

SECTION 50

BONDING

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[50.4-1](#) Summary of Pinabete Permit Area Reclamation Bond Amount

SECTION 50

BONDING

LIST OF EXHIBITS

EXHIBIT

NUMBER

EXHIBIT TITLE

<u>50.1-1</u>	Post-Mining Configuration For Bond Term
<u>50.1-2</u>	Bond Surface Configuration
<u>50.4-1</u>	Cut and Fill Contours
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BONDING

LIST OF APPENDICES

APPENDIX

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[50.A](#) Detailed Reclamation Bond Calculation

SECTION 50

BONDING

LIST OF REVISIONS DURING PERMIT TERM

REV.		DATE
NUMBER	REVISION DESCRIPTION	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 [Appendix 50.A](#). 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 [Appendix 50.A](#), 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 [Table 50.4-1](#).

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 [Exhibit 50.1-1](#) 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 ([Exhibit 50.1-2](#)), 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 out-slopes, 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 ([Exhibit 50.4-3](#)).

Suitable spoil and regolith/topdressing material (either stockpiled or in situ) are used to complete the 4-foot 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 ([Appendix 50.A](#)) 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 ([Appendix 50.A](#)) 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 ([Appendix 50.A](#)), 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 [Appendix 50.A](#), 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, [Appendix 50.A](#).

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. 22nd 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.

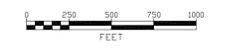
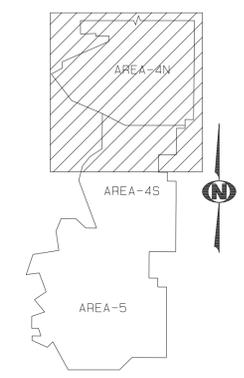
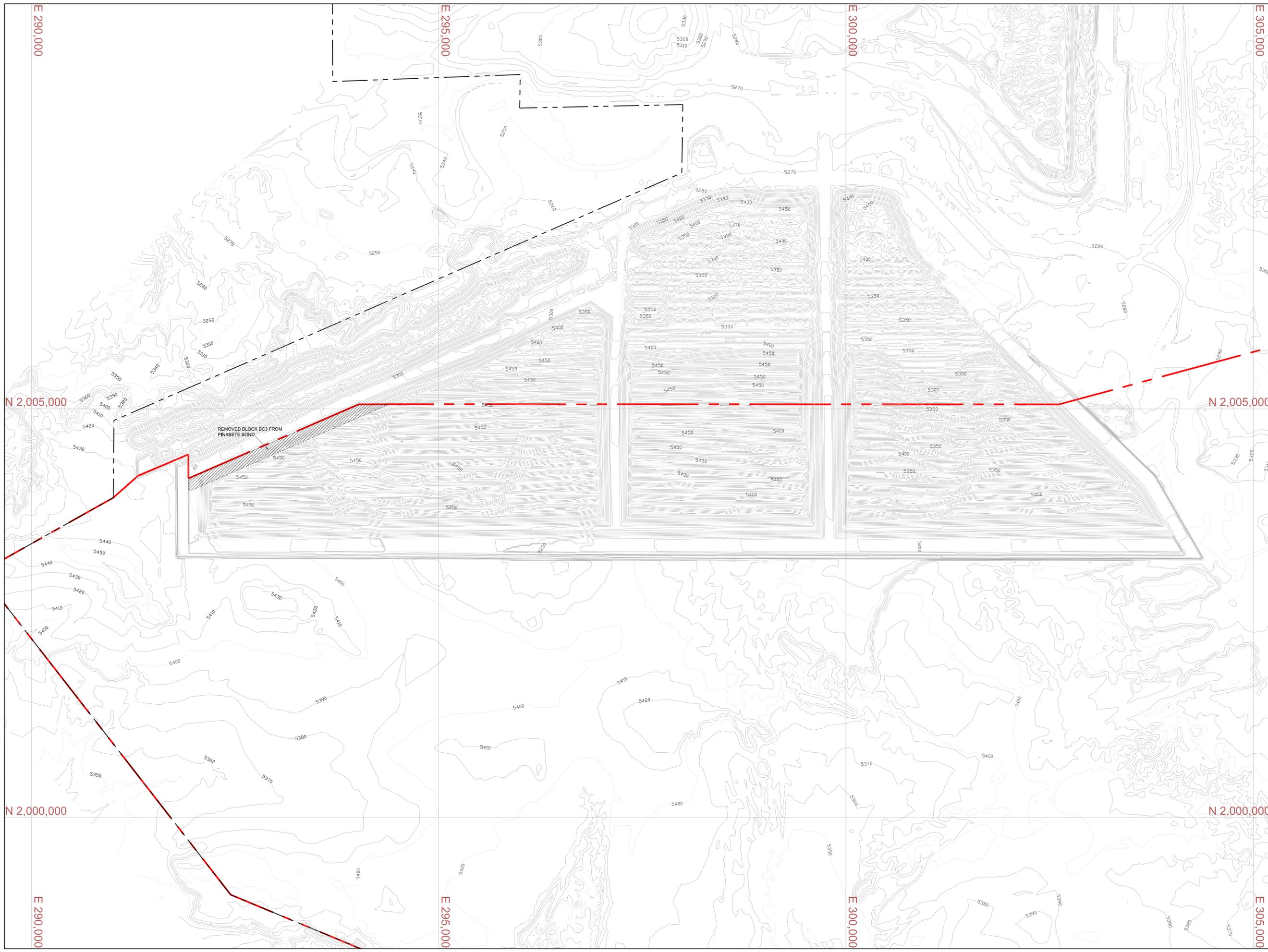
CRG-PRIMEDIA Equipment Watch, Cost Reference Guide for Construction Equipment. 2011. 1st Half Edition.

Office of Surface Mining Reclamation and Enforcement (OSM). 2000. Handbook for Calculation of Reclamation Bond Amount. U.S. Department of Interior. Washington, D.C.

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

		2012 Estimate	
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 Amount¹			\$ 16,459,152
Total Pinabete Permit Area Bond Amount			16,220,593

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



LEGEND

- - - - - PERMIT BOUNDARY
- - - - - LEASE BOUNDARY
- 5320 TOPOGRAPHY CONTOUR
- REMOVED BLOCK BC3 FROM PINABETE BOND

Original certified exhibits are maintained at the mine site and at OSM.

CONTOUR INTERVAL: 10'

REV.	DATE	BY	REVISION DESCRIPTION	ENG.	EC.	P.E.
12-A	Mar 2012	NL	PREPARED FOR OSM SUBMITTAL			

CERTIFICATION STATEMENT
 I, Sean Ennis, hereby certify that this drawing was reviewed by me and that the information shown is complete and accurate to the best of my knowledge.



EXHIBIT 50.1-1

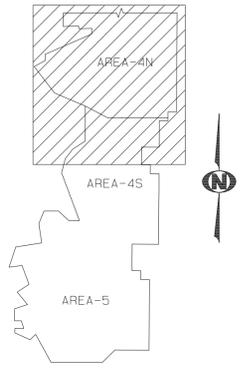


BHP Navajo Coal Company
 P.O. Box 1717 Fruitland, New Mexico, 87416 Phone: 505-598-4200 Fax: 505-568-3361

**PINABETE PERMIT
 POST MINING CONFIGURATION
 FOR BOND TERM**

PREPARED BY NL	DRAWN BY NL	SCALE 1" = 500'
APPROVED BY	DATE 03-19-2012	

FILE LOCATION: \\mchm-001\users\NL\Drawings\BOND\Pinabete\Pinabete_Permit\BOND_Permit\Part 1\Part 1\Section 50 Bonding\Sec 50 Exhibit\Navajo Coal\Pinabete 50.1-1



LEGEND

- - - PERMIT BOUNDARY
- - - LEASE BOUNDARY
- GRADING LIMIT
- CUT CONTOUR
- FILL CONTOUR
- REMOVED BLOCK BC3 FROM PINABETE BOND

Original certified exhibits are maintained at the mine site and at OSM.

CONTOUR INTERVAL: 10'

REV.	DATE	BY	DESCRIPTION	ENG.	EC.	P.E.
12-A	Mar 2012	NL	PREPARED FOR OSM SUBMITTAL			

CERTIFICATION STATEMENT
 I, the undersigned, hereby certify that this drawing was reviewed by me and that the information shown is complete and accurate to the best of my knowledge.



EXHIBIT 50.4-1

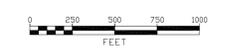
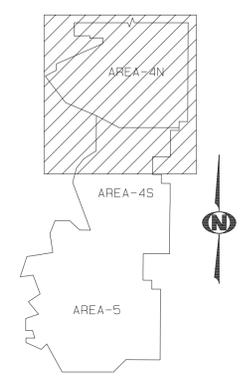
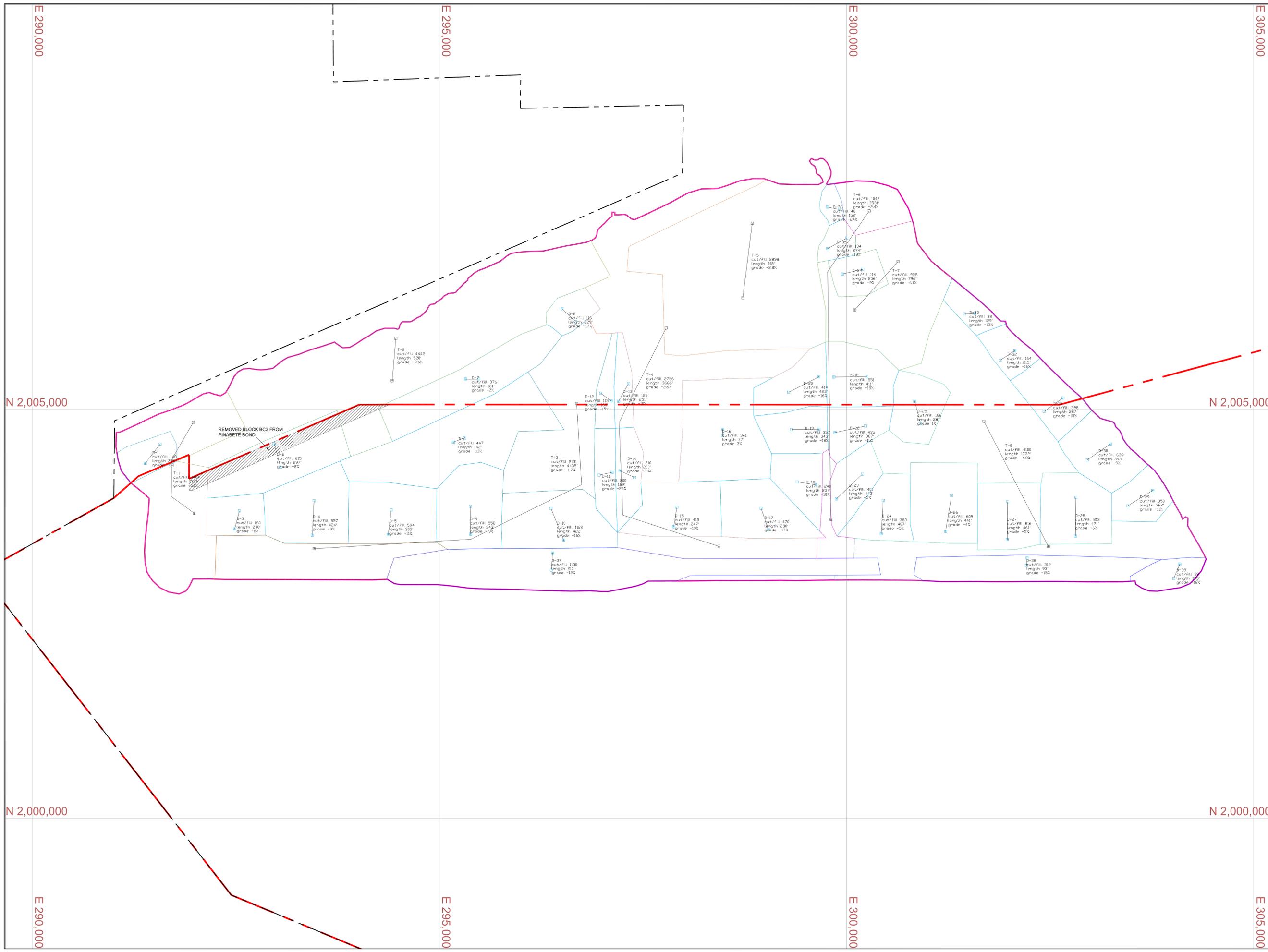


BHP Navajo Coal Company
 P.O. Box 1717 Fruitland, New Mexico, 87416 Phone: 505-598-4200 Fax: 505-568-3361

**PINABETE PERMIT
 CUT AND FILL
 CONTOURS**

PREPARED BY: NL	DRAWN BY: NL	SCALE: 1" = 500'
APPROVED BY:	DATE: 03-19-2012	

FILE LOCATION: \\win101-ws01\mnt\ms02\proj\0303\Subarea\Permits\0303\Subarea\Permit\50-4-1 Part 7\030303 50-4-1\0303\Subarea\Permit\50-4-1



LEGEND

- - - PERMIT BOUNDARY
- - - LEASE BOUNDARY
- GRADING LIMIT
- D-22 DOZER CUT AND FILL BLOCKS
- T-2 TRUCK CUT AND FILL BLOCKS
- REMOVED BLOCK BC3 FROM PINABETE BOND

Original certified exhibits are maintained at the mine site and at OSM.

REV.	DATE	BY	REVISION DESCRIPTION	ENG.	ES.	P.E.
12-A	Mar 2012	NL	PREPARED FOR OSM SUBMITTAL			

CERTIFICATION STATEMENT
 I, the undersigned, hereby certify that this drawing was reviewed by me and that the information shown is complete and accurate to the best of my knowledge.



EXHIBIT 50.4-2

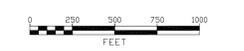
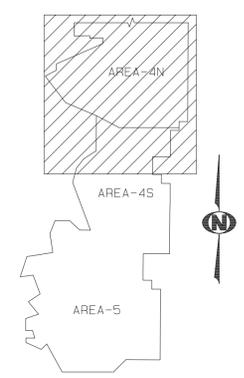


BHP Navajo Coal Company
 P.O. Box 1717 Fruitland, New Mexico, 87416 Phone: 505-598-4200 Fax: 505-568-3361

**PINABETE PERMIT
 CUT AND FILL BLOCKS**

PREPARED BY NL	DRAWN BY NL	SCALE 1"= 500'
APPROVED BY	DATE 03-30-2012	

FILE LOCATION: \\netcna-e01\mnt\WSP\Projects\BCC\Projects\Pinabete_Permit\504\BCCNA_Permit\Part 1A Part 1\Section 50 Bonding\Sec 50 Exhibit\Autocad Plot\Exhibit 50.4-2



LEGEND

- - - - PERMIT BOUNDARY
- - - - LEASE BOUNDARY
- GRADING LIMIT
- TOPSOIL REPLACEMENT POLYGONS
- REMOVED BLOCK BC3 FROM PINABETE BOND

Original certified exhibits are maintained at the mine site and at OSM.

REV.	DATE	BY	DESCRIPTION	ENG.	ES.	P.E.
12-A	Mar 2012	NL	PREPARED FOR OSM SUBMITTAL			

CERTIFICATION STATEMENT
 I, *Sean Ennis*, hereby certify that this drawing was reviewed by me and that the information shown is complete and accurate to the best of my knowledge.



EXHIBIT 50.4-3



BHP Navajo Coal Company

P.O. Box 1717 Phone: 505-598-4200
 Fruitland, New Mexico, 87416 Fax: 505-568-3361

**PINABETE PERMIT
 TOPSOIL REPLACEMENT**

PREPARED BY NL	DRAWN BY NL	SCALE 1" = 500'
APPROVED BY	DATE 03-20-2012	

FILE LOCATION: \\winston-ar201\users\MS\Projects\2012\Pinabete\Pinabete_Permit\504-3\504-3_Perm\504-3_Perm.dwg
 Part: 504-3\Section 50: Bonding\Sec: 50: Exhibit\Actual Plan\Exhibit 50.4-3

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



**TABLE 50-A-23
HISTORICAL EQUIPMENT OWNERSHIP AND OPERATING COSTS**

Equipment Model	Ownership Costs (\$/hr)			Overhaul Costs (\$/hr)				Field Repair and Fuel Costs (\$/hr)										Escalated Total (\$/hr)		
	Depreciation	Depreciation Multiplier	Adjusted Depreciation	Labor	Labor Multiplier	Adjusted Labor	O/H Parts	Labor	Labor Multiplier	Adjusted Labor	Parts	Fuel	Fuel Multiplier	Adjusted Fuel	Lube	Tires	Tire Multiplier		Adjusted Tires	GEC (2)
D9R Dozer Semi-U Blad	\$ 24.39	0.83	\$ 20.33	\$ 6.88	0.870	\$ 5.98	\$ 18.38	\$ 8.06	0.870	\$ 7.01	\$ 17.90	\$ 21.67	1.728	\$ 37.46	\$ 6.63	\$ -	\$ 1.73	\$ -	\$ 2.98	126.20
D10R Dozer Semi-U Blad	\$ 34.24	0.83	\$ 28.53	\$ 6.88	0.870	\$ 5.98	\$ 25.53	\$ 8.06	0.870	\$ 7.01	\$ 24.87	\$ 30.12	1.728	\$ 52.06	\$ 9.21	\$ -	\$ 1.73	\$ -	\$ 4.14	170.63
D11R Dozer U Blade	\$ 55.27	0.83	\$ 46.06	\$ 6.88	0.870	\$ 5.98	\$ 41.22	\$ 8.06	0.870	\$ 7.01	\$ 40.15	\$ 44.92	1.728	\$ 77.64	\$ 14.49	\$ -	\$ 1.73	\$ -	\$ 6.69	260.64
637G Scraper	\$ 25.01	0.83	\$ 20.84	\$ 6.72	0.870	\$ 5.84	\$ 18.33	\$ 10.07	0.870	\$ 8.76	\$ 18.19	\$ 28.12	1.728	\$ 48.60	\$ 8.77	\$ 5.21	\$ 1.73	\$ 5.21	\$ 0.77	144.95
992G Loader	\$ 67.59	0.83	\$ 56.33	\$ 4.20	0.870	\$ 3.65	\$ 14.26	\$ 5.12	0.870	\$ 4.45	\$ 15.73	\$ 38.66	1.728	\$ 66.82	\$ 12.77	\$ 22.57	\$ 1.73	\$ 22.57	\$ 2.14	213.30
777D Truck	\$ 42.09	0.83	\$ 35.08	\$ 16.06	0.870	\$ 13.97	\$ 14.58	\$ 9.86	0.870	\$ 8.57	\$ 9.00	\$ 27.20	1.728	\$ 47.01	\$ 10.54	\$ 13.72	\$ 1.73	\$ 13.72	\$ -	162.43
16H Grader	\$ 18.42	0.83	\$ 15.35	\$ 3.02	0.870	\$ 2.63	\$ 8.57	\$ 2.52	0.870	\$ 2.19	\$ 8.31	\$ 13.29	1.728	\$ 22.97	\$ 4.25	\$ 5.29	\$ 1.73	\$ 5.29	\$ 0.69	75.60
Water Truck 10,000 gal	\$ 28.40	0.83	\$ 23.67	\$ 5.76	0.870	\$ 5.01	\$ 5.71	\$ 13.97	0.870	\$ 12.15	\$ 11.01	\$ 22.25	1.728	\$ 38.46	\$ 5.81	\$ 9.32	\$ 1.73	\$ 9.32	\$ -	117.79
Small Backh Cat 446B	\$ 6.11	0.83	\$ 5.09	\$ 2.10	0.870	\$ 1.83	\$ 2.25	\$ 2.77	0.870	\$ 2.41	\$ 1.99	\$ 5.99	1.728	\$ 10.35	\$ 1.52	\$ 1.62	\$ 1.73	\$ 1.62	\$ 0.28	28.94
16H Grader, ripping	\$ 19.21	0.83	\$ 16.01	\$ 3.05	0.870	\$ 2.65	\$ 8.78	\$ 2.72	0.870	\$ 2.37	\$ 8.67	\$ 13.29	1.728	\$ 22.97	\$ 4.32	\$ 5.29	\$ 1.73	\$ 5.29	\$ 0.92	77.55
Pickup Truck	\$ 2.40	0.83	\$ 2.00	\$ 0.47	0.870	\$ 0.41	\$ 0.48	\$ 0.59	0.870	\$ 0.51	\$ 0.47	\$ 3.88	1.728	\$ 6.71	\$ 0.52	\$ 0.36	\$ 1.73	\$ 0.36	\$ -	11.96
Mechanic truck	\$ 3.19	0.83	\$ 2.66	\$ 0.47	0.870	\$ 0.41	\$ 0.64	\$ 0.59	0.870	\$ 0.51	\$ 0.62	\$ 2.26	1.728	\$ 3.91	\$ 0.41	\$ 0.48	\$ 1.73	\$ 0.48	\$ -	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 Assume two shifts per day		
Assume 90% availability on all equipment		0.83
Labor - Heavy Equipment Mechanic: Field Repair and Fuel Costs		
((0.08)(CRG Wages) + Local Wages) / CRG Wages		
CFG Wages	\$35.46 /hr	
Local Wages	\$28.00 /hr	
		0.87
Parts:	No adjustment	1
Fuel (Diesel) CFG Cost	\$1.51 /gal	
Local Cost	\$2.61 /gal	
Fuel Multiplier		1.73
Lube:	No adjustment	1
Tires:	XXX 2004 costs	1
GEC:	No adjustment	1
Inflation:		0.144

