Office of Surface Mining Reclamation and Enforcement, National Oversight Topic

Determination of Required Bond Amounts

Comparison of Ohio's Performance Security Estimates to Estimates Using OSM's Bonding Handbook

Pittsburgh Field Division, Columbus Office

December 2010

FINAL REPORT

Executive Summary

Ohio is adequately implementing and continuing to direct attention to the new bonding program requirements. One of the primary new features includes a process for estimating the cost for the state to reclaim a forfeiture site. This study found these estimates to be no less effective than estimates developed using OSM's methods. In addition, Ohio is working to ensure that mine site conditions are consistent with the criteria used in developing the estimates and that procedures are in place to make adjustments to estimates on a periodic basis.

There have been no performance security forfeitures in Ohio since 2005. Ohio plans to complete reclamation of all current forfeiture sites in 2010. This will be a first in the history of the Ohio program that all coal mine forfeiture sites have been reclaimed. However, based on findings of Ohio's own actuarial study concluded in June 2009, significant questions remain to be resolved regarding the potential risks associated with the design of Ohio's bond pool. A major issue is how those risks relate to the overall ability of Ohio's bond pool to ensure timely reclamation of forfeiture sites in the future, a remaining condition imposed by the Secretary of Interior's 1982 approval of Ohio's program. The actuarial report provided several recommendations that are under consideration pending the results of a second actuarial study that is now underway.

OSM is continuing to evaluate program changes already submitted by Ohio in response to a May 2005, 30 CFR Part 733 notice. OSM is deferring final action on amendments Ohio has already submitted pending additional submissions in response to OSM concerns, the development of additional supporting rules, and the outcome of a second actuarial study.

Introduction:

The Office of Surface Mining Reclamation and Enforcement (OSM) required its field offices to conduct a national oversight review of the states' procedures for estimating reclamation costs for establishing bonds on coal mining permits. This national review focused on three aspects of the Ohio program regarding performance security estimates (PSE) (Ohio refers to bond as performance security).

OSM's national guidelines for conducting this review provided the following three aspects that must be considered in the evaluation of each States' bonding program:

1. Review of how the state is calculating bond amounts for non-forfeited permits
2. Review of permit revisions to determine whether the state is properly evaluating bond adequacy as part of the permit revision application process
3. Evaluation of the reclamation of recently forfeited sites to determine if they are reclaimed in accordance with the approved reclamation plan

Ohio substantially revised statutory provisions regarding its bonding program in April 2007 in response to OSM's 30 CFR Part 733 notice of May 2005. Ohio formally submitted Program Amendment #82 to OSM in March 2007.

Ohio's revised alternative bonding system (ABS) provides an option for permit applicants to participate in a performance security (bond) pool or to provide full-cost performance security. Participants in the pool must provide a flat-rate performance security of $2,500 per acre and must pay an excise tax on coal production. The tax rate, based on the balance of funds in the pool, is currently 16 cents per ton. The new procedures are described in detail in Ohio's Procedure Directive (PD) Performance Security 2007-1. Ohio's program also requires permittees to establish an alternative financial security (AFS) to ensure long-term treatment of post-mining pollutional discharges that are identified. Another significant change established the Reclamation Forfeiture Fund Advisory Board. This board monitors the fund and makes recommendations to the Governor regarding the solvency of the fund.

With both options, Ohio develops a performance security estimate (PSE) based on the mining and reclamation plan provided by the applicant. The PSE provides the estimated cost to reclaim the site if the state has to reclaim it due to default by the permittee. Developing these estimates was a totally new venture for Ohio. The procedures are documented in PD Performance Security 2007-2 and other internal procedure documents and forms. The procedures have not yet been tested by a forfeiture of performance security. Currently, the liability of the performance security pool is limited to the estimated cost to reclaim, including future adjustments to the estimate developed by the state. However, Ohio has the ability to adjust estimates before and after issuance of a forfeiture order. Because the program limits the liability on the pool to the amount of the estimated cost to reclaim, the ability to adjust estimates after forfeiture orders are issued is necessary to ensure that unexpected site conditions and associated costs will be covered by the pool.

Ohio has not forfeited performance security on any site since the new requirements became effective. Although they are continuing to reclaim past forfeiture sites, assessing reclamation of those sites would not demonstrate the effectiveness of the new program. However, past OSM oversight studies regarding reclamation of forfeiture sites found that Ohio consistently completes reclamation in accordance with the approved reclamation plans.

Methodology:

The national guidelines for this study asked that eleven questions be answered by this review. These questions and our responses are in the next section.

OSM selected a sample of five permits to meet the criteria specified by the national study. The sample included two permits that are under the full-cost option and three permits under the pool option. The samples selected included an underground mine with a processing and coal waste disposal facility under the full-cost option; another small underground mine under the full-cost option; and a large, medium, and small surface mine all under the pool option. The sample permits were issued after the new procedures became effective, with one exception. A new area was added to that permit after the new procedures were in place. At least one of the permits includes permit revisions and/or incidental boundary revisions approved after the initial PSE was completed.

Since there have been no forfeitures under Ohio's new procedures to use as a demonstration of the effectiveness of Ohio's PSEs, an OSM engineer reviewed the mining and reclamation plans for the selected permits. This review provided an independent estimate using the criteria provided by OSM's Bonding Handbook. These estimates were compared to Ohio's PSE in general terms to see if there were any major differences in the elements of the process or in the final outcome. OSM is using the Bonding Handbook only as a guide for comparative purposes. OSM will **not** substitute its review for Ohio's. Rather, the comparison serves as a guide to determine if the two procedures result in major differences in the final PSE. If significant differences are consistently identified, the cause of the differences will be further explored and discussed with Ohio. OSM will use this evaluation to provide answers to all of the questions listed in the national guidelines above.

The findings of the study are summarized in this report, including answers to the questions in the national guidelines, recommendations, and the results of any discussions with Ohio.

Discussion and Response to Questions:

1. Is there a clear understanding by the regulatory authority and OSM as to the methodology that the state is using to calculate required bond amounts?

Yes. OSM worked with Ohio and the mining industry in development of the methodology for estimating reclamation costs. The methodology is described in Ohio's PD Performance Security 2007-02. Further guidance is provided on the spreadsheet format that makes up the PSE and other documentation of the process.

2. Are there any outstanding required program amendments or 30 CFR Part 732 notifications related to bonding?

Yes. A condition of the Secretary of Interior's August 1982 approval of the Ohio Regulatory Program remains in place. The condition in 30 CFR 935.11(h)states: "Steps will be taken to terminate approval found in 935.10: (1) Unless Ohio submits to the Secretary by September 30, 1985, a revised program amendment that demonstrates how the alternative bonding system will assure timely reclamation at the site of all operations for which bond has been forfeited."

In May 2005, based on requirements of 30 CFR 732.13(j)(4)(iii), the OSM Director issued notice to Ohio under 30 CFR 733.12(b) that he had reason to believe that Ohio is not effectively implementing, administering, maintaining, or enforcing any part of the state's coal mining regulatory program that the Secretary of the Interior approved under SMCRA. This action initiated the process for OSM to consider substituting Federal enforcement of a state program or withdrawing approval of a state program.

In response to OSM's notice, Ohio made substantial statutory changes to its bonding system in January 2007. In March 2007, Ohio submitted a program amendment to OSM regarding these changes. OSM reviewed the program amendment and sent a letter to Ohio in July 2007 that outlined several issues and the need for additional information and supporting rules before OSM could make a decision on the amendment. Ohio responded to the issues in January 2008 with a schedule for adopting necessary statutory changes and drafting regulations. Ohio followed up with additional information in July 2008 and has continued to ask for OSM's informal review of rule and statutory changes. This process is ongoing as Ohio continues to work out issues with the coal industry. Ohio has worked very closely with OSM throughout this process. Based on the progress Ohio is making, OSM has deferred any further action through the 30 CFR 733 process pending Ohio's submittal of additional formal amendments which are expected this year.

3. Has the Field Office or State received any citizen complaints related to bond adequacy in the past three years? If so, what was the ultimate outcome of those complaints?

We are not aware of any citizen complaints regarding bond adequacy. A state-wide environmental organization has expressed some interest in Ohio's changes to its bonding program. They periodically contact OSM regarding Ohio's progress with resolving the issues.

4. Has the State revised its bond calculation methodology since the last comprehensive OSM review?

Ohio's program did not require cost estimates prior to the 2007 changes to Ohio's bonding program because Ohio's ABS established a flat per-acre performance security rate of $2500. This performance security was, and still is, supported by an excise tax on coal production. Although the per-acre performance security rate remained the same after the 2007 amendments, the excise tax increased, and estimates of the cost to reclaim are now required on all permits. The estimates and subsequent adjustments serve as the limit of the liability for funding reclamation of forfeiture sites. This is the first OSM review of the methodology they are now using.

5. Has the bond calculation considered all features and structures in the approved plan, including whether roads and impoundments will be permanent?

Yes. Ohio's PSEs consider the entire approved mining and reclamation plan, including structures and facilities, permanent roads, and impoundments. Ohio's PSEs include line-items for each of these features.

6. Does the calculation include the costs of mobilization, demobilization, engineering redesign, and contractor profit and overhead?

Yes. Ohio's PSEs have a line-item for mobilization and demobilization. All unit-prices are established annually based on unit-prices of AML contracts from prior years. Under this approach, contractor profit and overhead are considered in the bids for those AML projects. In addition to unit-prices, the PSEs include a 10 to 20 percent contingency based on the Means Construction Guide, plus a 10 to 15 percent contingency for administrative costs that include design, contracting, and inspection costs. In addition, Ohio includes a 5 percent contingency for Ohio Environmental Protection Agency (OEPA) permitting fees that also includes design and development of the Storm Water Pollution Prevention Plans; weekly inspections and maintenance throughout construction; and all costs incurred by the state to install, maintain, and remove storm water-related construction materials and structures.

7. Are the revegetation costs in the bond calculation consistent with the approved revegetation plan?

Yes. The revegetation costs are based on the planting plans in the approved permit and the unit-costs established for that year.

8. What type of financial assurance is provided for any post-mining pollutional discharges, and how is the amount of that assurance calculated?

Ohio's new statute changes provide for establishing an alternative financial security (AFS) in the form of trust funds. However, Ohio has not yet had to implement that provision. Although Ohio's reclaimed forfeiture sites to date have not required post-reclamation water treatment, there are some current mine sites that may require long-term water treatment in the future. Ohio is in the process of developing rules and procedures for calculating an AFS for post-mining discharges and determining how and when an AFS will be required. They are currently working with a mining company to develop the first AFS agreement.

9. How does the bond amount (cost estimate) compare with that calculated using the OSM Bonding Handbook?

An OSM engineer developed estimates on five sites using the OSM Bonding Handbook. The five sites included: an underground mine with a processing and coal waste disposal facility under the full-cost option; another small underground mine under the full-cost option; and a large, medium, and small surface mine under the pool option. In comparing OSM's estimates based on

the OSM Bonding Handbook to the current PSEs developed by Ohio's process, differences in the estimates on the five permits ranged from 3 percent to 32 percent. Ohio's estimates were higher than OSM's in all five permits reviewed.

However, based on Ohio's comments on the draft report, the PSEs used in the OSM comparison were completed prior to Ohio's August 2009 unit-cost update. In support of its comments, Ohio provided an updated PSE on the sampled permits using the current unit-costs to demonstrate how the current unit-costs would affect the PSEs. Using the updated unit-costs, the percentage of difference between Ohio's PSEs and OSM's estimates changed.

The difference on permit D-2317 changed from +7 percent to -0.4%; on D-2286 from +32 percent to +13 percent; and on D-2335 from +3 percent to -15 percent (+ indicates Ohio is higher than OSM and - indicates Ohio is lower than OSM). For permit D-2187, there was no change because the estimate used in the comparison already included the current unit-cost. For permit D-2325, Ohio's PSE increased from the one used in the initial comparison. One reason is that the updated PSE included an increase in the earthwork unit-cost from the lower one used when the initial PSE was done. Ohio's PSE also included higher volume estimates for earthwork and demolition costs that were not considered in OSM's estimate. Therefore, the difference between Ohio's PSE and OSM's estimate increased from +20 percent to +23 percent. To summarize, Ohio's PSEs were from 10 to 23 percent higher than OSM's estimates on three permits. Ohio's PSEs were from 0.4 to 15 percent lower on two permits. Appendix A provides comparison data on the estimates for each of the permits in the sample. Appendix B summarizes OSM's calculations to support OSM's estimates.

A second consistent difference was that Ohio's PSE process provides for a contingency rate that covers a broader range of contingencies. Ohio PSE's use a 10 to 20 percent construction contingency based on the Means Guide recommendations; 5 percent NPDES permitting contingency for obtaining required NPDES permits from OEPA; and 10 to 15 percent administrative contingency that accounts for engineering design, contracting, and inspection. OSM's estimates used contingencies of 3 percent for construction and 3 percent for engineering redesign. Ohio will adjust the contingency rates as different phases of reclamation are completed. However, since all of the permits selected are relatively new, no adjustments have been made.

One reason that Ohio's contingencies are higher is based on input from the industry on the amount of detail required in the mine plan. The mining industry has not, in the past, provided very specific mine plan details. Based on workgroup meetings, which included industry input, the industry preferred to continue providing very basic mine plan details that will allow for more flexibility as changes are needed. Ohio's contingencies are partly in place to account for this. During development of the PSE process, Ohio told the industry that more specific mine plans would likely result in lower PSEs and the preference for less-detailed plans would result in higher PSEs.

