{\text{Truck}} = \frac{0.1 \text{ min} + 0.0 \text{ min}}{\text{Ioader cycle time}} * \frac{4}{\text{Ioader passes}} = 2.6 \text{ min}$ $\frac{\text{Truck Cycle}}{\text{Time}} = \frac{0.1 \text{ min} + 0.0 \text{ min}}{\text{haul time}} * \frac{0.0 \text{ min}}{\text{return time}} * \frac{2.6 \text{ min}}{\text{Ioading time per}} = 3.7 \text{ min}}{10000000000000000000000000000000000$								
Time Per TruckIndex passes per truckIndex p	Truck	net capacity						
Time Per TruckIoader cycle timeIoader passes per truckTimeIoading timeIoading timeIoading time per truckNumber of Trucks Required $3.7 \text{ min}$ truck cycle time/ $2.6 \text{ min}$ truck loading time= 1 trucks (round down)Production = net truck capacity $57 \text{ LCY} / 3.7 \text{ min}$ cycle time= 15.5 LCY/minHourly = Production rate $15 \text{ LCY/min}$ work hour $50 \text{ min/hr}$ work hour= 773 LCY/hrHours = return time $- \text{ LCY} / 773 \text{ LCY/hr}$ work hour factor $- \text{ hrs}$				capacity	per truck			
Time Per Truckloader cycle time per truckloader passes per truckTimehaul timereturn timeloading time per truckdump and maneuver timeNumber of Trucks Required $3.7 \text{ min}$ truck cycle time/ $2.6 \text{ min}$ truck loading time=1trucks return timeFroduction = $57 \text{ LCY} / 3.7 \text{ min}$ erturk capacity=15.5 LCY/minHourly = Production rate $15 \text{ LCY/min} * 50 \text{ min/hr}$ work hour= $773 \text{ LCY/hr}$ Hours Required= $- \text{ LCY} / 773 \text{ LCY/hr}$ work hour factor=-hrs				сараску	per truck			
Number of = $3.7 \text{ min}$ / $2.6 \text{ min}$ = 1 trucks Trucks Required ruck cycle time / $2.6 \text{ min}$ = 1 trucks Required ruck cycle time / $2.6 \text{ min}$ = 1 trucks (round down) time / $15.5 \text{ LCY/min}$ = $15.5 \text{ LCY/min}$ = $15.5 \text{ LCY/min}$ Hourly = $15 \text{ LCY/min}$ * $50 \text{ min/hr}$ = $773 \text{ LCY/hr}$ $100 \text{ Hours}$ = $- \text{ LCY}$ / $773 \text{ LCY/hr}$ = $- \text{ hrs}$ Required ruck capacity / $773 \text{ LCY/hr}$ = $- \text{ hrs}$	Loading	= 0.7 min * 4 = 2.6 min	Truck Cycle <sub>=</sub>		·	2.6 min	1 + 1.0 min =	3.7 m
Trucks Required       truck cycle time       truck loading time       (round down)       Rate       net truck capacity       cycle time         Hourly =       15       LCY/min       *       50       min/hr       =       -       LCY /       773       LCY/hr       =       -       hrs         Production       -       -       work hour       work hour       -       hrs	Time Per			0.1 min +	0.0 min +			3.7 m
Trucks Required       truck cycle time       truck loading time       (round down)       Rate       net truck capacity       cycle time         Hourly =       15       LCY/min       *       50       min/hr       =       -       LCY /       773       LCY/hr       =       -       hrs         Production       -       -       work hour       work hour       -       hrs	Time Per	loader cycle time loader passes		0.1 min +	0.0 min +	loading time pe	er dump and	3.7 m
Required $Hourly = 15 LCY/min * 50 min/hr = 773 LCY/hr  Production rate work hour T Hours = - LCY / 773 LCY/hr = - hrsRequired Hourly = - LCY / 773 LCY/hr = - hrs$	Time Per	loader cycle time loader passes		0.1 min +	0.0 min +	loading time pe	er dump and	3.7 m
Hourly = <u>15 LCY/min</u> * <u>50 min/hr</u> = 773 LCY/hr Production rate work hour Hours = <u>- LCY / 773 LCY/hr</u> = - hrs Required <sup>2</sup> volume to be work hour factor	Time Per Truck Number of	loader cycle time loader passes per truck	Time -	0.1 min + haul time	0.0 min + return time	loading time po truck	er dump and maneuver time	3.7 m
Production production rate work hour Required <sup>2</sup> volume to be work hour factor	Time Per Truck Number of Trucks	loader cycle time     loader passes per truck       =     3.7 min       truck cycle time     /       2.6 min     =       1     trucks       (round down)	Time -	0.1 min + haul time 57 LCY /	0.0 min + return time 3.7 min =	loading time po truck	er dump and maneuver time	3.7 m
Production rate work hour Required <sup>2</sup> volume to be work hour factor	Time Per Truck Number of Trucks	loader cycle time     loader passes per truck       =     3.7 min       truck cycle time     /       2.6 min     =       1     trucks       (round down)	Time -	0.1 min + haul time 57 LCY /	0.0 min + return time 3.7 min =	loading time po truck	er dump and maneuver time	3.7 m
	Time Per Truck Number of Trucks Required	loader cycle time     loader passes per truck       =     3.7 min       truck cycle time     /       2.6 min     =       1     trucks       truck cycle time     /       time     (round down)	Time - Production <sub>=</sub> Rate -	0.1 min + haul time 57 LCY /	0.0 min + return time 3.7 min =	loading time po truck	er dump and maneuver time	3.7 m
	Time Per Truck Number of Trucks Required Hourly	loader cycle time       loader passes per truck         =       3.7 min truck cycle time       /       2.6 min truck loading time       =       1 trucks         =       15 LCY/min       *       50 min/hr       =       773 LCY/hr	Time - Production = Rate - Hours =	0.1 min + haul time 57 LCY / net truck capacity - LCY /	0.0 min + return time + 3.7 min = cycle time = 773 LCY/hr =	loading time pr truck	er dump and maneuver time	3.7 m

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

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RODUCTIV	ITY AND HOURS REQ	UIRED FOR TRU	JCK USE								
arthmoving											
32	Intentionally Left Blank										
aracterizat	ion of Truck Used (type,	size etc.) <sup>3</sup>									
laraotorizat	Caterpillar 777D	0120, 010.)									
55	Struck Capacity [LCY]										
	Heaped Capacity [LCY	1									
	Adjusted Capacity (Ave	-	nd Heaped) [LCY	1							
		-		-							
escription c	of Truck Use (origin, des	tination, grade,ha	ul distance, truck	capacity, etc.):							
100	ft. average haul distand	ce									
1.0%	Grade (Loaded)										
	0.000 (200000)										
3.0%	Rolling Resisance										
3.0%	. ,										
	Rolling Resisance										
3.0% oductivity C	Rolling Resisance										
	Rolling Resisance	13 LCY =	5 passes	Net Truck <sub>=</sub>	13 LCY *	5	= 66	LCY			
oductivity C Loader Passes Per	Rolling Resisance calculation <sup>3</sup> = <u>67 LCY</u> /	13 LCY =	5 passes	Net Truck <sub>=</sub> Capacity <sup>-</sup>	loader bucket net	5 loader passes	= 66	LCY			
oductivity C Loader	Rolling Resisance calculation <sup>3</sup> = <u>67 LCY</u> /		5 passes				= 66	LCY			
oductivity C Loader Passes Per	Rolling Resisance calculation <sup>3</sup> = <u>67 LCY</u> /	loader bucket	5 passes		loader bucket net	loader passes	= 66	LCY			
oductivity C Loader Passes Per Truck Loading	Rolling Resisance Calculation <sup>3</sup> = <u>67 LCY</u> /	loader bucket	·	Capacity <sup>-</sup> Truck Cycle <sub>=</sub>	loader bucket net	loader passes per truck		LCY min +	1.0 min =	4.3	m
oductivity C Loader Passes Per Truck Loading Time Per	Rolling Resisance Calculation <sup>3</sup> $= \frac{67 \text{ LCY}}{\text{truck capacity}} / $ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} *$	loader bucket       net capacity       5       loader passes	·	Capacity <sup>-</sup>	loader bucket net capacity	loader passes per truck	+ <u>3.3</u> loading ti	min + me per	dump and	4.3	n
oductivity C Loader Passes Per Truck Loading	Rolling Resisance Calculation <sup>3</sup> $= \frac{67 \text{ LCY}}{\text{truck capacity}} / $ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} *$	loader bucket net capacity 5 =	·	Capacity <sup>-</sup> Truck Cycle <sub>=</sub>	loader bucket net capacity 0.1 min +	loader passes per truck 0.0 min	+ 3.3	min + me per		4.3	n
oductivity C Loader Passes Per Truck Loading Time Per Truck	Rolling Resisance Calculation <sup>3</sup> $= \frac{67 \text{ LCY}}{\text{truck capacity}} / $ $= \frac{0.7 \text{ min}}{\text{loader cycle time}} *$	loader bucket net capacity 5 = loader passes per truck	·	Capacity - Truck Cycle <sub>=</sub> Time -	loader bucket net capacity 0.1 min + haul time	loader passes per truck 0.0 min return time	+ 3.3 loading ti truc	min + me per k	dump and maneuver time	4.3	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of	Rolling Resisance Calculation <sup>3</sup> = 67 LCY / truck capacity / $= 0.7 min * loader cycle time * $ $= 4.3 min /$	loader bucket net capacity       5       loader passes per truck       3.3 min	3.3 min 1 trucks	Capacity - Truck Cycle <sub>=</sub> Time - Production <sub>=</sub>	loader bucket net capacity 0.1 min + haul time 66 LCY /	loader passes per truck 0.0 min return time 4.3 min	+ 3.3 loading ti truc	min + me per	dump and maneuver time	4.3	n
oductivity C Loader Passes Per Truck Loading Time Per Truck	Rolling Resisance Calculation <sup>3</sup> = 67 LCY / truck capacity / truck capacity / truck capacity / truck capacity / truck cycle time / truck cycle	loader bucket net capacity       5       loader passes per truck       3.3     min       truck loading	3.3 min	Capacity - Truck Cycle <sub>=</sub> Time -	loader bucket net capacity 0.1 min + haul time	loader passes per truck 0.0 min return time	+ 3.3 loading ti truc	min + me per k	dump and maneuver time	4.3	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of Trucks	Rolling Resisance Calculation <sup>3</sup> = 67 LCY / truck capacity / truck capacity / truck capacity / truck capacity / truck cycle time / truck cycle	loader bucket net capacity       5       loader passes per truck       3.3 min	3.3 min 1 trucks	Capacity - Truck Cycle <sub>=</sub> Time - Production <sub>=</sub>	loader bucket net capacity 0.1 min + haul time 66 LCY /	loader passes per truck 0.0 min return time 4.3 min	+ 3.3 loading ti truc	min + me per k	dump and maneuver time	4.3	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of Trucks Required	Rolling Resisance Calculation <sup>3</sup> = <u>67 LCY</u> / truck capacity = <u>0.7 min</u> * = <u>4.3 min</u> /	loader bucket         net capacity         5         loader passes         per truck         3.3         truck loading         time	3.3 min 1 trucks (round down)	Capacity - Truck Cycle = Time - Production = Rate -	loader bucket net capacity 0.1 min + haul time 66 LCY / net truck capacity	loader passes per truck 0.0 min return time 4.3 min cycle time	+ <u>3.3</u> loading ti truc = 15.2	<u>min</u> + me per k LCY/min	dump and maneuver time	4.3	n
oductivity C Loader Passes Per Truck Loading Time Per Truck Number of Trucks	Rolling Resisance Calculation <sup>3</sup> = <u>67 LCY</u> / truck capacity = <u>0.7 min</u> * = <u>4.3 min</u> / truck cycle time = 15 LCY/min *	loader bucket         net capacity         5         loader passes         per truck         3.3         truck loading         time	3.3 min 1 trucks	Capacity - Truck Cycle <sub>=</sub> Time - Production <sub>=</sub>	loader bucket net capacity 0.1 min + haul time 66 LCY /	loader passes per truck 0.0 min return time 4.3 min	+ <u>3.3</u> loading ti truc = 15.2	min + me per k	dump and maneuver time	4.3	n