TABLE 50-A-1

DEMOLITION UNIT COSTS

Means Reference Number (1)			ID	Item	Unit	2008 Bare Costs (1)	2008 Unit Costs
02 41	16.13	0012	1	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 50%	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 50%	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 50%	CF	\$0.15	\$0.15
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 50%	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	\$3.06
02 41	16.17	0300	8b	Floor, 4" concrete slab, mesh reinforced, rods	SF	\$3.37	\$3.57
02 41	16.17	0400	9	Floor, 6" concrete slab, plain	SF	\$3.59	\$3.88
02 41	16.17	0420	9a	Floor, 6" concrete slab, mesh reinforced	SF	\$3.96	\$4.25
02 41	16.17	0440	9b	Floor, 6" concrete slab, mesh reinforced, rods	SF	\$4.49	\$4.78
02 41	16.17	0420	10	Floor, 8" concrete slab, mesh reinforced	SF	\$5.28	\$5.67
02 41	16.17	0440	10a	Floor, 8" concrete slab, mesh reinforced, rods	SF	\$5.99	\$6.38
02 41	16.17	0440	11	Floor, 12" concrete slab, mesh reinforces rods	SF	\$8.98	\$9.57
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	\$11.43
02 41	16.17	1080	13	Footings, concrete, 1.5' x 2'	LF	\$11.16	\$12.92
02 41	16.17	2600	13a	Footings, concrete, 1.5' x 2', average reinforcing + 10%	LF	\$12.28	\$14.03
02 41	16.17	1120	14	Footings, concrete 1.5' x 3'	LF	\$13.95	\$16.58
02 41	16.17	2600	14a	Footings, concrete, 1.5' x 3', average reinforcing + 10%	LF	\$15.35	\$17.98
02 41	16.17	1140	15	Footings, concrete, 2' x 3'	LF	\$15.95	\$19.46
02 41	16.17	2600	15a	Footings, concrete, 2' x 3', average reinforcing + 10%	LF	\$17.55	\$21.06
02 41	16.17	1140	16	Footings, concrete, 2' x 6'	LF	\$31.90	\$38.92
02 41	16.17	2600	16a	Footings, concrete, 2' x 6', average reinforcing + 10%	LF	\$35.09	\$42.11
02 41	16.18	1140	51	Footings, concrete, 2' x 6', average reinforcing + 10%	LF	\$102.08	\$120.81
02 41	16.17	2400	17	Walls, concrete, 3.5" thick	SF	\$4.92	\$5.09
02 41	16.17	2400	18	Walls, concrete, 6" thick	SF	\$8.43	\$8.72
02 41	16.17	2600	18a	Walls, concrete, 6" thick, Average reinforcing + 10%	SF	\$9.27	\$9.57
02 41	16.17	2420	19	Walls, concrete, 8" thick	SF	\$9.64	\$10.03
02 41	16.17	2600	19a	Walls, concrete, 8" thick, Average reinforcing + 10%	SF	\$10.60	\$10.99
02 41	16.17	2440	49	Walls, concrete, 10" thick	SF	\$11.20	\$11.69
02 41	16.17	2600	49a	Walls, concrete, 10" thick, Average reinforcing + 10%	SF	\$12.32	\$12.81
02 41	16.17	2500	50	Walls, concrete, 12" thick	SF	\$13.45	\$14.04
02 41	16.17	2600	50a	Walls, concrete, 12" thick, Average reinforcing + 10%	SF	\$14.80	\$15.38
02 41	16.17	2500	20	Walls, concrete, 18" thick, Average reinforcing + 10%	SF	\$23.86	\$24.74
02 41	16.17	2500	21	Walls, concrete, 2' thick, Average reinforcing + 10%	SF	\$31.81	\$32.98

TABLE 50-A-1

DEMOLITION UNIT COSTS

Means Reference Number (1)			ID	Item	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	\$11.90
02 41	13.60	1650	23	Fencing, 5-strand barbed wire	LF	\$1.64	\$1.64
02 41	13.60	1700	24	Fencing, chain link, posts and fabric, 8' to 10' high	LF	\$2.25	\$3.71
02 41	13.38	2700	25	Cast iron pipe, 4" diameter	LF	\$3.36	\$3.36
02 41	13.54	0200	26	Plastic conduit, 3" to 6"	LF	\$1.82	\$1.82
02 41	13.33	4200	27	Sidewalk, concrete, mesh reinforced (converted to SF)	SF	\$6.67	\$6.67
02 41	13.17	5050	28	Pavement, bituminous, 4"- 6" (converted to SF)	SF	\$0.58	\$0.88
02 41	13.17	5200	29	Driveway, concrete, 6", mesh reinforced (converted to SF)	SF	\$0.96	\$1.26
02 41	13.17	5500	30	Concrete, 7" to 2' thick, reinforced (converted to CF)	CF	\$3.41	\$4.58
02 41	16.13	0500	31	Steel Tanks, Piping & Culvert (Use small building, steel)	CF	\$0.23	\$0.23
			32	69 kV Power Lines	MI	\$6,136.34	\$7,019.97
Unit Costs from 2004 (See "2" below)			33	Conveyor	LF	\$19.89	\$22.75
			34	Water Wells	EA	\$1,602.63	\$1,833.41
			35	Seedbed Prep per Acre	Acre	\$348.00	\$382.80
			36	Seeding, Mulching, Irrigation per Acre	Acre	\$1,165.00	\$1,281.50
			37	Drill Operator	Labor Hour	\$28.00	\$28.00
			38	Blast Laborer	Labor Hour	\$28.00	\$28.00
			39	Blast Foremen	Labor Hour	\$28.00	\$28.00
02 41	13.70	0600	40	Gabions, 18-36 inches deep	SY	\$83.00	\$98.80
02 41	13.43	0200	41	Box Culvert 8'x12'x8'	LF	\$13.70	\$24.82
02 41	13.86	0100	42	Road Rug (Geotextile Lining Material use Synthetic Grass Cost	SF	\$0.23	\$0.33
02 41	13.33	0800	43	Guard Rail, corrugated steel	LF	\$1.67	\$1.67
02 41	13.62	0400	44	Chain Link Gates,	EA	\$143.00	\$143.00
02 41	13.78	0400	71	Communications Tower, 300', 70lb section	EA	\$2,910.00	\$2,910.00
02 41	19.23	3080		Machine Loading Rubbish Truck	CY	\$13.35	\$13.35
02 41	19.23	5100		Rubbish Haul 20 CY Truck	MI	\$0.49	\$0.49
	Calculated		45	Rubbish Disposal (50 MI Haul)	CY	\$15.80	\$15.80
			46	Primacord	LF	\$0.09	\$0.10
	Unit Costs		47	ANFO	lb	\$0.14	\$0.15
			48	Primers	EA	\$4.05	\$4.63

1). Updated with data used for the 2011 Area 4 North pre-2016 worksheets

2). Based on http://inflationdata.com/Inflation/Inflation_Rate/InflationCalculator.asp (Inflation from ??? Updated with information from BHP - PDF s 11.3%

TABLE 50-A-23 EQUIPMENT OWNERSHIP AND OPERATING COSTS																					
Equipment Model		Ownership Costs (\$/hr)			Overhaul Costs (\$/hr)				Field Repair and Fuel Costs (\$/hr)											2008 Total [\$/hr]	
		Depreciation	Depreciation Multiplier	Adjusted Depreciation	Labor	Labor Multiplier	Adjusted Labor	O/H Parts	Labor	Labor Multiplier	Adjusted Labor	Parts	Fuel	Fuel Multiplier	Adjusted Fuel	Lube	Tires	Tire Multiplier	Adjusted Tires		GEC (2)
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	\$ 12.38	\$ -	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	\$ 21.45	\$ -	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	\$ 18.47	\$ 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	\$ 18.81	\$ 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	\$ 13.60	\$ 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, ripping		\$ 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	\$ 15.68	\$ -	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 equipment	0.83
Labor - Heavy Equipment Mechanic:	Field Repair and Fuel Costs	
	((0.08)(CRG Wages) + 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]¹
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&Overhead, from ACME Soil Remediation Inc. (ACME) 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%

Drilling and Blasting Characteristics		
Description	Value	Unit
Drill Model	IR DMM2 Drill	
Drill Bit Diameter	10.625	[in]
Drill Rod Length	35	[ft]
Penetration Rate	228	[ft/hr]
Burden	26	[ft]
Spacing	32	[ft]
Bench Height	40	[ft]
Drill Time	11	[min]
Rod Feed Time	1.6	[min]
Rod Pull Time	0.4	[min]
Lunch	30	[min]
Shift Change	15	[min]
Blasting	10	[min]
Service Time	6	[min]
Moving	5	[min]
Hours In A Shift	8	[hr/shift]
Powder Factor	0.9	[lb/bcy]

Scraper Properties		
Description	Value	Unit
Scraper Model	CAT 637G	
Struck Capacity	24	[yd ³]
Heaped Capacity	34	[yd ³]
Load Time per Pair	1.0	[min]
Load Time Single	0.6	[min]
Maneuver and Spread Time	0.6	[min]

Loaded (4%)	
Distance [ft]	Time [min]
-	-
693	0.50
990	0.63
3,960	2.00
7,260	3.40

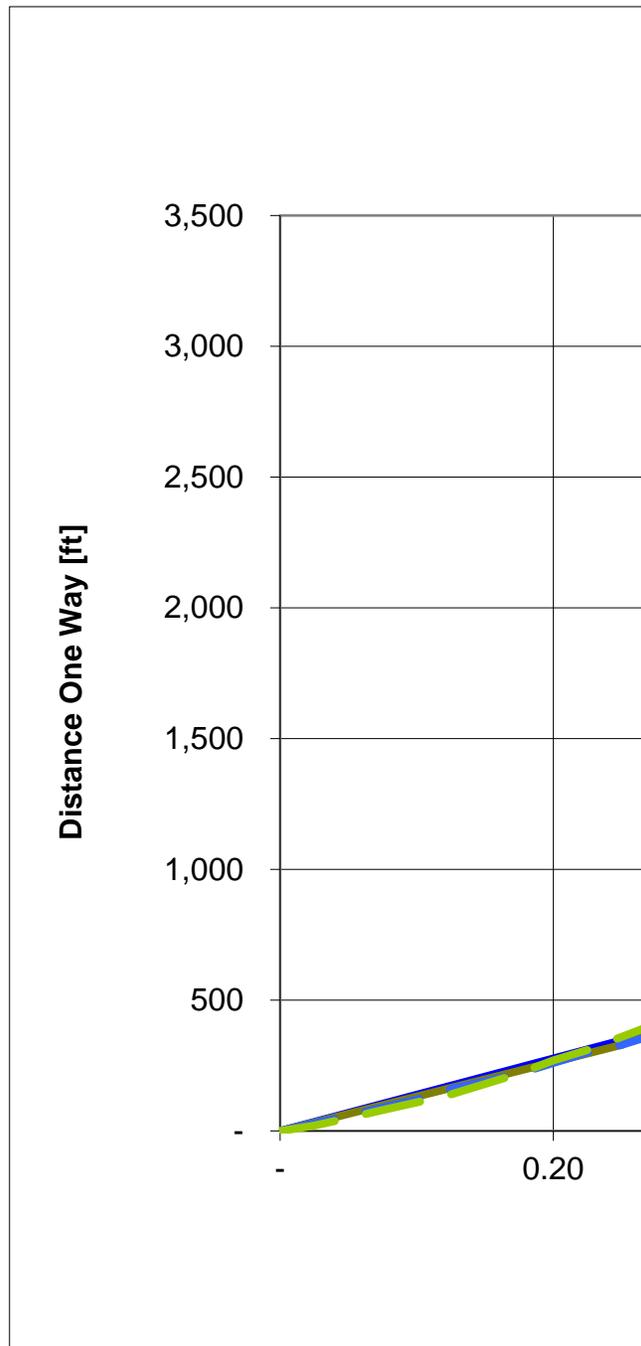
Loaded prediction	
Distance [ft]	Time [min]
-	-
30	0.025
60	0.050
90	0.075
120	0.100
160	0.125
190	0.150
220	0.175
260	0.200
300	0.225
330	0.250
370	0.275
410	0.300
440	0.325
480	0.350
520	0.375

560	0.400
600	0.425
650	0.450
690	0.475
730	0.500
770	0.525
810	0.550
860	0.575
900	0.600
950	0.625
990	0.650
1,040	0.675
1,080	0.700
1,130	0.725
1,180	0.750
1,230	0.775
1,270	0.800
1,320	0.825
1,370	0.850
1,420	0.875
1,470	0.900
1,520	0.925
1,570	0.950
1,620	0.975
1,670	1.000
1,730	1.025
1,780	1.050
1,830	1.075
1,880	1.100
1,940	1.125
1,990	1.150
2,040	1.175

2,100	1.200
2,150	1.225
2,210	1.250
2,260	1.275
2,320	1.300
2,370	1.325
2,430	1.350
2,490	1.375
2,540	1.400
2,600	1.425
2,660	1.450
2,710	1.475
2,770	1.500
2,830	1.525
2,890	1.550
2,940	1.575
3,000	1.600
3,060	1.625
3,120	1.650
3,180	1.675
3,240	1.700
3,300	1.725
3,360	1.750
3,420	1.775
3,480	1.800

Empty (4%)	
Distance [ft]	Time [min]
-	-
330	0.25
660	0.38
2,378	1
5,280	2.00
7,260	2.63

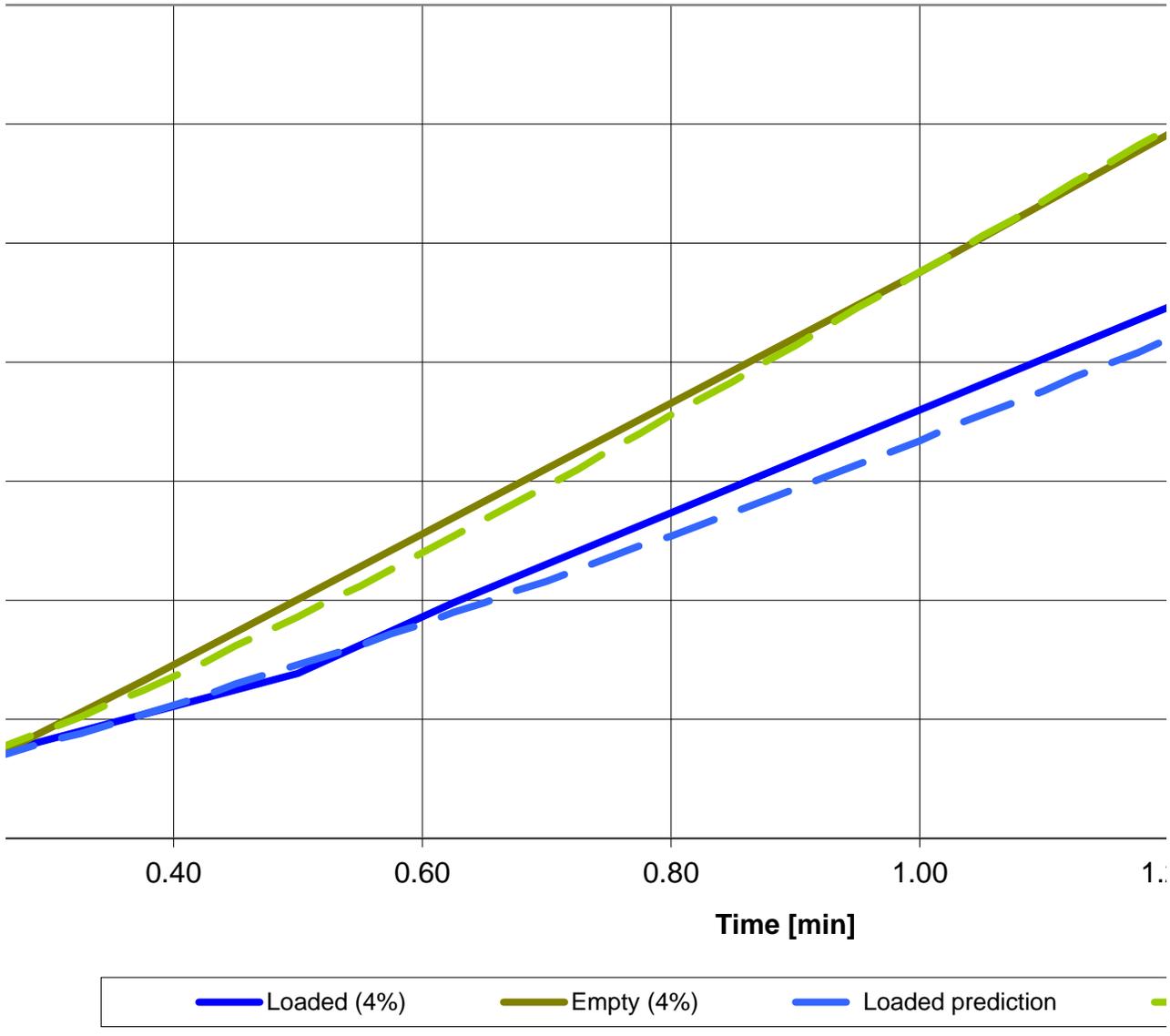
Empty prediction	
Distance [ft]	Time [min]
-	-
20	0.025
50	0.050
80	0.075
110	0.100
140	0.125
180	0.150
220	0.175
270	0.200
310	0.225
360	0.250
410	0.275
460	0.300
510	0.325
570	0.350
620	0.375

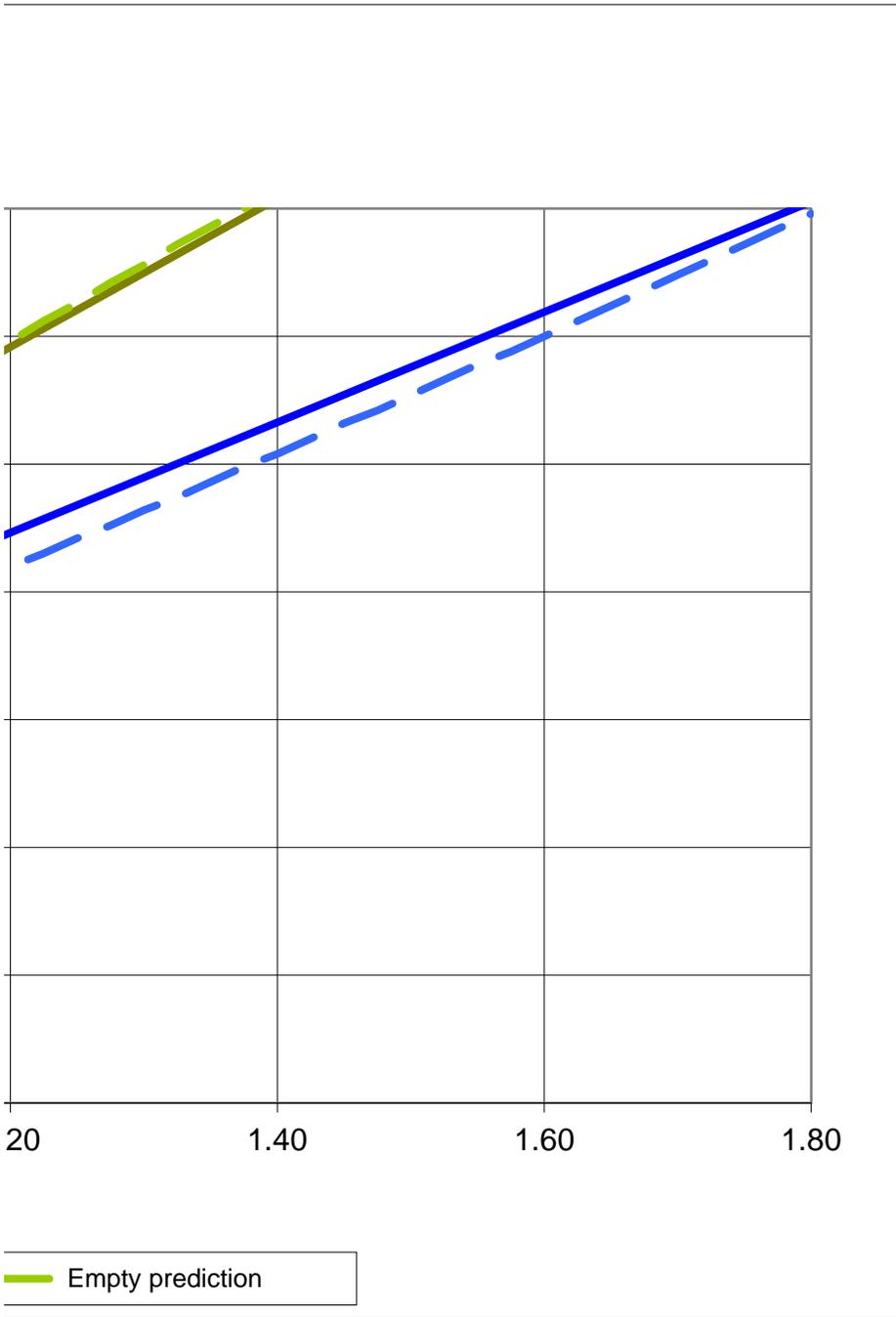


680	0.400
740	0.425
810	0.450
870	0.475
930	0.500
1,000	0.525
1,060	0.550
1,130	0.575
1,200	0.600
1,270	0.625
1,340	0.650
1,410	0.675
1,480	0.700
1,550	0.725
1,630	0.750
1,700	0.775
1,780	0.800
1,850	0.825
1,920	0.850
2,000	0.875
2,070	0.900
2,150	0.925
2,230	0.950
2,300	0.975
2,380	1.000
2,450	1.025
2,530	1.050
2,600	1.075
2,680	1.100
2,760	1.125
2,830	1.150
2,910	1.175