Although there were some significant differences in the comparisons, including variance in some of the earthwork estimates, the outcome is not unexpected. Various estimation procedures will most likely provide different results. Different people doing the estimates will also likely

produce different results. Ohio has been doing reclamation cost estimates for AML work for a significant number of years. This methodology was used to "create" the methodology for the PSE. The only new thing that Ohio has had to incorporate in this process is using a proposed plan rather than "on-the-ground" reality. The process has not been tested with an actual forfeiture. We have also not evaluated the success of OSM's estimation procedure with actual data from reclamation of forfeiture sites. Based on comparison of the procedures provided by OSM's Bonding Handbook, Ohio's estimation process should provide adequate funds to ensure proper reclamation of forfeiture sites. Ohio's procedures are no less effective than OSM's procedures.

10. Is the reclamation of bond forfeiture sites being done in conformance with the approved reclamation plan for the site? Are differences due to the inadequacy of the bond or available resources from the alternative bonding system?

Ohio has not forfeited performance security on any site since the new requirements became effective in 2007. Although they are continuing to reclaim past forfeiture sites, assessing reclamation of those sites would not demonstrate the effectiveness of the new program. Therefore, as part of this review, OSM did not conduct inspections of reclaimed forfeiture sites. However, past OSM oversight studies regarding reclamation of forfeiture sites, with the latest in 2002, found that Ohio consistently completes reclamation in accordance with the approved reclamation plans.

11. Is the State properly calculating bond amounts to ensure proper site reclamation?

Although Ohio's cost estimation process has not yet been tested with an actual forfeiture, Ohio compared the PSE process to bids on a prior forfeiture project to determine how close the estimate was to actual typical reclamation costs. The comparison on this one site found the PSE to be well within reason of the actual bids received. In addition, based on comparison of the procedures provided by OSM's Bonding Handbook, Ohio's estimation process should provide adequate funds to ensure proper reclamation of forfeiture sites. Ohio's procedures are no less effective than OSM's procedures.

Results of another OSM Oversight Study in Ohio in 2010

OSM concluded a separate oversight study in 2010 regarding the extent to which current mine site conditions matched the information used in the current PSE. The study was summarized as follows:

> "Based on the relatively short period of time since Ohio substantially revised its bonding program, DMRM has successfully developed extensive program changes. Overall, DMRM is effectively implementing these changes with few exceptions.[1] (Footnote added)

[1] This review found that Ohio had not yet started doing annual updates to PSEs at the time the permittee submits annual reports on their permits as required by their procedures. Based on OSM's evaluation of 28 sample sites that had PSEs completed at the time of the OSM site visit, the OSM inspectors noted some differences between the PSE's and the site conditions on seven sites. Differences ranged from having crushers and/or stockpiles on site that were not identified in the PSE (five sites), not following the approved plan when disposing of coal waste (one site),

These exceptions should be resolved in the near future as staff gains more experience, additional positions are added, and training continues. DMRM has made strides with initial training of current staff and industry in the new procedures. We suggest that training continue as procedures and staff resources continue to evolve. OSM will follow up regarding when DMRM expects to begin conducting the required annual PSE reviews and when PSEs on all the permits should be completed.

DMRM is directing greater attention to compliance with mine plans and contemporaneous reclamation, two very critical factors in the success of the PSE process. As long as DMRM continues to ensure compliance with these two factors and provides proper and timely adjustments to PSEs as specified by the program, the field aspects of this process should be successful."

Other Factors Related to Ohio's Bonding Program

As stated previously in this report, Ohio establishes the performance security amount on full-cost sites based on the PSE.[2] Currently, there are only 10 permits (about 3 percent of all permits) under the full-cost option. The performance security amount for the sites in the performance security pool is based on a flat rate of $2500 per acre and is supplemented by an excise tax on coal production. A PSE, as subsequently adjusted, on performance security pool sites serves as the limit of liability for expenditures to reclaim forfeiture sites. However, a PSE can be adjusted even after a performance security forfeiture order is issued if Ohio revises the reclamation plan because of changes in site conditions that were not considered in the latest PSE. Considering this provision, Ohio has the authority to adjust the PSE as necessary to reflect the actual cost to reclaim a forfeiture site to the standards of the approved reclamation plan.

As with any estimation procedure, it is only as good as the data and assumptions provided and the commitment to enforce compliance with mining and reclamation plans and to make timely adjustments as conditions change. Lacking any current forfeitures on which to judge Ohio's PSE process, we cannot say with certainty whether the process ensures proper reclamation at this time. However, Ohio's PSEs were higher than estimates using OSM's Bonding Handbook. This shows that Ohio's process is no less effective than the Federal procedures.

Although questions on the long-term viability of the performance security pool are not yet fully answered, the balance of the pool continues to grow and is expected to reach $10 million in the near future. Ohio has not issued any new performance security forfeitures since 2005. This may

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to having three pits instead of two (one site). None of these differences are considered programmatic problems, but are likely reflective of inspectors and permittees learning the new program changes. OSM inspectors did note that DMRM should provide additional clarity to the inspection staff regarding measurements of mining pits. Ohio explained reasons that some crushers and stockpiles were not included in the PSEs. Excluding the sites with questions about crushers/stockpiles, there were only two sites that had more substantive differences from the PSE. DMRM took action to address these two sites. See OSM, Pittsburgh Field Division, report "Comparison of Mine Site Conditions to Performance Security Estimates" May 2010.

[2] Permittees that place sites under the full-cost option do not pay excise tax on coal produced from the site. Permittees that place sites under the pool option pay excise tax of 12 to 16 cents per ton of coal produced from those sites depending on the balance in the pool.

be the longest period of time without performance security forfeitures in Ohio since passage of SMCRA. Ohio is expected to complete reclamation of all existing performance security forfeiture sites in 2010. Although this is a positive development, the financial condition of any company can change rapidly, potentially resulting in default on reclamation responsibility on one or multiple mine sites.

A large actuarial hurdle remains with the Ohio bonding program regarding the risk to the viability of the performance security pool if one or more of the five major coal producers (contributors to the reclamation forfeiture fund) would default. This risk is a double-edged sword in that the largest reclamation liability rests with these companies. Also, once they stop mining, there would be far less funds coming into the performance security pool. There are no present indicators that this risk could turn into reality, but this is unpredictable. Historically, there have been large spikes in the number of sites in default every five to seven years. The last large spike was in 2005. Fortunately, Ohio has worked with the mining company while forfeiture orders issued on 15 sites were under appeal to assure reclamation of permits resulting in the performance security pool dodging significant expenditures. However, an adequate system of financial assurances must be in place to cover future spikes in the number of forfeitures when mining and bonding companies are unable to fulfill their obligations under worst-case scenario conditions such as those considered in the actuarial study. Based on the current level of funds in the performance security pool, default by any of the large mining companies could easily overwhelm the ability of the pool to reclaim the forfeited sites within a reasonable time. However, we remain cautiously optimistic that the changes will improve Ohio's bonding program and that the program condition can be lifted based on future actuarial data that shows the new system will provide long-term solvency. We will continue to work with Ohio as resolution of this long-standing issue continues to evolve.

Conclusions and Recommendations

1. Based on the findings of the two OSM studies conducted in 2010, we believe that Ohio is adequately implementing and continuing to direct attention to the new requirements.

- Ohio's PSEs are no less effective than estimates developed using OSM methods. Ohio's PSE procedures provide a reasonable process for estimating reclamation costs. In turn, performance security on sites under the full-cost option will provide adequate funds to ensure complete reclamation of the mine site in the event of default.
- Ohio is working to ensure that mine site conditions are consistent with the criteria used in developing the PSEs and that procedures are in place to make adjustments.

OSM recommends that Ohio continue to increase awareness of the new program requirements by continuing training of field and permitting staff and mine operators.

2. There have been no performance security forfeitures in Ohio since 2005. Ohio plans to complete reclamation of all current forfeiture sites in 2010. This will be the first time in the history of the Ohio program that all coal forfeiture sites will be reclaimed. However, based on

findings of Ohio's own actuarial study concluded in June 2009[3], significant questions remain to be resolved regarding the potential risks associated with the design of the bond pool; especially how those risks relate to the overall ability of Ohio's bond pool to ensure timely reclamation of forfeiture sites in the future. The primary concern is if any of the top five coal-producing companies default on their reclamation responsibilities, there would be a very substantial negative impact on the viability of the pool. The actuarial report provided several recommendations that are under consideration pending the results of a second actuarial study that will be started later this year. Ohio intends this study to specifically look into how risks are assessed and how solvency is determined in other states.

OSM recommends that Ohio consider recommendations provided in the 2009 actuarial report and findings from the upcoming actuarial report that may address many of the questions regarding the risks to long-term solvency that were identified.

Appendices

Appendix A **Comparison of Results of OSM's Estimations on Five Sites Using the OSM Bonding Handbook to Ohio's Current PSEs**

Appendix B **Supporting Data for OSM's Estimates**

Appendix C **Ohio's Comments on Draft Report**

Appendix D **OSM Response to Comments**

[3] See "Analysis of the Reclamation Forfeiture Fund, Oversight by the Reclamation Forfeiture Fund Advisory Board, maintained by the Ohio Department of Natural Resources, Division of Mineral Resources Management, June 2009, Pinnacle Actuarial Resources, Inc."

Appendix A

Comparison of Results of OSM's Estimations on Five Sites Using the OSM Bonding Handbook to Ohio's Current PSEs								
Permit and Mine Type	**Ohio Performance security Option**	**Date of Ohio PSE**	**Ohio PSE**	**Adjusted Ohio PSE based on Current Unit-Cost**	**OSM Bond Handbook Estimate**	**Initial Difference between Ohio and OSM[4]**	**Adjusted Difference based on Current Unit-Cost**	**Comments**
D-2187 Underground	Full-Cost	10/2/2009	$677,000	$677,000	$614,296	Ohio 10% higher	Ohio 10% higher	Primary differences were accounted for by updating unit cost values and contingencies based on flexible mine plans.
D-2317 Underground with processing plant and refuse disposal	Full-Cost	8/25/2009	$1,995,000	$1,857,000	$1,865,435	Ohio 7% higher	Ohio 0.4% lower	
D-2335 Small surface mine	Pool	9/28/2009	$1,142,000	$941,000	$1,106,941	Ohio 3% higher	Ohio 15% lower	
D-2286 Medium surface mine	Pool	4/21/2009	$5,844,000	$4,993,000	$4,419,208	Ohio 32% higher	Ohio 13% higher	
D-2325 Large surface mine	Pool	10/24/2008	$3,620,000	$3,713,000	$3,008,164	Ohio 20% higher	Ohio 23% higher	

[4] Following their review of the draft report, Ohio provided revised PSEs using current unit-costs for the permits. Using the revised PSEs, the percentage of difference between Ohio's PSEs and OSM's estimates changed on four of the five permits. There was no change for D-2187 since the PSE used in the comparison reflected the current unit-cost. The PSE for D-2325 increased due to an increased unit-price for earth moving since the initial PSE was done. See discussion in response to Question 9, Pages 6-7.

Appendix B

Supporting Data for OSM's Estimates
D-2187
D-2317
D-2335
D-2286
D-2325

BOND AMOUNT COMPUTATION

Applicant:	Sterling Mining Corporation Shean Hill and Davison Mine		
Permit Number:	D-2187 & D-2187-1	**Permitted Acreage:**	50.5

Bonding Scheme: Permit Area

If Incremental:

Increment Number:
Increment Acreage:

If Cumulative:

Acres previously authorized for disturbance:
New acres proposed for disturbance:

Type of Operation:	Drift Underground Longwall Mine
Location:	Brush Creek Township, Jefferson County
PSE (October 2009):	$677,000
Prepared by:	Stefanie Self
Date:	5/5/2010
Total Bond Amount:	**$ 614,296**

WORKSHEET 1
DESCRIPTION OF THE WORST-CASE RECLAMATION SCENARIO

The worst case scenario for the Shean Hill and Davison Mines will be if the one pit (face-up area) is open with fill material located in storage areas. 3 ponds will need to be reclaimed, two structures and an overland conveyor belt will need to be removed. Topsoil replacement: 20 ac no more than 500 feet away, 8 ac more than 500 feet away (maximum approved distance).

The following tasks must be completed to reclaim the site:
Fill in open pit (115 ft x 115 ft x 40 ft), "upper portion of pit" (60 ft x 240 ft x 240 ft) and ramp (25 ft x 70 ft x 400 ft) Note: Volume to be hauled to pit area will be only the amount needed to fill pit. Rest of material will be graded in the spoil area.
Grade area of pits after filled, topsoil and revegetate
Grade area where material was obtained for filling pits (1500 linear feet), topsoil and revegetate
Remove 3 impoundments, grade, topsoil and revegetate
Remove coal stockpile area, grade, topsoil and revegetate
Remove 2 pole buildings "small buildings without structural steel" to be disposed of 20
Remove one overland conveyor belt, 1500 ft long
Remove trash, storage tanks, parts trailer and derelict equipment as needed

Assumptions:
Overburden mostly blasted shale with a density of 2100 lb/cubic yard and a swell factor of 0.75 or swell percent of 33%
Shrinkage for the overburden when placed in pit will be half the swell
Overburden/spoil stored 1500 feet from face-up area for underground mine, slope along haul distance = 0
Fill to be loaded and hauled to the open pit, then spread by dozer to fill area. Slope of push = 0 since both up and down pushes will be required.
6 inches of topsoil to be placed, 20 acres stored no more than 500 feet from area to be used, 8 acres stored more than 500 ft away (from permit)

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 2
STRUCTURE DEMOLITION AND DISPOSAL COSTS

Structures to be demolished:

Item	Construction Material	Volume (cubic feet)	Unit Cost Basis ($/cubic foot)	Demolition Cost ($)
Pole Building #1		21,000	0.28	$ 5,880
Pole Building #2		15,000	0.28	$ 4,200
				$ -
				$ -
				$ -
				$ -
				$ -
			Subtotal	$ 10,080

Other items to be demolished (paved roads, conveyors, utility poles, rail spurs, etc.)