1) Volume to be moved from Worksheet 3

2) Hours required go to Worksheet 13

PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE
Earthmoving Activity:
4 Grading - Scrapers Area 4 Project
Characterization of Scraper Used (type, size, etc.)3
Caterpillar 637G Scrapers Push-Pull Pair
24 Struck Capacity [yd <sup>3</sup> ]
34 Heaped Capacity [yd <sup>3</sup> ]
29 Adjusted Capacity (Average of Struck and Heaped) [yd³]
Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)
1,061 ft. average haul distance
-6.0% Grade (Loaded)
3% Rolling Resisance
Productivity Calculations <sup>3</sup> :
$Cycle = 1.0 \min + 0.7 \min + 0.6 \min + 0.6 \min = 2.8 \min$
Time <sup>3</sup> load time per pair loaded trip maneuver and return trip
time spread time time
Net Hourly = 29 LCY * 50 min/hr / 2.8 min * 2 = 1,027 LCY/h
Production adjusted capacity work hour cycle time number of
factor scrapers
Hours = 13,872,000 LCY / 1027 LCY/hr = 13,513 hrs
Required <sup>2</sup> volume to be net hourly
handled <sup>1</sup> production
Data Sources:

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET	NO. 11B				
PRODUCTIVIT	Y AND HOURS RE	QUIRED FOR S	CRAPER USE		
	<i></i>				
Earthmoving A	-				
32 Inte	entionally Left Blank				
Characterizatio	n of Scraper Used (	type, size, etc.)3			
Cat	terpillar 637G Scrap	ers Push-Pull Pa	ir		
24 Stru	uck Capacity [y	d <sup>3</sup> ]			
34 Hea	aped Capacity [y	d <sup>3</sup> ]			
29 Adj	usted Capacity (Ave	erage of Struck ar	nd Heaped) [yd³]		
Description of S	Scraper Use (origin,	destination, grad	le, haul distance,	material, etc.)	
100 ft.a	average haul distanc	e			
1.0% Gra	ade (Loaded)				
3% Rol	ling Resisance				
Productivity Ca	lculations <sup>3</sup> :				
Cycle =	1.0 min +	0.1 min +	0.6 min	+ 0.1 min =	1.8 min
Time <sup>3</sup>	oad time per pair	loaded trip	maneuver and	return trip	
		time	spread time	time	
Net Hourly =	29 LCY *	50 min/hr /	1.8 min	*=	1,657 LCY/hr
Production	adjusted capacity	work hour	cycle time	number of	
		factor		scrapers	
_					
Hours =	- LCY /	1657 LCY/hr =	- hrs		
Required <sup>2</sup>	volume to be	net hourly			
	handled <sup>1</sup>	production			
Data Sources:					

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET	NO. 11C				
PRODUCTIVI	TY AND HOURS R	EQUIRED FOR	SCRAPER USE		
Forthmoving (	a ativita u				
Earthmoving A 32 Int	-				
32 IIII	entionally Left Blan	ĸ			
Characterizati	on of Scraper Used	(type, size, etc.)	3		
Ca	aterpillar 637G Scra	pers Push-Pull F	Pair		
24 St	ruck Capacity [y	d <sup>3</sup> ]			
34 He	aped Capacity [y	d <sup>3</sup> ]			
29 Ac	ljusted Capacity (Av	verage of Struck	and Heaped) [yd <sup>3</sup>	]	
Description of	Scraper Use (origin	n, destination, gra	ade, haul distance	e, material, etc.)	
100 ft.	average haul distar	nce			
1.0% Gr	ade (Loaded)				
3% Ro	olling Resisance				
Productivity Ca	alculations <sup>3</sup> :				
Cycle <sub>=</sub>	1.0 min +	0.1 min +	0.6 min	+ 0.1 min =	1.8 min
Time <sup>3</sup>	load time per	loaded trip	maneuver and	return trip	
	pair	time	spread time	time	
Net Hourly $=$	29 LCY *	50 min/hr /	1.8 min	* 2 =	1,657 LCY/hr
Production	adjusted	work hour	cycle time	number of	
	capacity	factor		scrapers	
Hours =	- LCY /	1657 LCY/hr =	- hrs		
Required <sup>2</sup>	volume to be	net hourly			
	handled <sup>1</sup>	production			
Data Sources:					

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE         Earthmoving Activity:       32       Intentionally Left Blank         Caterpillar 637G Scrapers Push-Pull Pair         24       Struck Capacity [yd³]         34       Heaped Capacity [yd³]         29       Adjusted Capacity [yd³]         29       Adjusted Capacity (Average of Struck and Heaped) [yd³]         Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)         100       ft. average haul distance         1.0%       Grade (Loaded)         3%       Rolling Resisance         Productivity Calculations <sup>3</sup> :       Cycle =         Cycle =       1.0 min +         100 at time per pair       loaded trip         maneuver and time       return trip         100 the structure pair       spread time         Productivity Calculations <sup>3</sup> :       Cycle =         Cycle =       1.0 min +         0.1 min pair       1.8 min         Yere of time       1.8 min return trip         Yere of time       1.8 min return trip         Time <sup>3</sup> 29 LCY *       50 min/hr /         Adjusted       work hour       cycle time       number of scrapers
32 Intentionally Left Blank Characterization of Scraper Used (type, size, etc.)3 Caterpillar 637G Scrapers Push-Pull Pair 24 Struck Capacity [yd <sup>3</sup> ] 34 Heaped Capacity [yd <sup>3</sup> ] 29 Adjusted Capacity (Average of Struck and Heaped) [yd <sup>3</sup> ] Description of Scraper Use (origin, destination, grade, haul distance, material, etc.) 100 ft. average haul distance 1.0% Grade (Loaded) 3% Rolling Resisance Productivity Calculations <sup>3</sup> : Cycle = <u>1.0 min + 0.1 min + 0.1 min + 0.6 min + 0.1 min = 1.8 min time = 1.8 min = 1.8 mi</u>
32 Intentionally Left Blank Characterization of Scraper Used (type, size, etc.)3 Caterpillar 637G Scrapers Push-Pull Pair 24 Struck Capacity [yd <sup>3</sup> ] 34 Heaped Capacity [yd <sup>3</sup> ] 29 Adjusted Capacity (Average of Struck and Heaped) [yd <sup>3</sup> ] Description of Scraper Use (origin, destination, grade, haul distance, material, etc.) 100 ft. average haul distance 1.0% Grade (Loaded) 3% Rolling Resisance Productivity Calculations <sup>3</sup> : Cycle = <u>1.0 min + 0.1 min + 0.1 min + 0.6 min + 0.1 min = 1.8 min time = 1.8 min = 1.8 mi</u>
Characterization of Scraper Used (type, size, etc.)3         Caterpillar 637G Scrapers Push-Pull Pair         24 Struck Capacity [yd³]         34 Heaped Capacity [yd³]         29 Adjusted Capacity (Average of Struck and Heaped) [yd³]         Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)         100 ft. average haul distance         1.0% Grade (Loaded)         3% Rolling Resisance         Productivity Calculations <sup>3</sup> :         Cycle =       1.0 min +         10ad time per pair       loaded trip         10ad time per pair       loaded trip         spread time       *         29 LCY *       50 min/hr /         1.8 min       *         29 LCY *       50 min/hr /         1.8 min       *         21 = 1,657 LCY/hr
Caterpillar 637G Scrapers Push-Pull Pair24 Struck Capacity $[yd^3]$ 34 Heaped Capacity $[yd^3]$ 29 Adjusted Capacity (Average of Struck and Heaped) $[yd^3]$ Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)100 ft. average haul distance1.0% Grade (Loaded)3% Rolling ResisanceProductivity Calculations <sup>3</sup> : $Cycle = 1.0 \text{ min} + 0.1 \text{ min} + 0.1 \text{ min} + 0.6 \text{ min} + 0.1 \text{ min} + 0.1 \text{ min} + 1.8 \text{ min}$
Caterpillar 637G Scrapers Push-Pull Pair24 Struck Capacity $[yd^3]$ 34 Heaped Capacity $[yd^3]$ 29 Adjusted Capacity (Average of Struck and Heaped) $[yd^3]$ Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)100 ft. average haul distance1.0% Grade (Loaded)3% Rolling ResisanceProductivity Calculations <sup>3</sup> : $Cycle = 1.0 \text{ min} + 0.1 \text{ min} + 0.1 \text{ min} + 0.6 \text{ min} + 0.1 \text{ min} + 0.1 \text{ min} + 1.8 \text{ min} + 0.1 \text{ min} + 1.8 \text{ min}$
34 Heaped Capacity $[yd^3]$ 29 Adjusted Capacity (Average of Struck and Heaped) $[yd^3]$ Description of Scraper Use (origin, destination, grade, haul distance, material, etc.) 100 ft. average haul distance 1.0% Grade (Loaded) 3% Rolling Resisance Productivity Calculations <sup>3</sup> : $\frac{Cycle}{Time^3} = \frac{1.0 \text{ min}}{10 \text{ ad time per pair}} + \frac{0.1 \text{ min}}{10 \text{ aded trip}} + \frac{0.6 \text{ min}}{10 \text{ maneuver and spread time}} + \frac{0.1 \text{ min}}{100 \text{ time per pair}} = 1.8 \text{ min}$ Net Hourly = $\frac{29 \text{ LCY}}{\text{ adjusted}} + \frac{50 \text{ min/hr}}{\text{ work hour}} / \frac{1.8 \text{ min}}{\text{ cycle time}} + \frac{2}{\text{ number of}} = 1,657 \text{ LCY/hr}$
34 Heaped Capacity $[yd^3]$ 29 Adjusted Capacity (Average of Struck and Heaped) $[yd^3]$ Description of Scraper Use (origin, destination, grade, haul distance, material, etc.) 100 ft. average haul distance 1.0% Grade (Loaded) 3% Rolling Resisance Productivity Calculations <sup>3</sup> : $\frac{Cycle}{Time^3} = \frac{1.0 \text{ min}}{10 \text{ ad time per pair}} + \frac{0.1 \text{ min}}{10 \text{ aded trip}} + \frac{0.6 \text{ min}}{10 \text{ maneuver and spread time}} + \frac{0.1 \text{ min}}{100 \text{ time per pair}} = 1.8 \text{ min}$ Net Hourly = $\frac{29 \text{ LCY}}{\text{ adjusted}} + \frac{50 \text{ min/hr}}{\text{ work hour}} / \frac{1.8 \text{ min}}{\text{ cycle time}} + \frac{2}{\text{ number of}} = 1,657 \text{ LCY/hr}$
Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)         100 ft. average haul distance         1.0% Grade (Loaded)         3% Rolling Resisance         Productivity Calculations <sup>3</sup> : $Cycle = 1.0 \text{ min} + 0.1 \text{ min} + 0.1 \text{ min} + 0.6 \text{ min} + 0.1 \text{ min}$
Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)         100 ft. average haul distance         1.0% Grade (Loaded)         3% Rolling Resisance         Productivity Calculations <sup>3</sup> : $Cycle = 1.0 \text{ min} + 0.1 \text{ min} + 0.1 \text{ min} + 0.6 \text{ min} + 0.1 \text{ min}$
100 ft. average haul distance 1.0% Grade (Loaded) 3% Rolling Resisance Productivity Calculations <sup>3</sup> : $\frac{\text{Cycle}}{\text{Time}^3} = \frac{1.0 \text{ min}}{\text{load time per}} + \frac{0.1 \text{ min}}{\text{loaded trip}} + \frac{0.6 \text{ min}}{\text{maneuver and}} + \frac{0.1 \text{ min}}{\text{return trip}} = 1.8 \text{ min}$ $\frac{\text{Time}^3}{\text{return trip}} = \frac{29 \text{ LCY}}{\text{adjusted}} \times \frac{50 \text{ min/hr}}{\text{work hour}} / \frac{1.8 \text{ min}}{\text{cycle time}} \times \frac{2}{\text{number of}} = 1,657 \text{ LCY/hr}$
1.0% Grade (Loaded) 3% Rolling Resisance Productivity Calculations <sup>3</sup> : $\frac{\text{Cycle}}{\text{Time}^3} = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip}} + \frac{0.6 \text{ min}}{\text{maneuver and}} + \frac{0.1 \text{ min}}{\text{return trip}} = 1.8 \text{ min}$ Net Hourly = $\frac{29 \text{ LCY}}{\text{adjusted}} \times \frac{50 \text{ min/hr}}{\text{work hour}} / \frac{1.8 \text{ min}}{\text{cycle time}} \times \frac{2}{\text{number of}} = 1,657 \text{ LCY/hr}$
3% Rolling Resisance Productivity Calculations <sup>3</sup> : $\begin{array}{c} Cycle = & 1.0 \text{ min} + 0.1 \text{ min} \\ Time^{3} & load time per \\ pair & loaded trip \\ time & spread time & time \\ \end{array} + \begin{array}{c} 0.6 \text{ min} + 0.1 \text{ min} \\ \hline return trip \\ time & time \\ \end{array} = \begin{array}{c} 1.8 \text{ min} \\ \hline return trip \\ time & time \\ \end{array}$
Productivity Calculations <sup>3</sup> : $ \frac{\text{Cycle}}{\text{Time}^{3}} = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min} + \frac{0.1 \text{ min}}{\text{return trip tim}} = 1.8 $
$\frac{\text{Cycle}}{\text{Time}^{3}} = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$ Net Hourly = $\frac{29 \text{ LCY}}{\text{adjusted}} \times \frac{50 \text{ min/hr}}{\text{work hour}} / \frac{1.8 \text{ min}}{\text{cycle time}} \times \frac{2}{\text{number of}} = 1,657 \text{ LCY/hr}$
$\frac{\text{Cycle}}{\text{Time}^{3}} = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$ Net Hourly = $\frac{29 \text{ LCY}}{\text{adjusted}} \times \frac{50 \text{ min/hr}}{\text{work hour}} / \frac{1.8 \text{ min}}{\text{cycle time}} \times \frac{2}{\text{number of}} = 1,657 \text{ LCY/hr}$
Time <sup>3</sup> load time per pairloaded trip timemaneuver and spread timereturn trip timeNet Hourly =29 LCY *50 min/hr /1.8 min cycle time*2 number of=1,657 LCY/hr
Net Hourly = $29 \text{ LCY} * \frac{50 \text{ min/hr}}{\text{work hour}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of}} = 1,657 \text{ LCY/hr}$
Net Hourly = $29 \text{ LCY} * 50 \text{ min/hr} / 1.8 \text{ min} * 2 = 1,657 \text{ LCY/hr}$ Production adjusted work hour cycle time number of
Production adjusted work hour cycle time number of
Production adjusted work hour cycle time number of
Production adjusted work hour cycle time number of
adjusted work hour cycle time number of
capacity lactor scrapers
Hours = $-$ LCY / 1657 LCY/hr = - hrs
Required <sup>2</sup> volume to be net hourly handled <sup>1</sup> production
nanalea production