2,980	1.200
3,060	1.225
3,130	1.250
3,210	1.275
3,280	1.300
3,360	1.325
3,430	1.350
3,500	1.375
3,580	1.400

637G Travel Time





Truck Properties		
Description	Value	Unit
Truck Model	CAT 777D	
Struck Capacity	55	[yd ³]
Heaped Capacity	79	[yd ³]
Dump and Maneuver Time	1.0	[min]

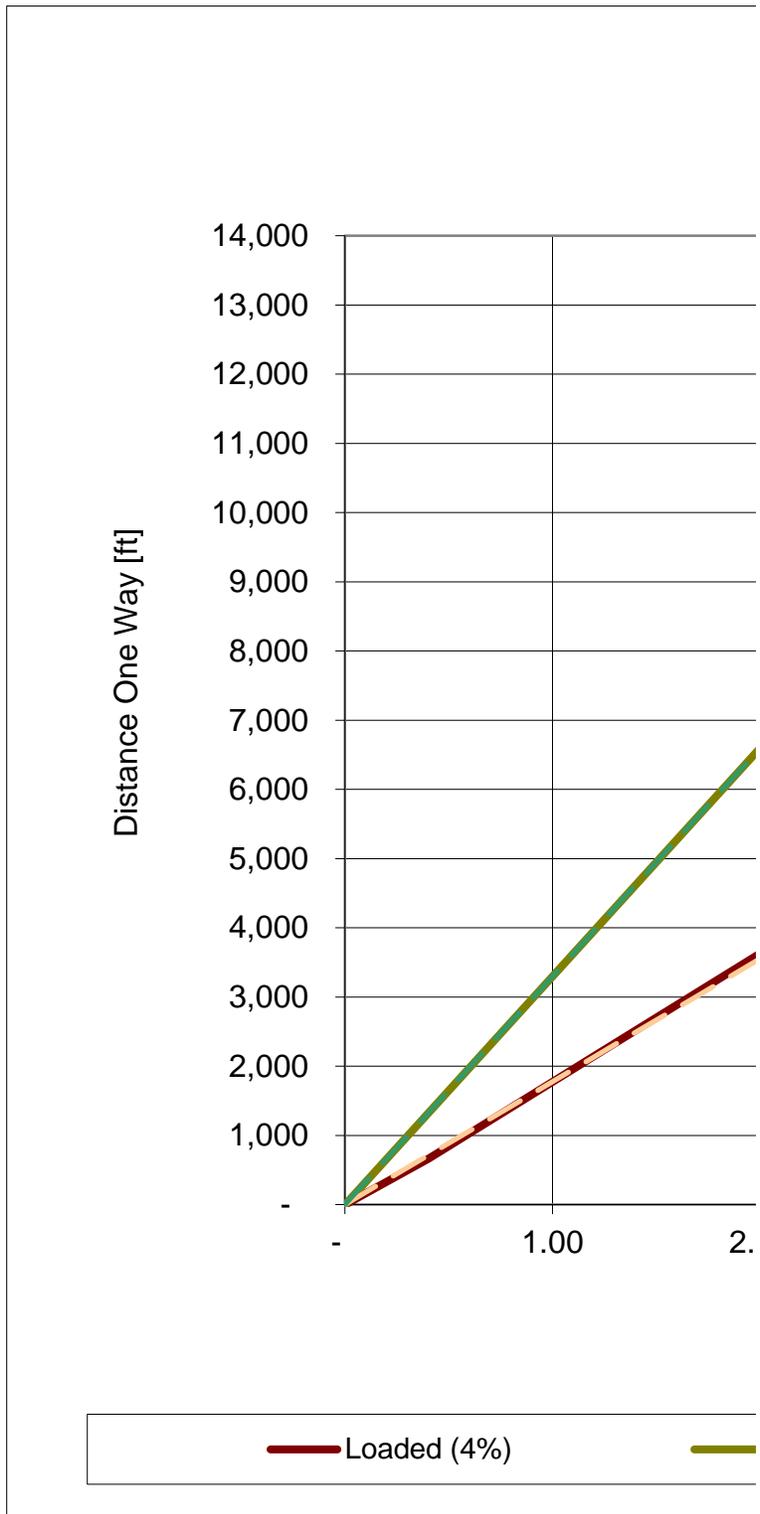
Loaded (4%)	
Distance [ft]	Time [min]
-	-
660	0.40
2,145	1.20
3,630	2.00
4,290	2.40
4,950	2.80
7,260	4.10

Loaded Prediction	
Distance [ft]	Time [min]
-	0.00
500	0.28
1,000	0.56
1,500	0.84
2,000	1.13
2,500	1.41
3,000	1.69
3,500	1.97
4,000	2.25
4,500	2.53
5,000	2.81
5,500	3.09
6,000	3.37
6,500	3.66
7,000	3.94
7,500	4.22
8,000	4.50
8,500	4.78
9,000	5.06

9,500	5.34
10,000	5.62
10,500	5.91
11,000	6.19
11,500	6.47
12,000	6.75
12,500	7.03
13,000	7.31

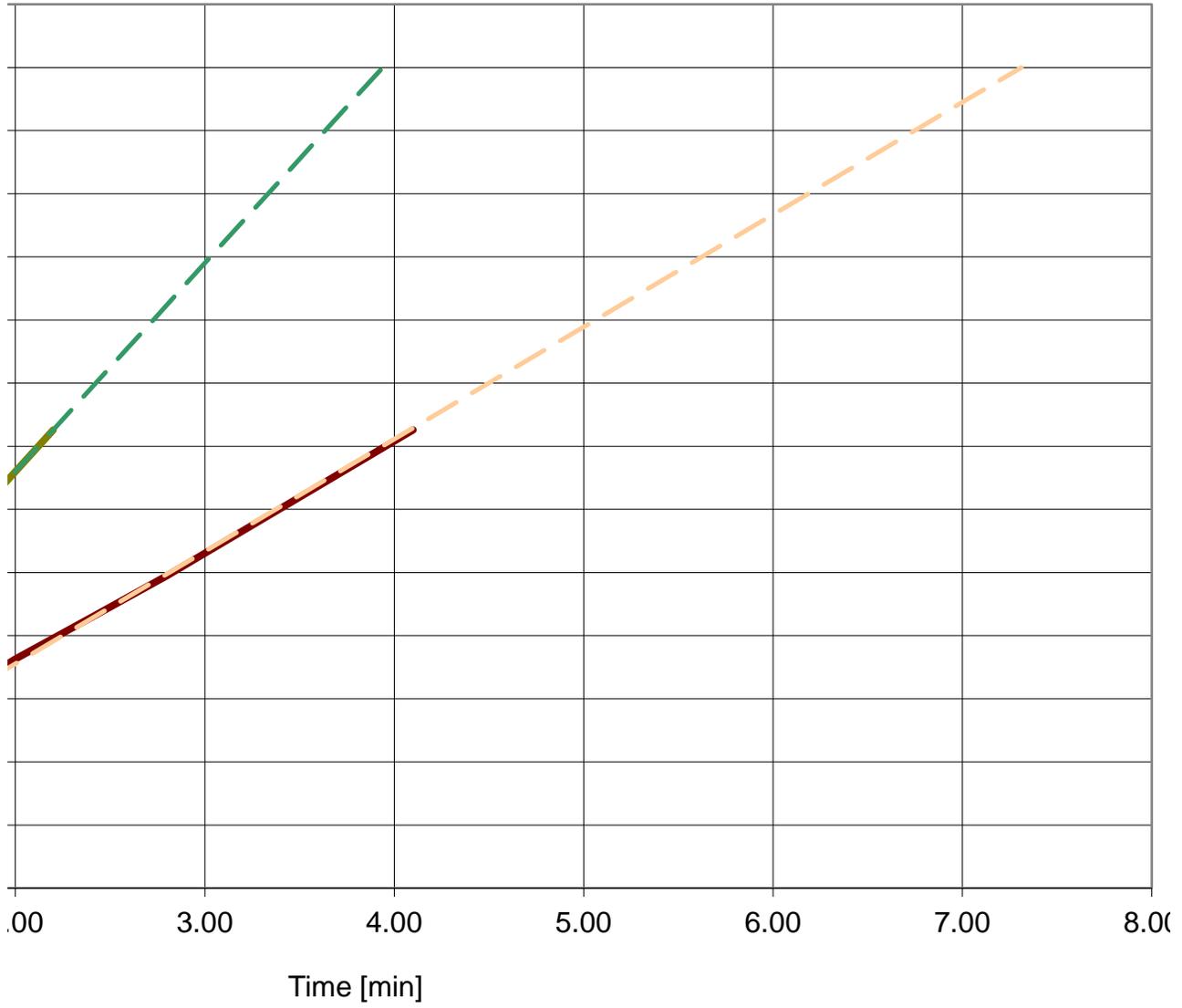
Empty (4%)	
Distance [ft]	Time [min]
-	-
7,260	2.20

Empty Prediction	
Distance [ft]	Time [min]
-	-
500	0.15
1,000	0.30
1,500	0.45
2,000	0.61
2,500	0.76
3,000	0.91
3,500	1.06
4,000	1.21
4,500	1.36
5,000	1.52
5,500	1.67
6,000	1.82
6,500	1.97
7,000	2.12
7,500	2.27
8,000	2.42
8,500	2.58
9,000	2.73



9,500	2.88
10,000	3.03
10,500	3.18
11,000	3.33
11,500	3.48
12,000	3.64
12,500	3.79
13,000	3.94

777F Travel Time



■ Empty (4%)

— Loaded Prediction

— Empty Prediction



0

Loader Properties		
Description	Value	Unit
Loader Model	CAT 992G	
Rated Bucket Capacity	15	[yd ³]
Basic Cycle Time	0.65	[min]

D11R-11U Data	
Distance [ft]	Production [ft ³ /hr]
50	4,600
75	3,500
100	2,800
125	2,300
150	1,950
175	1,700
200	1,500
225	1,350
250	1,200
275	1,100
300	1,050
325	1,000
350	900
375	850
400	800
450	700
500	600

Prediction	
Distance [ft]	Production [ft ³ /hr]
50.0	4,780
52.5	4,590
55.0	4,420
57.5	4,260
60.0	4,110
62.5	3,970
65.0	3,840
67.5	3,730
70.0	3,610
72.5	3,510
75.0	3,410
77.5	3,320
80.0	3,230
82.5	3,150
85.0	3,070
87.5	3,000
90.0	2,930
92.5	2,870
95.0	2,800
97.5	2,740
100.0	2,690
102.5	2,630
105.0	2,580
107.5	2,530
110.0	2,480
112.5	2,430
115.0	2,390
117.5	2,350
120.0	2,310

Changed by GGG

122.5	2,270
125.0	2,230
127.5	2,190
130.0	2,160
132.5	2,120
135.0	2,090
137.5	2,060
140.0	2,030
142.5	2,000
145.0	1,970
147.5	1,940
150.0	1,920
152.5	1,890
155.0	1,860
157.5	1,840
160.0	1,820
162.5	1,790
165.0	1,770
167.5	1,750
170.0	1,730
172.5	1,710
175.0	1,680
177.5	1,660
180.0	1,650
182.5	1,630
185.0	1,610
187.5	1,590
190.0	1,570
192.5	1,560
195.0	1,540
197.5	1,520
200.0	1,510

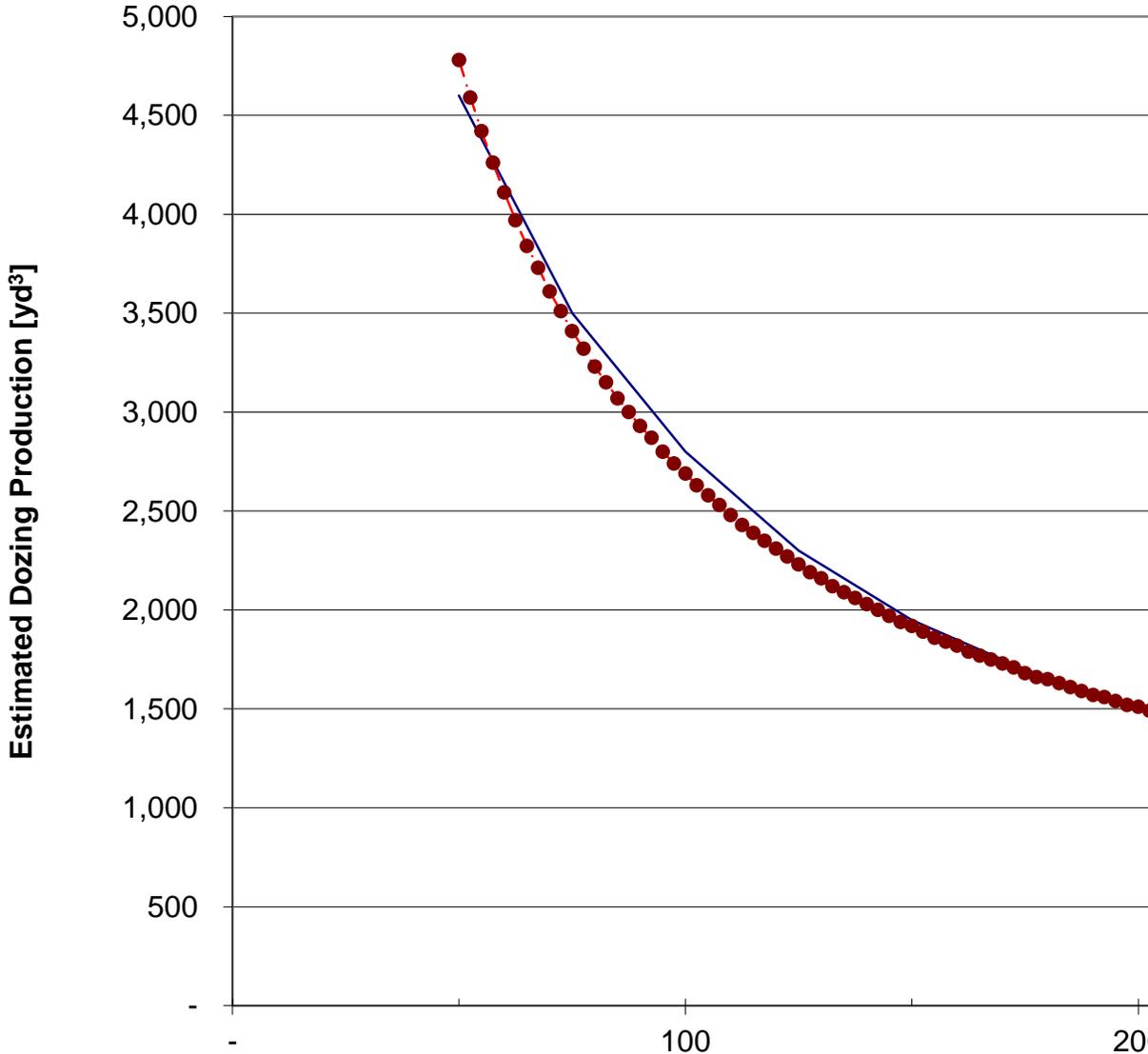
202.5	1,490
205.0	1,480
207.5	1,460
210.0	1,450
212.5	1,430
215.0	1,420
217.5	1,410
220.0	1,390
222.5	1,380
225.0	1,370
227.5	1,350
230.0	1,340
232.5	1,330
235.0	1,320
237.5	1,310
240.0	1,290
242.5	1,280
245.0	1,270
247.5	1,260
250.0	1,250
252.5	1,240
255.0	1,230
257.5	1,220
260.0	1,210
262.5	1,200
265.0	1,190
267.5	1,180
270.0	1,170
272.5	1,160
275.0	1,160
277.5	1,150
280.0	1,140

282.5	1,130
285.0	1,120
287.5	1,110
290.0	1,110
292.5	1,100
295.0	1,090
297.5	1,080
300.0	1,070
302.5	1,070
305.0	1,060
307.5	1,050
310.0	1,050
312.5	1,040
315.0	1,030
317.5	1,020
320.0	1,020
322.5	1,010
325.0	1,010
327.5	1,000
330.0	990
332.5	990
335.0	980
337.5	970
340.0	970
342.5	960
345.0	960
347.5	950
350.0	940
352.5	940
355.0	930
357.5	930
360.0	920

362.5	920
365.0	910
367.5	910
370.0	900
372.5	900
375.0	890
377.5	890
380.0	880
382.5	880
385.0	870
387.5	870
390.0	860
392.5	860
395.0	850
397.5	850
400.0	840
402.5	840
405.0	840
407.5	830
410.0	830
412.5	820
415.0	820
417.5	820
420.0	810
422.5	810
425.0	800
427.5	800
430.0	800
432.5	790
435.0	790
437.5	780
440.0	780

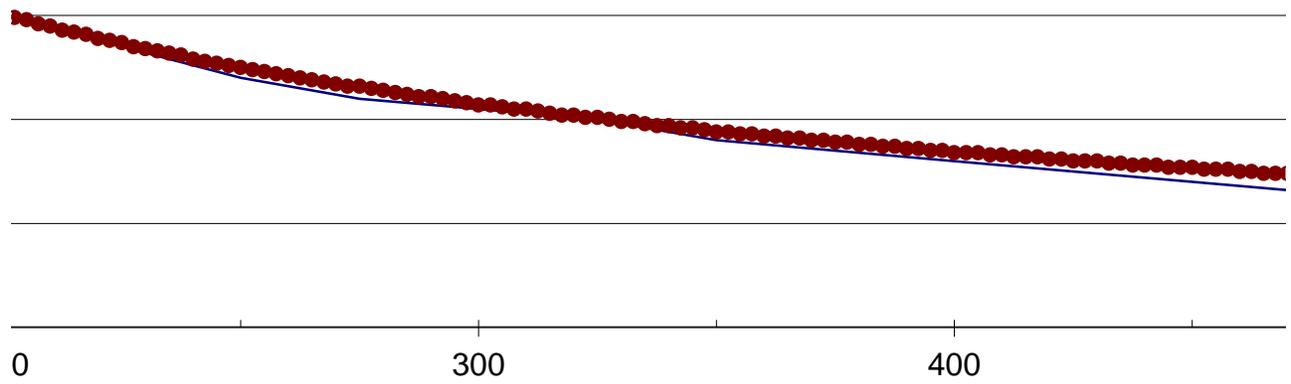
442.5	780
445.0	770
447.5	770
450.0	770
452.5	760
455.0	760
457.5	760
460.0	750
462.5	750
465.0	740
467.5	740
470.0	740
472.5	740
475.0	730
477.5	730
480.0	730
482.5	720
485.0	720
487.5	720
490.0	710
492.5	710
495.0	710
497.5	700
500.0	700

Estimated Dozir



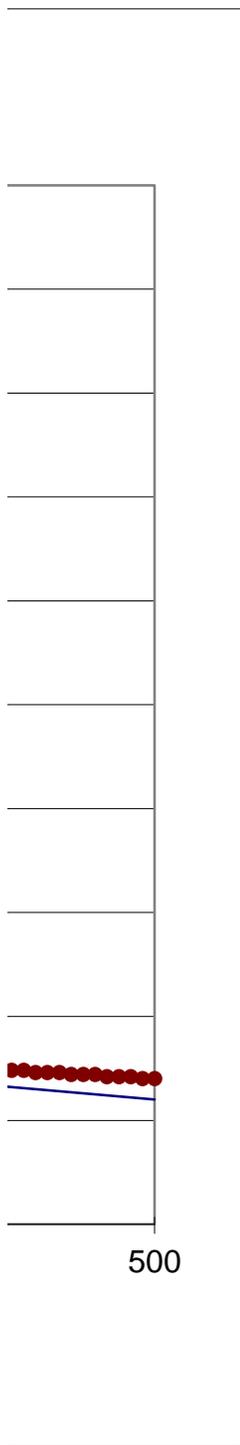
Av

ng Production (D11R)



Average Dozing Distance [ft]