Hill conveyor belt, 1500 ft long	$37 per linear foot	$ 55,500

Subtotal = $55,500

Debris handling and disposal costs:

Removal of trash and derelict equipment, Lump Sum $5,000

Subtotal = $5,000

TOTAL DEMOLITION AND DISPOSAL = $70,580

Data Sources:
Sterling Mining Co, Permit D-2187

WORKSHEET 3
MATERIAL HANDLING PLAN SUMMARY

Earthmoving Activity	Volume (CY)	Acre	Origin	Destination	Haul Distance (ft)	Grade * (%)	Equipment To Be Used
Load spoil to open pit	202,749		Excess Spoil Storage	Open Pit	1500	0	Caterpillar 992K
Haul spoil to open pit	202,749		Excess Spoil Storage	Open Pit	1500	0	Caterpillar 777F (2 trucks)
Spread spoil in open pit	101,375		Spoil Piles	Mine Area	240	0	Caterpillar D-9T Semi-U blade
Regrade area where spoil stored		5.71	In Place				Caterpillar D-9T Semi-U blade
Haul topsoil to pit area	4,609		Topsoil Storage	Mine Area	500	0	Caterpillar 992K
Spread topsoil over pit and spoil areas	2,304	5.71	In Place		499		Caterpillar D-9T Semi-U blade
Rip coal stockpile area		3.00	In Place				D9T-SU Multishank
Haul topsoil to coal stockpile area	7,260		Topsoil Storage	Coal Stockpile Area	500	0	Caterpillar 992K
Spread topsoil over coal stockpile area	3,630	3.00	In Place				Caterpillar D-9T Semi-U blade

*Record grade resistance here. Calculate total resistance on the appropriate worksheet. Total Resistance = Grade Resistance + Rolling Resistance.

WORKSHEET 4B
EARTHWORK QUANTITY

Spoil Swell Factor: **0.75** **Spoil Swell %:** **33**

Fill Open Pit:

Pit Volume	length	width	depth	BCY	LCY	Cubic Yards needed to account for compaction
Mine Area A	115 Ft	115 Ft	40 Ft	19,593	26,123	22,858
Upper portion of pit	240 Ft	240 Ft	60 Ft	128,000	170,667	149,333
Ramp	400 Ft	70 Ft	25 Ft	25,926	34,568	30,247
Top sides of ramp	6 Ft	120 Ft	10 Ft	267	356	311
Total:				173,785	231,714	202,749

Coal Processing Area (CPA):

Area	3 Ac		
Cut Length for Ripper	130,680 Sq Ft	361 Ft	

Soil Volumes (top-and sub-soil):	Area (sq ft)	Area (ac)	Depth (ft)	BCY
Soil Volume (Pit and Spoil Area) =	248,863	5.71 ac	0.5 Ft	4609
Soil Volume (Coal Pad Area) =	130,680	3.00 ac	1.5 Ft	7260
Total:				4,609

Data Source:
Sterling Mining Co, Permit D-2187

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Load spoil to open pit

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

Description of Loader Use (origin, destination, grade, haul distance, etc.):
Load spoil from stockpile
Quantity 202,749 CY

Productivity Calculations:

Cycle Time = 0 (haul time loaded (min)) **+** 0 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **0.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 0.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **1004** **LCY/hr**

Hours Required = 202,749 (volume to be moved (LCY)) **÷** 1004 (net hourly production (LCY/hr)) **=** **202.0** **hr**

use **202.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 9
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE

Earthmoving Activity:
Haul spoil to open pit

Characterization of Truck Use (type, size, etc.):
Caterpillar 777F (2 trucks)

Description of Truck Use (origin, destination, grade, haul distance, etc.):
Haul spoil from stockpile to open pit area

Volume to be moved (lcy):	202,749	Density (lb/lcy):	2100	Distance (ft):	1500	Grade (%):	0
		Rolling Resistance (%):	3			Total Resistance (%):	3

Productivity Calculations:

No. Loader Passes/Truck = 66.8 (truck capacity* (LCY)) ÷ 13.05 (loader bucket net capacity (LCY)) = **5.12** **passes**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Loading Time/Truck = 0.65 (loader cycle time (min) (From WS 8 or WS 10)) x 5.00 (number of loader passes/ truck) = **3.25** **min**

Truck Cycle Time = 0.8 (haul time (min)) + 0.42 (return time (min)) + 3.25 (loading time (min)) + 2 (dump and maneuver time (min)) = **6.5** **min.**

No. Trucks Required = 6.47 (truck cycle time (min)) ÷ 3.25 (total loading time (min)) = **1.99** **trucks**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Production Rate = 65.25 (net truck capacity **) x 2.00 (number of trucks) ÷ 6.47 (truck cycle time (min)) = **20.2** **LCY/min**

Hourly Production = 20.2 (production rate (LCY/min)) x 60 min (hr) x 0.83 (efficiency factor) = **1008.5** **LCY/hr**

Hours Required = 202,749 (volume to be moved (LCY)) ÷ 1008.5 (hourly production (LCY/hr)) = **202.0** **hr**

Use whichever is higher from Worksheets 8 & 9 **202.0** **hr**

* **Use the average of the heaped and struck capacities.**
** **Net truck capacity = loader bucket net capacity x no. loader passes/truck.**

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread spoil in open pit
Regrade area where spoil stored

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 101,375 Density (lb/lcy): 2100 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 1.00 (grade factor) **x** 1.10 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.48**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.48 (operating adjustment factor) **=** **958** **LCY/hr**

Hours Required = 101,375 (volume to be moved (LCY)) **/** 958 (net hourly production (LCY/hr)) **=** 105.8 hrs

use **106** **hrs**

Use whichever is higher from Worksheets 5, 8 & 9 **202.0** **hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to pit area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	4,609 CY		Distance (ft):	500		Grade (%):	0
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		3
Productivity Calculations:					Total Resistance (%):		3

Cycle Time = 0.45 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.55** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.55 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **421** **LCY/hr**

Hours Required = 4,609 (volume to be moved (LCY)) **÷** 421 (net hourly production (LCY/hr)) **=** **10.9** **hr**

use **11.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over pit and spoil areas

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 2,304 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 1.00 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.63**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.63 (operating adjustment factor) **=** **1258** **LCY/hr**

Hours Required = 2,304 (volume to be moved (LCY)) **/** 1258 (net hourly production (LCY/hr)) **=** 1.8 hrs

use **2 hrs**

Use whichever is higher from Worksheets 5 & 8 **11.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 7
PRODUCTIVITY AND HOURS REQUIRED FOR RIPPER-EQUIPPED DOZER USE

Ripping Activity:
Rip area of coal storage area, 3.0 acres

Characterization of Dozer and Ripper Use:
D9T-SU Multishank

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):
BCY: 4,840 Cut Spacing (ft): 11.60 Cut Length (ft): 361 Area (ac): 3.00
Assumed ground speeed of 1 mph Speed (ft/min): 88

Productivity Calculation:

Cycle Time = 361 (cut length (ft)) ÷ 88 (ft/min) + 0.25 (fixed turn time* (min)) = **4.4** **min/pass**

Passes/Hour = 60 min / hr ÷ 4.4 (cycle time (min/pass)) x 0.83 (efficiency factor) = **11.47** **passes/hr**

Volume Cut/Pass = 1 (tool penetration (ft)) x 11.6 (cut spacing (ft)) x 361 (cut length (ft)) ÷ 27 cu ft / cu yd = **155** **BCY/pass**

Hourly Production = 155 (volume cut/pass (BCY/pass)) x 11.47 (passes/hour) = **1781.9** **BCY/hr****

Hours Required = 4,840 (volume to be ripped (BCY)) ÷ 1781.9 (hourly production (BCY/hr)) = 2.7 hours

use **3** **hrs**

* **Fixed turn time depends upon dozer used. 0.25 min/turn is normal.**

** **Remember to use the swell factor to convert from bank cubic yards to loose cubic yards when applying these data to *Worksheet No. 5* . Calculate separate dozer hauling of ripped material for each lift on that worksheet.**

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to coal stockpile area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

Description of Loader Use (origin, destination, grade, haul distance, etc.):
Haul top soil from stockpile

Quantity	7,260 CY		Distance (ft):	500		Grade (%):	0
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		3
Productivity Calculations:					Total Resistance (%):		3

Cycle Time = 0.45 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.55** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.55 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **421** **LCY/hr**

Hours Required = 7,260 (volume to be moved (LCY)) **÷** 421 (net hourly production (LCY/hr)) **=** **17.2** **hr**

use **17.2** **hr**

*** See loader section of equipment manual.**

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over coal stockpile area

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 3,630 Density (lb/lcy): 1600 Distance (ft): 80 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 1.00 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.63**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.63 (operating adjustment factor) **=** **1258** **LCY/hr**

Hours Required = 3,630 (volume to be moved (LCY)) **/** 1258 (net hourly production (LCY/hr)) **=** 2.9 hrs

use **3 hrs**

Use whichever is higher from Worksheets 5 & 8 **17.2 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39

WORKSHEET 13
SUMMARY CALCULATION OF EARTHMOVING COSTS

Equipment *	Ownership & Operating Cost ($/hr)	Labor Cost ($/hr)	Total Hours Required **	Total Cost *** ($)
Caterpillar D-9T Semi-U blade	$ 176.53	$ 38.76	460	$ 99,139
Caterpillar 992K	$ 269.67	$ 38.76	230	$ 71,015
Caterpillar 777F (2 trucks)	$ 254.24	$ 28.94	404	$ 114,405
Caterpillar D9T with Semi-Universal Blade & Multishank Ripper	$ 176.53	$ 38.76	3	$ 646
			Grand Total of Earthmoving	**$ 285,205**

*** Be sure to include all necessary attachments and accessories for each item of equipment. Also, add support equipment such as water wagons and graders to match total project time as appropriate.**

**** Account for multiple units in truck and/or scraper teams**

***** Calculate the total cost for each item of equipment by adding the second and third columns (the ownership and operation and labor costs) and then multiplying that number by the fourth column (the total hours required).**

Data Sources:
Sterling Mining Co, Permit D-2187
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 14
REVEGETATION COSTS

Name and Description of Area To Be Revegetated:
Revegetate all areas to grazing land

Description of Revegetation Activities:

Revegetate 28.0 ac with a pasture seed mix

Cost Calculation for Individual Revegetation Activities:

Initial Seeding

28.0	x (	0	+	1200	) =	$ 33,600
area to be seeded (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		

Planting Trees and Shrubs

	x (		+		) =	$ -
area to be planted (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Reseeding *

7.0	x (	0	+	1200	) =	$ 8,400
area anticipated to need reseeding (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		

Replanting Trees and Shrubs *

	x (		+		) =	$ -
area anticipated to need replanting (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Other Necessary Revegetation Activities

(Examples of other activities that may be necessary include soil sampling, irrigation, and rill and gully repair. Describe each activity and provide a cost estimate with documentation. Use additional worksheets if necessary.)

TOTAL REVEGETATION COST = $ 42,000

* **Generally, the proportion of the area initially seeded and planted that is anticipated to need reseeding or replanting is determined on the basis of historic failure rates for similar sites and conditions. The same principle applies to determining the extent of seedbed preparation and soil amendments that may be needed as part of any reseeding or replanting effort. If anticipated failure rates vary within the area proposed for disturbance, use a separate worksheet for the area subject to each failure rate.**

Assumptions:

Second seeding at $____ per acre.
Assume 25% failure for second seeding.

Data Sources:
Sterling Mining Co, Permit D-2187
Per acre cost obtained from consultation with AML programs in surrounding states.

WORKSHEET 15
OTHER RECLAMATION ACTIVITY COSTS

(Includes subsidence damage repair costs, water supply replacement costs, and funds required to support long-term treatment of unanticipated acid or ferruginous mine drainage.)

Description of Reclamation, Repair or Pollution Abatement Activity:

Remove 3 sediment ponds
Dewater ponds

Assumptions:

Cost Estimate Calculations:

	Unit	Unit Cost	Total
Removal of 3 sediment ponds	3	$ 5,000	$ 15,000
Dewatering cost = $0.005 per gallon	2,355,903	$ 0.005	$ 11,780
Water Treatment cost = $0.01	706,771	$ 0.010	$ 7,068
Maintenance costs ($/acre)	28	$ 368.14	$ 10,308
TOTAL COSTS =			**$ 44,155**

Other Documentation or Notes:

State of Ohio estimates dewatering cost at $0.005/gallon, and then that 1/3 of the water removed from the ponds will need treatment at $0.01/gallon

Data Sources:
Sterling Mining Co, Permit D-2187

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 70,580	
2	**Total Earthmoving Costs**		$ 285,205	
3	**Total Revegetation Costs**		$ 42,000	
4	**Total Other Reclamation Activities Costs**		$ 44,155	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 441,940	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 441,940**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 13,258.19	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 13,258.19	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 13,258.19	
10	**Contractor Profit/Overhead** (See Graph 1)	**25.0% of line 6**	$ 110,484.95	
11	**Project Management Fee** (See Graph 2)	**5.0% of line 6**	$ 22,096.99	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 172,357**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 614,296**

*Inflation factor = ENR Construction Cost Index (CCI) for current mo/yr / ENR CCI for mo/yr 3 years prior to current mo/yr = 1 / 1 = 1.00

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

***** This calculation does not reflect an inflation factor because the purpose of the calculation is to determine if the posted bond is sufficient for the current conditions.