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET NO. 11E PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE
FRODUCTIVITY AND HOURS REQUIRED FOR SCRAFER USE
Earthmoving Activity:
32 Intentionally Left Blank
Characterization of Scraper Used (type, size, etc.)3
Caterpillar 637G Scrapers Push-Pull Pair
24 Struck Capacity [yd <sup>3</sup> ]
34 Heaped Capacity [yd <sup>3</sup> ]
29 Adjusted Capacity (Average of Struck and Heaped) [yd <sup>3</sup> ]
Description of Scraper Use (origin, destination, grade, haul distance, material, etc.)
100 ft. average haul distance
1.0% Grade (Loaded)
3% Rolling Resisance
Productivity Calculations <sup>3</sup> :
Cycle = 1.0 min + 0.1 min + 0.6 min + 0.1 min = 1.8 min
Time <sup>3</sup> load time per pair loaded trip maneuver and return trip
time spread time time
Net Hourly = 29 LCY * 50 min/hr / 1.8 min * 2 = 1,657 LCY/r
Production adjusted capacity work hour cycle time number of
factor scrapers
Hours = - LCY / 1657 LCY/hr = - hrs
Required <sup>2</sup> volume to be net hourly
handled <sup>1</sup> production
Data Sources:

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

WORKSHEET	「NO. 11F				
PRODUCTIVI	TY AND HOURS R	EQUIRED FOR S	SCRAPER USE		
Earthmoving A	-				
32 Int	entionally Left Blan	k			
Characterizati	on of Scraper Used	l (type, size, etc.);	3		
Ca	aterpillar 637G Scra	pers Push-Pull P	air		
24 St	ruck Capacity [y	d <sup>3</sup> ]			
34 He	eaped Capacity [y	'd <sup>3</sup> ]			
	justed Capacity (A	-	and Heaped) [vd <sup>3</sup> ]		
	,, (				
Description of	Scraper Use (origin	n, destination, gra	de, haul distance,	material, etc.)	
100 ft.	average haul distar	nce		·	
1.0% Gr	ade (Loaded)				
	olling Resisance				
	5				
Productivity C	alculations <sup>3</sup> :				
Cycle <sub>=</sub>	1.0 min +	0.1 min +	0.6 min	+ 0.1 min =	1.8 min
Time <sup>3</sup>	load time per	loaded trip	maneuver and	return trip	
	pair	time	spread time	time	
Net Hourly =	29 LCY *	50 min/hr /	1.8 min	* 2 =	1,657 LCY/hr
Production	adjusted	work hour	cycle time	number of	
	capacity	factor	-	scrapers	
Hours <sub>=</sub>		1657 LCY/hr =	- hrs		
Required <sup>2</sup>	volume to be	net hourly	- 1115		
	handled <sup>1</sup>	production			
Data Sources:					

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

3) Caterpillar Performance Handbook, Edition 37

WORKSHEET N	NO. 12A										
PRODUCTIVITY	AND HOUR	S FOR MOTO	OR GRADER US	SE GRADING							
Earthmoving Act	,										
29 Ro	ad Ripping A	rea 4 Project									
Characterization	of Grader Us	ed (type, size	e capacity, etc.) <sup>3</sup>								
Ca	aterpillar 16H										
Description of G	rader Route (	push distance	e,% blade effecti	ve length, operatin	g speed,	etc.):					
	pper width [ft]	·		0		,					
Productivity Calc	culations <sup>3</sup> :										
Contour Grading:											
Hourly =	3.4 mi/hr x	9.75 ft. x	5,280 ft/mi /	43,560 ft <sup>2</sup> /ac x	0.83	x 0.90	= 3.0 ac / hr	Hours =	0 ac	/ 2.99 ac/hr =	0 hr
Productivity -	speed	effective blade width	conversion factor	conversion factor	work hour factor	availability	<del>,</del>	Required	acreage to be graded <sup>1</sup>	hourly productivity	
Scarification:											
	1.25 mi/hr x	9.75 ft. x	5,280 ft/mi /	43,560 ft <sup>2</sup> /ac x	0.83	x 0.90	= 1.1 ac / hr	Hours =	117 ac	/ 1.10 ac/hr =	107 hr
Productivity -	work	scarifier	conversion	conversion	work	availability	,	Required	acreage to	hourly	
	speed	width	factor	factor	hour factor				be ripped <sup>1</sup>	productivity	
								Total Hours =	0 hr	+ 107 hr =	107 hr
								Required <sup>2</sup>	grading	scarification	
									hours	hours required	
									required		

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

3) Caterpillar Performance Handbook, Edition 37

WORKSHEET N	NO. 12B								
PRODUCTIVITY	AND HOUR	S FOR MOTO	OR GRADER US	E GRADING					
	tiv itv e								
Earthmoving Act	-								
33 Gra	ading Topsoil	Areas							
Characterization	of Grader Us	ed (type, size	capacity, etc.) <sup>3</sup>						
Ca	terpillar 16H								
Description of G	rader Route (r	oush distance	% blade effectiv	ve length, operating	n speed, e	etc.):			
-	oper width [ft]		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		<i>, , , , , , , , , , , , , , , , , , , </i>				
Productivity Calc	culations <sup>3</sup> :								
Contour Grading:									
Hourly =	3.4 mi/hr x	11.90 ft. x	5,280 ft/mi /	43,560 ft <sup>2</sup> /ac ×	0.83	x 0.90	= 3.7 ac / hr		341 h
Productivity -	speed	effective blade	conversion factor	conversion factor	work hour	availability	-	Required acreage to be hourly graded <sup>1</sup> productivity	
		width			factor				
Scarification:									
Hourly = Productivity	1.25 mi/hr x	9.75 ft. x	5,280 ft/mi /			x 0.90	= 1.1 ac / hr	Hours = $- ac / 1.10 ac/hr =$ Required acrosses to be bours	- h
Troductivity	work speed	scarifier width	conversion factor	conversion factor	work hour	availability		Required acreage to be hourly ripped* productivity	
	·				factor				
								2	341 h
								Required <sup>2</sup> grading hours scarification	
								required hours required	
								required	

1) Acres from Worksheet 3

2) Hours required go to Worksheet 13

3) Caterpillar Performance Handbook, Edition 37

\*No Ripping on Topsoiled Areas

Project	Equipment Type <sup>1</sup>	Ratio	Unit	ipment Costs [\$/hr] <sup>2</sup>		Costs			R	Total Hours equired <sup>4</sup>	Total Cos	
Grading - Dozer Area 4 Project	D11R Dozer	100%	(	\$304	+	\$	35	)	*	19,924	=	\$ 6,760,674
Backfill Ponds Area 4 Project	D11R Dozer	100%	(	\$304	+	\$	35	)	*	82	=	\$ 27,879
ntentionally Left Blank	D11R Dozer	100%	(	\$304	+	\$	35	)	*	-	=	\$
ntentionally Left Blank	D11R Dozer	100%	(	\$304	+	\$	35	)	*	-	=	\$ 
ntentionally Left Blank	D11R Dozer	100%	(	\$304	+	\$	35	)	*	-	=	\$ 
ntentionally Left Blank	D11R Dozer	100%	(	\$304	+	\$	35	)	*	-	=	\$ 
ntentionally Left Blank	D11R Dozer	100%	(	\$304	+	\$	35	)	*	-	=	\$ 

Total Cost = \$ 6,788,553

Equipment and Accesory Identification

1) Caterpillar D11R with Universal Blade

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 5

Project	Equipment Type <sup>1</sup>	Ratio	Equipment Unit Costs [\$/hr] <sup>2</sup>		С	abor osts /hr] <sup>3</sup>		Re	Total Hours equired <sup>4</sup>		To	tal Cost [\$
Grading - Loader/Truck Area 4 Project	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	5,709	=	\$	1,626,537
	16H Grader	50%	<b>(</b> \$ 92	+	\$	35	)	*	2,855	=	\$	363,102
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	5,709	=	\$	1,019,186
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	2,855	=	\$	480,686
Mitigation - Loader/Truck Area 4 Project	1992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	654	=	\$	186,193
	16H Grader	50%	<b>(</b> \$ 92	+	\$	35	)	*	327	=	\$	41,565
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	654	=	\$	116,668
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	327	=	\$	55,025
Topsoil - Loader/Truck Area 4 Project	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	815	=	\$	232,313
	16H Grader	50%	<b>(</b> \$ 92	+	\$	35	)	*	408	=	\$	51,861
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	815	=	\$	145,567
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	408	=	\$	68,655
Intentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	-	=	\$	
	16H Grader	50%	(\$92			35		*	-	=	\$	
	D9R Dozer	100%	<b>(</b> \$143					*	-	=	\$	
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	-	=	\$	
Intentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	-	=	\$	
	16H Grader	50%	(\$92	+	\$	35	)	*	-	=	\$	
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	-	=	\$	

Equipment and Accesory Identification

1) Caterpillar 992G Loader with standard 15 cubic yard bucket

Caterpillar 16H Grader, standard blade, road maintenance time = 1/2 loader time Caterpillar D9R Dozer with Semi-Universal Blade time = loader time

10,000 gal. Water truck, road maintenance time = 1/2 loader time

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 8 and Note 1 above

Project	Equipment Type <sup>1</sup>	Ratio	Equipment Unit Costs [\$/hr] <sup>2</sup>		С	abor osts /hr] <sup>3</sup>		Re	Total Hours quired <sup>4</sup>	Total Cost [
Intentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	- =	\$
	16H Grader	50%	(\$92	+	\$	35	)	*	- =	\$
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	- =	\$
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	- =	\$
Intentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	- =	\$
	16H Grader	50%	<b>(</b> \$92	+	\$	35	)	*	- =	\$
	D9R Dozer	100%	<b>(</b> \$143				)	*	- =	\$
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	- =	\$
ntentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	- =	\$
	16H Grader	50%	(\$92					*	- =	\$
	D9R Dozer	100%	<b>(</b> \$143					*	- =	\$
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	- =	\$
Intentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	- =	\$
	16H Grader	50%	(\$92	+	\$	35	)	*	- =	\$
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	- =	\$
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	- =	\$
Intentionally Left Blank	992G Loader	100%	<b>(</b> \$249	+	\$	35	)	*	- =	\$
	16H Grader	50%	(\$92	+	\$	35	)	*	- =	\$
	D9R Dozer	100%	<b>(</b> \$143	+	\$	35	)	*	- =	\$
	Water Truck	50%	<b>(</b> \$133	+	\$	35	)	*	- =	\$
								Tot	al Cost =	\$