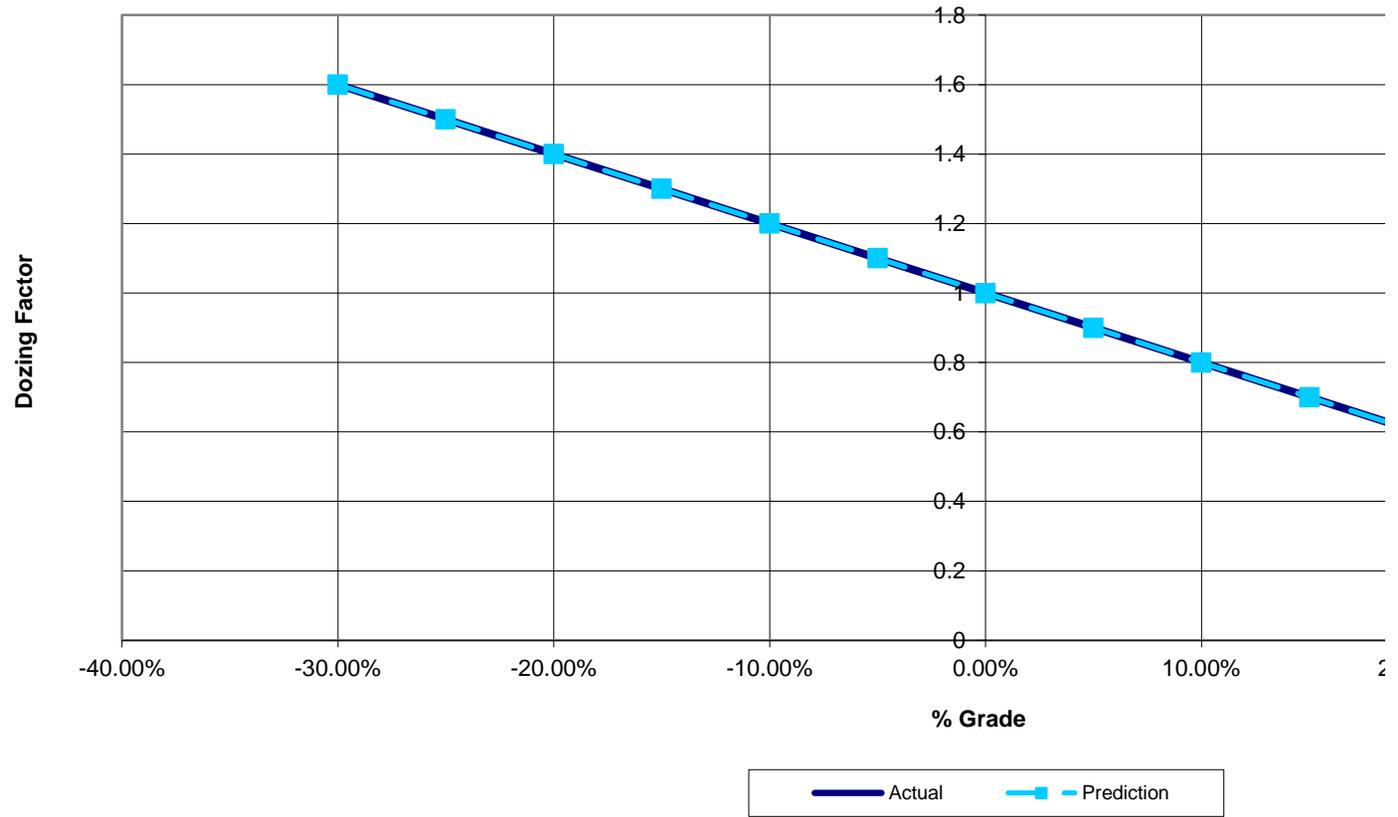


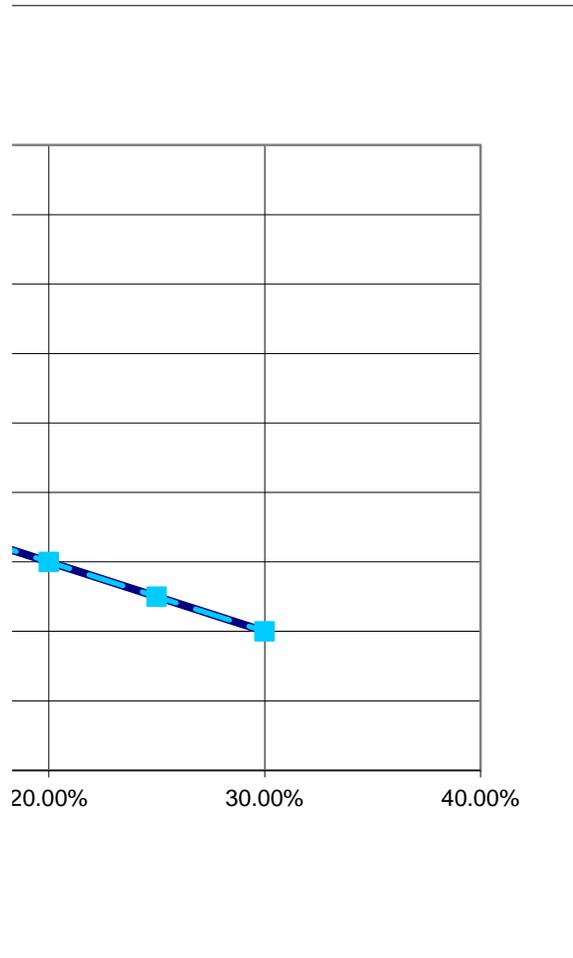


Actual	
% Grade	Grade Factor
-30.00%	1.6
-15.00%	1.3
0.00%	1
30.00%	0.4

Prediction	
% Grade	Grade Factor
-30%	1.6
-25%	1.5
-20%	1.4
-15%	1.3
-10%	1.2
-5%	1.1
0%	1
5%	0.9
10%	0.8
15%	0.7
20%	0.6
25%	0.5
30%	0.4

% Grade vs. Dozing Factor (-) Downhill (+) Uphill





Pinabete Permit (2016 to 2021)					
Dozer Polygons					
Poly ID	Volume	Av. Push Distance	Grade	Area	
	yd ³	ft.	%	ft ²	Acres
D-1	148,000	296	-6.0	298,185	6.8
D-2	269,782	297	-7.9	706,877	16.2
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	375,627	161	-2.0	1,032,978	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	14,789,409			23,602,218	542
Wt. Average		324	-11.1		

For Wt. Average	
Distance	Grade
43,808,000	-888,000
80,125,254	-2,131,278
36,800,000	-1,312,000
236,168,000	-5,068,700
181,170,000	-6,415,200
63,474,000	-5,989,800
60,475,947	-751,254
26,564,000	-2,006,800
191,394,000	-5,747,400
473,484,000	-18,176,400
33,800,000	-4,760,000
18,080,000	-1,717,600
31,375,000	-1,212,500
42,000,000	-4,137,000
102,505,000	-7,719,000
26,257,000	1,057,100
131,600,000	-8,225,000
56,880,000	-4,320,000
122,451,000	-6,426,000
175,122,000	-6,831,000
226,461,000	-8,209,900
168,345,000	-6,525,000
177,643,000	-2,085,200
155,881,000	-1,876,700
52,266,000	223,200
268,569,000	-2,557,800
376,176,000	-4,243,200
382,923,000	-4,634,100
126,700,000	-3,955,000
219,177,000	-5,942,700
114,226,000	-5,850,600
35,260,000	-2,591,200
4,902,000	-482,600
29,184,000	-980,400
36,716,000	-1,688,400
6,992,000	-1,099,400
237,300,000	-13,560,000
29,016,000	-4,804,800
<u>7,334,000</u>	<u>-596,600</u>
4,788,604,201	-164,238,232

Scraper or Truck / Loader or Scraper Polygons							
Poly ID	Volume	Av. One way Distance	Grade	Cut area		Fill Area (if separate)	
	yd ³	ft.	%	ft ²	Acres	ft ²	Acres
T-1	1,269,906	1326	-5.1	1,010,786	23.2	1,530,867	35.1
T-2	4,344,898	520	-9.6	5,716,288	131.2		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
TOTALS		WEIGHTED AVERAGES		TOTALS			
Scraper	13,640,804	1063	-6.0	20,224,035	464	4,984,402	114
Truck / Shovel	5,929,000	3989	-2.2				

Scrapers		Truck Shovel	
For Wt. Average		For Wt. Average	
Distance	Grade	Distance	Grade
1,683,895,356	-6,476,521		
2,259,346,960	-41,711,021		
		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
		<u>7,060,200,000</u>	<u>-19,680,000</u>
#####	-81,922,741	23,650,583,000	-13,289,100

NOTES:

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

High Wall Reclamation 1,336,000 bcy

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

19-Mar-14

Cut Block	Total Volume cu. yds.	Permanent Program %	Permanent Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project										
D-1	148,000	100%	148,000	D-1	296	296			-6	Straight or Radial Push
D-2	269,782	100%	269,782	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	375,627	100%	375,627	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
Totals				Weighted Average						
Area 4 Project	14,789,409	100%	14,789,409		324	324			-11.1	
GRAND TOTAL	14,789,409		14,789,409							

Total yards go to Worksheet 3

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

19-Mar-14

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

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

19-Mar-14

Cut Block	Total Volume cu. yds.	Permanent Program %	Permanent Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project										
T-1	1,269,906	100%	1,269,906			1,326			-5.1	Adj. Dist. reflects haul route
T-2	4,344,898	100%	4,344,898			520			-9.6	Adj. Dist. reflects haul route
T-5	2,998,000	100%	2,998,000			918			-2.8	Adj. Dist. reflects haul route
T-7	928,000	100%	928,000			796			-6.1	Adj. Dist. reflects haul route
T-8	4,100,000	100%	4,100,000			1,722			-4.8	Adj. Dist. reflects haul route
Totals				Weighted Average						
Area 4 Project	13,640,804	100%	13,640,804			1,063			-6.0	
GRAND TOTAL	13,640,804		13,640,804							

Total yards go to Worksheet 3

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

19-Mar-14

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

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-13
AREA 4 BOND REGRADE TOPSOILING
TRUCKS AND LOADER**

19-Mar-14

Cut Block	Total Volume cu. yds.	Area acres	Perm. Topsoil Volume cu. yds.	Root Zone Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project	858,706	1,120.5	858,706		Area 4 Project		2,970			4.00%	Adj. Dist. reflects haul route
TOTAL	858,706	1,120.5	858,706		Weighted Average:		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-22
AREA BOND REGRADE MITIGATION
SCRAPERS**

19-Mar-14

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

Total yards go to Worksheet 3

Assumptions:

10.8%
4.0

of all reclaim acres require mitigation

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-16
AREA 4 BOND REGRADE MITIGATION
TRUCKS AND LOADER**

19-Mar-14

Cut Block	Total Volume cu. yds.	Area acres	Topsoil Volume cu. yds.	Perm. Root Zone Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft.	Fill Elev. ft.	Grade %	Comments
Area 4 Project	688,230	1,120.5		688,230	Area 4 Project		8,372			4.00%	Adj. Dist. reflects haul route
TOTAL	688,230	1,121		688,230	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 4
- 0.5 feet topsoil replacement depth Area 4

Project: Pinabete Permit

Date: Mar-2014

TABLE 12-B-2			
CULVERT VOLUMES FOR DEMOLITION AND REMOVAL			
CULVERT ID	Diameter [in]	Length [ft]	Volume [ft³]
CP-189	30	318	1,561
Total			1,561

TABLE 12-B-3 BACKFILLING OF PONDS AND IMPOUNDMENTS									
Pond	Pond Volume		Dam ²					Dozer Push Distance [ft]	Backfill Volume ³ [bcy] ¹
	[ac-ft]	[bcy] ¹	Bottom [ft]	Top [ft]	Height [ft]	Length [ft]	Volume [bcy] ¹		
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
TOTAL		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.

TABLE 12-B-25			
DRILL AND BLAST QUANTITIES			
Area	Volume [yd³]	Equipment	Comments
Area 4 Project	1,336,000	Ingersoll-Rand DM23	Drilling and Blasting pit highwalls
Total	1,336,000		

WORKSHEET NO. 2																	
STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY																	
Structure	Length (ft)	Width (ft)	Area (sf)	#	Construction	Buildings / Utilities / Other Structures				Floors, Surfaces & Walls				Footings			
						Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	Cost	Length [ft]	Ref	Unit Cost	Cost
Concrete - Floors, Surfaces & Walls	Length (ft)	Width (ft)	Area (sf)	#	Construction												
										-	8b	3.57	\$0				
										-	8b	3.57	\$0				
										-	11	9.57	\$0				
										-	9b	4.78	\$0				
										-	9b	4.78	\$0				
										-	8b	3.57	\$0				
										-	8b	3.57	\$0				
										-	11	9.57	\$0				
										-	9b	4.78	\$0				
										-	11	9.57	\$0				
										-	10a	6.38	\$0				
										-	8b	3.57	\$0				
										-	11	9.57	\$0				
										-	8b	3.57	\$0				
										-	8b	3.57	\$0				
Concrete/Asphalt - Aprons & Driveways	Length (ft)	Width (ft)	Area (sf)	#	Construction												
										-	28	0.88	\$0				
										-	28	0.88	\$0				
										-	28	0.88	\$0				
										-	29	1.26	\$0				
										-	11	9.57	\$0				
										-	9b	4.78	\$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				
										-	50	14.04	\$0				
Utilities			Length (lf)			Construction	Length (lf)										
							- 25	3.36	\$0								
							- 25	3.36	\$0								
							- 32	7,019.97	\$0								
							- 26	1.82	\$0								

WORKSHEET NO. 2																	
STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY																	
Structure							Buildings / Utilities / Other Structures				Floors, Surfaces & 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	\$0							
							-	24	3.71	\$0							
							-	20	24.74	\$0							
							-	31	0.23	\$0							
							-	11	9.57	\$0							
							-	11	9.57	\$0							
							-	11	9.57	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	71	2,910.00	\$0							
							-	31	0.23	\$0							
Conveyors	Length (ft)	Width (ft)	Area (sf)		#	Construction											
							-	33	22.75	\$0							
							-	29	1.26	\$0							
							-	11	9.57	\$0							
Area 4 South																	
Buildings - Above Concrete	Length (ft)	Width (ft)	Area (sf)	Height (ft)	#	Construction											
			0			Steel Building	-	1	0.22	\$0							
			0			Steel Building	-	1	0.22	\$0							

WORKSHEET NO. 2																		
STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY																		
Structure							Buildings / Utilities / Other Structures				Floors, Surfaces & Walls				Footings			
							Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	Cost	Length [ft]	Ref	Unit Cost	Cost
Concrete - Footings	Length (ft) on Long Axis	Length (ft) on Short Axis			#	Construction												
						Concrete									-	12a	11.43	\$0
Concrete - Floors, Surfaces & Walls	Length (ft)	Width (ft)	Area (sf)		#	Construction												
			-			Concrete				-	9a	4.25	\$0					
			-			MSE Wall				-	20	24.74	\$0					
Concrete/Asphalt - Aprons & Driveways																		
Concrete - 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					
Utilities			Length (lf)			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								
Other Structures	Length (ft)	Width (ft)	Area (sf)	Capacity (gal)	#	Construction												
Raw Water Storage Tank					1	Steel Tank	-	31	0.23	\$0								
Conveyors	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								
TOTAL										\$0								\$0
TOTAL DEMOLITION COST																	\$0	

WORKSHEET NO. 3
MATERIAL HANDLING SUMMARY SHEET

	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	14,789,409 LCY	1	14,789,409 LCY	324	-11.1%	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	13,640,804 LCY	1	13,640,804 LCY	1,063	-6.0%	637G
5	Topsoil - Loader/Truck Area 4 Project	858,706 BCY	1.142	980,642 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	688,230 BCY	1.142	785,959 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	1,121 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

WORKSHEET NO. 5A	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
2	Grading - Dozer Area 4 Project
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
-11.1% grade on average 324 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.2}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.8$
Net Hourly Production	$= \frac{0.8}{\text{operating adjustment factor}} * \frac{990 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 761 \text{ LCY/hr}$
Hours Required ²	$= \frac{14,789,409 \text{ LCY}}{\text{volume to be moved}^1} / \frac{761 \text{ LCY/hr}}{\text{net hourly production}} = 19,446.1 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5B	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
23	Backfill Ponds Area 4 Project
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
0.0% grade on average 173 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{1,650 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,037 \text{ LCY/hr}$
Hours Required ²	$= \frac{85,217 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,037 \text{ LCY/hr}}{\text{net hourly production}} = 82.2 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5C	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{volume to be moved}^1}{\text{net hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5D	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{volume to be moved}^1}{1,657 \text{ LCY/hr}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5E	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{volume to be moved}^1}{1,657 \text{ LCY/hr}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5F	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	= $\frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	= $\frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	= $\frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5G	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	= $\frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	= $\frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	= $\frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8A	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
3	Grading - Loader/Truck Area 4 Project
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 0.90 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.90}{\text{bucket fill factor}} = 13.5 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{13.5 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,038 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{5,929,000 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,038 \text{ LCY/hr}}{\text{net hourly production}} = 5,709 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8B	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
7	Mitigation - Loader/Truck Area 4 Project
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 0.90 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{785,959 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 649 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8C	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
5	Topsoil - Loader/Truck Area 4 Project
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 1.05 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{980,642 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 809 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8D	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 0.95 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.95}{\text{bucket fill factor}} = 14.3 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{14.3 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,096 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,096 \text{ LCY/hr}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8E	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 1.05 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,212 \text{ LCY/hr}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8F	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 1.05 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,212 \text{ LCY/hr}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8G	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 1.05 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,212 \text{ LCY/hr}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8H**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks

0.95 Bucket Fill Factor

15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.95}{\text{bucket fill factor}} = 14.3 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{14.3 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,096 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\quad - \text{LCY}}{\text{volume to be moved}^1} / \frac{1,096 \text{ LCY/hr}}{\text{net hourly production}} = 0 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8H	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 0.95 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.95}{\text{bucket fill factor}} = 14.3 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{14.3 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,096 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,096 \text{ LCY/hr}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8H	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 0.88 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.88}{\text{bucket fill factor}} = 13.2 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{13.2 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,015 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,015 \text{ LCY/hr}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9A PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
3 Grading - Loader/Truck Area 4 Project	
Characterization of Truck Used (type, size, etc.) ³	
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.):	
3,989 ft. average haul distance -2.2% Grade (Loaded) 3.0% Rolling Resisance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} = 5.0 \text{ passes}$	$\text{Net Truck Capacity} = \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{5}{\text{loader passes per truck}} = 67 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.65 \text{ min}}{\text{loader cycle time}} * \frac{5}{\text{loader passes per truck}} = 3.2 \text{ min}$	$\text{Truck Cycle Time} = \frac{2.2 \text{ min}}{\text{haul time}} + \frac{1.2 \text{ min}}{\text{return time}} + \frac{3.2 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 7.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{7.7 \text{ min}}{\text{truck cycle time}} / \frac{3.2 \text{ min}}{\text{truck loading time}} = 2 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{67 \text{ LCY}}{\text{net truck capacity}} / \frac{7.7 \text{ min}}{\text{cycle time}} = 8.7 \text{ LCY/min}$
$\text{Hourly Production} = \frac{9 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 436 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{5,929,000 \text{ LCY}}{\text{volume to be moved}^1} / \frac{436 \text{ LCY/hr}}{\text{hourly production}} = 13,607 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9B PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
7 Mitigation - Loader/Truck Area 4 Project	
Characterization of Truck Used (type, size, etc.) ³	
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.):	
8,372 ft. average haul distance 4.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} = 5 \text{ passes}$	$\text{Net Truck Capacity} = \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{5}{\text{loader passes per truck}} = 67 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{5}{\text{loader passes per truck}} = 3.2 \text{ min}$	$\text{Truck Cycle Time} = \frac{4.7 \text{ min}}{\text{haul time}} + \frac{2.5 \text{ min}}{\text{return time}} + \frac{3.2 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 11.5 \text{ min}$
$\text{Number of Trucks Required} = \frac{11.5 \text{ min}}{\text{truck cycle time}} / \frac{3.2 \text{ min}}{\text{truck loading time}} = 3 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{67 \text{ LCY}}{\text{net truck capacity}} / \frac{11.5 \text{ min}}{\text{cycle time}} = 5.8 \text{ LCY/min}$
$\text{Hourly Production} = \frac{6 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 292 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{785,959 \text{ LCY}}{\text{volume to be moved}^1} / \frac{292 \text{ LCY/hr}}{\text{hourly production}} = 2,696 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9C PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
5 Topsoil - Loader/Truck Area 4 Project	
Characterization of Truck Used (type, size, etc.) ³	
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.):	
2,970 ft. average haul distance 4.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{15.8 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{15.8 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{1.7 \text{ min}}{\text{haul time}} + \frac{0.9 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 6.2 \text{ min}$
$\text{Number of Trucks Required} = \frac{6.2 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 2 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{6.2 \text{ min}}{\text{cycle time}} = 10.2 \text{ LCY/min}$
$\text{Hourly Production} = \frac{10 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 510 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{980,642 \text{ LCY}}{\text{volume to be moved}^1} / \frac{510 \text{ LCY/hr}}{\text{hourly production}} = 1,921 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9D PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.): ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 57 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{57 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 15.5 \text{ LCY/min}$
$\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 773 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{773 \text{ LCY/hr}}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9E PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 17.1 \text{ LCY/min}$
$\text{Hourly Production} = \frac{17 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 854 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{- \text{LCY}}{\text{volume to be moved}^1} / \frac{854 \text{ LCY/hr}}{\text{hourly production}} = - \text{hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9F PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.): ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 17.1 \text{ LCY/min}$
$\text{Hourly Production} = \frac{17 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 854 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9G	
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.): ³	
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 ft. average haul distance	
1.0% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 17.1 \text{ LCY/min}$
$\text{Hourly Production} = \frac{17 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 854 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{854 \text{ LCY/hr}}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9H PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.): ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 57 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{57 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 15.5 \text{ LCY/min}$
$\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 773 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{773 \text{ LCY/hr}}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 91 PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$ $\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$ $\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$ $\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 773 \text{ LCY/hr}$	$\text{Net Truck Capacity} = \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 57 \text{ LCY}$ $\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$ $\text{Production Rate} = \frac{57 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 15.5 \text{ LCY/min}$ $\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{773 \text{ LCY/hr}}{\text{work hour factor}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9J PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{13 \text{ LCY}}{\text{loader bucket net capacity}} = 5 \text{ passes}$ $\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{5}{\text{loader passes per truck}} = 3.3 \text{ min}$ $\text{Number of Trucks Required} = \frac{4.3 \text{ min}}{\text{truck cycle time}} / \frac{3.3 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$ $\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 761 \text{ LCY/hr}$	$\text{Net Truck Capacity} = \frac{13 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{5}{\text{loader passes per truck}} = 66 \text{ LCY}$ $\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{3.3 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 4.3 \text{ min}$ $\text{Production Rate} = \frac{66 \text{ LCY}}{\text{net truck capacity}} / \frac{4.3 \text{ min}}{\text{cycle time}} = 15.2 \text{ LCY/min}$ $\text{Hours Required}^2 = \frac{\text{ } \text{LCY}}{\text{volume to be moved}^1} / \frac{761 \text{ LCY/hr}}{\text{work hour factor}} = \text{ } \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11A**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 [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.)