Data Sources:
Sterling Mining Co, Permit D-2187

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 70,580	
2	**Total Earthmoving Costs**		$ 285,205	
3	**Total Revegetation Costs**		$ 42,000	
4	**Total Other Reclamation Activities Costs**		$ 44,155	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 441,940	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 502,486**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 15,074.57	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 15,074.57	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 15,074.57	
10	**Contractor Profit/Overhead** (See Graph 1)	**24.5% of line 6**	$ 123,108.96	
11	**Project Management Fee** (See Graph 2)	**4.9% of line 6**	$ 24,621.79	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 192,954**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 695,440**

*Inflation factor = 1.137

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

Data Sources:
Sterling Mining Co, Permit D-2187

BOND AMOUNT COMPUTATION

Applicant:	Gatling Ohio, LLC Yellowbush Mine		
Permit Number:	D-2317 and D-2317-2	**Permitted Acreage:**	82.2 Surface 2032.2 Underground

Bonding Scheme: Permit Area

Type of Operation:	Underground Room and Pillar Mine with Prep Plant and Refuse Disposal
Location:	Sutton Township, Meigs County
PSE (August 2009):	$1,995,000
Prepared by:	Stefanie Self
Date:	5/5/2010
Total Bond Amount:	**$ 1,865,435**

WORKSHEET 1
DESCRIPTION OF THE WORST-CASE RECLAMATION SCENARIO

The worst case scenario for the Yellowbush Mine will be with the following conditions exist: 7 ponds will need to be reclaimed, 5 bridges and 6 roads will need to be removed. Coal refuse area will need to be graded, capped, alkaline matter added, and then soil added and revegetated. Topsoil no more than 500 feet away (maximum approved distance). NOTE: The slope entry has been constructed at ground level, no face-up area/pit has been constructed.

The following tasks must be completed to reclaim the site:
Remove 2 embankments
Remove 7 impoundments, grade, topsoil and revegetate
Remove prep plant and coal stockpile area, grade, topsoil and revegetate (10 acres)
Slurry disposal area reclamation: Grade, cap with 1.5 ft of clay material, resoil with 2.5 ft of topsoil, then revegetate (25 acres)
Remove 5 bridges (linear feet)
Remove 6 haul roads (area)
Remove 2 steel and 2 modular buildings
Reclaim 2 ventilation shafts (14' dia) and 2 slope entries
Remove mine fan and escape hoist
Remove one thickener (120 ft diameter x 1 ft thick walls x 6 ft high)
Remove 5 conveyor belts (linear feet)
Remove trash, storage tanks, parts trailer and derelict equipment as needed

Assumptions:

Impoundment embankments will be built with mostly blasted shale with a density of 2835 lb/cubic yard and a swell factor of 0.75
6 inches of topsoil to be placed, 10 acres stored no more than 500 feet from area to be used, 47.5 acres stored more than 500 ft away (from permit)
Sufficient alkaline material will be added to neutralize 30 inches of surface zone. Per ARP dated Jan 2010, 1365 tons of limestone will be added to 102,400 tons of refuse.

Data Sources:

Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 2
STRUCTURE DEMOLITION AND DISPOSAL COSTS

Structures to be demolished:

Item	Construction Material	Volume (cubic feet)	Unit Cost Basis ($/cubic foot)	Demolition Cost ($)
Prep Plant	Steel	390,000	$ 0.26	$ 101,400.00
Belt Press Building	Steel	43,400	$ 0.26	$ 11,284.00
Air Intake Shaft and Hoist	Steel	54,000	$ 0.26	$ 14,040.00
Exhaust Fan	Steel	30,000	$ 0.26	$ 7,800.00
Office Building	Modular	21,600	$ 0.25	$ 5,400.00
Bathhouse	Modular	14,400	$ 0.25	$ 3,600.00
				$ -
			Subtotal	$ 143,524.00

Other items to be demolished (paved roads, conveyors, utility poles, rail spurs, etc.)

	Unit	Unit Cost	Cost
Remove 5 bridges (linear feet)	510	$ 100.00	$ 51,000
Reclaim 2 ventilation shafts (14' dia) and 2 slope entries	4	$ 1,450.00	$ 5,800
Remove one thickener (120 ft diameter x 1 ft thick walls x 6 ft high)	2243	$ 50.00	$ 112,155
Remove 5 conveyor belts (linear feet)	5,185	$ 37.00	$ 191,845

Subtotal = $360,800

Debris handling and disposal costs:

Removal of trash and derelict equipment, Lump Sum= $5,000

Subtotal = $5,000

TOTAL DEMOLITION AND DISPOSAL = $509,324

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2

WORKSHEET 3
MATERIAL HANDLING PLAN SUMMARY

Earthmoving Activity	Volume (BCY)	Volume (LCY)	Acre (ac)	Origin	Destination	Haul Distance (ft)	Grade * (%)	Equipment To Be Used
Remove 2 embankments	248,400	331,200		In Place				Caterpillar D-9T Semi-U blade
Rip coal stockpile area			10	In Place				Caterpillar D9T-SU Blade with Multishank Ripper
Haul topsoil to coal stockpile area	8,067			Topsoil Storage	Coal Stockpile Area	500		Caterpillar 992K
Spread topsoil over coal stockpile area			10	In Place				Caterpillar D-9T Semi-U blade
Rip haul road areas			0.6	In Place				Caterpillar D9T-SU Blade with Multishank Ripper
Haul topsoil to haul road areas	484			Topsoil Storage	Haul Road Areas	500		Caterpillar 992K
Spread topsoil over haul road areas			0.6	In Place				Caterpillar D9T-SU Blade with Multishank Ripper
Grade slurry area			25.0	In Place				Caterpillar D-9T Semi-U blade
Load and haul clay to slurry area	60,500	80,667		Clay Storage	Slurry Area	500		Caterpillar 992K
Spread clay over slurry area			25.0	In Place				Caterpillar D-9T Semi-U blade
Haul topsoil to slurry area	100,833			Topsoil Storage	Slurry Area	500		Caterpillar 992K
Spread topsoil over slurry area			25.0	In Place				Caterpillar D-9T Semi-U blade

*Record grade resistance here. Calculate total resistance on the appropriate worksheet. Total Resistance = Grade Resistance + Rolling Resistance.

WORKSHEET 4B
EARTHWORK QUANTITY

Spoil Swell Factor:	**0.75**	**Spoil Swell %:**	**33**
Clay Material Swell Factor:	**0.75**	**Clay Material Swell %:**	**33**

Miscellaneous Earthwork/Embankments:	BCY	LCY
Yellowbush Embankment	247,490	329,987
IBR #3 Embankment	910	1,213
Total =	248,400	331,200

Coal Processing Area (CPA):

Area	10	Ac	
Cut Length for Ripper	435,600	Sq Ft	660 Ft

Haul Roads:

Area	0.6	Ac	
Cut Length for Ripper	26,136	Sq Ft	162 Ft

Coal Slurry Area:

							Cubic Yards needed to account for
Area	25	Ac					
Length for Grading and Spreader	1,089,000	Sq Ft	1044 Ft	Depth (ft)	BCY	LCY	compaction
Clay Volume (Coal Slurry Area) =	1,089,000	Sq Ft	25.00 ac	1.5 Ft	60,500	80,667	70,583

Soil Volumes (top-and sub-soil):	Area (sq ft)		Area (ac)	Depth (ft)	BCY
Soil Volume (Haul Roads) =	26,136	Sq Ft	0.6 ac	0.5 Ft	484
Soil Volume (Coal Prep Area) =	435,600	Sq Ft	10.00 ac	0.5 Ft	8,067
Soil Volume (Coal Slurry Area) =	1,089,000	Sq Ft	25.00 ac	2.5 Ft	100,833
Total:					8,067

Data Source:
Gatling Mining Co, Permit D-2317 & 2317-2

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Remove 2 embankments

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 331,200 Density (lb/lcy): 2835 Distance (ft): 200 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 1.00 (grade factor) **x** 0.81 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.35**

Net Hourly Production = 700 (normal hourly production (lcy/hr)) **x** 0.35 (operating adjustment factor) **=** **248** **LCY/hr**

Hours Required = 331,200 (volume to be moved (LCY)) **/** 248 (net hourly production (LCY/hr)) **=** 1333.0 hrs

use **1334 hrs**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 7
PRODUCTIVITY AND HOURS REQUIRED FOR RIPPER-EQUIPPED DOZER USE

Ripping Activity:
Rip coal stockpile area

Characterization of Dozer and Ripper Use:
Caterpillar D9T-SU Blade with Multishank Ripper

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):
BCY: 16,133 Cut Spacing (ft): 11.6 Cut Length (ft): 660 Area (ac): 10.00
Assumed ground speeed of 1 mph Speed (ft/min): 88

Productivity Calculation:

Cycle Time = 660 (cut length (ft)) ÷ 88 (ft/min) + 0.25 (fixed turn time* (min)) = **7.8** **min/pass**

Passes/Hour = 60 min / hr ÷ 7.8 (cycle time (min/pass)) x 0.83 (efficiency factor) = **6.45** **passes/hr**

Volume Cut/Pass = 1 (tool penetration (ft)) x 11.6 (cut spacing (ft)) x 660 (cut length (ft)) ÷ 27 cu ft / cu yd = **284** **BCY/pass**

Hourly Production = 284 (volume cut/pass (BCY/pass)) x 6.45 (passes/hour) = **1829.4** **BCY/hr****

Hours Required = 16,133 (volume to be ripped (BCY)) ÷ 1829.4 (hourly production (BCY/hr)) = 8.8 hours

use **9** **hrs**

* **Fixed turn time depends upon dozer used. 0.25 min/turn is normal.**

** **Remember to use the swell factor to convert from bank cubic yards to loose cubic yards when applying these data to *Worksheet No. 5* . Calculate separate dozer hauling of ripped material for each lift on that worksheet.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to coal stockpile area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	8,067 CY		Distance (ft):	500		Grade (%):	0
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		3
Productivity Calculations:					Total Resistance (%):		3

Cycle Time = 0.45 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.55** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.55 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **421** **LCY/hr**

Hours Required = 8,067 (volume to be moved (LCY)) **÷** 421 (net hourly production (LCY/hr)) **=** **19.2** **hr**

use **20.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over coal stockpile area

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 4,033 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 1.00 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.63**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.63 (operating adjustment factor) **=** **1258** **LCY/hr**

Hours Required = 4,033 (volume to be moved (LCY)) **/** 1258 (net hourly production (LCY/hr)) **=** 3.2 hrs

use **4 hrs**

Use whichever is higher from Worksheets 5 & 8 **20.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 7
PRODUCTIVITY AND HOURS REQUIRED FOR RIPPER-EQUIPPED DOZER USE

Ripping Activity:
Rip haul road areas

Characterization of Dozer and Ripper Use:
Caterpillar D9T-SU Blade with Multishank Ripper

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):
BCY: 968 Cut Spacing (ft): 11.6 Cut Length (ft): 162 Area (ac): 0.60
Assumed ground speeed of 1 mph Speed (ft/min): 88

Productivity Calculation:

Cycle Time = 162 (cut length (ft)) ÷ 88 (ft/min) + 0.25 (fixed turn time* (min)) = **2.1** **min/pass**

Passes/Hour = 60 min / hr ÷ 2.1 (cycle time (min/pass)) x 0.83 (efficiency factor) = **23.96** **passes/hr**

Volume Cut/Pass = 1 (tool penetration (ft)) x 11.6 (cut spacing (ft)) x 162 (cut length (ft)) ÷ 27 cu ft / cu yd = **69** **BCY/pass**

Hourly Production = 69 (volume cut/pass (BCY/pass)) x 23.96 (passes/hour) = **1663.9** **BCY/hr****

Hours Required = 968 (volume to be ripped (BCY)) ÷ 1663.9 (hourly production (BCY/hr)) = 0.6 hours

use **1** **hrs**

* **Fixed turn time depends upon dozer used. 0.25 min/turn is normal.**

** **Remember to use the swell factor to convert from bank cubic yards to loose cubic yards when applying these data to *Worksheet No. 5* . Calculate separate dozer hauling of ripped material for each lift on that worksheet.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to haul road areas

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	484 CY		Distance (ft):	500		Grade (%):	0
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		3
Productivity Calculations:					Total Resistance (%):		3

Cycle Time = 0.45 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.55** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.55 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **421** **LCY/hr**

Hours Required = 484 (volume to be moved (LCY)) **÷** 421 (net hourly production (LCY/hr)) **=** **1.1** **hr**

use **2.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over haul road areas

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 242 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 1.00 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.63**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.63 (operating adjustment factor) **=** **1258** **LCY/hr**

Hours Required = 242 (volume to be moved (LCY)) **/** 1258 (net hourly production (LCY/hr)) **=** 0.2 hrs

use **1 hrs**

Use whichever is higher from Worksheets 5 & 8 **2.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET NO. 6
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE--GRADING

Earthmoving Activity:
Grade slurry area

Characterization of Dozer Used (type, size, etc.):
D9T with Semi-Universal Blade

Description of Dozer Use (% grade, effective blade width, operating speed, etc.):

Area (ac.): 25.0 Grade (%): 20 Average Speed (mph): 4.2 Effective Blade Width (ft): 13.17 Density (lb/lcy) 2700

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.55 (grade factor) **x** 0.85 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.20**

Hourly Production = 4.2 (average speed (mph)) **x** 13.17 (effective blade width (ft)) **x** _____ (mile) **x** _____ (43,560 sq ft) **=** **6.7** **ac/hr**

Net hourly Production = 6.7 (hourly production (ac/hr)) **x** 0.20 (operating adjustment factor) **=** **1.4** **ac/hr**

Hours Required = 25.0 (area to be graded (ac)) **/** 1.4 (net hourly production (ac/hr)) **=** 18.2 hours

use **19** **hrs**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Load and haul clay to slurry area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity 70,583 CY

Productivity Calculations:

Cycle Time = 0 (haul time loaded (min)) **+** 0 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **0.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 0.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **1004** **LCY/hr**