Equipment and Accesory Identification

1) Caterpillar 992G Loader with standard 15 cubic yard bucket

Caterpillar 16H Grader, standard blade, road maintenance time = 1/2 loader time Caterpillar D9R Dozer with Semi-Universal Blade time = loader time

10,000 gal. Water truck, road maintenance time = 1/2 loader time

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 8 and Note 1 above

	Project	Equipment Type <sup>1</sup>	Ratio		ipment t Costs [\$/hr] <sup>2</sup>	;	С	aboı osts 3/hr] <sup>5</sup>	5	R	Total Hours tequired <sup>4</sup>	Тс	otal Cost [\$
Grading - Loader/Truck Area 4	Project	777D Truck	100%	(	\$177	+	\$	35	)	*	13,607 =	\$	2,894,776
Mitigation - Loader/Truck Area	4 Project	777D Truck	100%	(	\$177	+	\$	35	)	*	2,716 =	\$	577,759
Горsoil - Loader/Truck Area 4	Project	777D Truck	100%	(	\$177	+	\$	35	)	*	1,935 =	\$	411,718
ntentionally Left Blank		777D Truck	100%	(	\$ 177	+	\$	35	)	*	- =	\$	
ntentionally Left Blank		777D Truck	100%	(	\$ 177	+	\$	35	)	*	- =	\$	
ntentionally Left Blank		777D Truck	100%	(	\$ 177	+	\$	35	)	*	- =	\$	
ntentionally Left Blank		777D Truck	100%	(	\$ 177	+	\$	35	)	*	- =	\$	
ntentionally Left Blank		777D Truck	100%	(	\$177	+	\$	35	)	*	- =	\$	
ntentionally Left Blank		777D Truck	100%	(	\$177	+	\$	35	)	*	- =	\$	
		777D Truck	100%	(	\$177	+	\$	35	)	*	- =	\$	

Equipment and Accesory Identification

1) Caterpillar 777D Dump Truck, mechanical drive, standard bed

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 9

Project	Equipment Type <sup>1</sup>	Ratio		ipment Costs [\$/hr] <sup>2</sup>	5	C	abor osts 5/hr] <sup>3</sup>		R	Total Hours equired <sup>4</sup>		To	tal Cost [\$
Grading - Scrapers Area 4 Project	637G Scraper	100%	(	\$235	+	\$	35	)	*	13,513	=	\$	3,651,598
	637G Scraper	100%	(	\$235	+	\$	35	)	*	13,513	=	\$	3,651,598
	16H Grader	13%	(	\$ 92	+	\$	35	)	*	1,689	=	\$	214,851
	Water Truck	13%	(	\$133	+	\$	35	)	*	1,689	=	\$	284,426
Intentionally Left Blank	637G Scraper	100%	(	\$235	-+	\$	35	)	*	-	=	\$	-
	637G Scraper	100%	(	\$235	+	\$	35	)	*	-	=	\$	-
	16H Grader	13%	(	\$ 92	+	\$	35	)	*	-	=	\$	······
	Water Truck	13%	(	\$133	+	\$	35	)	*	-	=	\$	
Intentionally Left Blank	637G Scraper	100%	(	\$235	+	\$	35	)	*	-	=	\$	
	637G Scraper	100%	(	\$235	+	\$	35	)	*	-	=	\$	
	16H Grader	13%	(	\$ 92	+	\$	35	)	*	-	=	\$	
	Water Truck	13%	(	\$133	+	\$	35	)	*	-	=	\$	
Intentionally Left Blank	637G Scraper	100%	(	\$235	-+	\$	35	)	*	-	=	\$	
	637G Scraper	100%	(	\$235	+	\$	35	)	*	-	=	\$	
	16H Grader	13%	(	\$ 92	+	\$	35	)	*	-	=	\$	
	Water Truck	13%	(	\$133	+	\$	35	)	*	-	=	\$	
Intentionally Left Blank	637G Scraper	100%	(	\$235	+	\$	35	)	*	-	=	\$	
	637G Scraper	100%	(	\$235	+	\$	35	)	*	-	=	\$	
	16H Grader	13%	(	\$ 92	+	\$	35	)	*	-	=	\$	
	Water Truck	13%	(	\$133	+	\$	35	)	*	-	=	\$	

Equipment and Accesory Identification

1) Caterpillar 637G Scraper Push-Pull Pair

Caterpillar 16H Grader, standard blade, road maintenance time = 1/8 scraper time 10,000 gal. Water truck, road maintenance time = 1/8 scraper time

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 8 and Note 1 above

100% 100% 13% 13% 100%	(\$235 (\$235 (\$92 (\$133 (\$235	+ +	\$ \$	35	)	* * *	-	= =	
13% 13% 100%	(\$92 (\$133	+	\$			*	-	=	\$
13% 100%	(\$133			35	)	*			<b>T</b>
100%		+	\$				-	=	\$
	(\$235		Ψ	35	)	*	-	=	\$
1000/	· · · · · · · · · · · · · · · · · · ·	+	\$	35	)	*	-	=	\$
100%	(\$235	+	\$	35	)	*	-	=	\$
13%	(\$92	+	\$	35	)	*	-	=	\$
13%	(\$133	+	\$	35	)	*	-	=	\$
	13%	13% (	13% ( <u>\$133</u> +	13% ( <u>\$133</u> + \$	13% ( <u>\$133</u> + \$ 35	13% ( <u>\$133</u> + \$ 35)		13% ( <u>\$133</u> + \$ 35) * -	13% ( \$133 + \$ 35 ) * - =

Equipment and Accesory Identification

- 1) Caterpillar 992G Loader with standard 15 cubic yard bucket
  - Caterpillar 16H Grader, standard blade, road maintenance time = 1/8 scraper time 10,000 gal. Water truck, road maintenance time = 1/8 scraper time

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 8 and Note 1 above

Total Cost = \$

57,518

Project	Equipment Type <sup>1</sup>	Ratio	Equipment Unit Costs [\$/hr] <sup>2</sup>	Labor Costs [\$/hr] <sup>3</sup>	Total Hours Required <sup>4</sup>	Total Cost [\$
Road Ripping Area 4 Project	16H Grader, ripping	100%	<b>(</b> \$97+	\$ 35)	* 107 =	\$ 14,112
Grading Topsoil Areas	16H Grader	100%	<b>(</b> \$ 92 <b>+</b>			\$ 43,407

Equipment and Accesory Identification

1) Caterpillar 16H Motor Grader with Ripper Blade

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total Hours Required from Worksheet 12

Total Cost = \$

119,311

WORKSHEET NO. 13H SUMMARY CALCULATION OF EA	RTHMOVING COSTS	6 - Drilling				
Project	Equipment Type <sup>1</sup>	Ratio	Equipment Unit Costs [\$/hr] <sup>2</sup>	Labor Costs [\$/hr] <sup>3</sup>	Total Hours Required <sup>4</sup>	Total Cost [\$]
Drill & Blast Area 4 Project	DMM2 Drill	100%	<b>(</b> \$313 +	\$ 35)	* 343 =	\$ 119,311
Intentionally Left Blank	DMM2 Drill	100%	<b>(</b> \$313 +	\$ 35)	* 0 =	:\$0

Equipment and Accesory Identification

1) Ingersoll-Rand DMM2 Crawler-type Drill

- 2) PRIMEDIA Equipmentwatch, "Cost Reference Guide for Construction
  - Equipment," 2011 1st half edition. (see Table 12-B-23)
- 3) Labor Cost based on 2011 contract with ACME Inc. (see Table 12-B-24)
- 4) Total yardage drilled from 12-B-25 D&B

# WORKSHEET NO. 14A REVEGETATION COSTS

Name and Description of Areas to be Revegetated:

9 Revegetation Area 4 Project

Description of Revegetation Activities

Costs For <sub>=</sub> Seeding <sup>-</sup>	1,129 ac Acreage to be reseeded	_* (	382.8 \$/ac. cost for seedbed preparation	_ + _	1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	)	=	\$ 1,878,822
20% Contingency	/ for vegetation fail	ure:						
Costs For <sub>=</sub> Reseeding <sup>-</sup>	226 ac Acreage to be reseeded	_* (	382.8 \$/ac. cost for seedbed preparation	_ + <u>-</u>	1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	)	=	\$ 375,764
Other Revegetation	Activity for this Ar	ea (e.g	. Son Sampling,					
			Т	OTAL R	EVEGETATION COST	;	=	\$ 2,254,587

Data Sources:

Navajo Mine records for contractor planting costs

Seedbed Preparation includes discing and ripping, drill seeding, topsoil and spoil sampling

IO. 14B								
N COSTS								
tion Roads Area	4 Proje	-						
cy for vegetation fa	ilure:							
117 ac Acreage to be reseeded	_* (	382.8 \$/ac. cost for seedbed preparation	+	1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	)	=	\$	194,957
cy for vegetation fa	ilure:							
23 ac Acreage to be reseeded	_* (	382.8 \$/ac. cost for seedbed preparation	+	1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	)	=	\$	38,99
n Activity for this A	area (e.ç	g. Soil Sampling	g):					
	N COSTS ription of Areas to tion Roads Area evegetation Activ cy for vegetation fa 117 ac Acreage to be reseeded cy for vegetation fa 23 ac Acreage to be reseeded	N COSTS         ription of Areas to be R         tion Roads Area 4 Projet         evegetation Activities         cy for vegetation failure:         117 ac       * (         Acreage to be         reseeded         cy for vegetation failure:         23 ac       * (         Acreage to be         reseeded	N COSTS         ription of Areas to be Revegetated:         tion Roads Area 4 Project         evegetation Activities         cy for vegetation failure:         117 ac       * ( 382.8 \$/ac.         Acreage to be reseeded       cost for seedbed preparation         cy for vegetation failure:       23 ac       * ( 382.8 \$/ac.         Acreage to be reseeded       cost for seedbed preparation         cy for vegetation failure:       23 ac       * ( 382.8 \$/ac.	N COSTS         ription of Areas to be Revegetated:         tion Roads Area 4 Project         evegetation Activities         cy for vegetation failure:         117 ac       * ( 382.8 \$/ac. + cost for seedbed preparation         Acreage to be reseeded       * cost for seedbed preparation         cy for vegetation failure:       * ( 382.8 \$/ac. + cost for seedbed preparation	N COSTS         ription of Areas to be Revegetated:         tion Roads Area 4 Project         evegetation Activities         cy for vegetation failure:         117 ac       * ( 382.8 \$/ac. + 1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         Acreage to be reseeded       * ( 382.8 \$/ac. + 1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         cy for vegetation failure:       * ( 382.8 \$/ac. + 1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	N COSTS         ription of Areas to be Revegetated:         tion Roads Area 4 Project         evegetation Activities         evegetation Activities         cy for vegetation failure:         117 ac       * ( 382.8 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         Acreage to be reseeded       cost for seedbed preparation         cy for vegetation failure:       - 1281.5 \$/ac. (cost for seeding, fertilizing, mulching, and irrigation)         cy for vegetation failure:       - 23 ac (cost for seedbed preparation)         23 ac (cost for seedbed preparation)       + 1281.5 \$/ac. (cost for seeding, fertilizing, mulching, and irrigation)         cy for vegetation failure:       - 23 ac (cost for seedbed preparation)         expected       cost for seedbed preparation)         acreage to be reseeded       cost for seeding, fertilizing, mulching, and irrigation)	N COSTS         ription of Areas to be Revegetated:         tion Roads Area 4 Project         evegetation Activities         evegetation Activities         evegetation failure:         117 ac       * ( 382.8 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         Acreage to be reseeded       * ( 382.8 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         every for vegetation failure:       * ( 382.8 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         every for vegetation failure:       * ( 382.8 \$/ac. cost for seeding, fertilizing, mulching, and irrigation         every for vegetation failure:       * ( 382.8 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	N COSTS         ription of Areas to be Revegetated:         tion Roads Area 4 Project         evegetation Activities         evegetation Activities         cy for vegetation failure:         117 ac       * (         Acreage to be       cost for         reseeded       cost for         seedbed       fertilizing, mulching, and irrigation         every for vegetation failure:       23 ac         23 ac       * (         Acreage to be       cost for seeding, fertilizing, mulching, and irrigation         every for vegetation failure:       1281.5 \$/ac.         23 ac       * (         Acreage to be       cost for seeding, fertilizing, mulching, and irrigation         reseeded       cost for seeding, fertilizing, mulching, and irrigation

Navajo Mine records for contractor planting costs

Seedbed Preparation includes discing and ripping, drill seeding, topsoil and spoil sampling