1,063 ft. average haul distance

-6.0% Grade (Loaded)

3% Rolling Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.7 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.6 \text{ min}}{\text{return trip time}} = 2.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY}}{\text{adjusted capacity}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{2.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,027 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{13,640,804 \text{ LCY}}{\text{volume to be handled}^1} / \frac{1027 \text{ LCY/hr}}{\text{net hourly production}} = 13,288 \text{ hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11B**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY}}{\text{adjusted capacity}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} / \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11C**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} / \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11D	
PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER 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 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 distance 1.0% Grade (Loaded) 3% Rolling Resistance	
Productivity Calculations ³ :	
$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$	
$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} \div \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} \div \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11E**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} / \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11F	
PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER 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 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 distance 1.0% Grade (Loaded) 3% Rolling Resistance	
Productivity Calculations ³ :	
$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$	
$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} \div \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} \div \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11F**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} / \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 12A	
PRODUCTIVITY AND HOURS FOR MOTOR GRADER USE -- GRADING	
Earthmoving Activity:	
29 Road Ripping Area 4 Project	
Characterization of Grader Used (type, size capacity, etc.) ³	
Caterpillar 16H	
Description of Grader Route (push distance,% blade effective length, operating speed, etc.):	
9.75 Ripper width [ft]	
Productivity Calculations ³ :	
Contour Grading:	
$\text{Hourly Productivity} = \frac{3.4 \text{ mi/hr}}{\text{speed}} \times \frac{9.75 \text{ ft.}}{\text{effective blade width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} \div \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 3.0 \text{ ac / hr}$	$\text{Hours Required} = \frac{0 \text{ ac}}{\text{acreage to be graded}^1} \div \frac{2.99 \text{ ac/hr}}{\text{hourly productivity}} = 0 \text{ hr}$
Scarification:	
$\text{Hourly Productivity} = \frac{1.25 \text{ mi/hr}}{\text{work speed}} \times \frac{9.75 \text{ ft.}}{\text{scarifier width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} \div \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 1.1 \text{ ac / hr}$	$\text{Hours Required} = \frac{117 \text{ ac}}{\text{acreage to be ripped}^1} \div \frac{1.10 \text{ ac/hr}}{\text{hourly productivity}} = 107 \text{ hr}$
$\text{Total Hours Required}^2 = \frac{0 \text{ hr}}{\text{grading hours required}} + \frac{107 \text{ hr}}{\text{scarification hours required}} = 107 \text{ hr}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 12B	
PRODUCTIVITY AND HOURS FOR MOTOR GRADER USE -- GRADING	
Earthmoving Activity:	
33 Grading Topsoil Areas	
Characterization of Grader Used (type, size capacity, etc.) ³	
Caterpillar 16H	
Description of Grader Route (push distance,% blade effective length, operating speed, etc.):	
11.9 Ripper width [ft]	
Productivity Calculations ³ :	
Contour Grading:	
$\text{Hourly Productivity} = \frac{3.4 \text{ mi/hr}}{\text{speed}} \times \frac{11.90 \text{ ft.}}{\text{effective blade width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} \div \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 3.7 \text{ ac / hr}$	$\text{Hours Required} = \frac{1,238 \text{ ac}}{\text{acreage to be graded}^1} \div \frac{3.65 \text{ ac/hr}}{\text{hourly productivity}} = 339 \text{ hr}$
Scarification:	
$\text{Hourly Productivity} = \frac{1.25 \text{ mi/hr}}{\text{work speed}} \times \frac{9.75 \text{ ft.}}{\text{scarifier width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} \div \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 1.1 \text{ ac / hr}$	$\text{Hours Required} = \frac{- \text{ ac}}{\text{acreage to be ripped}^*} \div \frac{1.10 \text{ ac/hr}}{\text{hourly productivity}} = - \text{ hr}$
$\text{Total Hours Required}^2 = \frac{339 \text{ hr}}{\text{grading hours required}} + \frac{0 \text{ hr}}{\text{scarification hours required}} = 339 \text{ hr}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

*No Ripping on Topsoiled Areas

WORKSHEET NO. 13A						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Dozers						
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
² Grading - Dozer Area 4 Project	D11R Dozer	100%	(\$304 + \$ 35)	*	19,446	= \$ 6,598,373
²³ Backfill Ponds Area 4 Project	D11R Dozer	100%	(\$304 + \$ 35)	*	82	= \$ 27,879
³² Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	-	= \$ -
³² Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	-	= \$ -
³² Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	-	= \$ -
³² Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	-	= \$ -
³² Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	-	= \$ -
Total Cost = \$ 6,626,252						

Equipment and Accessory Identification

- 1) Caterpillar D11R with Universal Blade

Data Sources:

- 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

WORKSHEET NO. 13B						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Loaders						
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
3	Grading - Loader/Truck Area 4 Project	992G Loader	100%	(\$ 249 + \$ 35)	*	5,709 = \$ 1,626,537
		16H Grader	50%	(\$ 92 + \$ 35)	*	2,855 = \$ 363,102
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	5,709 = \$ 1,019,186
		Water Truck	50%	(\$ 133 + \$ 35)	*	2,855 = \$ 480,686
7	Mitigation - Loader/Truck Area 4 Project	992G Loader	100%	(\$ 249 + \$ 35)	*	649 = \$ 184,814
		16H Grader	50%	(\$ 92 + \$ 35)	*	324 = \$ 41,257
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	649 = \$ 115,804
		Water Truck	50%	(\$ 133 + \$ 35)	*	324 = \$ 54,618
5	Topsoil - Loader/Truck Area 4 Project	992G Loader	100%	(\$ 249 + \$ 35)	*	809 = \$ 230,593
		16H Grader	50%	(\$ 92 + \$ 35)	*	405 = \$ 51,477
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	809 = \$ 144,489
		Water Truck	50%	(\$ 133 + \$ 35)	*	405 = \$ 68,147
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
Total Cost =						\$ 4,380,711

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13C						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Loaders						
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
Total Cost = \$						-

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13D							
SUMMARY CALCULATION OF EARTHMOVING COSTS - Trucks							
	Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
3	Grading - Loader/Truck Area 4 Project	777D Truck	100%	(\$ 177 + \$ 35)	*	13,607 =	\$ 2,894,776
7	Mitigation - Loader/Truck Area 4 Project	777D Truck	100%	(\$ 177 + \$ 35)	*	2,696 =	\$ 573,482
5	Topsoil - Loader/Truck Area 4 Project	777D Truck	100%	(\$ 177 + \$ 35)	*	1,921 =	\$ 408,670
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	- =	\$ -
Total Cost =							\$ 3,876,927

Equipment and Accessory Identification

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

Data Sources:

- 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

WORKSHEET NO. 13E						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Scrapers						
Project	Equipment Type ¹	Ratio	Equipment Unit Costs [\$/hr] ²	Labor Costs [\$/hr] ³	Total Hours Required ⁴	Total Cost [\$]
4	Grading - Scrapers Area 4 Project	637G Scraper	100%	(\$ 235 + \$ 35)	*	13,288 = \$ 3,590,739
		637G Scraper	100%	(\$ 235 + \$ 35)	*	13,288 = \$ 3,590,739
		16H Grader	13%	(\$ 92 + \$ 35)	*	1,661 = \$ 211,270
		Water Truck	13%	(\$ 133 + \$ 35)	*	1,661 = \$ 279,686
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
Total Cost =						\$ 7,672,434

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13F						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Scrapers						
Project	Equipment Type ¹	Ratio	Equipment Unit Costs [\$/hr] ²	Labor Costs [\$/hr] ³	Total Hours Required ⁴	Total Cost [\$]
32 Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$	-
	Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$	-
32 Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$	-
	Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$	-
32 Intentionally Left Blank						
32 Intentionally Left Blank						
32 Intentionally Left Blank						
Total Cost = \$						-

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13G							
SUMMARY CALCULATION OF EARTHMOVING COSTS - Motor Graders							
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]	
29 Road Ripping Area 4 Project	16H Grader, ripping	100%	(\$ 97 + \$ 35)	*	107 =	\$	14,112
33 Grading Topsoil Areas	16H Grader	100%	(\$ 92 + \$ 35)	*	339 =	\$	43,116
Total Cost =						\$	57,227

Equipment and Accessory Identification

- 1) Caterpillar 16H Motor Grader with Ripper Blade

Data Sources:

- 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

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

Equipment and Accessory Identification

- 1) Ingersoll-Rand DMM2 Crawler-type Drill

Data Sources:

- 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 Seeding	$= \frac{1,121 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) =$
20% Contingency for vegetation failure:	
Costs For Reseeding	$= \frac{224 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) =$
Other Revegetation Activity for this Area (e.g. Soil Sampling):	
TOTAL REVEGETATION COST =	

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

ct: Pinabete Permit
Date: Mar-2014

\$ 1,864,912
\$ 372,982
\$ 2,237,895

WORKSHEET NO. 14B**REVEGETATION COSTS**

Name and Description of Areas to be Revegetated:

34 Revegetation Roads Area 4 Project

Description of Revegetation Activities

20% Contingency for vegetation failure:

$$\text{Costs For Seeding} = \frac{117 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ 194,957$$

20% Contingency for vegetation failure:

$$\text{Costs For Reseeding} = \frac{23 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ 38,991$$

Other Revegetation Activity for this Area (e.g. Soil Sampling):

TOTAL REVEGETATION COST = \$ 233,948

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

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

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

WORKSHEET NO. 14D	
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 Seeding	$= \frac{\text{ - ac}}{\text{Acreage to be reseeded}} * \left(\frac{\text{ 382.8 \$/ac.}}{\text{cost for seedbed preparation}} + \frac{\text{ 1281.5 \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ \text{ -}$
Reseeding 20% of permanent program lands that were revegged during or before 1999:	
Costs For Reseeding	$= \frac{\text{ 0 ac}}{\text{Acreage to be reseeded*}} * \left(\frac{\text{ 382.8 \$/ac.}}{\text{cost for seedbed preparation}} + \frac{\text{ 1281.5 \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ \text{ -}$
Other Revegetation Activity for this Area (e.g. Soil Sampling):	
TOTAL REVEGETATION COST = \$ -	

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

WORKSHEET NO. 15A
PRODUCTIVITY AND HOURS FOR DRILL USE

Earthmoving Activity:

1 Drill & Blast Area 4 Project

Characterization of Drill Used

Drill Model IR DMM2 Drill					
Drill Bit Diameter	10.63 [in]	Burden	26 [ft]	1,233	Volume Shot per hole [bcy]
Drill Rod Length	35 [ft]	Bench Height	40 [ft]		
Penetration Rate	228 [ft/hr]	Spacing	32 [ft]		

Description of Activity:

Drilling holes to provide space for explosives

Calculation:

$$\text{Cycles per Hour} = \frac{60 \text{ min}}{\text{time available}} / \left(\frac{10.5 \text{ min}}{\text{drill time}} + \frac{1.6 \text{ min}}{\text{rod feed time}} + \frac{0.4 \text{ min}}{\text{rod pull time}} + \frac{2.0 \text{ min}}{\text{misc.}} \right) = 4.1 \text{ cycles/hr}$$

$$\begin{aligned} \text{Operating Delays} &= \frac{30.0 \text{ min}}{\text{lunch}} + \frac{15.0 \text{ min}}{\text{shift change}} + \frac{10.0 \text{ min}}{\text{blasting}} + \frac{6.0 \text{ min}}{\text{service time}} + \frac{5.0 \text{ min}}{\text{moving}} + \frac{5 \text{ min}}{\text{misc.}} = 71 \text{ min} \\ &= 14.8\% \text{ of a shift} \\ &= 85.2\% \text{ operational utilization} \end{aligned}$$

$$\text{Effective Pit Utilization (EPU)} = \frac{85.2\%}{\text{operational utilization}} * \frac{90.0\%}{\text{availability}} = 76.7\%$$

$$\text{Maximum Penetration Rate} = \frac{40 \text{ ft}}{\text{bench height}} * \frac{4.1 \text{ cycles/hr}}{\text{cycles per hour}} * \frac{76.7\% \text{ EPU}}{\text{pit utilization}} = 126.5 \text{ ft/hr}$$

Maximum Production:

$$\text{per Scheduled Shift} = \frac{26 \text{ ft}}{\text{burden}} * \frac{32 \text{ ft}}{\text{spacing}} * \frac{126.5 \text{ ft/hr}}{\text{max. penetration rate}} * \frac{8.0 \text{ hr/shift}}{\text{hours in a shift}} / \frac{27 \text{ ft}^3/\text{yd}^3}{\text{conversion factor}} = 31,184 \text{ bcy/shift}$$

$$\text{per Scheduled Hour} = \frac{31,184 \text{ bcy/shift}}{\text{max. production per sched. shift}} / \frac{8 \text{ hr/shift}}{\text{conversion factor}} = 3,898 \text{ bcy/hr}$$

$$\text{Drill Hours Required} = \frac{1,336,000 \text{ bcy}}{\text{volume to be blasted}} / \frac{3,898 \text{ bcy/hr}}{\text{production rate}} = 343 \text{ hr}$$

WORKSHEET NO. 15B
PRODUCTIVITY AND HOURS FOR DRILL USE

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Drill Used

Drill Model IR DMM2 Drill					
Drill Bit Diameter	10.63 [in]	Burden	26 [ft]	1,233	Volume Shot per hole [bcy]
Drill Rod Length	35 [ft]	Bench Height	40 [ft]		
Penetration Rate	228 [ft/hr]	Spacing	32 [ft]		

Description of Activity:

Drilling holes to provide space for explosives

Calculation:

$$\text{Cycles per Hour} = \frac{60 \text{ min}}{\text{time available}} / \left(\frac{10.5 \text{ min}}{\text{drill time}} + \frac{1.6 \text{ min}}{\text{rod feed time}} + \frac{0.4 \text{ min}}{\text{rod pull time}} + \frac{2.0 \text{ min}}{\text{misc.}} \right) = 4.1 \text{ cycles/hr}$$

$$\begin{aligned} \text{Operating Delays} &= \frac{30.0 \text{ min}}{\text{lunch}} + \frac{15.0 \text{ min}}{\text{shift change}} + \frac{10.0 \text{ min}}{\text{blasting}} + \frac{6.0 \text{ min}}{\text{service time}} + \frac{5.0 \text{ min}}{\text{moving}} + \frac{5 \text{ min}}{\text{misc.}} = 71 \text{ min} \\ &= 14.8\% \text{ of a shift} \\ &= 85.2\% \text{ operational utilization} \end{aligned}$$

$$\text{Effective Pit Utilization (EPU)} = \frac{85.2\%}{\text{operational utilization}} * \frac{90.0\%}{\text{availability}} = 76.7\%$$

$$\text{Maximum Penetration Rate} = \frac{40 \text{ ft}}{\text{bench height}} * \frac{4.1 \text{ cycles/hr}}{\text{cycles per hour}} * \frac{76.7\% \text{ EPU}}{\text{pit utilization}} = 126.5 \text{ ft/hr}$$

Maximum Production:

$$\text{per Scheduled Shift} = \frac{26 \text{ ft}}{\text{burden}} * \frac{32 \text{ ft}}{\text{spacing}} * \frac{126.5 \text{ ft/hr}}{\text{max. penetration rate}} * \frac{8.0 \text{ hr/shift}}{\text{conversion factor}} = 31,184 \text{ bcy/shift}$$

$$\text{per Scheduled Hour} = \frac{31,184 \text{ bcy/shift}}{\text{max. production per sched. shift}} / \frac{8 \text{ hr/shift}}{\text{conversion factor}} = 3,898 \text{ bcy/hr}$$

$$\text{Drill Hours Required} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} / \frac{3,898 \text{ bcy/hr}}{\text{production rate}} = 0 \text{ hr}$$

WORKSHEET NO. 15C

PRODUCTIVITY AND COSTS FOR BLASTING ACTIVITIES

Earthmoving Activity:

1 Drill & Blast Area 4 Project

Characterization of Blasting Parameters

Ingersoll Rand DMM2 Drill

Burden	26 [ft]	Powder Factor [lb/bcy]	0.9 [lb/bcy]
Bench Height	40 [ft]	Volume Shot per hole [bcy]	1,233 [bcy]
Spacing	32 [ft]		

Description of Activity:

ANFO used with boosters and primacord for explosive load

Calculation:

$$\text{Total ANFO Required} = \frac{1,336,000 \text{ bcy}}{\text{volume to be blasted}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 1,202,400 \text{ lb}$$

$$\text{Miscellaneous Powder Supplies} = \frac{1,202,400 \text{ lb}}{\text{ANFO required}} * \frac{5\%}{\text{contingency factor}} = 60,120 \text{ lb}$$

$$\text{Cord Cost per Hole} = \left(\frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right) * \frac{10\%}{\text{waste factor}} * \frac{0.10 \text{ \$/ft}}{\text{cord unit cost}} = 11 \text{ \$/hole}$$

$$\text{ANFO Cost per Hole} = \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} * \frac{0.15 \text{ \$/lb}}{\text{ANFO unit cost}} = 171 \text{ \$/hole}$$

$$\text{Primer Cost per Hole} = \frac{1}{\text{primers per hole}} * \frac{4.63 \text{ \$/ea}}{\text{primer unit cost}} = 4.63 \text{ \$/hole}$$

$$\text{Volumetric Blasting Cost} = \left(\frac{11 \text{ \$/hole}}{\text{cord cost per hole}} + \frac{171 \text{ \$/hole}}{\text{ANFO cost per hole}} + \frac{4.63 \text{ \$/hole}}{\text{primer cost per hole}} \right) / \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} = 0.15 \text{ \$/bcy}$$

$$\text{Total Blasting Cost} = \frac{0.15 \text{ \$/bcy}}{\text{volumetric blasting cost}} * \frac{1,336,000 \text{ bcy}}{\text{volume to be blasted}} = \$ 202,751$$

WORKSHEET NO. 15D

PRODUCTIVITY AND COSTS FOR BLASTING ACTIVITIES

Earthmoving Activity:

32 Intentionally Left Blank

Characterization 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]

Description of Activity:

ANFO used with boosters and primacord for explosive load

Calculation:

$$\text{Total ANFO Required} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 0 \text{ lb}$$

$$\text{Miscellaneous Powder Supplies} = \frac{0 \text{ lb}}{\text{ANFO required}} * \frac{5\%}{\text{contingency factor}} = 0 \text{ lb}$$

$$\text{Cord Cost per Hole} = \left(\frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right) * \frac{10\%}{\text{waste factor}} * \frac{0.10 \text{ \$/ft}}{\text{cord unit cost}} = 11 \text{ \$/hole}$$

$$\text{ANFO Cost per Hole} = \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} * \frac{0.15 \text{ \$/lb}}{\text{ANFO unit cost}} = 171 \text{ \$/hole}$$

$$\text{Primer Cost per Hole} = \frac{1}{\text{primers per hole}} * \frac{4.63 \text{ \$/ea}}{\text{primer unit cost}} = 4.63 \text{ \$/hole}$$

$$\text{Volumetric Blasting Cost} = \left(\frac{11 \text{ \$/hole}}{\text{cord cost per hole}} + \frac{171 \text{ \$/hole}}{\text{ANFO cost per hole}} + \frac{4.63 \text{ \$/hole}}{\text{primer cost per hole}} \right) / \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} = 0.15 \text{ \$/bcy}$$

$$\text{Total Blasting Cost} = \frac{0.15 \text{ \$/bcy}}{\text{volumetric blasting cost}} * \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \$ 0$$