Hours Required = 70,583 (volume to be moved (LCY)) **÷** 1004 (net hourly production (LCY/hr)) **=** **70.3** **hr**

use **71.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 9
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE

Earthmoving Activity:
Load and haul clay to slurry area
Characterization of Truck Use (type, size, etc.):
Caterpillar 777F (2 Trucks)
Description of Truck Use (origin, destination, grade, haul distance, etc.):

Volume to be moved (lcy):	70,583	Density (lb/lcy):	2300	Distance (ft):	500	Grade (%):	10
		Rolling Resistance (%):	3			Total Resistance (%):	13

Productivity Calculations:

No. Loader Passes/Truck = 66.8 (truck capacity* (LCY)) ÷ 13.05 (loader bucket net capacity (LCY)) = **5.12** **passes**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Loading Time/Truck = 0.65 (loader cycle time (min) (From WS 8 or WS 10)) x 5.00 (number of loader passes/ truck) = **3.25** **min**

Truck Cycle Time = 1.0 (haul time (min)) + 0.5 (return time (min)) + 3.25 (loading time (min)) + 2 (dump and maneuver time (min)) = **6.8** **min.**

No. Trucks Required = 6.75 (truck cycle time (min)) ÷ 3.25 (total loading time (min)) = **2.08** **trucks**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Production Rate = 65.25 (net truck capacity **) x 2.00 (number of trucks) ÷ 6.75 (truck cycle time (min)) = **19.3** **LCY/min**

Hourly Production = 19.3 (production rate (LCY/min)) x 60 min (hr) x 0.83 (efficiency factor) = **966.7** **LCY/hr**

Hours Required = 70,583 (volume to be moved (LCY)) ÷ 966.7 (hourly production (LCY/hr)) = **74.0** **hr**

Use whichever is higher from Worksheets 8 & 9 **74.0** **hr**

* **Use the average of the heaped and struck capacities.**
** **Net truck capacity = loader bucket net capacity x no. loader passes/truck.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET NO. 6
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE--GRADING

Earthmoving Activity:
Spread clay over slurry area

Characterization of Dozer Used (type, size, etc.):
D9T with Semi-Universal Blade

Description of Dozer Use (% grade, effective blade width, operating speed, etc.):

Area (ac.): 25.0 Grade (%): 20 Average Speed (mph): 4.2 Effective Blade Width (ft): 13.17 Density (lb/lcy) 2300

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) x 0.70 (material factor) x 0.83 (efficiency factor) x 0.55 (grade factor) x 1.00 (weight correction factor) x 1.00 (production method/ blade factor) x 1.00 (visibility factor) x 1.00 (elevation factor) = **0.24**

Hourly Production = 4.2 (average speed (mph)) x 13.17 (effective blade width (ft)) x _____ (mile) x _____ (43,560 sq ft) = **6.7** **ac/hr**

Net hourly Production = 6.7 (hourly production (ac/hr)) x 0.24 (operating adjustment factor) = **1.6** **ac/hr**

Hours Required = 25.0 (area to be graded (ac)) / 1.6 (net hourly production (ac/hr)) = 15.5 hours

use **16** **hrs**

Note: Use double the hours here for compaction of clay

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to slurry area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity 100,833 CY

Productivity Calculations:

Cycle Time = 0 (haul time loaded (min)) **+** 0 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **0.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 0.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **1004** **LCY/hr**

Hours Required = 100,833 (volume to be moved (LCY)) **÷** 1004 (net hourly production (LCY/hr)) **=** **100.4** **hr**

use **101.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 9
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE

Earthmoving Activity:
Haul topsoil to slurry area
Characterization of Truck Use (type, size, etc.):
Caterpillar 777F (2 trucks)
Description of Truck Use (origin, destination, grade, haul distance, etc.):

Volume to be moved (lcy):	100,833	Density (lb/lcy):	1600	Distance (ft):	500	Grade (%):	10
		Rolling Resistance (%):	3			Total Resistance (%):	13

Productivity Calculations:

No. Loader Passes/Truck = 66.8 (truck capacity* (LCY)) ÷ 13.05 (loader bucket net capacity (LCY)) = **5.12** **passes**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Loading Time/Truck = 0.65 (loader cycle time (min) (From WS 8 or WS 10)) x 5.00 (number of loader passes/ truck) = **3.25** **min**

Truck Cycle Time = 1.0 (haul time (min)) + 0.5 (return time (min)) + 3.25 (loading time (min)) + 2 (dump and maneuver time (min)) = **6.8** **min.**

No. Trucks Required = 6.75 (truck cycle time (min)) ÷ 3.25 (total loading time (min)) = **2.08** **trucks**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Production Rate = 65.25 (net truck capacity **) x 2.00 (number of trucks) ÷ 6.75 (truck cycle time (min)) = **19.3** **LCY/min**

Hourly Production = 19.3 (production rate (LCY/min)) x 60 min (hr) x 0.83 (efficiency factor) = **966.7** **LCY/hr**

Hours Required = 100,833 (volume to be moved (LCY)) ÷ 966.7 (hourly production (LCY/hr)) = **105.0** **hr**

Use whichever is higher from Worksheets 8 & 9 **105.0** **hr**

* **Use the average of the heaped and struck capacities.**
** **Net truck capacity = loader bucket net capacity x no. loader passes/truck.**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over slurry area

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-9T Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 50,417 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) x 0.70 (material factor) x 0.83 (efficiency factor) x 1.00 (grade factor) x 1.44 (weight correction factor) x 1.00 (production method/ blade factor) x 1.00 (visibility factor) x 1.00 (elevation factor) = **0.63**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) x 0.63 (operating adjustment factor) = **1258** **LCY/hr**

Hours Required = 50,417 (volume to be moved (LCY)) / 1258 (net hourly production (LCY/hr)) = 40.1 hrs

use **41** **hrs**

Use whichever is higher from Worksheets 5, 8 & 9 **105.0** **hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39

WORKSHEET 13
SUMMARY CALCULATION OF EARTHMOVING COSTS

Equipment *	Ownership & Operating Cost ($/hr)	Labor Cost ($/hr)	Total Hours Required **	Total Cost *** ($)
Caterpillar D-9T Semi-U blade	$ 161.24	$ 38.76	1639	$ 327,800.00
Caterpillar D9T-SU Blade with Multishank Ripper	$ 176.53	$ 38.76	10	$ 2,152.90
Caterpillar 992K	$ 269.67	$ 38.76	201	$ 61,994.43
Caterpillar 777F (2 trucks)	$ 254.24	$ 28.94	358	$ 101,378.44
			Grand Total of Earthmoving	**$ 493,325.77**

*** Be sure to include all necessary attachments and accessories for each item of equipment. Also, add support equipment such as water wagons and graders to match total project time as appropriate.**

**** Account for multiple units in truck and/or scraper teams**

***** Calculate the total cost for each item of equipment by adding the second and third columns (the ownership and operation and labor costs) and then multiplying that number by the fourth column (the total hours required).**

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 14
REVEGETATION COSTS

Name and Description of Area To Be Revegetated:
Revegetate all disturbed areas

Description of Revegetation Activities:

Revegetate 82.2 ac with a pasture seed mix

Cost Calculation for Individual Revegetation Activities:

Initial Seeding

82.2	x (	0	+	1200	) =	$ 98,640
area to be seeded (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		

Planting Trees and Shrubs

	x (		+		) =	$ -
area to be planted (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Reseeding *

20.6	x (	0	+	1200	) =	$ 24,660
area anticipated to need reseeding (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		

Replanting Trees and Shrubs *

	x (		+		) =	$ -
area anticipated to need replanting (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Other Necessary Revegetation Activities

(Examples of other activities that may be necessary include soil sampling, irrigation, and rill and gully repair. Describe each activity and provide a cost estimate with documentation. Use additional worksheets if necessary.)

TOTAL REVEGETATION COST = $ 123,300

* **Generally, the proportion of the area initially seeded and planted that is anticipated to need reseeding or replanting is determined on the basis of historic failure rates for similar sites and conditions. The same principle applies to determining the extent of seedbed preparation and soil amendments that may be needed as part of any reseeding or replanting effort. If anticipated failure rates vary within the area proposed for disturbance, use a separate worksheet for the area subject to each failure rate.**

Assumptions:

$_____ per acre includes seed mix, 2T/ac. mulch, 3T/ac. Lime, 50 lb/ac. Nitrogen, 100 lb/ac. Phosphorous, and 100 lb/ac. Potassium.
Second seeding at $____ per acre.
Assume 25% failure for second seeding.

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2
Per acre cost obtained from consultation with AML programs in surrounding states.

WORKSHEET 15
OTHER RECLAMATION ACTIVITY COSTS

(Includes subsidence damage repair costs, water supply replacement costs, and funds required to support long-term treatment of unanticipated acid or ferruginous mine drainage.)

Description of Reclamation, Repair or Pollution Abatement Activity:

Remove 7 sediment ponds
Dewater ponds
Additional Lime needed for slurry area

Assumptions:

2 Lump Sum "Known Events" are included in Ohio's PSE calculation.

Cost Estimate Calculations:

	Unit	Unit Cost	Cost
Removal of 7 sediment ponds	7	$ 5,000	$ 35,000
Dewatering cost = $0.005 per gallon	10,863,872	$ 0.005	$ 54,319
Water Treatment cost = $0.01 per gallon	3,259,162	$ 0.010	$ 32,592
Lime (tons)	1365	$ 40.00	$ 54,600
Removal of substation in IBR #2			$ 45,000
Maintenance costs ($/acre)	82.2	$ 368.14	$ 30,261
		Total:	$ 251,772

Other Documentation or Notes:

State of Ohio estimates dewatering cost at $0.005/gallon, and then that 1/3 of the water removed from the ponds will need treatment at $0.01/gallon

Data Sources:
Gatling Mining Co, Permit D-2317 & 2317-2

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 509,324	
2	**Total Earthmoving Costs**		$ 493,326	
3	**Total Revegetation Costs**		$ 123,300	
4	**Total Other Reclamation Activities Costs**		$ 251,772	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 1,377,722	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 1,377,722**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 41,331.65	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 41,331.65	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 41,331.65	
10	**Contractor Profit/Overhead** (See Graph 1)	**22.0% of line 6**	$ 303,098.78	
11	**Project Management Fee** (See Graph 2)	**4.4% of line 6**	$ 60,619.76	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 487,713**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 1,865,435**

*Inflation factor = ENR Construction Cost Index (CCI) for current mo/yr / ENR CCI for mo/yr 3 years prior to current mo/yr = 1 / 1 = 1.00

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

***** This calculation does not reflect an inflation factor because the purpose of the calculation is to determine if the posted bond is sufficient for the current conditions.

Data Sources:

Gatling Mining Co, Permit D-2317 & 2317-2

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 509,324	
2	**Total Earthmoving Costs**		$ 493,326	
3	**Total Revegetation Costs**		$ 123,300	
4	**Total Other Reclamation Activities Costs**		$ 251,772	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 1,377,722	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 1,566,469.59**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 46,994.09	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 46,994.09	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 46,994.09	
10	**Contractor Profit/Overhead** (See Graph 1)	**21.5% of line 6**	$ 336,790.96	
11	**Project Management Fee** (See Graph 2)	**4.3% of line 6**	$ 66,574.96	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 544,348**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 2,110,818**

*Inflation factor = ENR Construction Cost Index (CCI) for current mo/yr / ENR CCI for mo/yr 3 years prior to current mo/yr = 1 / 1 = 1.137

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

Data Sources:

Gatling Mining Co, Permit D-2317 & 2317-2

BOND AMOUNT COMPUTATION

Applicant:	Buckeye Industrial Mining Co Freed Road Mine		
Permit Number:	D-2335	**Permitted Acreage:**	87.9

Bonding Scheme: Permit Area

If Incremental:

Increment Number:
Increment Acreage:

If Cumulative:

Acres previously authorized for disturbance:
New acres proposed for disturbance:

Type of Operation:	Small Surface Contour Mine
Location:	Paris Township, Stark County
PSE:	$1,142,000
Prepared by:	Stefanie Self
Date:	5/5/2010
Total Bond Amount:	**$ 1,106,941**

WORKSHEET 1
DESCRIPTION OF THE WORST-CASE RECLAMATION SCENARIO

The worst case scenario for the Freed Road Mine will be if all three allowed pits are open to their fullest extent with fill material piled up behind no more than 1500 linear feet away (the maximum allowed under permit conditions) and topsoil no more than 500 feet away (maximum approved distance). Four impoundments and a coal stockpile area will also need to be removed and reclaimed.

The following tasks must be completed to reclaim the site:
Fill in existing pits (3, each 100 ft x 400 ft x 80 ft)
Grade area of pits after filled, topsoil and revegetate
Grade area where material was obtained for filling pits (1500 linear feet), topsoil and revegetate
Cap auger holes in exposed highwall, maximum 300 ft exposed
Remove 4 impoundments, grade, topsoil and revegetate
Remove coal stockpile area, grade, topsoil and revegetate
Remove trash, storage tanks, parts trailer and derelict equipment as needed

Assumptions:
Overburden mostly blasted shale with a density of 2100 lb/cubic yard and a swell factor of 0.75 or swell percent of 33%
6 inches of topsoil to be placed, stored no more than 500 feet from area to be used (from permit)

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 2
STRUCTURE DEMOLITION AND DISPOSAL COSTS

Structures to be demolished:

Item	Construction Material	Volume (cubic feet)	Unit Cost Basis ($)	Demolition Cost ($)
				0
				0
				0
				0
				0
				0
				0
			Subtotal	0

Other items to be demolished (paved roads, conveyors, utility poles, rail spurs, etc.)