WORKSHEET NO. 14C					
REVEGETATION COSTS					
Name and Description of Areas to be	Revegetated:				
32 Intentionally Left Blank					
Description of Revegetation Activities					
Costs For <sub>=</sub> - ac * ( Seeding Acreage to be reseeded	382.8 \$/ac. cost for seedbed preparation	_ +	1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	) =	\$ -
20% Contingency for vegetation failure:	:				
Costs For = 0 ac * ( Reseeding Acreage to be reseeded	382.8 \$/ac. cost for seedbed preparation		1281.5 \$/ac. cost for seeding, fertilizing, mulching, and irrigation	) =	\$ -
Other Revegetation Activity for this Area (	e.g. Soil Sampli	ng):			
		TOTAL F	REVEGETATION COST	=	\$ -

Navajo Mine records for contractor planting costs

Seedbed Preparation includes discing and ripping, drill seeding, topsoil and spoil sampling

REVEGETATION COSTS         Name and Description of Areas to be Revegetated:         32       Intentionally Left Blank         Description of Revegetation Activities         20% Contingency for vegetation failure:         Costs For =       - ac         Acreage to be       * ( $\frac{382.8 \text{ $/ac.}}{\text{cost for seeding, reseeded}}$ + $\frac{1281.5 \text{ $/ac.}}{\text{cost for seeding, and irrigation}}$ ) = \$ - Costs For =         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For =       0 ac         * ( $\frac{382.8 \text{ $/ac.}}{\text{cost for}}$ + $\frac{1281.5 \text{ $/ac.}}{\text{cost for seeding, and irrigation}}$ ) = \$ - Reseeding 20% of permenent program lands that were revegged during or before 1999:
32 Intentionally Left Blank         Description of Revegetation Activities         20% Contingency for vegetation failure:         Costs For =* ( 382.8 \$/ac + 1281.5 \$/ac ) = \$ - Seeding =Acreage to be reseeded         Seeding - ac* ( 382.8 \$/ac + 1281.5 \$/ac ) = \$ - Cost for seeding, fertilizing, mulching, and irrigation         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For =0 ac* ( 382.8 \$/ac + 1281.5 \$/ac ) = \$ - Description
32 Intentionally Left Blank         Description of Revegetation Activities         20% Contingency for vegetation failure:         Costs For =* ( <u>382.8 \$/ac.</u> + <u>1281.5 \$/ac.</u> ) = \$ - Seeding         Costs For =* ( <u>382.8 \$/ac.</u> + <u>1281.5 \$/ac.</u> ) = \$ - Cost for seeding, fertilizing, mulching, and irrigation         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For =0 ac* ( <u>382.8 \$/ac.</u> + <u>1281.5 \$/ac.</u> ) = \$ - Desceding
Description of Revegetation Activities         20% Contingency for vegetation failure:         Costs For = $\frac{-ac}{Acreage to be}$ * $(382.8 \$/ac.)$ + $\frac{1281.5 \$/ac.}{cost for seeding}$ ) = $\$$ - $cost for seeding, fertilizing, mulching, and irrigation         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For = 0 ac       * (382.8 \$/ac.)       + 1281.5 \$/ac.       ) = \$       - cost for seeding, fertilizing, mulching, and irrigation   $
20% Contingency for vegetation failure:         Costs For =* ( 382.8 \$/ac. + 1281.5 \$/ac. ) = \$ - Seeding Acreage to be reseeded seedbed reseeded preparation         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For = 0 ac* ( 382.8 \$/ac. + 1281.5 \$/ac. ) = \$ - Deceeding
20% Contingency for vegetation failure:         Costs For =* ( 382.8 \$/ac. + 1281.5 \$/ac. ) = \$ - Seeding Acreage to be reseeded seedbed reseeded preparation         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For = 0 ac* ( 382.8 \$/ac. + 1281.5 \$/ac. ) = \$ - Deceeding
$\begin{array}{c} \text{Costs For} = \underbrace{-\text{ ac}}_{\text{Acreage to be}} * \left( \underbrace{382.8 \ \text{s/ac.}}_{\text{cost for}} + \underbrace{1281.5 \ \text{s/ac.}}_{\text{cost for seeding,}} \right) = \$ & -\\ & \begin{array}{c} \text{cost for seeding,} \\ \text{reseeded} \end{array} \right) = \$ & -\\ & \begin{array}{c} \text{cost for seeding,} \\ \text{fertilizing, mulching,} \\ \text{and irrigation} \end{array} \right) = \$ & -\\ & \begin{array}{c} \text{Reseeding 20\% of permenent program lands that were revegged during or before 1999:} \end{array}$
$\begin{array}{c} \text{Costs For} = \underbrace{-\text{ ac}}_{\text{Acreage to be}} * \left( \underbrace{382.8 \ \text{s/ac.}}_{\text{cost for}} + \underbrace{1281.5 \ \text{s/ac.}}_{\text{cost for seeding,}} \right) = \$ & -\\ & \begin{array}{c} \text{cost for seeding,} \\ \text{reseeded} \end{array} \right) = \$ & -\\ & \begin{array}{c} \text{cost for seeding,} \\ \text{fertilizing, mulching,} \\ \text{and irrigation} \end{array} \right) = \$ & -\\ & \begin{array}{c} \text{Reseeding 20\% of permenent program lands that were revegged during or before 1999:} \end{array}$
Seeding $Acreage to bereseeded Acreage to bepreparation Acreage to beand irrigation Acreage to beand irrigation Acreage to bereseeded Acreage to bepreparation Acreage to beand irrigation Acreage to beAcreage to bereseeded Acreage to bepreparation Acreage to beand irrigation Acreage to beAcreage to beand irrigation Acreage to beAcreage to bepreparation Acreage to beand irrigation Acreage to beAcreage $
Seeding $\frac{1}{\text{Acreage to be}}$ $\frac{1}{\text{cost for}}$ $\frac{1}{\text{cost for seeding,}}$ $\frac{1}{cost for see$
Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For =       0 ac       * ( 382.8 \$/ac.       + 1281.5 \$/ac.       ) = \$ -
preparation       and irrigation         Reseeding 20% of permenent program lands that were revegged during or before 1999:         Costs For =       0 ac       * ( 382.8 \$/ac.       + 1281.5 \$/ac.       ) = \$ -
Reseeding 20% of permenent program lands that were revegged during or before 1999: Costs For = 0 ac * ( 382.8 \$/ac. + 1281.5 \$/ac. ) = \$ -
Costs For = 0 ac * $(382.8 \text{/ac.} + 1281.5 \text{/ac.}) = $
Reseeding Acreage to be cost for cost for seeding,
reseeded* seedbed fertilizing, mulching,
preparation and irrigation
Other Revegetation Activity for this Area (e.g. Soil Sampling):
TOTAL REVEGETATION COST = \$ -

Navajo Mine records for contractor planting costs

Seedbed Preparation includes discing and ripping, drill seeding, topsoil and spoil sampling

WORKSHEET NO. 15A	
PRODUCTIVITY AND HOURS FOR I	DRILL USE
Earthmoving Activity:	
Earthmoving Activity: 1 Drill & Blast Area 4 Pro	iect
Characterization of Drill Used	
Drill Model IR DMM2	? Drill
Drill Bit Diameter 10.63	
Drill Rod Length 35 Penetration Rate 228	[ft] Bench Height 40 [ft] [ft/hr] Spacing 32 [ft]
renetration Rate 220	
Description of Activity:	
Drilling holes to provide space for ex	plosives
Calculation:	
Cycles per = 60 min Hour time available	/ ( 10.5 min + 1.6 min + 0.4 min + 2.0 min ) = 4.1 cycles/hr drill time rod feed time rod pull time misc.
<b>6</b>	
Operating = <u>30.0 min</u> Delays lunch	+ <u>15.0 min</u> + <u>10.0 min</u> + <u>6.0 min</u> + <u>5.0 min</u> + <u>5 min</u> = 71 min shift change blasting service time moving — misc. = 14.8% of a shift
	shift change blasting service time moving misc. = 14.8% of a shift = 85.2% operational utilizatio
Effective Pit = 85.2%	* 90.0% = 76.7%
Utilization operational (EPU) utilization	availability
Maximum = 40 ft	* 4.1 cycles/hr * 76.7% EPU = 126.5 ft/hr
Penetration Bench height Rate	* <u>4.1 cycles/hr</u> * <u>76.7% EPU</u> = 126.5 ft/hr cycles per hour pit utilization
Maximum Production:	
per = 26 ft	* 32 ft * 126.5 ft/hr * 8.0 hr/shift / 27 ft <sup>3</sup> /yd <sup>3</sup> = 31,184 bcy/shift
Scheduled burden Shift:	spacing max. penetration hours in a shift conversion factor rate
per = 31,184 bcy/shift	Beruined
Scheduled max. production Hour per sched. shift	conversion factor Required volume to be blasted production rate

VORKSHEET NO. 15B						
RODUCTIVITY AND HOURS FOR	DRILL USE					
arthmoving Activity:						
32 Intentionally Left Blan	k					
characterization of Drill Used Drill Model IR DMM						
Drill Bit Diameter 10.63		Burden 26	6 [ft] 1,233	Volume Shot per hole [bcy]		
			) [ft]			
Penetration Rate 228	3 [ft/hr]	Spacing 32	2 [ft]			
Description of Activity: Drilling holes to provide space for early a state of the s	xplosives					
Shiming holes to provide space for e	Api001900					
Calculation:						
Cycles per = 60 min Hour time available	_/ (10.5 min	+ 1.6 min	+ 0.4 min +	2.0 min ) =	4.1 cycles/hr	
Hour time available	drill time	rod feed time	rod pull time	misc.		
Operating = 30.0 min	+ 15.0 min	+ 10.0 min	+ 6.0 min +	• 5.0 min +	5 min =	71 min
Delays lunch	shift change	blasting	service time	moving	misc. =	14.8% of a shift
					=	85.2% operational utilization
Effective Pit = 85.2%	* 90.0%	= 76.7%				
Utilization operational (EPU) utilization	availability	- 1011/0				
Maximum = 40 ft	* 4.4 avalaa/ba	* 70 70/ EDU				
Penetration bench height	* 4.1 cycles/hr cycles per hour	pit utilization	= 126.5 ft/hr			
Rate						
Maximum Production: per = 26 ft	* 22.4	* 100 5 4/6	* 00	07 <i>u</i> <sup>3</sup> u <sup>3</sup>	1 101 have at 1	
Scheduled burden	* <u>32</u> ft spacing	* 126.5 ft/hr max. penetration	* 8.0 hr/shift /	$\frac{27 \text{ ft}^3/\text{yd}^3}{\text{conversion factor}} = 3$	1,184 bcy/shift	
Shift:		rate				
Scheduled = 31,184 bcy/shift max. production	t / 8 hr/shift conversion factor	= 3,898 bcy/hr	Drill Hours = Required		3,898 bcy/hr = roduction rate	0 hr
Hour per sched. shift	COnversion (actor			volume to be blasted p	TOUGENON TALE	

WORKSHEET NO.	15C											
PRODUCTIVITY AN	D COSTS FOR BLA	STING ACTIVITIES										
Earthmoving Activity	<i>ı</i> :											
1 Drill	& Blast Area 4 Proje	ct										
Characterization of I	Blasting Parameters											
Ingersoll Rand DM	-											
Burden	26 [ft]	Powde	ər F	actor [lb/bcy] 0.9	[lb/	/bcy]						
Bench Height	40 [ft]	Volume Sh	ot p	per hole [bcy] 1,233	[bc	;y]						
Spacing	32 [ft]											
Description of Activi	ty:											
	oosters and primacor	d for explosive load										
Calculation:												
Total ANFO = Required	1,336,000 bcy *	0.3 10/009	=	1,202,400 lb								
Required	volume to be blasted	powder factor										
Miscellaneous =	1,202,400 lb *	5%	_	60,120 lb								
Powder - Supplies	ANFO required	contingency factor		00,120 15								
Cord Cost per <b>=(</b>	26 ft 🛛 🕇	32 ft	+	40 ft	)*	10%	*	0.10 \$	6/ft	=	11	\$/hole
Hole	burden	spacing		bench height	-  -	waste factor	(	cord uni	t cost	_		
ANFO Cost = per Hole	1,233 bcy *	0.9 lb/bcy		0.15 \$/lb	=	171 \$/hole						
permote	volume shot per hole	powder factor		ANFO unit cost								
Primer Cost 😑	1 *	4.63 \$/ea	=	4.63 \$/hole								
per Hole	primers per hole	primer unit cost		4.00 φ/Ποιο								
Volumetric <b>=(</b> Blasting Cost	11 \$/hole +	171 \$/hole ANFO cost per hole		4.63 \$/hole primer cost per hole	)/	1,233 bcy volume shot	=	0.15	\$/bcy			
-						per hole						
Total Blasting <sub>=</sub> Cost <sup>-</sup>	0.15 \$/bcy * volumetric blasting cost	1,336,000 bcy volume to be blasted	-	\$ 202,751								