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

WORKSHEET NO. 16**BOND 2016 to 2021 - PINABETE PERMIT RECLAMATION BOND SUMMARY SHEET**

		2012 Estimate	
1	Total Facility and Structure Removal Costs	\$	-
2	Total Earthmoving Costs	\$	22,732,862
3	Total Revegetation Costs	\$	2,471,843
4	Total Blast and Other Reclamation Activities Costs	\$	265,011
5	Subtotal: Total Direct Costs	\$	<u>25,469,715</u>
6	Mobilization and Demobilization (at 1.0% of Item 5)	1.0%	\$ 254,697
7	Contingencies (at 5.0% of Item 5)	5.0%	\$ 1,273,486
8	Engineering Redesign Fee (at 1.8% of Item 5)	1.8%	\$ 458,455
9	Contractor Profit and Overhead (at 15.0% of Item 5)	15.0%	\$ 3,820,457
10	Reclamation Management Fee (at 3.9% of Item 5)	3.9%	\$ 993,319
GRAND TOTAL BOND AMOUNT			<u>\$ 32,270,129</u>
<i>(Sum of Items 5 through 10)</i>			

LESS Pre-2016 2011 Area 4N Calculation

\$16,459,152

(Facility and structure removal left in Pre-2016)

NEW BOND TO ADD FOR 2016 to 2021 (Area 4 Project)**\$15,810,977**

WORKSHEET NO. 16a
AREA 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
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	
LESS STRUCTURE NOT INCLUDED IN Post 2016			\$16,459,152

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

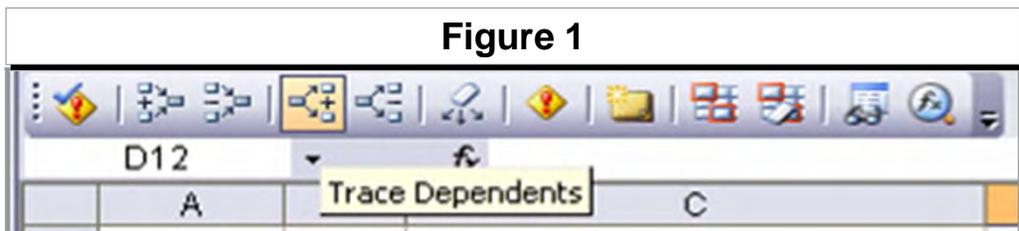


TABLE 50-A-23
HISTORICAL EQUIPMENT OWNERSHIP AND OPERATING COSTS

Equipment Model	Ownership Costs (\$/hr)			Overhaul Costs (\$/hr)				Field Repair and Fuel Costs (\$/hr)										Escalated Total (\$/hr)		
	Depreciation	Depreciation Multiplier	Adjusted Depreciation	Labor	Labor Multiplier	Adjusted Labor	O/H Parts	Labor	Labor Multiplier	Adjusted Labor	Parts	Fuel	Fuel Multiplier	Adjusted Fuel	Lube	Tires	Tire Multiplier		Adjusted Tires	GEC (2)
D9R Dozer Semi-U Blad	\$ 24.39	0.83	\$ 20.33	\$ 6.88	0.870	\$ 5.98	\$ 18.38	\$ 8.06	0.870	\$ 7.01	\$ 17.90	\$ 21.67	1.728	\$ 37.46	\$ 6.63	\$ -	\$ 1.73	\$ -	\$ 2.98	126.20
D10R Dozer Semi-U Blad	\$ 34.24	0.83	\$ 28.53	\$ 6.88	0.870	\$ 5.98	\$ 25.53	\$ 8.06	0.870	\$ 7.01	\$ 24.87	\$ 30.12	1.728	\$ 52.06	\$ 9.21	\$ -	\$ 1.73	\$ -	\$ 4.14	170.63
D11R Dozer U Blade	\$ 55.27	0.83	\$ 46.06	\$ 6.88	0.870	\$ 5.98	\$ 41.22	\$ 8.06	0.870	\$ 7.01	\$ 40.15	\$ 44.92	1.728	\$ 77.64	\$ 14.49	\$ -	\$ 1.73	\$ -	\$ 6.69	260.64
637G Scraper	\$ 25.01	0.83	\$ 20.84	\$ 6.72	0.870	\$ 5.84	\$ 18.33	\$ 10.07	0.870	\$ 8.76	\$ 18.19	\$ 28.12	1.728	\$ 48.60	\$ 8.77	\$ 5.21	\$ 1.73	\$ 5.21	\$ 0.77	144.95
992G Loader	\$ 67.59	0.83	\$ 56.33	\$ 4.20	0.870	\$ 3.65	\$ 14.26	\$ 5.12	0.870	\$ 4.45	\$ 15.73	\$ 38.66	1.728	\$ 66.82	\$ 12.77	\$ 22.57	\$ 1.73	\$ 22.57	\$ 2.14	213.30
777D Truck	\$ 42.09	0.83	\$ 35.08	\$ 16.06	0.870	\$ 13.97	\$ 14.58	\$ 9.86	0.870	\$ 8.57	\$ 9.00	\$ 27.20	1.728	\$ 47.01	\$ 10.54	\$ 13.72	\$ 1.73	\$ 13.72	\$ -	162.43
16H Grader	\$ 18.42	0.83	\$ 15.35	\$ 3.02	0.870	\$ 2.63	\$ 8.57	\$ 2.52	0.870	\$ 2.19	\$ 8.31	\$ 13.29	1.728	\$ 22.97	\$ 4.25	\$ 5.29	\$ 1.73	\$ 5.29	\$ 0.69	75.60
Water Truck 10,000 gal	\$ 28.40	0.83	\$ 23.67	\$ 5.76	0.870	\$ 5.01	\$ 5.71	\$ 13.97	0.870	\$ 12.15	\$ 11.01	\$ 22.25	1.728	\$ 38.46	\$ 5.81	\$ 9.32	\$ 1.73	\$ 9.32	\$ -	117.79
Small Backho Cat 446B	\$ 6.11	0.83	\$ 5.09	\$ 2.10	0.870	\$ 1.83	\$ 2.25	\$ 2.77	0.870	\$ 2.41	\$ 1.99	\$ 5.99	1.728	\$ 10.35	\$ 1.52	\$ 1.62	\$ 1.73	\$ 1.62	\$ 0.28	28.94
16H Grader, ripping	\$ 19.21	0.83	\$ 16.01	\$ 3.05	0.870	\$ 2.65	\$ 8.78	\$ 2.72	0.870	\$ 2.37	\$ 8.67	\$ 13.29	1.728	\$ 22.97	\$ 4.32	\$ 5.29	\$ 1.73	\$ 5.29	\$ 0.92	77.55
Pickup Truck	\$ 2.40	0.83	\$ 2.00	\$ 0.47	0.870	\$ 0.41	\$ 0.48	\$ 0.59	0.870	\$ 0.51	\$ 0.47	\$ 3.88	1.728	\$ 6.71	\$ 0.52	\$ 0.36	\$ 1.73	\$ 0.36	\$ -	11.96
Mechanic truck	\$ 3.19	0.83	\$ 2.66	\$ 0.47	0.870	\$ 0.41	\$ 0.64	\$ 0.59	0.870	\$ 0.51	\$ 0.62	\$ 2.26	1.728	\$ 3.91	\$ 0.41	\$ 0.48	\$ 1.73	\$ 0.48	\$ -	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: Assume two shifts per day		
Assume 90% availability on all equipment		0.83
Labor - Heavy Equipment Mechanic: Field Repair and Fuel Costs		
((0.08)(CRG Wages) + Local Wages) / CRG Wages		
CFG Wages	\$35.46 /hr	
Local Wages	\$28.00 /hr	
		0.87
Parts:	No adjustment	1
Fuel (Diesel): CFG Cost		
Local Cost	\$1.51 /gal	
Fuel Multiplier	\$2.61 /gal	1.73
Lube:	No adjustment	1
Tires:	XXX 2004 costs	1
GEC:	No adjustment	1
Inflation:		0.144

TABLE 50-A-1

DEMOLITION UNIT COSTS

Means Reference Number (1)			ID	Item	Unit	2008 Bare Costs (1)	2008 Unit Costs
02 41	16.13	0012	1	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 50%	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 50%	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 50%	CF	\$0.15	\$0.15
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 50%	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	\$3.06
02 41	16.17	0300	8b	Floor, 4" concrete slab, mesh reinforced, rods	SF	\$3.37	\$3.57
02 41	16.17	0400	9	Floor, 6" concrete slab, plain	SF	\$3.59	\$3.88
02 41	16.17	0420	9a	Floor, 6" concrete slab, mesh reinforced	SF	\$3.96	\$4.25
02 41	16.17	0440	9b	Floor, 6" concrete slab, mesh reinforced, rods	SF	\$4.49	\$4.78
02 41	16.17	0420	10	Floor, 8" concrete slab, mesh reinforced	SF	\$5.28	\$5.67
02 41	16.17	0440	10a	Floor, 8" concrete slab, mesh reinforced, rods	SF	\$5.99	\$6.38
02 41	16.17	0440	11	Floor, 12" concrete slab, mesh reinforces rods	SF	\$8.98	\$9.57
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	\$11.43
02 41	16.17	1080	13	Footings, concrete, 1.5' x 2'	LF	\$11.16	\$12.92
02 41	16.17	2600	13a	Footings, concrete, 1.5' x 2', average reinforcing + 10%	LF	\$12.28	\$14.03
02 41	16.17	1120	14	Footings, concrete 1.5' x 3'	LF	\$13.95	\$16.58
02 41	16.17	2600	14a	Footings, concrete, 1.5' x 3', average reinforcing + 10%	LF	\$15.35	\$17.98
02 41	16.17	1140	15	Footings, concrete, 2' x 3'	LF	\$15.95	\$19.46
02 41	16.17	2600	15a	Footings, concrete, 2' x 3', average reinforcing + 10%	LF	\$17.55	\$21.06
02 41	16.17	1140	16	Footings, concrete, 2' x 6'	LF	\$31.90	\$38.92
02 41	16.17	2600	16a	Footings, concrete, 2' x 6', average reinforcing + 10%	LF	\$35.09	\$42.11
02 41	16.18	1140	51	Footings, concrete, 2' x 6', average reinforcing + 10%	LF	\$102.08	\$120.81
02 41	16.17	2400	17	Walls, concrete, 3.5" thick	SF	\$4.92	\$5.09
02 41	16.17	2400	18	Walls, concrete, 6" thick	SF	\$8.43	\$8.72
02 41	16.17	2600	18a	Walls, concrete, 6" thick, Average reinforcing + 10%	SF	\$9.27	\$9.57
02 41	16.17	2420	19	Walls, concrete, 8" thick	SF	\$9.64	\$10.03
02 41	16.17	2600	19a	Walls, concrete, 8" thick, Average reinforcing + 10%	SF	\$10.60	\$10.99
02 41	16.17	2440	49	Walls, concrete, 10" thick	SF	\$11.20	\$11.69
02 41	16.17	2600	49a	Walls, concrete, 10" thick, Average reinforcing + 10%	SF	\$12.32	\$12.81
02 41	16.17	2500	50	Walls, concrete, 12" thick	SF	\$13.45	\$14.04
02 41	16.17	2600	50a	Walls, concrete, 12" thick, Average reinforcing + 10%	SF	\$14.80	\$15.38
02 41	16.17	2500	20	Walls, concrete, 18" thick, Average reinforcing + 10%	SF	\$23.86	\$24.74
02 41	16.17	2500	21	Walls, concrete, 2' thick, Average reinforcing + 10%	SF	\$31.81	\$32.98

TABLE 50-A-1

DEMOLITION UNIT COSTS

Means Reference Number (1)			ID	Item	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	\$11.90
02 41	13.60	1650	23	Fencing, 5-strand barbed wire	LF	\$1.64	\$1.64
02 41	13.60	1700	24	Fencing, chain link, posts and fabric, 8' to 10' high	LF	\$2.25	\$3.71
02 41	13.38	2700	25	Cast iron pipe, 4" diameter	LF	\$3.36	\$3.36
02 41	13.54	0200	26	Plastic conduit, 3" to 6"	LF	\$1.82	\$1.82
02 41	13.33	4200	27	Sidewalk, concrete, mesh reinforced (converted to SF)	SF	\$6.67	\$6.67
02 41	13.17	5050	28	Pavement, bituminous, 4"- 6" (converted to SF)	SF	\$0.58	\$0.88
02 41	13.17	5200	29	Driveway, concrete, 6", mesh reinforced (converted to SF)	SF	\$0.96	\$1.26
02 41	13.17	5500	30	Concrete, 7" to 2' thick, reinforced (converted to CF)	CF	\$3.41	\$4.58
02 41	16.13	0500	31	Steel Tanks, Piping & Culvert (Use small building, steel)	CF	\$0.23	\$0.23
			32	69 kV Power Lines	MI	\$6,136.34	\$7,019.97
Unit Costs from 2004 (See "2" below)			33	Conveyor	LF	\$19.89	\$22.75
			34	Water Wells	EA	\$1,602.63	\$1,833.41
			35	Seedbed Prep per Acre	Acre	\$348.00	\$382.80
			36	Seeding, Mulching, Irrigation per Acre	Acre	\$1,165.00	\$1,281.50
			37	Drill Operator	Labor Hour	\$28.00	\$28.00
			38	Blast Laborer	Labor Hour	\$28.00	\$28.00
			39	Blast Foremen	Labor Hour	\$28.00	\$28.00
02 41	13.70	0600	40	Gabions, 18-36 inches deep	SY	\$83.00	\$98.80
02 41	13.43	0200	41	Box Culvert 8'x12'x8'	LF	\$13.70	\$24.82
02 41	13.86	0100	42	Road Rug (Geotextile Lining Material use Synthetic Grass Cos	SF	\$0.23	\$0.33
02 41	13.33	0800	43	Guard Rail, corrugated steel	LF	\$1.67	\$1.67
02 41	13.62	0400	44	Chain Link Gates,	EA	\$143.00	\$143.00
02 41	13.78	0400	71	Communications Tower, 300', 70lb section	EA	\$2,910.00	\$2,910.00
02 41	19.23	3080		Machine Loading Rubbish Truck	CY	\$13.35	\$13.35
02 41	19.23	5100		Rubbish Haul 20 CY Truck	MI	\$0.49	\$0.49
	Calculated		45	Rubbish Disposal (50 MI Haul)	CY	\$15.80	\$15.80
			46	Primacord	LF	\$0.09	\$0.10
	Unit Costs		47	ANFO	lb	\$0.14	\$0.15
			48	Primers	EA	\$4.05	\$4.63

1). Updated with data used for the 2011 Area 4 North pre-2016 worksheets

2). Based on http://inflationdata.com/Inflation/Inflation_Rate/InflationCalculator.asp (Inflation from ??? Updated with information from BHP - PD 11.3%

TABLE 50-A-23 EQUIPMENT OWNERSHIP AND OPERATING COSTS																					
Equipment Model		Ownership Costs (\$/hr)			Overhaul Costs (\$/hr)				Field Repair and Fuel Costs (\$/hr)											2008 Total [\$/hr]	
		Depreciation	Depreciation Multiplier	Adjusted Depreciation	Labor	Labor Multiplier	Adjusted Labor	O/H Parts	Labor	Labor Multiplier	Adjusted Labor	Parts	Fuel	Fuel Multiplier	Adjusted Fuel	Lube	Tires	Tire Multiplier	Adjusted Tires		GEC (2)
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	\$ 12.38	\$ -	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	\$ 21.45	\$ -	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	\$ 18.47	\$ 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	\$ 18.81	\$ 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	\$ 13.60	\$ 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, ripping		\$ 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	\$ 15.68	\$ -	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 equipment	0.83
Labor - Heavy Equipment Mechanic:	Field Repair and Fuel Costs	
	((0.08)(CRG Wages) + 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]¹
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&Overhead, from ACME Soil Remediation Inc. (ACME) 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%

Pinabete Permit (2016 to 2021)

Dozer Polygons					
Poly ID	Volume	Av. Push Distance	Grade	Area	
	yd ³	ft.	%	ft ²	Acres
D-1	148,000	296	-6.0	298,185	6.8
D-2	269,782	297	-7.9	706,877	16.2
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	375,627	161	-2.0	1,032,978	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	14,789,409			23,602,218	542
Wt. Average		324	-11.1		

For Wt. Average	
Distance	Grade
43,808,000	-888,000
80,125,254	-2,131,278
36,800,000	-1,312,000
236,168,000	-5,068,700
181,170,000	-6,415,200
63,474,000	-5,989,800
60,475,947	-751,254
26,564,000	-2,006,800
191,394,000	-5,747,400
473,484,000	-18,176,400
33,800,000	-4,760,000
18,080,000	-1,717,600
31,375,000	-1,212,500
42,000,000	-4,137,000
102,505,000	-7,719,000
26,257,000	1,057,100
131,600,000	-8,225,000
56,880,000	-4,320,000
122,451,000	-6,426,000
175,122,000	-6,831,000
226,461,000	-8,209,900
168,345,000	-6,525,000
177,643,000	-2,085,200
155,881,000	-1,876,700
52,266,000	223,200
268,569,000	-2,557,800
376,176,000	-4,243,200
382,923,000	-4,634,100
126,700,000	-3,955,000
219,177,000	-5,942,700
114,226,000	-5,850,600
35,260,000	-2,591,200
4,902,000	-482,600
29,184,000	-980,400
36,716,000	-1,688,400
6,992,000	-1,099,400
237,300,000	-13,560,000
29,016,000	-4,804,800
7,334,000	-596,600
4,788,604,201	-164,238,232

Scraper or Truck / Loader or Scraper Polygons							
Poly ID	Volume	Av. One way Distance	Grade	Cut area		Fill Area (if separate)	
	yd ³	ft.	%	ft ²	Acres	ft ²	Acres
T-1	1,269,906	1326	-5.1	1,010,786	23.2	1,530,867	35.1
T-2	4,344,898	520	-9.6	5,716,288	131.2		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
TOTALS		WEIGHTED AVERAGES		TOTALS			
Scraper	13,640,804	1063	-6.0	20,224,035	464	4,984,402	114
Truck / Shovel	5,929,000	3989	-2.2				

Scrapers		Truck Shovel	
For Wt. Average		For Wt. Average	
Distance	Grade	Distance	Grade
1,683,895,356	-6,476,521		
2,259,346,960	-41,711,021		
		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	-19,680,000
		#####	-81,922,741
		23,650,583,000	-13,289,100

NOTES:

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

High Wall Reclamation 1,336,000 bcy

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

12-Dec-13

Cut Block	Total Volume cu. yds.	Permanent Program %	Permanent Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project										
D-1	148,000	100%	148,000	D-1	296	296			-6	Straight or Radial Push
D-2	269,782	100%	269,782	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	375,627	100%	375,627	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
Totals				Weighted Average						
Area 4 Project	14,789,409	100%	14,789,409		324	324			-11.1	
GRAND TOTAL	14,789,409		14,789,409							

Total yards go to Worksheet 3

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

12-Dec-13

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

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

12-Dec-13

Cut Block	Total Volume cu. yds.	Permanent Program %	Permanent Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project										
T-1	1,269,906	100%	1,269,906			1,326			-5.1	Adj. Dist. reflects haul route
T-2	4,344,898	100%	4,344,898			520			-9.6	Adj. Dist. reflects haul route
T-5	2,998,000	100%	2,998,000			918			-2.8	Adj. Dist. reflects haul route
T-7	928,000	100%	928,000			796			-6.1	Adj. Dist. reflects haul route
T-8	4,100,000	100%	4,100,000			1,722			-4.8	Adj. Dist. reflects haul route
Totals				Weighted Average						
Area 4 Project	13,640,804	100%	13,640,804			1,063			-6.0	
GRAND TOTAL	13,640,804		13,640,804							

Total yards go to Worksheet 3

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

12-Dec-13

Cut Block	Total Volume cu. yds.	Area acres	Perm. Topsoil Volume cu. yds.	Root Zone Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project	858,706	1,120.5	858,706		Area 4 Project		2,970			4.00%	Adj. Dist. reflects haul route
TOTAL	858,706	1,120.5	858,706		Weighted Average:		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**

12-Dec-13

Cut Block	Total Volume cu. yds.	Area acres	Topsoil Volume cu. yds.	Perm. Root Zone Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
Area 4 Project	688,230	1,120.5		688,230	Area 4 Project		8,372			4.00%	Adj. Dist. reflects haul route
TOTAL	688,230	1,121		688,230	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 4
- 0.5 feet topsoil replacement depth Area 4

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

12-Dec-13

Cut Block	Total Volume cu. yds.	Area acres	Topsoil Volume cu. yds.	Root Zone Volume cu. yds.	Fill Block	Centroid Distance ft.	Planned Adj. Distance ft.	Cut Elev. ft	Fill Elev. ft	Grade %	Comments
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**

12-Dec-13

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

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

Project: Pinabete Permit

Date: Dec-2013

TABLE 12-B-2			
CULVERT VOLUMES FOR DEMOLITION AND REMOVAL			
CULVERT ID	Diameter [in]	Length [ft]	Volume [ft³]
CP-189	30	318	1,561
Total			1,561

TABLE 12-B-3 BACKFILLING OF PONDS AND IMPOUNDMENTS										
Pond	Pond Volume		Dam ²					Dozer Push Distance [ft]	Backfill Volume ³ [bcy] ¹	
	[ac-ft]	[bcy] ¹	Bottom [ft]	Top [ft]	Height [ft]	Length [ft]	Volume [bcy] ¹			
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
TOTAL		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.