	Unit	Unit cost	
Utility lines needing moved (ft)	2,132	$ 8.67	$ 18,484.44
Auger holes to be sealed (ft)	300	$ 5.92	$ 1,776.00

Note: Unit costs above based on Ohio's estimations from previous reclamation contracts

Subtotal = $20,260

Debris handling and disposal costs:

Removal of trash and derelict equipment, Lump Sum= $5,000

Subtotal = $5,000

TOTAL DEMOLITION AND DISPOSAL = $25,260

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335

WORKSHEET 3
MATERIAL HANDLING PLAN SUMMARY

Earthmoving Activity	Volume (BCY)	Volume (LCY)	Area (ac)	Origin	Destination	Distance (ft)	Grade* (%)	Equipment To Be Used
Load spoil for open pits	355,556	414,815		Spoil Piles	3 Open Pits	1500	10	Caterpillar D-10 Semi-U blade
Haul spoil for open pits	355,556	414,815		Spoil Piles	3 Open Pits	1500	10	0
Spread spoil in open pits	177,778	237,037		In Place				Caterpillar D-10 Semi-U blade
Regrade area over pits			2.75	In Place				Caterpillar D-10 Semi-U blade
Regrade area where spoil stored			4.13	In Place				Caterpillar D-10 Semi-U blade
Haul topsoil to pit area				Topsoil Storage	3 Open Pits	500	-5	Caterpillar 992K
Haul topsoil to spoil storage area	5,556			Topsoil Storage	Spoil Area	500	-5	Caterpillar 992K
Spread topsoil over pit and spoil areas			6.89	In Place				Caterpillar D-10 Semi-U blade
Rip coal stockpile area			2.00	In Place				Caterpillar D9T-SU Blade with Multishank Ripper
Haul topsoil to coal stockpile area	1,613			Topsoil Storage	Coal Stockpile Area	500	0	Caterpillar 992K
Spread topsoil over coal stockpile area			2.00	In Place				Caterpillar D-10 Semi-U blade

*Record grade resistance here. Calculate total resistance on the appropriate worksheet. Total Resistance = Grade Resistance + Rolling Resistance.

WORKSHEET 4B
EARTHWORK QUANTITY

Spoil Swell Factor: **0.75** **Spoil Swell %:** **33**

Fill Open Pit:

Pit Volume	length	width	depth	BCY	LCY	Cubic Yards needed to account for compaction
Pit 1	100 Ft	400 Ft	80 Ft	118,519	158,025	138,272
Pit 2	100 Ft	400 Ft	80 Ft	118,519	158,025	138,272
Pit 3	100 Ft	400 Ft	80 Ft	118,519	158,025	138,272
Total:				355,556	474,074	414,815

Remove Coal Storage Area:

Area	Length
2 ac	295 Ft

Soil Volumes (top-and sub-soil):	Area (sq ft)	Area (ac)	Depth (ft)	BCY	Push length
Soil Volume (Pit and Spoil Area) =	300,000	6.89 ac	0.5 Ft	5,556	548
Soil Volume (Coal Prep Area) =	87,120	2.00 ac	0.5 Ft	1,613	295
Total:				7,169	

Data Source:
Buckeye Industrial Mining Co, Permit D-2335

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Load spoil for open pits

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

Description of Loader Use (origin, destination, grade, haul distance, etc.):
Load spoil from stockpile
Quantity 414,815 CY

Productivity Calculations:

Cycle Time = 0 (haul time loaded (min)) **+** 0 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **0.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 0.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **1004** **LCY/hr**

Hours Required = 414,815 (volume to be moved (LCY)) **÷** 1004 (net hourly production (LCY/hr)) **=** **413.2** **hr**

use **414.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 9
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE

Earthmoving Activity:
Haul spoil for open pits

Characterization of Truck Use (type, size, etc.):
Caterpillar 777F (2 trucks)

Description of Truck Use (origin, destination, grade, haul distance, etc.):
Haul spoil from stockpile to open pit area

Volume to be moved (lcy):	414,815	Density (lb/lcy):	2100	Distance (ft):	1500	Grade (%):	0
		Rolling Resistance (%):	3			Total Resistance (%):	3

Productivity Calculations:

No. Loader Passes/Truck = 66.8 (truck capacity* (LCY)) ÷ 13.05 (loader bucket net capacity (LCY)) = **5.12** **passes**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Loading Time/Truck = 0.65 (loader cycle time (min) (From WS 8 or WS 10)) x 5.00 (number of loader passes/ truck) = **3.25** **min**

Truck Cycle Time = 0.8 (haul time (min)) + 0.42 (return time (min)) + 3.25 (loading time (min)) + 2 (dump and maneuver time (min)) = **6.5** **min.**

No. Trucks Required = 6.47 (truck cycle time (min)) ÷ 3.25 (total loading time (min)) = **1.99** **trucks**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Production Rate = 65.25 (net truck capacity **) x 2.00 (number of trucks) ÷ 6.47 (truck cycle time (min)) = **20.2** **LCY/min**

Hourly Production = 20.2 (production rate (LCY/min)) x 60 min (hr) x 0.83 (efficiency factor) = **1008.5** **LCY/hr**

Hours Required = 414,815 (volume to be moved (LCY)) ÷ 1008.5 (hourly production (LCY/hr)) = **412.0** **hr**

Use whichever is higher from Worksheets 8 & 9 **414.0** **hr**

* **Use the average of the heaped and struck capacities.**
** **Net truck capacity = loader bucket net capacity x no. loader passes/truck.**

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread spoil in open pits
Regrade area over pits
Regrade area where spoil stored

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 237,037 Density (lb/lcy): 2100 Distance (ft): 50 Grade (%): 10

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.80 (grade factor) **x** 1.10 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.38**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.38 (operating adjustment factor) **=** **1073** **LCY/hr**

Hours Required = 237,037 (volume to be moved (LCY)) **/** 1073 (net hourly production (LCY/hr)) **=** 220.8 hrs

use **221 hrs**

Use whichever is higher from Worksheets 5, 8 & 9 **414.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to pit area
Haul topsoil to spoil storage area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

Description of Loader Use (origin, destination, grade, haul distance, etc.):
Haul topsoil to pit area
Haul topsoil to spoil storage area

Quantity	5,556 CY		Distance (ft):	500		Grade (%):	-5
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		-2
Productivity Calculations:					Total Resistance (%):		8

Cycle Time = 0.45 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.55** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.55 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **421** **LCY/hr**

Hours Required = 5,556 (volume to be moved (LCY)) **÷** 421 (net hourly production (LCY/hr)) **=** **13.2** **hr**

use **14.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over pit and spoil areas

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 2,778 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 10

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.80 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.50**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.50 (operating adjustment factor) **=** **1006** **LCY/hr**

Hours Required = 2,778 (volume to be moved (LCY)) **/** 1006 (net hourly production (LCY/hr)) **=** 2.8 hrs

use **3 hrs**

Use whichever is higher from Worksheets 5 & 8 **14.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 7
PRODUCTIVITY AND HOURS REQUIRED FOR RIPPER-EQUIPPED DOZER USE

Ripping Activity:
Rip area of coal storage area, 2.0 acres

Characterization of Dozer and Ripper Use:
Caterpillar D9T-SU Blade with Multishank Ripper

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):
BCY: 3,227 Cut Spacing (ft): 11.6 Cut Length (ft): 295 Area (ac): 2.00
Assumed ground speeed of 1 mph Speed (ft/min): 88

Productivity Calculation:

Cycle Time = 295 (cut length (ft)) ÷ 88 (ft/min) + 0.25 (fixed turn time* (min)) = **3.6 min/pass**

Passes/Hour = 60 min (hr) ÷ 3.6 (cycle time (min/pass)) x 0.83 (efficiency factor) = **13.87 passes/hr**

Volume Cut/Pass = 1 (tool penetration (ft)) x 11.6 (cut spacing (ft)) x 295 (cut length (ft)) ÷ 27 cu ft (cu yd) = **127 BCY/pass**

Hourly Production = 127 (volume cut/pass (BCY/pass)) x 13.87 (passes/hour) = **1759.2 BCY/hr****

Hours Required = 3,227 (volume to be ripped (BCY)) ÷ 1759.2 (hourly production (BCY/hr)) = 1.8 hours

use **2 hrs**

* **Fixed turn time depends upon dozer used. 0.25 min/turn is normal.**

** **Remember to use the swell factor to convert from bank cubic yards to loose cubic yards when applying these data to *Worksheet No. 5* . Calculate separate dozer hauling of ripped material for each lift on that worksheet.**

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to coal stockpile area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	1,613	CY	Distance (ft):	500		Grade (%):	0
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		3
Productivity Calculations:					Total Resistance (%):		3

Cycle Time = 0.45 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.55** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.55 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **421** **LCY/hr**

Hours Required = 1,613 (volume to be moved (LCY)) **÷** 421 (net hourly production (LCY/hr)) **=** **3.8** **hr**

use **4.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over coal stockpile area

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 807 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 10

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.80 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.50**

Net Hourly Production = 2000 (normal hourly production (lcy/hr)) **x** 0.50 (operating adjustment factor) **=** **1006** **LCY/hr**

Hours Required = 807 (volume to be moved (LCY)) **/** 1006 (net hourly production (LCY/hr)) **=** 0.8 hrs

use **1 hrs**

Use whichever is higher from Worksheets 5 & 8 **4.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39

WORKSHEET 13
SUMMARY CALCULATION OF EARTHMOVING COSTS

Equipment *	Ownership & Operating Cost ($/hr)	Labor Cost ($/hr)	Total Hours Required **	Total Cost *** ($)
Caterpillar D-10 Semi-U blade	$ 220.33	$ 38.76	864	$ 223,853.76
Caterpillar 992K	$ 269.67	$ 38.76	432	$ 133,241.76
Caterpillar 777F (2 trucks)	$ 254.24	$ 28.94	828	$ 234,473.04
Caterpillar D9T-SU Blade with Multishank Ripper	$ 176.53	$ 38.76	2	$ 430.58
			Grand Total of Earthmoving	**$ 591,999.14**

*** Be sure to include all necessary attachments and accessories for each item of equipment. Also, add support equipment such as water wagons and graders to match total project time as appropriate.**

**** Account for multiple units in truck and/or scraper teams**

***** Calculate the total cost for each item of equipment by adding the second and third columns (the ownership and operation and labor costs) and then multiplying that number by the fourth column (the total hours required).**

Data Sources:

Buckeye Industrial Mining Co, Permit D-2335
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 14
REVEGETATION COSTS

Name and Description of Area To Be Revegetated:
Revegetate all disturbed areas

Description of Revegetation Activities:

Revegetate 87.9 ac with a pasture seed mix

Cost Calculation for Individual Revegetation Activities:

Initial Seeding

87.9	x (	0	+	1200	) =	$ 105,480
area to be seeded (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		

Planting Trees and Shrubs

	x (		+		) =	$ -
area to be planted (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Reseeding *

22.0	x (	0	+	1200	) =	$ 26,370
area anticipated to need reseeding (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		

Replanting Trees and Shrubs *

	x (		+		) =	$ -
area anticipated to need replanting (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Other Necessary Revegetation Activities

(Examples of other activities that may be necessary include soil sampling, irrigation, and rill and gully repair. Describe each activity and provide a cost estimate with documentation. Use additional worksheets if necessary.)

TOTAL REVEGETATION COST = $ 131,850

* **Generally, the proportion of the area initially seeded and planted that is anticipated to need reseeding or replanting is determined on the basis of historic failure rates for similar sites and conditions. The same principle applies to determining the extent of seedbed preparation and soil amendments that may be needed as part of any reseeding or replanting effort. If anticipated failure rates vary within the area proposed for disturbance, use a separate worksheet for the area subject to each failure rate.**

Assumptions:

$_____ per acre includes seed mix, 2T/ac. mulch, 3T/ac. Lime, 50 lb/ac. Nitrogen, 100 lb/ac. Phosphorous, and 100 lb/ac. Potassium.
Second seeding at $____ per acre.
Assume 25% failure for second seeding.

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335
Per acre cost obtained from consultation with AML programs in surrounding states.

WORKSHEET 15
OTHER RECLAMATION ACTIVITY COSTS

(Includes subsidence damage repair costs, water supply replacement costs, and funds required to support long-term treatment of unanticipated acid or ferruginous mine drainage.)

Description of Reclamation, Repair or Pollution Abatement Activity:

Assumptions:

Cost Estimate Calculations:

	Unit	Unit Cost	Total
Removal of 4 sediment ponds	4	$ 5,000	$ 20,000
Dewatering cost = $0.005 per gallon	3,047,684	$ 0.005	$ 1,524
Water Treatment cost = $0.01 per gallon	914,305	$ 0.010	$ 9,143
Maintenance costs ($/acre)	87.9	$ 368.14	$ 32,360
TOTAL COSTS =			**$ 63,026**

Other Documentation or Notes:

State of Ohio estimates dewatering cost at $0.005/gallon, and then that 1/3 of the water removed from the ponds will need treatment at $0.01/gallon

Data Sources:
Buckeye Industrial Mining Co, Permit D-2335

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1 Total Facility and Structure Removal Costs		$ 25,260		
2 Total Earthmoving Costs		$ 591,999		
3 Total Revegetation Costs		$ 131,850		
4 Total Other Reclamation Activities Costs		$ 63,026		
5 Total Direct Costs (Sum of Lines 1 through 4)		$ 812,136		
6 Inflated Total Direct Costs (Line 5 times inflation factor*)			**$**	**812,136**
7 Mobilization/Demobilization (1%-10% of Line 6	**3% of line 6**	$ 24,364.08		
8 Contingencies (3%-5% of Line 6)	**3% of line 6**	$ 24,364.08		
9 Engineering Redesign Fee (2.5%-6% of Line 6)	**3% of line 6**	$ 24,364.08		
10 Contractor Profit/Overhead (See Graph 1)	**23.0% of line 6**	$ 186,791.28		
11 Project Management Fee (See Graph 2)	**4.3% of line 6**	$ 34,921.85		
12 Total Indirect Costs (Sum of Lines 7 through 11)			**$**	**294,805**
13 Grand Total Bond Amount (Sum of Lines 6 and 120			**$**	**1,106,941**

*Inflation factor = ENR Construction Cost Index (CCI) for current mo/yr / ENR CCI for mo/yr 3 years prior to current mo/yr = 1 / 1 = 1.00

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

* This calculation does not reflect an inflation factor because the purpose of the calculation is to determine if the posted bond is sufficient for the current conditions.