Powder SuppliesANFO requiredcontingency factorCord Cost per Hole= $\frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \cdot \frac{10\%}{\text{waste factor}} \cdot \frac{0.10 \text{ $s/ft}}{\text{cord unit cost}} = 11 \text{ $s/hole}$ ANFO Cost Per Hole= $\frac{1,233 \text{ bcy}}{\text{volume shot per hole}} \cdot \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} \cdot \frac{0.15 \text{ $s/lb}}{\text{ANFO unit cost}} = 171 \text{ $s/hole}$ Primer Cost Per Hole= $\frac{1}{\text{primer sper hole}} \cdot \frac{4.63 \text{ $s/ea}}{\text{primer unit cost}} = 4.63 \text{ $s/hole}$ Volumetric Blasting Cost= $\frac{11 \text{ $s/hole}}{\text{cord cost per hole}} + \frac{171 \text{ $s/hole}}{\text{ANFO cost per hole}} + \frac{4.63 \text{ $s/hole}}{\text{primer cost per hole}} \cdot \frac{1.233 \text{ bcy}}{\text{volume shot}} = 0.15 \text{ $s/bcy}$ Total Blasting Cost= $0.15 \text{ $s/bcy}^* \cdot 0 \text{ bcy}}{\text{volume to be blasted}} = \$ 0$	WORKSHEET NO	. 15D									
32 Intentionally Left Blank 25 Diracterization of Blasting Parameters Ingersoll Rand DMM2 Drill 26 Burden [ft] 0.9 Powder Factor [lb/bcy] 32 Spacing [ft] 1.233 Volume Shot per hole [bcy] 40 Bench Height [ft] 26 Dench Height [ft] 27 Diract ANFO = 0 bcy • 0.9 lb/bcy = 0 lb 28 Durden f = 0 bcy • 0.9 lb/bcy = 0 lb 29 Durder factor Total ANFO = 0 bcy • 0.9 lb/bcy = 0 lb Powder = 0 lb • 0 lb • 0 lb Powder = 0 lb • 0 lb • 0 lb 20 Durden * 22 ft + 32 ft + 40 ft * 00 lb • 0 lb 20 Durden * 25 ft • 0.10 S/ft = 11 Shole ANFO Cost = 1,233 bcy • 0.9 lb/bcy • 0.15 \$/lb = 171 \$/hole Primer Cost = 1,233 bcy • 0.9 lb/bcy • 0.15 \$/lb = 171 \$/hole Primer Cost = 1 \$/ 0 lb • 0 lb • 0 lb • 0 lb/bcy = 4.63 \$/hole 20 Durden * 171 \$/hole 20 Durden * 0.15 \$/lbcy • 0 bcy = 100 lb • 0			ASTING ACTIVITIES								
32 Intentionally Left Blank 25 Diracterization of Blasting Parameters Ingersoll Rand DMM2 Drill 26 Burden [ft] 0.9 Powder Factor [lb/bcy] 32 Spacing [ft] 1.233 Volume Shot per hole [bcy] 40 Bench Height [ft] 26 Dench Height [ft] 27 Diract ANFO = 0 bcy * 0.9 lb/bcy = 0 lb 28 Durden f = 0 bcy * 0.9 lb/bcy = 0 lb 29 Durder factor Total ANFO = 0 bcy * 0.9 lb/bcy = 0 lb Powder = 0 lb * 0 lb * 0.9 lb/bcy = 0 lb Powder = 0 lb * 0.10 \$/ft = 11 \$/hole ANFO required * 0.9 lb/bcy * 0.15 \$/lb = 171 \$/hole ANFO Cost = 1,233 bcy * 0.9 lb/bcy * 0.15 \$/lb = 171 \$/hole Primer Cost = 1 * 0 * 0.9 lb/bcy * 0.15 \$/lb = 171 \$/hole Primer Cost = 1 * 0 * 0.9 lb/bcy * 0.15 \$/lb = 0.15 \$/bcy Powder factor * 0.10 \$/ft = 0.15 \$/bcy * 0.51 \$/hole Volumetric = ( 11 \$/hole + 171 \$/hole + 4.63 \$/hole \$/ 1.233 bcy = 0.15 \$/bcy Blasting Cost * 0.15 \$/bcy * 0 bcy = \$ 0 Total Blasting = 0.15 \$/bcy * 0 bcy = \$ 0 Total Blasting = 0.15 \$/bcy * 0 bcy = \$ 0											
Characterization of Blasting Parameters Ingersoll Rand DMM2 Drill 26 Burden [t] 32 Spacing [t1] 40 Bench Height [t] Description of Activity: ANFO used with boosters and primacord for explosive load Calculation: Total ANFO = <u>0 bcy</u> • <u>0.9 lb/bcy</u> = 0 lb Required = <u>0 lb</u> • <u>0 lb</u> • <u>0.9 lb/bcy</u> = 0 lb Miscellaneous = <u>0 lb</u> • <u>0.9 lb/bcy</u> = 0 lb Supplies Cord Cost per = ( <u>26 ft</u> + <u>32 ft</u> + <u>40 ft</u> )* <u>10%</u> • <u>0.10 \$/ft</u> = 11 \$/hole ANFO Cost = <u>1,233 bcy</u> • <u>0.9 lb/bcy</u> • <u>0.15 \$/lb</u> = 171 \$/hole Primer Cost = <u>1</u> • <u>4.63 \$/rea</u> = 4.63 \$/hole Primer Cost = <u>1 \$/hole</u> + <u>171 \$/hole</u> + <u>4.63 \$/hole</u> / <u>1233 bcy</u> = 0.15 \$/bcy Blasting Cost = <u>0.15 \$/bcy</u> • <u>0 bcy</u> = \$ 0 Cost = <u>0.15 \$/bcy</u> • <u>0 bcy</u> = \$ 0											
Ingersoll Rand DMM2 Drill 26 Burden [ft] 0.9 Powder Factor [lb/bcy] 32 Spacing [ft] 1.233 Volume Shot per hole [bcy] 40 Bench Height [ft] Description of Activity: ANFO used with boosters and primacord for explosive load Calculation: Total ANFO = 0 bcy * 0.9 lb/bcy = 0 lb Powder factor Powder factor Powder factor = 0 lb Powder factor = 0 lb Cord Cost per = (26 ft + 32 ft + 40 ft )* 10% * 0.10 \$/ft = 11 \$/hole ANFO Cost = 1.233 bcy * 0.9 lb/bcy * 0.15 \$/lb = 171 \$/hole Powder factor * 0.15 \$/lb = 171 \$/hole ANFO Cost = 1.23 bcy * 0.9 lb/bcy * 0.15 \$/lb = 171 \$/hole Primer Cost = 1 * 4.63 \$/ea = 4.63 \$/hole Primer Cost = 1 * 171 \$/hole + 171 \$/hole + 4.63 \$/hole Volumetric = (11 \$/hole + 171 \$/hole + 4.63 \$/hole / 1.233 bcy = 0.15 \$/bcy Blasting Cost = 0.15 \$/bcy * 0 bcy = \$ 0 Total Blasting = 0.15 \$/bcy * 0 bcy = \$ 0	32 Int	entionally Left Blank									
26 Burden [ft] 32 Spacing [ft] 40 Bench Height [ft] Description of Activity: ANFO used with boosters and primacord for explosive load Containable for ex	Characterization of	Blasting Parameters									
32 Spacing [ft] 40 Bench Height [ft] Description of Activity: ANFO used with boosters and primacord for explosive load Calculation: Total ANFO $\frac{1}{1000} = \frac{0 \text{ bcy}}{\text{volume to be}} \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 0 \text{ lb}$ Miscellaneous $= \frac{0 \text{ lb}}{\text{ANFO required}} \frac{5\%}{\text{contingency factor}} = 0 \text{ lb}$ $\frac{11 \text{ Synder}}{\text{Hole}} = \frac{26 \text{ ft}}{\text{hole}} \frac{32 \text{ ft}}{\text{cord not generative}} \frac{40 \text{ ft}}{\text{hole}} \frac{10\%}{\text{waste factor}} \frac{0.10 \text{ S/ft}}{\text{cord unit cost}} = 11 \text{ Syhole}$ $\frac{11 \text{ Synder factor}}{\text{hole}} \frac{1.233 \text{ bcy}}{\text{powder factor}} \frac{0.9 \text{ lb/bcy}}{\text{ord unit cost}} \frac{0.15 \text{ Sylb}}{\text{waste factor}} \frac{11 \text{ Syhole}}{\text{cord unit cost}} = 171 \text{ Syhole}$ $\frac{11 \text{ Synder factor}}{\text{hole}} \frac{1.233 \text{ bcy}}{\text{primer unit cost}} \frac{0.9 \text{ lb/bcy}}{\text{ANFO unit cost}} \frac{0.15 \text{ Sylb}}{\text{ANFO unit cost}} = 171 \text{ Syhole}$ $\frac{11 \text{ Syhole}}{\text{per Hole}} \frac{11 \text{ Syhole}}{\text{primer sper hole}} \frac{4.63 \text{ Sylea}}{\text{primer unit cost}} = 4.63 \text{ Syhole}$ $\frac{11 \text{ Syhole}}{\text{total Blasting Cost}} = \frac{0.15 \text{ Sybcy}}{\text{volume thole}} \frac{0 \text{ bcy}}{\text{volume to be blasted}} \frac{0 \text{ bcy}}{\text{volume to be}} \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \frac{0.15 \text{ Sybcy}}{\text{volume thole}} \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \frac{0.15 \text{ Sybcy}}{\text{volume to be blasted}} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \frac{0.5 \text{ Sybcy}}{\text{volume to be blasted}} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} = 0 \text{ bcy$	Ingersoll Rand DI	MM2 Drill									
40 Bench Height [ft] Description of Activity: ANFO used with boosters and primacord for explosive load Salculation: Total ANFO = $\frac{0 \text{ bcy}}{\text{volume to be}} \stackrel{\circ}{} \frac{0.9 \text{ b/bcy}}{\text{powder factor}} = 0 \text{ lb}$ Miscellaneous = $\frac{0 \text{ lb}}{\text{ANFO required}} \stackrel{\circ}{} \frac{5\%}{\text{contingency factor}} = 0 \text{ lb}$ Cord Cost per =( $\frac{26 \text{ ft}}{\text{burden}} \stackrel{\circ}{} \frac{32 \text{ ft}}{\text{contingency factor}} \stackrel{\circ}{} \frac{0.15 \text{ $1/b}}{\text{bench height}} = 171 \text{ $10\%} \stackrel{\circ}{} \frac{0.10 \text{ $5/ft}}{\text{cord unit cost}} = 111 \text{ $1/hole}$ ANFO Cost = $\frac{1,233 \text{ bcy}}{\text{volume shot per}} \stackrel{\circ}{} \frac{0.9 \text{ Ib/bcy}}{\text{powder factor}} \stackrel{\circ}{} \frac{0.15 \text{ $1/b}}{\text{ANFO unit cost}} = 171 \text{ $1/hole}$ Primer Cost = $\frac{1}{\text{primers per hole}} \stackrel{\circ}{} \frac{4.63 \text{ $2/ea}}{\text{primer unit cost}} = 4.63 \text{ $1/hole}$ Volumetric =( $\frac{11 \text{ $3/hole + }}{\text{cord cost per hole}} \stackrel{\circ}{} \frac{171 \text{ $3/hole}}{\text{primer cost per hole}} \stackrel{\circ}{} \frac{0.15 \text{ $2/b}}{\text{primer cost per hole}} = 0.15 \text{ $2/bcy}$ Total Blasting Cost = $\frac{0.15 \text{ $3/bcy}}{\text{cord cost per hole}} \stackrel{\circ}{} \frac{0 \text{ bcy}}{\text{volume to be blasted}} = $0$	26 Bu	rden [ft]	0.9	Po	wder Factor [lb/bcy	y]					
Description of Activity: ANFO used with boosters and primacord for explosive load Calculation: Total ANFO = 0 boy * 0.9 lb/boy = 0 lb Required = 0 boy * 0.9 lb/boy = 0 lb Miscellaneous = 0 lb * 5% = 0 lb Powder factor * 0.10 \$/ft = 11 \$/hole Hole = $\frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right) * \frac{10\%}{\text{waste factor}} * 0.10 $/ft = 11 $/hole$ ANFO Cost = $\frac{1,233 \text{ boy}}{\text{volume shot per}} * \frac{0.9 \text{ lb/boy}}{\text{powder factor}} = 4.63 $/hole = 171 $/hole$ Primer Cost = $\frac{1}{\text{primers per hole}} + \frac{171 $/hole}{\text{primer unit cost}} = 4.63 $/hole$ Volumetric = $\left(\frac{11 $/hole}{\text{cord cost per hole}} + \frac{171 $/hole}{\text{ANFO cost per hole}} + \frac{4.63 $/hole}{\text{primer cost per hole}} \right) \frac{1,233 \text{ boy}}{\text{volume shot per hole}} = 0.15 $/boy $	32 Sp	acing [ft]	1,233	Vc	olume Shot per hole	e [bo	cy]				
ANFO used with boosters and primacord for explosive load Calculation: Total ANFO Required = $\frac{0 \text{ bcy}}{\text{volume to be}}^* \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 0 \text{ lb}$ Miscellaneous = $\frac{0 \text{ lb}}{\text{ANFO required}}^* \frac{5\%}{\text{contingency factor}} = 0 \text{ lb}$ Cord Cost per = $\frac{26 \text{ ft}}{\text{Hole}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right)^* \frac{10\%}{\text{waste factor}} \cdot \frac{0.10 \text{ $\screwtrm{s}/t}}{\text{cord unit cost}} = 11 \text{ $\screwtrm{s}/hole}$ ANFO Cost = $\frac{1,233 \text{ bcy}}{\text{volume shot per hole}}^* \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} \cdot \frac{0.15 \text{ $\screwtrm{s}/lb}}{\text{ANFO unit cost}} = 171 \text{ $\screwtrm{s}/hole}$ Primer Cost = $\frac{1}{\text{primers per hole}} \cdot \frac{4.63 \text{ $\screwtrm{s}/lb}}{\text{primer unit cost}} = 4.63 \text{ $\screwtrm{s}/hole}$ Volumetric = $\left(\frac{11 \text{ $\screwtrm{s}/hole}}{\text{cord cost per hole}} + \frac{171 \text{ $\screwtrm{s}/hole}}{\text{ANFO cost per hole}} + \frac{0.15 \text{ $\screwtrm{s}/hole}}{\text{primer cost per hole}} \right) \cdot \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} = 0.15 \text{ $\screwtrm{s}/hole}$ Total Blasting Cost = $\frac{0.15 \text{ $\screwtrm{s}/hole}}{\text{cost}} \cdot \frac{0 \text{ by}}{\text{volume to be blasted}} = \$ 0 \text{ by}$	40 Be	nch Height [ft]									
ANFO used with boosters and primacord for explosive load Calculation: Total ANFO Required = $\frac{0 \text{ bcy}}{\text{volume to be}}^* \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 0 \text{ lb}$ Miscellaneous = $\frac{0 \text{ lb}}{\text{ANFO required}}^* \frac{5\%}{\text{contingency factor}} = 0 \text{ lb}$ Cord Cost per = $\frac{26 \text{ ft}}{\text{Hole}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right)^* \frac{10\%}{\text{waste factor}} \cdot \frac{0.10 \text{ $\screwtrm{s}/t}}{\text{cord unit cost}} = 11 \text{ $\screwtrm{s}/hole}$ ANFO Cost = $\frac{1,233 \text{ bcy}}{\text{volume shot per hole}}^* \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} \cdot \frac{0.15 \text{ $\screwtrm{s}/lb}}{\text{ANFO unit cost}} = 171 \text{ $\screwtrm{s}/hole}$ Primer Cost = $\frac{1}{\text{primers per hole}} \cdot \frac{4.63 \text{ $\screwtrm{s}/lb}}{\text{primer unit cost}} = 4.63 \text{ $\screwtrm{s}/hole}$ Volumetric = $\left(\frac{11 \text{ $\screwtrm{s}/hole}}{\text{cord cost per hole}} + \frac{171 \text{ $\screwtrm{s}/hole}}{\text{ANFO cost per hole}} + \frac{0.15 \text{ $\screwtrm{s}/hole}}{\text{primer cost per hole}} \right) \cdot \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} = 0.15 \text{ $\screwtrm{s}/hole}$ Total Blasting Cost = $\frac{0.15 \text{ $\screwtrm{s}/hole}}{\text{cost}} \cdot \frac{0 \text{ by}}{\text{volume to be blasted}} = \$ 0 \text{ by}$											
Calculation:         Total ANFO         Required $=$ 0       by         blasted         Miscellaneous $=$ 0       bb         Powder $=$ 0       bb         Powder $=$ 0       bb         Powder $=$ 0       bb         Cord Cost per       =       26 ft $+$ 32 ft         Hole $=$ $=$ 26 ft $+$ 32 ft         Hole $=$ $=$ 26 ft $+$ 32 ft         Hole $=$ $=$ $=$ $0.10 \text{ $$/tt}$ $=$ 11 \$\$/hole         ANFO Cost $=$ $1.233 \text{ bcy}$ $+$ $0.9 \text{ b/bcy}$ $=$ $0.15 \text{ $$/bb}$ $=$ $171 \text{ $$/hole}$ Primer Cost $=$ $1$ $1.63 \text{ $$/ea}$ $=$ $4.63 \text{ $$/hole}$ $y$ $1.233 \text{ bcy}$ $=$ $0.15 \text{ $$/bcy}$ Primer Cost $=$ $11 \text{ $$/hole} +$ $171 \text{ $$/hole} +$ $1.63 \text{ $$/hole}$ $y$ $1.233 \text{ bcy}$ $y$ $0.15 \text{ $$/bcy}$											
$\begin{array}{rcl} \text{Total ANFO} &=& \underbrace{0 \ \text{bcy}}{\text{volume to be}}^{*} & \underbrace{0.9 \ \text{lb/bcy}}{\text{powder factor}}^{=} & 0 \ \text{lb} \\ \end{array}$ $\begin{array}{rcl} \text{Miscellaneous} &=& \underbrace{0 \ \text{lb}}{\text{ANFO required}}^{*} & \underbrace{5\%}{\text{contingency factor}}^{=} & 0 \ \text{lb} \\ \end{array}$ $\begin{array}{rcl} \text{Miscellaneous} &=& \underbrace{0 \ \text{lb}}{\text{ANFO required}}^{*} & \underbrace{5\%}{\text{contingency factor}}^{=} & 0 \ \text{lb} \\ \end{array}$ $\begin{array}{rcl} \text{Cord Cost per } =& \underbrace{26 \ \text{ft}}{\text{burden}}^{*} & \underbrace{32 \ \text{ft}}{\text{spacing}}^{*} & \underbrace{40 \ \text{ft}}{\text{bench height}}^{*} & \underbrace{10\%}{\text{waste factor}}^{*} & \underbrace{0.10 \ \$/\text{ft}}{\text{cord unit cost}}^{=} & 11 \ \$/\text{hole} \\ \end{array}$ $\begin{array}{rcl} \text{ANFO Cost} &=& \underbrace{1,233 \ \text{bcy}}{\text{volume shot per}}^{*} & \underbrace{0.9 \ \text{lb/bcy}}{\text{powder factor}}^{*} & \underbrace{0.15 \ \$/\text{bb}}{\text{ANFO unit cost}}^{=} & 171 \ \$/\text{hole} \\ \end{array}$ $\begin{array}{rcl} \text{Primer Cost} &=& \underbrace{1 \ \text{primers per hole}}^{*} & \underbrace{4.63 \ \$/\text{ea}}{\text{primer unit cost}}^{=} & 4.63 \ \$/\text{hole} \\ \end{array}$ $\begin{array}{rcl} \text{Volumetric} &=& \underbrace{1 \ \$/\text{hole}}^{*} & \underbrace{171 \ \$/\text{hole}}{\text{ANFO cost per hole}}^{*} & \underbrace{171 \ \$/\text{hole}}{\text{primer cost per hole}}^{*} & \underbrace{0.15 \ \$/\text{hole}}{\text{primer bole}}^{*} & \underbrace{0.15 \ \$/\text{hole}}{\text{primer hole}}^{*} & \underbrace{0.15 \ \$/\text{hole}}{\text{primer bole}}^{*} & \underbrace{0.15 \ \And/\text{hole}}{\text{primer bole}}^{*} & 0.15$	ANFO used with I	boosters and primaco	rd for explosive load								
$\begin{array}{rcl} \text{Total ANFO} &=& \underbrace{0 \ \text{bcy}}{\text{volume to be}}^{*} & \underbrace{0.9 \ \text{lb/bcy}}{\text{powder factor}}^{=} & 0 \ \text{lb} \\ \end{array}$ $\begin{array}{rcl} \text{Miscellaneous} &=& \underbrace{0 \ \text{lb}}{\text{ANFO required}}^{*} & \underbrace{5\%}{\text{contingency factor}}^{=} & 0 \ \text{lb} \\ \end{array}$ $\begin{array}{rcl} \text{Miscellaneous} &=& \underbrace{0 \ \text{lb}}{\text{ANFO required}}^{*} & \underbrace{5\%}{\text{contingency factor}}^{=} & 0 \ \text{lb} \\ \end{array}$ $\begin{array}{rcl} \text{Cord Cost per } =& \underbrace{26 \ \text{ft}}{\text{burden}}^{*} & \underbrace{32 \ \text{ft}}{\text{spacing}}^{*} & \underbrace{40 \ \text{ft}}{\text{bench height}}^{*} & \underbrace{10\%}{\text{waste factor}}^{*} & \underbrace{0.10 \ \$/\text{ft}}{\text{cord unit cost}}^{=} & 11 \ \$/\text{hole} \\ \end{array}$ $\begin{array}{rcl} \text{ANFO Cost} &=& \underbrace{1,233 \ \text{bcy}}{\text{volume shot per}}^{*} & \underbrace{0.9 \ \text{lb/bcy}}{\text{powder factor}}^{*} & \underbrace{0.15 \ \$/\text{bb}}{\text{ANFO unit cost}}^{=} & 171 \ \$/\text{hole} \\ \end{array}$ $\begin{array}{rcl} \text{Primer Cost} &=& \underbrace{1 \ \text{primers per hole}}^{*} & \underbrace{4.63 \ \$/\text{ea}}{\text{primer unit cost}}^{=} & 4.63 \ \$/\text{hole} \\ \end{array}$ $\begin{array}{rcl} \text{Volumetric} &=& \underbrace{1 \ \$/\text{hole}}^{*} & \underbrace{171 \ \$/\text{hole}}{\text{ANFO cost per hole}}^{*} & \underbrace{171 \ \$/\text{hole}}{\text{primer cost per hole}}^{*} & \underbrace{0.15 \ \$/\text{hole}}{\text{primer bole}}^{*} & \underbrace{0.15 \ \And/\text{hole}}{\text{primer bole}}^{*} & \underbrace{0.15 \ \And/\text{hole}}{\text{primer bole}}^{*} & \underbrace{0.15 \ \And/\text{hole}}{pr$	Coloulation										
Requiredvolume to be blastedpowder factorMiscellaneous Powder Supplies0 lb ANFO required5% contingency factor0 lbCord Cost per Hole $=$ $26 \text{ ft}$ burden $+$ $32 \text{ ft}$ spacing $+$ $40 \text{ ft}$ bench height $*$ $0.10 \text{ $%/tt}$ waste factor $=$ $11 \text{ $%/hole}$ cord unit cost $=$ $11 \text{ $%/hole}$ powder factor $=$ $11 \text{ $%/hole}$ ANFO cost = $=$ $1.233 \text{ bcy}$ powder factor $=$ $0.15 \text{ $%/lb}$ ANFO unit cost $=$ $171 \text{ $%/hole}$ ANFO unit cost $=$ $171 \text{ $%/hole}$ volume shot per hole $=$ $1.63 \text{ $%/ea}$ primer cost per hole $=$ $1.63 \text{ $%/hole}$ volume shot per hole $=$ $1.63 \text{ $%/hole}$ volume shot per hole $=$ $1.1 \text{ $%/hole}$ ANFO cost per hole $=$ $4.63 \text{ $%/hole}$ volume shot per hole $=$ $0.15 \text{ $%/bcy}$ volume shot per hole $=$ $0.15 \text{ $%/bcy}$ volume to be blasted $=$ $0 \text{ bcy}$ volume to be blasted $=$ $0 \text{ bcy}$ volume to be blasted		0 boy	* 0.9.lb/boy	_	0 lb						
$\begin{array}{l} \text{Miscellaneous} \\ \text{Powder} \\ \text{Supplies} \end{array} = \frac{0 \text{ lb}}{\text{ANFO required}} * \frac{5\%}{\text{contingency factor}} = 0 \text{ lb} \\ \hline \\ \text{Cord Cost per } = \left( \frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right)^* \frac{10\%}{\text{waste factor}} * \frac{0.10 \text{s}/\text{ft}}{\text{cord unit cost}} = 11 \text{s}/\text{hole} \\ \hline \\ \text{ANFO Cost} = \frac{1,233 \text{ bcy}}{\text{volume shot per}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} * \frac{0.15 \text{s}/\text{lb}}{\text{ANFO unit cost}} = 171 \text{s}/\text{hole} \\ \hline \\ \text{Primer Cost} = \frac{1}{\text{primers per hole}} * \frac{4.63 \text{s}/\text{ea}}{\text{primer unit cost}} = 4.63 \text{s}/\text{hole} \\ \hline \\ \hline \\ \text{Volumetric} = \left( \frac{11 \text{s}/\text{hole}}{\text{cord cost per hole}} + \frac{171 \text{s}/\text{hole}}{\text{ANFO cost per hole}} \right) + \frac{4.63 \text{s}/\text{hole}}{\text{primer cost per hole}} = 0.15 \text{s}/\text{bcy} \\ \hline \\ \hline \\ \text{Total Blasting} = \frac{0.15 \text{s}/\text{bcy}}{\text{cost}} * \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \$ 0 \\ \hline \end{array}$					di U						
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Powder SuppliesANFO required contingency factorcontingency factorCord Cost per Hole= $\begin{pmatrix} 26 \text{ ft} \\ burden \end{pmatrix}^* + \frac{32 \text{ ft}}{spacing} + \frac{40 \text{ ft}}{bench height} \end{pmatrix}^* \frac{10\%}{waste factor} * \frac{0.10 \text{ $/ft}}{cord unit cost} = 11 \text{ $/hole}$ ANFO Cost Per Hole= $\begin{pmatrix} 1,233 \text{ bcy} \\ volume shot per \\ hole \end{pmatrix}^* \frac{0.9 \text{ lb/bcy}}{powder factor} * \frac{0.15 \text{ $/lb}}{ANFO unit cost} = 171 \text{ $/hole}$ Primer Cost Per Hole= $\begin{pmatrix} 1 \\ primer sper hole \end{pmatrix}^* \frac{4.63 \text{ $/ea}}{primer unit cost} = 4.63 \text{ $/hole}$ Volumetric Blasting Cost= $\begin{pmatrix} 11 \\ s/hole \end{pmatrix}^* \frac{171 \\ ANFO cost per hole } + \frac{171 \\ ANFO cost per hole } + \frac{4.63 \\ ANFO cost per hole } + \frac{0 \text{ bcy}}{per hole} = 8 0$											
Supplies Supplies Contrigency factor $\frac{11 \text{ $/hole }}{\text{Hole }} = \frac{26 \text{ ft}}{\text{burden }} + \frac{32 \text{ ft}}{\text{spacing }} + \frac{40 \text{ ft}}{\text{bench height }} + \frac{10\%}{\text{waste factor }} + \frac{0.10 \text{ $//t}}{\text{cord unit cost }} = 11 \text{ $/hole }$ $\frac{\text{ANFO Cost}}{\text{Hole }} = \frac{1,233 \text{ bcy }}{\text{volume shot per hole }} + \frac{0.9 \text{ lb/bcy }}{\text{powder factor }} + \frac{0.15 \text{ $//b}}{\text{ANFO unit cost }} = 171 \text{ $/hole }$ $\frac{\text{Primer Cost}}{\text{hole }} = \frac{1}{\text{primers per hole }} + \frac{4.63 \text{ $/ea}}{\text{primer unit cost }} = 4.63 \text{ $/hole }$ $\frac{\text{Volumetric }}{\text{cord cost per hole }} + \frac{171 \text{ $/hole }}{\text{ANFO cost per hole }} + \frac{4.63 \text{ $//hole }}{\text{primer cost per hole }} = 0.15 \text{ $//bcy }$	Miscellaneous =	0 lb	* 5%	=	0 lb						
$Cord Cost per = \left( \underbrace{26 \text{ ft}}{\text{hole}} + \underbrace{32 \text{ ft}}{\text{spacing}} + \underbrace{40 \text{ ft}}{\text{bench height}} \right)^* \underbrace{10\%}{\text{waste factor}} * \underbrace{0.10 \text{ $/ft}}{\text{cord unit cost}} = 11 \text{ $/hole}$ $ANFO Cost = \underbrace{1,233 \text{ bcy}}{\text{volume shot per}} * \underbrace{0.9 \text{ lb/bcy}}{\text{powder factor}} * \underbrace{0.15 \text{ $/lb}}{\text{ANFO unit cost}} = 171 \text{ $/hole}$ $Primer Cost = \underbrace{1}{\text{primers per hole}} * \underbrace{4.63 \text{ $/ea}}{\text{primer unit cost}} = 4.63 \text{ $/hole}$ $Volumetric = \left( \underbrace{11 \text{ $/hole}}{\text{cord cost per hole}} + \underbrace{171 \text{ $/hole}}{\text{ANFO cost per hole}} + \underbrace{4.63 \text{ $/hole}}{\text{primer cost per hole}} \right) / \underbrace{1,233 \text{ bcy}}{\text{per hole}} = 0.15 \text{ $/bcy}$ $Total Blasting = \underbrace{0.15 \text{ $/bcy}}{\text{volume tric blasting}} * \underbrace{0 \text{ bcy}}{\text{volume to be blasted}} = \$ 0$		ANFO required	contingency factor	-							
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$ANFO Cost = \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} * \frac{0.15 \text{ $/lb}}{\text{ANFO unit cost}} = 171 \text{ $/hole}$ $Primer Cost = \frac{1}{\text{primers per hole}} * \frac{4.63 \text{ $/ea}}{\text{primer unit cost}} = 4.63 \text{ $/hole}$ $Volumetric = (\frac{11 \text{ $/hole}}{\text{cord cost per hole}} + \frac{171 \text{ $/hole}}{\text{ANFO cost per hole}} + \frac{4.63 \text{ $/hole}}{\text{primer cost per hole}} ) \frac{1,233 \text{ bcy}}{\text{volume shot}} = 0.15 \text{ $/bcy}$ $Total Blasting = \frac{0.15 \text{ $/bcy}}{\text{volume tric blasting}} * \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \$ 0$				+	<u> </u>	′ _			=	11	\$/hole
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per Hole volume shot per hole powder factor ANFO unit cost Primer Cost = $\frac{1}{\text{primers per hole}}^* \frac{4.63 /\text{ea}}{\text{primer unit cost}} = 4.63 /\text{hole}$ Volumetric =( $\frac{11 /\text{hole}}{\text{cord cost per hole}}^* \frac{171 /\text{hole}}{\text{ANFO cost per hole}}^* \frac{4.63 /\text{hole}}{\text{primer cost per hole}}$ )/ 1,233 bcy = 0.15 \$/bcy Blasting Cost = $\frac{0.15 /\text{bcy}}{\text{cord cost per hole}}^* \frac{0  \text{bcy}}{\text{volume to be blasted}} = \$ 0$											
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per Hole primers per hole primer unit cost Volumetric =( $11 /\text{hole} + 171 /\text{hole} + 4.63 /\text{hole} / 1,233  \text{bcy} = 0.15 /\text{bcy}$ Blasting Cost = $(0.15 /\text{bcy} + 171 /\text{hole} + 171 /\text{hole} + 4.63 /\text{hole} / 1,233  \text{bcy} = 0.15 /\text{bcy}$ Total Blasting = $(0.15 /\text{bcy} + 0   0  \text{bcy} = 100   0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  \text{bcy} = 100  0  0  0  0  0  0  0  0  0  0  $		hole									
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Volumetric =( $11 \text{ s/hole} + 171 \text{ s/hole} + 4.63 \text{ s/hole}   1.233 \text{ bcy} = 0.15 \text{ s/bcy}$ Blasting Cost = $0.15 \text{ s/bcy} + ANFO \text{ cost per hole} + ANFO \text{ cost per hole} + 0 \text{ bcy} = 0.15 \text{ s/bcy}$		1	* 4.63 \$/ea	=	4.63 \$/hole						
Blasting Cost       cord cost per hole       ANFO cost per hole       primer cost per hole       volume shot per hole         Total Blasting =       0.15 \$/bcy *       0 bcy volume to be blasted       =       0	per Hole	primers per hole	primer unit cost								
Blasting Cost       cord cost per hole       ANFO cost per hole       primer cost per hole       volume shot per hole         Total Blasting =       0.15 \$/bcy *       0 bcy volume to be blasted       =       0											
Blasting Cost       cord cost per hole       ANFO cost per hole       primer cost per hole       volume shot per hole         Total Blasting =       0.15 \$/bcy *       0 bcy volume to be blasted       =       0	Volumetrie		4-4 44 -					0.45 <b>*</b> *			
$Total Blasting = \underbrace{0.15 \ \text{$/bcy}}_{\text{Volumetric blasting}} * \underbrace{0 \ bcy}_{\text{Volume to be blasted}} = \$ 0$			-	- +		·		0.15 \$/b	су		
Cost volumetric blasting volume to be blasted	-										
Cost volumetric blasting volume to be blasted											
Cost volumetric blasting volume to be blasted	Total Blasting =	0.15 \$/bcv	* 0 bcv	=	\$ 0						
cost	Cost	volumetric blasting		-							
		cost									