TABLE 12-B-25			
DRILL AND BLAST QUANTITIES			
Area	Volume [yd³]	Equipment	Comments
Area 4 Project	1,336,000	Ingersoll-Rand DM23	Drilling and Blasting pit highwalls
Total	1,336,000		

WORKSHEET NO. 2																		
STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY																		
Structure							Buildings / Utilities / Other Structures				Floors, Surfaces & Walls				Footings			
							Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	Cost	Length [ft]	Ref	Unit Cost	Cost
Area 4 North																		
Buildings - Above Concrete	Length (ft)	Width (ft)	Area (sf)	Height (ft)	#	Construction												
							-	4	0.23	\$0								
							-	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								
							-	1a	0.11	\$0								
							-	1	0.22	\$0								
							-	5a	0.12	\$0								
							-	1a	0.11	\$0								
							-	2a	0.15	\$0								
							-	1a	0.11	\$0								
							-	1	0.22	\$0								
Concrete - Footings	Length (ft) on Long Axis	Length (ft) on Short Axis			#	Construction												
														-	12a	11.43	\$0	
														-	12a	11.43	\$0	
														-	15a	21.06	\$0	
														-	12a	11.43	\$0	
														-	12a	11.43	\$0	
														-	12a	11.43	\$0	
														-	12a	11.43	\$0	
														-	15a	21.06	\$0	
														-	12a	11.43	\$0	
														-	15a	21.06	\$0	
														-	13a	14.03	\$0	
														-	12a	11.43	\$0	
														-	15a	21.06	\$0	
														-	12a	11.43	\$0	
														-	12a	11.43	\$0	

WORKSHEET NO. 2																	
STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY																	
Structure	Length (ft)	Width (ft)	Area (sf)	#	Construction	Buildings / Utilities / Other Structures				Floors, Surfaces & Walls				Footings			
						Volume [ft3]	Ref	Unit Cost	Cost	Area [ft2]	Ref	Unit Cost	Cost	Length [ft]	Ref	Unit Cost	Cost
Concrete - Floors, Surfaces & Walls	Length (ft)	Width (ft)	Area (sf)	#	Construction												
										-	8b	3.57	\$0				
										-	8b	3.57	\$0				
										-	11	9.57	\$0				
										-	9b	4.78	\$0				
										-	9b	4.78	\$0				
										-	8b	3.57	\$0				
										-	8b	3.57	\$0				
										-	11	9.57	\$0				
										-	9b	4.78	\$0				
										-	11	9.57	\$0				
										-	10a	6.38	\$0				
										-	8b	3.57	\$0				
										-	11	9.57	\$0				
										-	8b	3.57	\$0				
										-	8b	3.57	\$0				
Concrete/Asphalt - Aprons & Driveways	Length (ft)	Width (ft)	Area (sf)	#	Construction												
										-	28	0.88	\$0				
										-	28	0.88	\$0				
										-	28	0.88	\$0				
										-	29	1.26	\$0				
										-	11	9.57	\$0				
										-	9b	4.78	\$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				
										-	50	14.04	\$0				
Utilities			Length (lf)		Construction		Length (lf)										
							-	25	3.36	\$0							
							-	25	3.36	\$0							
							-	32	7,019.97	\$0							
							-	26	1.82	\$0							

WORKSHEET NO. 2																	
STRUCTURE DEMOLITION AND DISPOSAL COST SUMMARY																	
Structure	Length (ft)	Width (ft)	Area (sf)	Capacity (gal)	#	Construction	Buildings / Utilities / Other Structures				Floors, Surfaces & 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	\$0							
							-	24	3.71	\$0							
							-	20	24.74	\$0							
							-	31	0.23	\$0							
							-	11	9.57	\$0							
							-	11	9.57	\$0							
							-	11	9.57	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	28	0.88	\$0							
							-	71	2,910.00	\$0							
							-	31	0.23	\$0							
Conveyors	Length (ft)	Width (ft)	Area (sf)	Capacity (gal)	#	Construction											
							-	33	22.75	\$0							
							-	29	1.26	\$0							
							-	11	9.57	\$0							
Area 4 South																	
Buildings - Above Concrete	Length (ft)	Width (ft)	Area (sf)	Height (ft)	#	Construction											
			0			Steel Building	-	1	0.22	\$0							
			0			Steel Building	-	1	0.22	\$0							

WORKSHEET NO. 3						
MATERIAL HANDLING SUMMARY SHEET						
Description	Quantity	Swell Factor	Adjusted Quantity	Push/Haul Distance [ft]	Push/Haul Grade [%]	Equipment
Area 4 Project						
1 Drill & Blast Area 4 Project	1,336,000 BCY					DMM2
2 Grading - Dozer Area 4 Project	14,789,409 LCY	1	14,789,409 LCY	324	-11.1%	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	13,640,804 LCY	1	13,640,804 LCY	1,063	-6.0%	637G
5 Topsoil - Loader/Truck Area 4 Project	858,706 BCY	1.142	980,642 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	688,230 BCY	1.142	785,959 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	1,121 ac.					
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
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.					

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

WORKSHEET NO. 5A	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
2	Grading - Dozer Area 4 Project
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
-11.1% grade on average 324 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.2}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.8$
Net Hourly Production	$= \frac{0.8}{\text{operating adjustment factor}} * \frac{990 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 761 \text{ LCY/hr}$
Hours Required ²	$= \frac{14,789,409 \text{ LCY}}{\text{volume to be moved}^1} / \frac{761 \text{ LCY/hr}}{\text{net hourly production}} = 19,446.1 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5B	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
23	Backfill Ponds Area 4 Project
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
0.0% grade on average 173 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{1,650 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,037 \text{ LCY/hr}$
Hours Required ²	$= \frac{85,217 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,037 \text{ LCY/hr}}{\text{net hourly production}} = 82.2 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5C	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{- LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{- hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5D	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{- LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{- hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5E	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5F	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{ - LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 5G	
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Dozer Used (type, size, etc.) ³	
Caterpillar D11R, Universal blade	
Description of Dozer Use (origin, destination, grade, haul distance, material, etc.)	
1.0% grade on average 100 ft typical dozer push distance 2,700 Loose clay and sand density [lb/yd ³]	
Productivity Calculations ³ :	
Operating Adjustment Factor	$= \frac{0.9}{\text{operator factor}} * \frac{1.0}{\text{material factor}} * \frac{0.8}{\text{work hour factor}} * \frac{1.0}{\text{grade factor}} * \frac{0.9}{\text{weight correction factor}} * \frac{0.9}{\text{visibility factor}} * \frac{1.0}{\text{elevation factor}} * \frac{1.1}{\text{production factor}} = 0.6$
Net Hourly Production	$= \frac{0.6}{\text{operating adjustment factor}} * \frac{2,690 \text{ LCY/hr}}{\text{Normal Hourly Production}} = 1,657 \text{ LCY/hr}$
Hours Required ²	$= \frac{\text{- LCY}}{\text{volume to be moved}^1} / \frac{1,657 \text{ LCY/hr}}{\text{net hourly production}} = \text{- hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8A**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

3 Grading - Loader/Truck Area 4 Project

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks
 0.90 Bucket Fill Factor
 15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.90}{\text{bucket fill factor}} = 13.5 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{13.5 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,038 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{5,929,000 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,038 \text{ LCY/hr}}{\text{net hourly production}} = 5,709 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8B**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

7 Mitigation - Loader/Truck Area 4 Project

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks
 0.90 Bucket Fill Factor
 15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{785,959 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 649 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8C**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

5 Topsoil - Loader/Truck Area 4 Project

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks
 1.05 Bucket Fill Factor
 15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{980,642 \text{ LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 809 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8D	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 0.95 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.95}{\text{bucket fill factor}} = 14.3 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{14.3 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,096 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\quad - \text{LCY}}{\text{volume to be moved}^1} / \frac{1,096 \text{ LCY/hr}}{\text{net hourly production}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8E	
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization of Loader Used (type, size, etc.) ³	
Caterpillar 992G with 15 CYD Bucket	
Description of Loader Use (origin, destination, grade, haul distance, etc.)	
Load Caterpillar 777D Trucks 1.05 Bucket Fill Factor 15 Rated Bucket Capacity [LCY]	
Productivity Calculations ³	
$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$	
$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$	
$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\quad - \text{LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 0 \text{ hrs}$	

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8F**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks

1.05 Bucket Fill Factor

15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\quad - \text{LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 0 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8G**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks

1.05 Bucket Fill Factor

15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{1.05}{\text{bucket fill factor}} = 15.8 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{15.8 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,212 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\quad - \text{LCY}}{\text{volume to be moved}^1} / \frac{1,212 \text{ LCY/hr}}{\text{net hourly production}} = 0 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8H**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks
 0.95 Bucket Fill Factor
 15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.95}{\text{bucket fill factor}} = 14.3 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{14.3 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,096 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,096 \text{ LCY/hr}} = 0 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8H**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks

0.95 Bucket Fill Factor

15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\text{loaded haul time}}{\text{loaded haul time}} + \frac{\text{empty haul time}}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.95}{\text{bucket fill factor}} = 14.3 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{14.3 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,096 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{1,096 \text{ LCY/hr}} = 0 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 8H**PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE**

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Loader Used (type, size, etc.)³

Caterpillar 992G with 15 CYD Bucket

Description of Loader Use (origin, destination, grade, haul distance, etc.)

Load Caterpillar 777D Trucks

0.88 Bucket Fill Factor

15 Rated Bucket Capacity [LCY]

Productivity Calculations³

$$\text{Cycle Time} = \frac{\quad}{\text{loaded haul time}} + \frac{\quad}{\text{empty haul time}} + \frac{0.65 \text{ min}}{\text{basic cycle time}} = 0.65 \text{ min}$$

$$\text{Net Bucket Capacity} = \frac{15 \text{ LCY}}{\text{heaped bucket capacity}} * \frac{0.88}{\text{bucket fill factor}} = 13.2 \text{ LCY}$$

$$\text{Net Hourly Production} = \frac{13.2 \text{ LCY}}{\text{net bucket capacity}} / \frac{0.65 \text{ min}}{\text{cycle time}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 1,015 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\quad - \text{LCY}}{\text{volume to be moved}^1} / \frac{1,015 \text{ LCY/hr}}{\text{net hourly production}} = 0 \text{ hrs}$$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9A PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
3 Grading - Loader/Truck Area 4 Project	
Characterization of Truck Used (type, size, etc.) ³	
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.):	
3,989 ft. average haul distance	
-2.2% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} = 5.0 \text{ passes}$	$\text{Net Truck Capacity} = \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{5}{\text{loader passes per truck}} = 67 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.65 \text{ min}}{\text{loader cycle time}} * \frac{5}{\text{loader passes per truck}} = 3.2 \text{ min}$	$\text{Truck Cycle Time} = \frac{2.2 \text{ min}}{\text{haul time}} + \frac{1.2 \text{ min}}{\text{return time}} + \frac{3.2 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 7.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{7.7 \text{ min}}{\text{truck cycle time}} / \frac{3.2 \text{ min}}{\text{truck loading time}} = 2 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{67 \text{ LCY}}{\text{net truck capacity}} / \frac{7.7 \text{ min}}{\text{cycle time}} = 8.7 \text{ LCY/min}$
$\text{Hourly Production} = \frac{9 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 436 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{5,929,000 \text{ LCY}}{\text{volume to be moved}^1} / \frac{436 \text{ LCY/hr}}{\text{hourly production}} = 13,607 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9B	
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
7 Mitigation - Loader/Truck Area 4 Project	
Characterization of Truck Used (type, size, etc.) ³	
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.):	
8,372 ft. average haul distance	
4.0% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} = 5 \text{ passes}$	$\text{Net Truck Capacity} = \frac{13.5 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{5}{\text{loader passes per truck}} = 67 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{5}{\text{loader passes per truck}} = 3.2 \text{ min}$	$\text{Truck Cycle Time} = \frac{4.7 \text{ min}}{\text{haul time}} + \frac{2.5 \text{ min}}{\text{return time}} + \frac{3.2 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 11.5 \text{ min}$
$\text{Number of Trucks Required} = \frac{11.5 \text{ min}}{\text{truck cycle time}} / \frac{3.2 \text{ min}}{\text{truck loading time}} = 3 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{67 \text{ LCY}}{\text{net truck capacity}} / \frac{11.5 \text{ min}}{\text{cycle time}} = 5.8 \text{ LCY/min}$
$\text{Hourly Production} = \frac{6 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 292 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{785,959 \text{ LCY}}{\text{volume to be moved}^1} / \frac{292 \text{ LCY/hr}}{\text{hourly production}} = 2,696 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9C PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
5 Topsoil - Loader/Truck Area 4 Project	
Characterization of Truck Used (type, size, etc.) ³	
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.):	
2,970 ft. average haul distance 4.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{15.8 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{15.8 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{1.7 \text{ min}}{\text{haul time}} + \frac{0.9 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 6.2 \text{ min}$
$\text{Number of Trucks Required} = \frac{6.2 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 2 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{6.2 \text{ min}}{\text{cycle time}} = 10.2 \text{ LCY/min}$
$\text{Hourly Production} = \frac{10 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 510 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{980,642 \text{ LCY}}{\text{volume to be moved}^1} / \frac{510 \text{ LCY/hr}}{\text{hourly production}} = 1,921 \text{ hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9D PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$ $\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$ $\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$ $\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 773 \text{ LCY/hr}$	$\text{Net Truck Capacity} = \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 57 \text{ LCY}$ $\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$ $\text{Production Rate} = \frac{57 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 15.5 \text{ LCY/min}$ $\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9E	
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance	
1.0% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} \div \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} \div \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} \div \frac{3.7 \text{ min}}{\text{cycle time}} = 17.1 \text{ LCY/min}$
$\text{Hourly Production} = \frac{17 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 854 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9F PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 17.1 \text{ LCY/min}$
$\text{Hourly Production} = \frac{17 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 854 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{854 \text{ LCY/hr}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9G	
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance	
1.0% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{16 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 63 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{63 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 17.1 \text{ LCY/min}$
$\text{Hourly Production} = \frac{17 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 854 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{854 \text{ LCY/hr}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9H PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance 1.0% Grade (Loaded) 3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$ $\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$ $\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$ $\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 773 \text{ LCY/hr}$	$\text{Net Truck Capacity} = \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 57 \text{ LCY}$ $\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$ $\text{Production Rate} = \frac{57 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 15.5 \text{ LCY/min}$ $\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{\text{hourly production}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9I	
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance	
1.0% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} = 4 \text{ passes}$	$\text{Net Truck Capacity} = \frac{14 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{4}{\text{loader passes per truck}} = 57 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{4}{\text{loader passes per truck}} = 2.6 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{2.6 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 3.7 \text{ min}$
$\text{Number of Trucks Required} = \frac{3.7 \text{ min}}{\text{truck cycle time}} / \frac{2.6 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{57 \text{ LCY}}{\text{net truck capacity}} / \frac{3.7 \text{ min}}{\text{cycle time}} = 15.5 \text{ LCY/min}$
$\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 773 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{\text{work hour factor}} / \frac{773 \text{ LCY/hr}}{\text{work hour factor}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 9J	
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE	
Earthmoving Activity:	
32 Intentionally Left Blank	
Characterization of Truck Used (type, size, etc.) ³	
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 ft. average haul distance	
1.0% Grade (Loaded)	
3.0% Rolling Resistance	
Productivity Calculation ³	
$\text{Loader Passes Per Truck} = \frac{67 \text{ LCY}}{\text{truck capacity}} / \frac{13 \text{ LCY}}{\text{loader bucket net capacity}} = 5 \text{ passes}$	$\text{Net Truck Capacity} = \frac{13 \text{ LCY}}{\text{loader bucket net capacity}} * \frac{5}{\text{loader passes per truck}} = 66 \text{ LCY}$
$\text{Loading Time Per Truck} = \frac{0.7 \text{ min}}{\text{loader cycle time}} * \frac{5}{\text{loader passes per truck}} = 3.3 \text{ min}$	$\text{Truck Cycle Time} = \frac{0.1 \text{ min}}{\text{haul time}} + \frac{0.0 \text{ min}}{\text{return time}} + \frac{3.3 \text{ min}}{\text{loading time per truck}} + \frac{1.0 \text{ min}}{\text{dump and maneuver time}} = 4.3 \text{ min}$
$\text{Number of Trucks Required} = \frac{4.3 \text{ min}}{\text{truck cycle time}} / \frac{3.3 \text{ min}}{\text{truck loading time}} = 1 \text{ trucks (round down)}$	$\text{Production Rate} = \frac{66 \text{ LCY}}{\text{net truck capacity}} / \frac{4.3 \text{ min}}{\text{cycle time}} = 15.2 \text{ LCY/min}$
$\text{Hourly Production} = \frac{15 \text{ LCY/min}}{\text{production rate}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} = 761 \text{ LCY/hr}$	$\text{Hours Required}^2 = \frac{\text{volume to be moved}^1}{761 \text{ LCY/hr}} = \text{ - hrs}$

Data Sources:

- 1) Volume to be moved from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11A**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 [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.)

1,063 ft. average haul distance

-6.0% Grade (Loaded)

3% Rolling Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.7 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.6 \text{ min}}{\text{return trip time}} = 2.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY}}{\text{adjusted capacity}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{2.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,027 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{13,640,804 \text{ LCY}}{\text{volume to be handled}^1} / \frac{1027 \text{ LCY/hr}}{\text{net hourly production}} = 13,288 \text{ hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11B**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY}}{\text{adjusted capacity}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} / \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11C**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} / \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11D**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11E	
PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER 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 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 distance	
1.0% Grade (Loaded)	
3% Rolling Resistance	
Productivity Calculations ³ :	
$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$	
$\text{Net Hourly Production} = \frac{29 \text{ LCY}}{\text{adjusted capacity}} * \frac{50 \text{ min/hr}}{\text{work hour factor}} / \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$	
$\text{Hours Required}^2 = \frac{\text{volume to be handled}^1 - \text{LCY}}{1657 \text{ LCY/hr}} = \text{ - hrs}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11F**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 11F**PRODUCTIVITY AND HOURS REQUIRED FOR SCRAPER USE**

Earthmoving Activity:

32 Intentionally Left Blank

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 Resistance

Productivity Calculations³:

$$\text{Cycle Time}^3 = \frac{1.0 \text{ min}}{\text{load time per pair}} + \frac{0.1 \text{ min}}{\text{loaded trip time}} + \frac{0.6 \text{ min}}{\text{maneuver and spread time}} + \frac{0.1 \text{ min}}{\text{return trip time}} = 1.8 \text{ min}$$

$$\text{Net Hourly Production} = \frac{29 \text{ LCY} *}{\text{adjusted capacity}} \frac{50 \text{ min/hr}}{\text{work hour factor}} \div \frac{1.8 \text{ min}}{\text{cycle time}} * \frac{2}{\text{number of scrapers}} = 1,657 \text{ LCY/hr}$$

$$\text{Hours Required}^2 = \frac{\text{ - LCY}}{\text{volume to be handled}^1} \div \frac{1657 \text{ LCY/hr}}{\text{net hourly production}} = \text{ - hrs}$$

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 12A	
PRODUCTIVITY AND HOURS FOR MOTOR GRADER USE -- GRADING	
Earthmoving Activity:	
29 Road Ripping Area 4 Project	
Characterization of Grader Used (type, size capacity, etc.) ³	
Caterpillar 16H	
Description of Grader Route (push distance,% blade effective length, operating speed, etc.):	
9.75 Ripper width [ft]	
Productivity Calculations ³ :	
Contour Grading:	
$\text{Hourly Productivity} = \frac{3.4 \text{ mi/hr}}{\text{speed}} \times \frac{9.75 \text{ ft.}}{\text{effective blade width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} / \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 3.0 \text{ ac / hr}$	$\text{Hours Required} = \frac{0 \text{ ac}}{\text{acreage to be graded}^1} / \frac{2.99 \text{ ac/hr}}{\text{hourly productivity}} = 0 \text{ hr}$
Scarification:	
$\text{Hourly Productivity} = \frac{1.25 \text{ mi/hr}}{\text{work speed}} \times \frac{9.75 \text{ ft.}}{\text{scarifier width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} / \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 1.1 \text{ ac / hr}$	$\text{Hours Required} = \frac{117 \text{ ac}}{\text{acreage to be ripped}^1} / \frac{1.10 \text{ ac/hr}}{\text{hourly productivity}} = 107 \text{ hr}$
$\text{Total Hours Required}^2 = \frac{0 \text{ hr}}{\text{grading hours required}} + \frac{107 \text{ hr}}{\text{scarification hours required}} = 107 \text{ hr}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