Data Sources:

Buckeye Industrial Mining Co, Permit D-2335

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 25,260	
2	**Total Earthmoving Costs**		$ 591,999	
3	**Total Revegetation Costs**		$ 131,850	
4	**Total Other Reclamation Activities Costs**		$ 63,026	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 812,136	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 923,399**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 27,701.96	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 27,701.96	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 27,701.96	
10	**Contractor Profit/Overhead** (See Graph 1)	**23.0% of line 6**	$ 212,381.68	
11	**Project Management Fee** (See Graph 2)	**4.3% of line 6**	$ 39,244.44	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 334,732**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 1,258,131**

*Inflation factor = 1.137

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

Data Sources:

Buckeye Industrial Mining Co, Permit D-2335

BOND AMOUNT COMPUTATION

Applicant:	Valley Mining, Inc. Pickens Mine		
Permit Number:	D-2286	**Permitted Acreage:**	313.1

Bonding Scheme: Permit Area

If Incremental:

Increment Number:
Increment Acreage:

If Cumulative:

Acres previously authorized for disturbance:
New acres proposed for disturbance:

Type of Operation:	Medium Contour and Area Surface Mine
Location:	Harrisville Quad, Belmont & Harrison Counties
PSE (April 2009):	$5,844,000
Prepared by:	Stefanie Self
Date:	5/5/2010
Total Bond Amount:	**$ 4,419,208**

WORKSHEET 1
DESCRIPTION OF THE WORST-CASE RECLAMATION SCENARIO

The worst case scenario for the Pickens Mine will be if all four allowed pits (2 contour, 2 area) are open to their fullest extent with fill material piled up behind no more than 1500 linear feet away (the maximum allowed under contour mining permit conditions) or 4 spoil ridges (maximum allowed under area mining permit conditions) and topsoil no more than 500 feet away (maximum approved distance) and stripped to 300 feet ahead of mining. Two impoundments, an open channel spillway and a coal stockpile area will also need to be removed and reclaimed.

The following tasks must be completed to reclaim the site:
Fill in contour pits (2, each 100 ft x 100 ft x 70 ft)
Fill in area pits (2, each 200 ft x 100 ft x 100 ft)
Grade area of pits after filled, topsoil and revegetate
Grade area where material was obtained for filling pits, topsoil and revegetate
Remove 2 impoundments, grade, topsoil and revegetate
Remove coal stockpile area, grade, topsoil and revegetate
Remove open channel spillway EWI-23R
Remove trash, storage tanks, parts trailer and derelict equipment as needed

Assumptions:
Overburden composed of variable interbedded siltstone, shale, clay and limestone as well as #9 spoil from previous surface mining; Swell Factor = 0.67, or swell percent of 49%, Density = 2700 (average of Shale, Clay & Limestone, along with Decomposed Rock for spoil)
6 inches of topsoil to be placed, stored no more than 500 feet from area to be used (from permit)

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 2
STRUCTURE DEMOLITION AND DISPOSAL COSTS

Structures to be demolished:

Item	Construction Material	Volume (cubic feet)	Unit Cost Basis ($)	Demolition Cost ($)
				0
				0
				0
				0
				0
				0
				0
			Subtotal	0

Other items to be demolished (paved roads, conveyors, utility poles, rail spurs, etc.)

		Unit				
Utilities affected (linear feet)	2,132		$	8.67	$	18,484

Note: Unit costs above based on Ohio's estimations from previous reclamation contracts

Subtotal = $18,484

Debris handling and disposal costs:

Removal of trash and derelict equipment, Lump Sum = $5,000

Subtotal = $5,000

TOTAL DEMOLITION AND DISPOSAL = $23,484

Data Sources:
Valley Mining, Inc., Permit D-2286

WORKSHEET 3
MATERIAL HANDLING PLAN SUMMARY

Earthmoving Activity	Volume (BCY)	Volume (LCY)	Area (ac)	Origin	Destination	Distance (ft)	Grade* (%)	Equipment To Be Used
Haul topsoil to prestripping area	3,333			Topsoil Storage	Prestripping Area	500	5	Caterpillar 992K
Regrade area that was prestripped			4.13	In Place				Caterpillar D-10 Semi-U blade
Push spoil into open area pits	148,148	221,117		Spoil Ridges	3 Open Pits	600	5	Caterpillar D-10 Semi-U blade
Regrade area over area pits and spoil ridges			4.59	In Place				Caterpillar D-10 Semi-U blade
Haul topsoil to area pit and spoil storage areas	3,704			Topsoil Storage	3 Open Pits	500	5	Caterpillar 992K
Spread topsoil over pit and spoil areas			4.59	In Place				Caterpillar D-10 Semi-U blade
Load spoil for open contour pits	51,852	77,391		Spoil Piles	3 Open Pits		5	0
Haul spoil for open contour pits	51,852	77,391		Spoil Piles	3 Open Pits	1500	5	Caterpillar 992K
Spread spoil in open contour pits	25,926	38,695		In Place				Caterpillar D-10 Semi-U blade
Regrade area where spoil stored			1.15	In Place				Caterpillar D-10 Semi-U blade
Haul topsoil to contour pit and spoil storage areas	926			Topsoil Storage	3 Open Pits	500	5	Caterpillar 992K
Spread topsoil over pit and spoil areas			1.15	In Place				Caterpillar D-10 Semi-U blade
Rip coal stockpile area			2.60	In Place				D9-T Semi-U Multishank Ripper
Haul topsoil to coal stockpile area	2,097			Topsoil Storage	Coal Stockpile Area	500	5	Caterpillar 992K
Spread topsoil over coal stockpile area			2.60	In Place				Caterpillar D-10 Semi-U blade

*Record grade resistance here. Calculate total resistance on the appropriate worksheet. Total Resistance = Grade Resistance + Rolling

WORKSHEET 4B
EARTHWORK QUANTITY

Spoil Swell Factor: **0.67** **Spoil Swell %:** **49**

Fill Open Pit:

Area Pits	length	width	depth	BCY	LCY	Cubic Yards needed to account for compaction
Area Mine Pit 1	200 Ft	100 Ft	100 Ft	74,074	110,558	
Area Mine Pit 2	200 Ft	100 Ft	100 Ft	74,074	110,558	
Total:				148,148	221,117	
Contour Pits						
Contour Mine Pit 1	100 Ft	100 Ft	70 Ft	25,926	38,695	32,311
Contour Mine Pit 2	100 Ft	100 Ft	70 Ft	25,926	38,695	32,311
Total:				51,852	77,391	64,621

Coal Processing Area (CPA):

Area	2.6 Ac	
Cut Length for Ripper	113,256 Sq Ft	337 Ft

Open channel Spillway (EWI-23R):	Height (ft)	Top Width (ft)	Length (ft)	U/S & D/S Slopes	Abutment Slope	Volume (permit)	Area (sq ft)
	7.4 Ft	64.4 Ft	200 Ft	2:1	3:1	47,656 c yds	0.296

Soil Volumes (top-and sub-soil):	Area (sq ft)	Area (ac)	Depth (ft)	BCY
Soil Volume (Prestripping Areas) =	180,000	4.13 ac	0.5 Ft	3,333
Soil Volume (Area Pit and Spoil Areas) =	200,000	4.59 ac	0.5 Ft	3,704
Soil Volume (Contour Pit and Spoil Areas) =	50,000	1.15 ac	0.5 Ft	926
Soil Volume (Coal Area) =	113,256	2.60 ac	0.5 Ft	2,097
				6,727

Data Source:
Valley Mining, Inc., Permit D-2286

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to prestripping area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	3,333 CY		Distance (ft):	500		Grade (%):	5
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		8
Productivity Calculations:					Total Resistance (%):		-2

Cycle Time = 0.55 (haul time loaded (min)) **+** 0.45 (return time empty (min)) **+** 0.65 (basic cycle time (min)) **=** **1.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **395** **LCY/hr**

Hours Required = 3,333 (volume to be moved (LCY)) **÷** 395 (net hourly production (LCY/hr)) **=** **8.4** **hr**

use **9.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Regrade area that was prestripped

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 1,667 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 5

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.90 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.57**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.57 (operating adjustment factor) **=** **1585** **LCY/hr**

Hours Required = 1,667 (volume to be moved (LCY)) **/** 1585 (net hourly production (LCY/hr)) **=** 1.1 hrs

use **2 hrs**

Use whichever is higher from Worksheets 5 & 8 **9.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Push spoil into open area pits
Regrade area over area pits and spoil ridges

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 221,117 Density (lb/lcy): 2700 Distance (ft): 600 Grade (%): 5

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.90 (grade factor) **x** 0.85 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.34**

Net Hourly Production = 350 (normal hourly production (lcy/hr)) **x** 0.34 (operating adjustment factor) **=** **117** **LCY/hr**

Hours Required = 221,117 (volume to be moved (LCY)) **/** 117 (net hourly production (LCY/hr)) **=** 1883.5 hrs

use **1884** **hrs**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to area pit and spoil storage areas

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	3,704 CY		Distance (ft):	500		Grade (%):	5
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		8
Productivity Calculations:					Total Resistance (%):		-2

Cycle Time = 0.55 (haul time loaded (min)) **+** 0.45 (return time empty (min)) **+** 0.65 (basic cycle time (min)) **=** **1.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **395** **LCY/hr**

Hours Required = 3,704 (volume to be moved (LCY)) **÷** 395 (net hourly production (LCY/hr)) **=** **9.4** **hr**

use **10.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over pit and spoil areas

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 1,852 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 5

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.90 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.57**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.57 (operating adjustment factor) **=** **1585** **LCY/hr**

Hours Required = 1,852 (volume to be moved (LCY)) **/** 1585 (net hourly production (LCY/hr)) **=** 1.2 hrs

use **2 hrs**

Use whichever is higher from Worksheets 5 & 8 **10.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Load spoil for open contour pits

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

Description of Loader Use (origin, destination, grade, haul distance, etc.):
Load spoil from stockpile
Quantity 64,621 CY

Productivity Calculations:

Cycle Time = 0 (haul time loaded (min)) + 0 (return time empty) + 0.65 (basic cycle time (min)) = **0.65 min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) x 0.87 (bucket fill factor*) = **13.05 LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) ÷ 0.65 (cycle time (min)) x 0.83 (efficiency factor) x 60 (hr) = **1004 LCY/hr**

Hours Required = 64,621 (volume to be moved (LCY)) ÷ 1004 (net hourly production (LCY/hr)) = **64.4 hr**

use 65.0 hr

*** See loader section of equipment manual.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 9
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE

Earthmoving Activity:
Haul spoil for open contour pits
Characterization of Truck Use (type, size, etc.):
Caterpillar 777F (2 trucks)
Description of Truck Use (origin, destination, grade, haul distance, etc.):
Haul spoil from stockpile to open pit area

Volume to be moved (lcy):	64,621	Density (lb/lcy):	2100	Distance (ft):	1500	Grade (%):	0
		Rolling Resistance (%):	3			Total Resistance (%):	3

Productivity Calculations:

No. Loader Passes/Truck = 66.8 (truck capacity* (LCY)) ÷ 13.05 (loader bucket net capacity (LCY)) = **5.12** **passes**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Loading Time/Truck = 0.65 (loader cycle time (min) (From WS 8 or WS 10)) x 5.00 (number of loader passes/ truck) = **3.25** **min**

Truck Cycle Time = 0.8 (haul time (min)) + 0.42 (return time (min)) + 3.25 (loading time (min)) + 2 (dump and maneuver time (min)) = **6.5** **min.**

No. Trucks Required = 6.47 (truck cycle time (min)) ÷ 3.25 (total loading time (min)) = **1.99** **trucks**
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Production Rate = 65.25 (net truck capacity **) x 2.00 (number of trucks) ÷ 6.47 (truck cycle time (min)) = **20.2** **LCY/min**

Hourly Production = 20.2 (production rate (LCY/min)) x 60 min (hr) x 0.83 (efficiency factor) = **1008.5** **LCY/hr**

Hours Required = 64,621 (volume to be moved (LCY)) ÷ 1008.5 (hourly production (LCY/hr)) = **65.0** **hr**

Use whichever is higher from Worksheets 8 & 9 **65.0** **hr**

* **Use the average of the heaped and struck capacities.**
** **Net truck capacity = loader bucket net capacity x no. loader passes/truck.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Regrade area where spoil stored

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 32,311 Density (lb/lcy): 2700 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.90 (grade factor) **x** 0.85 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.34**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.34 (operating adjustment factor) **=** **939** **LCY/hr**

Hours Required = 32,311 (volume to be moved (LCY)) **/** 939 (net hourly production (LCY/hr)) **=** 34.4 hrs

use **35 hrs**

Use whichever is higher from Worksheets 5 & 8 **65.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to contour pit and spoil storage areas

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	926 CY		Distance (ft):	500		Grade (%):	5
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		8
Productivity Calculations:					Total Resistance (%):		-2

Cycle Time = 0.55 (haul time loaded (min)) **+** 0.45 (return time empty (min)) **+** 0.65 (basic cycle time (min)) **=** **1.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) = **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **395** **LCY/hr**