WORKSHEET NO. 15E	
Other Reclamation Activity Costs	
Earthmoving Activity:	
Rip-Rap for Channels and Drop Structures	
Calculation:	
See detailed calculations in Appendix 12-C	
Cost for Area 4 Project: \$ 62,260	from 2011 Area 4 N estimate (Marston)
Total: \$ 62,260	
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BOND 2016 to 2021 - PINABETE PERMIT RECLAMATION BOND SUMMARY SHEET 2012 Estimate									
1	Total Facility and Structure Removal Costs	\$							
2	Total Earthmoving Costs	\$	23,039,465						
3	Total Revegetation Costs	\$	2,488,535						
4	Total Blast and Other Reclamation Activities Costs	\$	265,011						
5	Subtotal: Total Direct Costs			\$	25,793,011				
6	Mobilization and Demobilization (at 1.0% of Item 5)		1.0%	\$	257,930				
7	Contingencies (at 5.0% of Item 5)		5.0%	\$	1,289,651				
8	Engineering Redesign Fee (at 1.8% of Item 5)		1.8%	\$	464,274				
9	Contractor Profit and Overhead (at 15.0% of Item 5)		15.0%	\$	3,868,952				
10	Reclamation Management Fee (at 3.9% of Item 5)		3.9%	\$	1,005,927				
	GRAND TOTAL BOND AMOUNT			\$	32,679,745				
	(Sum of Items 5 through 10)								
	<i>(Sum of Items 5 through 10)</i> LESS Pre-2016 2011 Area 4N Calculation (Facility and structure removal left in Pre-2016)				\$16,459,1				