WORKSHEET NO. 12B	
PRODUCTIVITY AND HOURS FOR MOTOR GRADER USE -- GRADING	
Earthmoving Activity:	
33 Grading Topsoil Areas	
Characterization of Grader Used (type, size capacity, etc.) ³	
Caterpillar 16H	
Description of Grader Route (push distance,% blade effective length, operating speed, etc.):	
11.9 Ripper width [ft]	
Productivity Calculations ³ :	
Contour Grading:	
$\text{Hourly Productivity} = \frac{3.4 \text{ mi/hr}}{\text{speed}} \times \frac{11.90 \text{ ft.}}{\text{effective blade width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} \div \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 3.7 \text{ ac/hr}$	$\text{Hours Required} = \frac{1,238 \text{ ac}}{\text{acreage to be graded}^1} \div \frac{3.65 \text{ ac/hr}}{\text{hourly productivity}} = 339 \text{ hr}$
Scarification:	
$\text{Hourly Productivity} = \frac{1.25 \text{ mi/hr}}{\text{work speed}} \times \frac{9.75 \text{ ft.}}{\text{scarifier width}} \times \frac{5,280 \text{ ft/mi}}{\text{conversion factor}} \div \frac{43,560 \text{ ft}^2/\text{ac}}{\text{conversion factor}} \times \frac{0.83}{\text{work hour factor}} \times \frac{0.90}{\text{availability}} = 1.1 \text{ ac/hr}$	$\text{Hours Required} = \frac{- \text{ ac}}{\text{acreage to be ripped}^*} \div \frac{1.10 \text{ ac/hr}}{\text{hourly productivity}} = - \text{ hr}$
$\text{Total Hours Required}^2 = \frac{339 \text{ hr}}{\text{grading hours required}} + \frac{0 \text{ hr}}{\text{scarification hours required}} = 339 \text{ hr}$	

Data Sources:

- 1) Acres from Worksheet 3
- 2) Hours required go to Worksheet 13
- 3) Caterpillar Performance Handbook, Edition 37

*No Ripping on Topsoiled Areas

WORKSHEET NO. 13A						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Dozers						
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
2 Grading - Dozer Area 4 Project	D11R Dozer	100%	(\$304 + \$ 35)	*	19,446 =	\$ 6,598,373
23 Backfill Ponds Area 4 Project	D11R Dozer	100%	(\$304 + \$ 35)	*	82 =	\$ 27,879
32 Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	- =	\$ -
32 Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	- =	\$ -
32 Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	- =	\$ -
32 Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	- =	\$ -
32 Intentionally Left Blank	D11R Dozer	100%	(\$304 + \$ 35)	*	- =	\$ -
Total Cost =						\$ 6,626,252

Equipment and Accesory Identification

- 1) Caterpillar D11R with Universal Blade

Data Sources:

- 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

WORKSHEET NO. 13B						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Loaders						
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
3	Grading - Loader/Truck Area 4 Project	992G Loader	100%	(\$ 249 + \$ 35)	*	5,709 = \$ 1,626,537
		16H Grader	50%	(\$ 92 + \$ 35)	*	2,855 = \$ 363,102
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	5,709 = \$ 1,019,186
		Water Truck	50%	(\$ 133 + \$ 35)	*	2,855 = \$ 480,686
7	Mitigation - Loader/Truck Area 4 Project	992G Loader	100%	(\$ 249 + \$ 35)	*	649 = \$ 184,814
		16H Grader	50%	(\$ 92 + \$ 35)	*	324 = \$ 41,257
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	649 = \$ 115,804
		Water Truck	50%	(\$ 133 + \$ 35)	*	324 = \$ 54,618
5	Topsoil - Loader/Truck Area 4 Project	992G Loader	100%	(\$ 249 + \$ 35)	*	809 = \$ 230,593
		16H Grader	50%	(\$ 92 + \$ 35)	*	405 = \$ 51,477
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	809 = \$ 144,489
		Water Truck	50%	(\$ 133 + \$ 35)	*	405 = \$ 68,147
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
Total Cost =						\$ 4,380,711

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13C						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Loaders						
Project	Equipment Type ¹	Ratio	Equipment Unit Costs [\$/hr] ²	Labor Costs [\$/hr] ³	Total Hours Required ⁴	Total Cost [\$]
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	992G Loader	100%	(\$ 249 + \$ 35)	*	- = \$ -
		16H Grader	50%	(\$ 92 + \$ 35)	*	- = \$ -
		D9R Dozer	100%	(\$ 143 + \$ 35)	*	- = \$ -
		Water Truck	50%	(\$ 133 + \$ 35)	*	- = \$ -
Total Cost = \$						-

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13D							
SUMMARY CALCULATION OF EARTHMOVING COSTS - Trucks							
	Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]
3	Grading - Loader/Truck Area 4 Project	777D Truck	100%	(\$ 177 + \$ 35)	*	13,607	= \$ 2,894,776
7	Mitigation - Loader/Truck Area 4 Project	777D Truck	100%	(\$ 177 + \$ 35)	*	2,696	= \$ 573,482
5	Topsoil - Loader/Truck Area 4 Project	777D Truck	100%	(\$ 177 + \$ 35)	*	1,921	= \$ 408,670
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
32	Intentionally Left Blank	777D Truck	100%	(\$ 177 + \$ 35)	*	-	= \$ -
Total Cost =							\$ 3,876,927

Equipment and Accessory Identification

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

Data Sources:

- 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

WORKSHEET NO. 13E						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Scrapers						
Project	Equipment Type ¹	Ratio	Equipment Unit Costs [\$/hr] ²	Labor Costs [\$/hr] ³	Total Hours Required ⁴	Total Cost [\$]
4	Grading - Scrapers Area 4 Project	637G Scraper	100%	(\$ 235 + \$ 35)	*	13,288 = \$ 3,590,739
		637G Scraper	100%	(\$ 235 + \$ 35)	*	13,288 = \$ 3,590,739
		16H Grader	13%	(\$ 92 + \$ 35)	*	1,661 = \$ 211,270
		Water Truck	13%	(\$ 133 + \$ 35)	*	1,661 = \$ 279,686
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
32	Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$ -
		16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$ -
		Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$ -
Total Cost =						\$ 7,672,434

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13F						
SUMMARY CALCULATION OF EARTHMOVING COSTS - Scrapers						
Project	Equipment Type ¹	Ratio	Equipment Unit Costs [\$/hr] ²	Labor Costs [\$/hr] ³	Total Hours Required ⁴	Total Cost [\$]
32 Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$	-
	Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$	-
32 Intentionally Left Blank	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	637G Scraper	100%	(\$ 235 + \$ 35)	*	- = \$	-
	16H Grader	13%	(\$ 92 + \$ 35)	*	- = \$	-
	Water Truck	13%	(\$ 133 + \$ 35)	*	- = \$	-
32 Intentionally Left Blank						
32 Intentionally Left Blank						
32 Intentionally Left Blank						
Total Cost = \$						-

Equipment and Accessory 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

Data Sources:

- 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

WORKSHEET NO. 13G							
SUMMARY CALCULATION OF EARTHMOVING COSTS - Motor Graders							
Project	Equipment Type¹	Ratio	Equipment Unit Costs [\$/hr]²	Labor Costs [\$/hr]³	Total Hours Required⁴	Total Cost [\$]	
29 Road Ripping Area 4 Project	16H Grader, ripping	100%	(\$ 97 + \$ 35)	*	107 =	\$	14,112
33 Grading Topsoil Areas	16H Grader	100%	(\$ 92 + \$ 35)	*	339 =	\$	43,116
Total Cost =						\$	57,227

Equipment and Accesory Identification

- 1) Caterpillar 16H Motor Grader with Ripper Blade

Data Sources:

- 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

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

Equipment and Accessory Identification

- 1) Ingersoll-Rand DMM2 Crawler-type Drill

Data Sources:

- 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

$$\text{Costs For Seeding} = \frac{1,121 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ 1,864,912$$

20% Contingency for vegetation failure:

$$\text{Costs For Reseeding} = \frac{224 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ 372,982$$

Other Revegetation Activity for this Area (e.g. Soil Sampling):**TOTAL REVEGETATION COST = \$ 2,237,895**

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

WORKSHEET NO. 14B	
REVEGETATION COSTS	
Name and Description of Areas to be Revegetated:	
34 Revegetation Roads Area 4 Project	
Description of Revegetation Activities	
20% Contingency for vegetation failure:	
Costs For Seeding =	$\frac{117 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ 194,957$
20% Contingency for vegetation failure:	
Costs For Reseeding =	$\frac{23 \text{ ac}}{\text{Acreage to be reseeded}} * \left(\frac{382.8 \text{ \$/ac.}}{\text{cost for seedbed preparation}} + \frac{1281.5 \text{ \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ 38,991$
Other Revegetation Activity for this Area (e.g. Soil Sampling):	
TOTAL REVEGETATION COST = \$ 233,948	

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

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

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

WORKSHEET NO. 14D	
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 Seeding =	$\frac{\text{- ac}}{\text{Acreage to be reseeded}} * \left(\frac{\text{382.8 \$/ac.}}{\text{cost for seedbed preparation}} + \frac{\text{1281.5 \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ \text{-}$
Reseeding 20% of permanent program lands that were revegged during or before 1999:	
Costs For Reseeding =	$\frac{\text{0 ac}}{\text{Acreage to be reseeded*}} * \left(\frac{\text{382.8 \$/ac.}}{\text{cost for seedbed preparation}} + \frac{\text{1281.5 \$/ac.}}{\text{cost for seeding, fertilizing, mulching, and irrigation}} \right) = \$ \text{-}$
Other Revegetation Activity for this Area (e.g. Soil Sampling):	
TOTAL REVEGETATION COST = \$ -	

Data Sources:

Navajo Mine records for contractor planting costs

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

Irrigation costs are included with seeding, fertilizing and mulching costs

WORKSHEET NO. 15A
PRODUCTIVITY AND HOURS FOR DRILL USE

Earthmoving Activity:

1 Drill & Blast Area 4 Project

Characterization of Drill Used

Drill Model IR DMM2 Drill				
Drill Bit Diameter	10.63 [in]	Burden	26 [ft]	1,233 Volume Shot per hole [bcy]
Drill Rod Length	35 [ft]	Bench Height	40 [ft]	
Penetration Rate	228 [ft/hr]	Spacing	32 [ft]	

Description of Activity:

Drilling holes to provide space for explosives

Calculation:

$$\text{Cycles per Hour} = \frac{60 \text{ min}}{\text{time available}} / \left(\frac{10.5 \text{ min}}{\text{drill time}} + \frac{1.6 \text{ min}}{\text{rod feed time}} + \frac{0.4 \text{ min}}{\text{rod pull time}} + \frac{2.0 \text{ min}}{\text{misc.}} \right) = 4.1 \text{ cycles/hr}$$

$$\begin{aligned} \text{Operating Delays} &= \frac{30.0 \text{ min}}{\text{lunch}} + \frac{15.0 \text{ min}}{\text{shift change}} + \frac{10.0 \text{ min}}{\text{blasting}} + \frac{6.0 \text{ min}}{\text{service time}} + \frac{5.0 \text{ min}}{\text{moving}} + \frac{5 \text{ min}}{\text{misc.}} = 71 \text{ min} \\ &= 14.8\% \text{ of a shift} \\ &= 85.2\% \text{ operational utilization} \end{aligned}$$

$$\text{Effective Pit Utilization (EPU)} = \frac{85.2\%}{\text{operational utilization}} * \frac{90.0\%}{\text{availability}} = 76.7\%$$

$$\text{Maximum Penetration Rate} = \frac{40 \text{ ft}}{\text{bench height}} * \frac{4.1 \text{ cycles/hr}}{\text{cycles per hour}} * \frac{76.7\% \text{ EPU}}{\text{pit utilization}} = 126.5 \text{ ft/hr}$$

Maximum Production:

$$\text{per Scheduled Shift:} = \frac{26 \text{ ft}}{\text{burden}} * \frac{32 \text{ ft}}{\text{spacing}} * \frac{126.5 \text{ ft/hr}}{\text{max. penetration rate}} * \frac{8.0 \text{ hr/shift}}{\text{hours in a shift}} / \frac{27 \text{ ft}^3/\text{yd}^3}{\text{conversion factor}} = 31,184 \text{ bcy/shift}$$

$$\text{per Scheduled Hour} = \frac{31,184 \text{ bcy/shift}}{\text{max. production per sched. shift}} / \frac{8 \text{ hr/shift}}{\text{conversion factor}} = 3,898 \text{ bcy/hr}$$

$$\text{Drill Hours Required} = \frac{1,336,000 \text{ bcy}}{\text{volume to be blasted}} / \frac{3,898 \text{ bcy/hr}}{\text{production rate}} = 343 \text{ hr}$$

WORKSHEET NO. 15B
PRODUCTIVITY AND HOURS FOR DRILL USE

Earthmoving Activity:

32 Intentionally Left Blank

Characterization of Drill Used

Drill Model IR DMM2 Drill				
Drill Bit Diameter	10.63 [in]	Burden	26 [ft]	1,233 Volume Shot per hole [bcy]
Drill Rod Length	35 [ft]	Bench Height	40 [ft]	
Penetration Rate	228 [ft/hr]	Spacing	32 [ft]	

Description of Activity:

Drilling holes to provide space for explosives

Calculation:

$$\text{Cycles per Hour} = \frac{60 \text{ min}}{\text{time available}} / \left(\frac{10.5 \text{ min}}{\text{drill time}} + \frac{1.6 \text{ min}}{\text{rod feed time}} + \frac{0.4 \text{ min}}{\text{rod pull time}} + \frac{2.0 \text{ min}}{\text{misc.}} \right) = 4.1 \text{ cycles/hr}$$

$$\begin{aligned} \text{Operating Delays} &= \frac{30.0 \text{ min}}{\text{lunch}} + \frac{15.0 \text{ min}}{\text{shift change}} + \frac{10.0 \text{ min}}{\text{blasting}} + \frac{6.0 \text{ min}}{\text{service time}} + \frac{5.0 \text{ min}}{\text{moving}} + \frac{5 \text{ min}}{\text{misc.}} = 71 \text{ min} \\ &= 14.8\% \text{ of a shift} \\ &= 85.2\% \text{ operational utilization} \end{aligned}$$

$$\text{Effective Pit Utilization (EPU)} = \frac{85.2\%}{\text{operational utilization}} * \frac{90.0\%}{\text{availability}} = 76.7\%$$

$$\text{Maximum Penetration Rate} = \frac{40 \text{ ft}}{\text{bench height}} * \frac{4.1 \text{ cycles/hr}}{\text{cycles per hour}} * \frac{76.7\% \text{ EPU}}{\text{pit utilization}} = 126.5 \text{ ft/hr}$$

Maximum Production:

$$\text{per Scheduled Shift} = \frac{26 \text{ ft}}{\text{burden}} * \frac{32 \text{ ft}}{\text{spacing}} * \frac{126.5 \text{ ft/hr}}{\text{max. penetration rate}} * \frac{8.0 \text{ hr/shift}}{\text{conversion factor}} / \frac{27 \text{ ft}^3/\text{yd}^3}{\text{conversion factor}} = 31,184 \text{ bcy/shift}$$

$$\text{per Scheduled Hour} = \frac{31,184 \text{ bcy/shift}}{\text{max. production per sched. shift}} / \frac{8 \text{ hr/shift}}{\text{conversion factor}} = 3,898 \text{ bcy/hr}$$

$$\text{Drill Hours Required} = \frac{0 \text{ bcy}}{\text{volume to be blasted}} / \frac{3,898 \text{ bcy/hr}}{\text{production rate}} = 0 \text{ hr}$$

WORKSHEET NO. 15C

PRODUCTIVITY AND COSTS FOR BLASTING ACTIVITIES

Earthmoving Activity:

1 Drill & Blast Area 4 Project

Characterization of Blasting Parameters

Ingersoll Rand DMM2 Drill

Burden	26 [ft]	Powder Factor [lb/bcy]	0.9 [lb/bcy]
Bench Height	40 [ft]	Volume Shot per hole [bcy]	1,233 [bcy]
Spacing	32 [ft]		

Description of Activity:

ANFO used with boosters and primacord for explosive load

Calculation:

$$\text{Total ANFO Required} = \frac{1,336,000 \text{ bcy}}{\text{volume to be blasted}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 1,202,400 \text{ lb}$$

$$\text{Miscellaneous Powder Supplies} = \frac{1,202,400 \text{ lb}}{\text{ANFO required}} * \frac{5\%}{\text{contingency factor}} = 60,120 \text{ lb}$$

$$\text{Cord Cost per Hole} = \left(\frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}} \right) * \frac{10\%}{\text{waste factor}} * \frac{0.10 \text{ \$/ft}}{\text{cord unit cost}} = 11 \text{ \$/hole}$$

$$\text{ANFO Cost per Hole} = \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} * \frac{0.15 \text{ \$/lb}}{\text{ANFO unit cost}} = 171 \text{ \$/hole}$$

$$\text{Primer Cost per Hole} = \frac{1}{\text{primers per hole}} * \frac{4.63 \text{ \$/ea}}{\text{primer unit cost}} = 4.63 \text{ \$/hole}$$

$$\text{Volumetric Blasting Cost} = \left(\frac{11 \text{ \$/hole}}{\text{cord cost per hole}} + \frac{171 \text{ \$/hole}}{\text{ANFO cost per hole}} + \frac{4.63 \text{ \$/hole}}{\text{primer cost per hole}} \right) / \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} = 0.15 \text{ \$/bcy}$$

$$\text{Total Blasting Cost} = \frac{0.15 \text{ \$/bcy}}{\text{volumetric blasting cost}} * \frac{1,336,000 \text{ bcy}}{\text{volume to be blasted}} = \$ 202,751$$

WORKSHEET NO. 15D	
PRODUCTIVITY AND COSTS FOR BLASTING ACTIVITIES	
Earthmoving Activity:	
32	Intentionally Left Blank
Characterization 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]	
Description of Activity:	
ANFO used with boosters and primacord for explosive load	
Calculation:	
Total ANFO Required	= $\frac{0 \text{ bcy}}{\text{volume to be blasted}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} = 0 \text{ lb}$
Miscellaneous Powder Supplies	= $\frac{0 \text{ lb}}{\text{ANFO required}} * \frac{5\%}{\text{contingency factor}} = 0 \text{ lb}$
Cord Cost per Hole	= $(\frac{26 \text{ ft}}{\text{burden}} + \frac{32 \text{ ft}}{\text{spacing}} + \frac{40 \text{ ft}}{\text{bench height}}) * \frac{10\%}{\text{waste factor}} * \frac{0.10 \text{ \$/ft}}{\text{cord unit cost}} = 11 \text{ \$/hole}$
ANFO Cost per Hole	= $\frac{1,233 \text{ bcy}}{\text{volume shot per hole}} * \frac{0.9 \text{ lb/bcy}}{\text{powder factor}} * \frac{0.15 \text{ \$/lb}}{\text{ANFO unit cost}} = 171 \text{ \$/hole}$
Primer Cost per Hole	= $\frac{1}{\text{primers per hole}} * \frac{4.63 \text{ \$/ea}}{\text{primer unit cost}} = 4.63 \text{ \$/hole}$
Volumetric Blasting Cost	= $(\frac{11 \text{ \$/hole}}{\text{cord cost per hole}} + \frac{171 \text{ \$/hole}}{\text{ANFO cost per hole}} + \frac{4.63 \text{ \$/hole}}{\text{primer cost per hole}}) / \frac{1,233 \text{ bcy}}{\text{volume shot per hole}} = 0.15 \text{ \$/bcy}$
Total Blasting Cost	= $\frac{0.15 \text{ \$/bcy}}{\text{volumetric blasting cost}} * \frac{0 \text{ bcy}}{\text{volume to be blasted}} = \$ 0$

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

WORKSHEET NO. 16**BOND 2016 to 2021 - PINABETE PERMIT RECLAMATION BOND SUMMARY SHEET**

		2012 Estimate	
1	Total Facility and Structure Removal Costs	\$	-
2	Total Earthmoving Costs	\$	22,732,862
3	Total Revegetation Costs	\$	2,471,843
4	Total Blast and Other Reclamation Activities Costs	\$	265,011
5	Subtotal: Total Direct Costs	\$	<u>25,469,715</u>
6	Mobilization and Demobilization (at 1.0% of Item 5)	1.0%	\$ 254,697
7	Contingencies (at 5.0% of Item 5)	5.0%	\$ 1,273,486
8	Engineering Redesign Fee (at 1.8% of Item 5)	1.8%	\$ 458,455
9	Contractor Profit and Overhead (at 15.0% of Item 5)	15.0%	\$ 3,820,457
10	Reclamation Management Fee (at 3.9% of Item 5)	3.9%	\$ 993,319
GRAND TOTAL BOND AMOUNT			<u>\$ 32,270,129</u>
<i>(Sum of Items 5 through 10)</i>			

LESS Pre-2016 2011 Area 4N Calculation

\$16,459,152

(Facility and structure removal left in Pre-2016)

NEW BOND TO ADD FOR 2016 to 2021 (Area 4 Project)**\$15,810,977**

WORKSHEET NO. 16a
AREA 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
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	
LESS STRUCTURE NOT INCLUDED IN Post 2016			\$16,459,152