NEW BOND TO ADD FOR 2016 to 2021 (Area 4 Project)	\$16,220,593
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## Project: Navajo Mine Date: Sep-2011

### WORKSHEET NO. 16a AREA 4 NORTH RECLAMATION BOND SUMMARY SHFFT

A 4 NORTH RECLAMATION BOND SUMMARY SHEET			
	2011 Estimate		
1 Total Facility and Structure Removal Costs	\$621,216		
2 Total Earthmoving Costs	\$12,040,004		
3 Total Revegetation Costs	\$1,104,192		
4 Total Other Reclamation Activities Costs	\$161,505		
5 Subtotal: Total Direct Costs		\$13,926,917	\$13,305,701
6 Mobilization and Demobilization (at 1.0% of Item 5)	1.00%	\$139,269	\$133,057.01
7 Contingencies (at 2.0% of Item 5)	2.00%	\$278,538	\$266,114.02
8 Engineering Redesign Fee (at 1.8% of Item 5)	1.80%	\$250,685	\$239,502.62
0. Construction Ductitional Overhead (at 15,00/ of Home 5)	45.000/	¢0,000,000	
9 Contractor Profit and Overhead (at 15.0% of Item 5)	15.00%	\$2,089,038	\$1,995,855.15
10 Reclamation Management Fee (at 3.9% of Item 5)	3.90%	\$543,150	\$518,922.34
GRAND TOTAL BOND AMOUNT (Sum of Items 5 through 10)		\$17,227,596	
			\$16,459,152
LESS STRUCTURE NOT INCLUDED IN Post 2016			