Hours Required = 926 (volume to be moved (LCY)) **÷** 395 (net hourly production (LCY/hr)) **=** **2.3** **hr**

use **3.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over pit and spoil areas

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 1,852 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 5

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.90 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.57**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.57 (operating adjustment factor) **=** **1585** **LCY/hr**

Hours Required = 1,852 (volume to be moved (LCY)) **/** 1585 (net hourly production (LCY/hr)) **=** 1.2 hrs

use **2 hrs**

Use whichever is higher from Worksheets 5 & 8 **3.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 7
PRODUCTIVITY AND HOURS REQUIRED FOR RIPPER-EQUIPPED DOZER USE

Ripping Activity:
Rip area of coal storage area, 2.6 acres

Characterization of Dozer and Ripper Use:
D9-T Semi-U Multishank Ripper

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):

BCY:	4,195	Cut Spacing (ft):	11.6	Cut Length (ft):	337	Area (ac):	2.60
Assumed ground speeed of 1 mph		Speed (ft/min):	88				

Productivity Calculation:

Cycle Time = 337 (cut length (ft)) ÷ 88 (ft/min) + 0.25 (fixed turn time* (min)) = **4.1** **min/pass**

Passes/Hour = 60 min (hr) ÷ 4.1 (cycle time (min/ pass)) x 0.83 (efficiency factor) = **12.27** **passes/hr**

Volume Cut/Pass = 1 (tool penetration (ft)) x 11.6 (cut spacing (ft)) x 337 (cut length (ft)) ÷ 27 cu ft (cu yd) = **145** **BCY/pass**

Hourly Production = 145 (volume cut/pass (BCY/ pass)) x 12.27 (passes/ hour) = **1774.4** **BCY/hr****

Hours Required = 4,195 (volume to be ripped (BCY)) ÷ 1774.4 (hourly production (BCY/hr)) = 2.4 hours

use **3** **hrs**

* **Fixed turn time depends upon dozer used. 0.25 min/turn is normal.**

** **Remember to use the swell factor to convert from bank cubic yards to loose cubic yards when applying these data to *Worksheet No. 5* . Calculate separate dozer hauling of ripped material for each lift on that worksheet.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to coal stockpile area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	2,097 CY	Distance (ft):	500		Grade (%):	5
	Density (lb/lcy): 1600	Rolling Resistance (%):	3		Total Resistance (%):	8
Productivity Calculations:					Total Resistance (%):	-2

Cycle Time = 0.55 (haul time loaded (min)) **+** 0.45 (return time empty (min)) **+** 0.65 (basic cycle time (min)) **=** **1.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **395** **LCY/hr**

Hours Required = 2,097 (volume to be moved (LCY)) **÷** 395 (net hourly production (LCY/hr)) **=** **5.3** **hr**

use **6.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over coal stockpile area

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 1,049 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 5

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.90 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.57**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.57 (operating adjustment factor) **=** **1585** **LCY/hr**

Hours Required = 1,049 (volume to be moved (LCY)) **/** 1585 (net hourly production (LCY/hr)) **=** 0.7 hrs

use **1 hrs**

Use whichever is higher from Worksheets 5 & 8 **6.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39

WORKSHEET 13
SUMMARY CALCULATION OF EARTHMOVING COSTS

Equipment *	Ownership & Operating Cost ($/hr)	Labor Cost ($/hr)	Total Hours Required **	Total Cost *** ($)
Caterpillar D-10 Semi-U blade	$ 220.33	$ 38.76	2070	$ 536,316.30
Caterpillar 992K	$ 269.67	$ 38.76	93	$ 28,683.99
Caterpillar 777F (2 trucks)	$ 254.24	$ 28.94	130	$ 36,813.40
Caterpillar D9T with Semi-Universal Blade & Multishank Ripper	$ 176.53	$ 38.76	3	$ 645.87
			Grand Total of Earthmoving	**$ 602,459.56**

*** Be sure to include all necessary attachments and accessories for each item of equipment. Also, add support equipment such as water wagons and graders to match total project time as appropriate.**

**** Account for multiple units in truck and/or scraper teams**

***** Calculate the total cost for each item of equipment by adding the second and third columns (the ownership and operation and labor costs) and then multiplying that number by the fourth column (the total hours required).**

Data Sources:

Valley Mining, Inc., Permit D-2286
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 14
REVEGETATION COSTS

Name and Description of Area To Be Revegetated:
Revegetate disturbed areas to grazing land

Description of Revegetation Activities:

Revegetate 269.7 ac with a pasture seed mix

Cost Calculation for Individual Revegetation Activities:

Initial Seeding

area to be seeded (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		
269.7	x (	0	+	1200	) =	$ 323,640

Planting Trees and Shrubs

area to be planted (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		
	x (		+		) =	$ -

Reseeding *

area anticipated to need reseeding (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)		
67.4	x (	0	+	1200	) =	$ 80,910

***Replanting Trees and Shrubs* ***

_____	**x (**		+		**) =**	**$ -**
area anticipated to need replanting (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)		

Other Necessary Revegetation Activities

(Examples of other activities that may be necessary include soil sampling, irrigation, and rill and gully repair. Describe each activity and provide a cost estimate with documentation. Use additional worksheets if necessary.)

TOTAL REVEGETATION COST = $ 404,550

*****

Generally, the proportion of the area initially seeded and planted that is anticipated to need reseeding or replanting is determined on the basis of historic failure rates for similar sites and conditions. The same principle applies to determining the extent of seedbed preparation and soil amendments that may be needed as part of any reseeding or replanting effort. If anticipated failure rates vary within the area proposed for disturbance, use a separate worksheet for the area subject to each failure rate.

Assumptions:

$_____ per acre includes seed mix, 2T/ac. mulch, 3T/ac. Lime, 50 lb/ac. Nitrogen, 100 lb/ac. Phosphorous, and 100 lb/ac. Potassium.
Second seeding at $____ per acre.
Assume 25% failure for second seeding.

Data Sources:

Valley Mining, Inc., Permit D-2286
Per acre cost obtained from consultation with AML programs in surrounding states.

WORKSHEET 15
OTHER RECLAMATION ACTIVITY COSTS

(Includes subsidence damage repair costs, water supply replacement costs, and funds required to support long-term treatment of unanticipated acid or ferruginous mine drainage.)

Description of Reclamation, Repair or Pollution Abatement Activity:

Remove 3 impounding structures
Dewater ponds

Assumptions:

Due to the exceptionally large size of these ponds, doubling the unit cost estimation

Cost Estimate Calculations:

	Volume (cubic yards)	Unit Cost ($/cu yd)	Cost
Crushed Rock D50 between 6-18 inches	4950	31	$ 153,450
Crushed Rock D50 less than 6 inches	1238	31	$ 38,378
Removal of 3 impounding structures	3	$ 10,000	$ 30,000
Dewatering cost = $0.005 per gallon	226,551,166	$ 0.005	$ 1,132,756
Water Treatment cost = $0.01 per gallon	67,965,350	$ 0.010	$ 679,653
Wetland Mitigation (acres)	10.6	$ 20,000	$ 212,000
Maintenance costs ($/acre)	269.7	$ 368.14	$ 99,287
TOTAL COSTS =			**$ 2,345,525**

Other Documentation or Notes:

State of Ohio estimates dewatering cost at $0.005/gallon, and then that 1/3 of the water removed from the ponds will need treatment at $0.01/gallon
State of Ohio estimates used for wetland mitigation

Data Sources:
Valley Mining, Inc., Permit D-2286

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 23,484	
2	**Total Earthmoving Costs**		$ 602,460	
3	**Total Revegetation Costs**		$ 404,550	
4	**Total Other Reclamation Activities Costs**		$ 2,345,525	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 3,376,019	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 3,376,019**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 101,280.56	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 101,280.56	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 101,280.56	
10	**Contractor Profit/Overhead** (See Graph 1)	**18.0% of line 6**	$ 607,683.36	
11	**Project Management Fee** (See Graph 2)	**3.9% of line 6**	$ 131,664.73	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 1,043,190**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 4,419,208**

*Inflation factor = ENR Construction Cost Index (CCI) for current mo/yr / ENR CCI for mo/yr 3 years prior to current mo/yr = 1 / 1 = 1.00

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

* This calculation does not reflect an inflation factor because the purpose of the calculation is to determine if the posted bond is sufficient for the current conditions.

Data Sources:

Valley Mining, Inc., Permit D-2286

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 23,484	
2	**Total Earthmoving Costs**		$ 602,460	
3	**Total Revegetation Costs**		$ 404,550	
4	**Total Other Reclamation Activities Costs**		$ 2,345,525	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 3,376,019	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 3,838,533**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 115,156.00	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 115,156.00	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 115,156.00	
10	**Contractor Profit/Overhead** (See Graph 1)	**17.5% of line 6**	$ 671,743.32	
11	**Project Management Fee** (See Graph 2)	**3.9% of line 6**	$ 147,783.53	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 1,164,995**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 5,003,528**

*Inflation factor = 1.137

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

Data Sources:

Valley Mining, Inc., Permit D-2286

BOND AMOUNT COMPUTATION

Applicant:	Oxford Mining Company, LLC		
Permit Number:	D-2325	**Permitted Acreage:**	956

Bonding Scheme: Permit Area

If Incremental:

Increment Number:
Increment Acreage:

If Cumulative:

Acres previously authorized for disturbance:
New acres proposed for disturbance:

Type of Operation:	Large Surface Contour and Auger Mine
Location:	Rush Township, Tuscarawas County
PSE (October 2008):	$3,620,000
Prepared by:	Stefanie Self
Date:	5/5/2010
Total Bond Amount:	**$ 3,008,164**

WORKSHEET 1
DESCRIPTION OF THE WORST-CASE RECLAMATION SCENARIO

The worst case scenario will be if all six allowed pits are open to their fullest extent with fill material piled up behind no more than 1500 linear feet away (the maximum allowed under permit conditions) and topsoil no more than 500 feet away (maximum approved distance). Twenty-nine impoundments will also need to be removed and reclaimed.

The following tasks must be completed to reclaim the site:
Cap auger holes in exposed highwall, maximum 900 ft exposed
Fill in open pits (6, each 150 ft x 350 ft x 80 ft) from recent spoil ridges
Grade area of pits after filled, topsoil and revegetate
Grade area where material was obtained for filling pits, topsoil and revegetate
Remove 29 impoundments, grade, topsoil and revegetate
Remove haul roads (2.8 acres)
Remove trash, storage tanks, parts trailer and derelict equipment as needed

Assumptions:
Overburden mostly blasted shale with a density of 2100 lb/cubic yard and a swell factor of 0.75 or swell percent of 33%
Overburden stored next to open pit as mining progresses, so dozer push = 225 ft average
6 inches of topsoil to be placed, stored no more than 500 feet from area to be used (from permit)

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook
OSM Handbook for Calculation of Reclamation Bond Amounts, Revised April 2000

WORKSHEET 2
STRUCTURE DEMOLITION AND DISPOSAL COSTS

Structures to be demolished:

Item	Construction Material	Volume (cubic feet)	Unit Cost Basis ($)	Demolition Cost ($)
				0
				0
				0
				0
				0
				0
				0
			Subtotal	0

Other items to be demolished (paved roads, conveyors, utility poles, rail spurs, etc.)

	Unit	Unit cost	
Utility lines needing moved (ft)	23,400	$ 8.67	$ 202,878
Auger holes to be sealed (ft)	900	$ 5.92	$ 5,328

Note: Unit costs above based on Ohio's estimations from previous reclamation contracts

Subtotal = $208,206

Debris handling and disposal costs:

Removal of trash and derelict equipment, Lump Sum = $5,000

Subtotal = $5,000

TOTAL DEMOLITION AND DISPOSAL = $213,206

Data Sources:
Oxford Mining Company, LLC. Permit D-2325

WORKSHEET 3
MATERIAL HANDLING PLAN SUMMARY

Earthmoving Activity	Volume (BCY)	Volume (LCY)	Acre	Origin	Destination	Haul Distance (ft)	Grade * (%)	Equipment To Be Used
Load spoil for filling open pits	622,222	829,630		Spoil Piles	3 Open Pits	1500	10	Caterpillar 992K
Push spoil into open pits	622,222	829,630		Spoil Piles	3 Open Pits	1500	10	Caterpillar 777F (2 trucks)
Grade spoil in open pits	311,111	414,815		In Place				Caterpillar D-10 Semi-U blade
Regrade area over pits			7.23	In Place				Caterpillar D-10 Semi-U blade
Regrade area where spoil stored			10.85	In Place				Caterpillar D-10 Semi-U blade
Haul topsoil to pit and spoil area	14,583			Topsoil Storage	3 Open Pits	500	10	Caterpillar 992K
Spread topsoil over pit and spoil areas			18.08	In Place				Caterpillar D-10 Semi-U blade
Rip haul road area			2.80	In Place				Caterpillar D9T-SU Multishank
Haul topsoil to haul road area	2,259			Topsoil Storage	Coal Stockpile Area	500	5	Caterpillar 992K
Spread topsoil over haul road area			2.80	In Place				Caterpillar D-10 Semi-U blade

*Record grade resistance here. Calculate total resistance on the appropriate worksheet. Total Resistance = Grade Resistance + Rolling Resistance.

WORKSHEET 4B
EARTHWORK QUANTITY

Spoil Swell Factor: **0.75** **Spoil Swell %:** **33**

Fill Open Pits:

Pit Volume	length	width	depth	BCY	LCY	Cubic Yards needed to account for compaction
Mine Pit 1	350 Ft	150 Ft	80 Ft	155,556	207,407	181,481
Mine Pit 2	350 Ft	150 Ft	80 Ft	155,556	207,407	181,481
Mine Pit 3	350 Ft	150 Ft	80 Ft	155,556	207,407	181,481
Mine Pit 4	350 Ft	150 Ft	80 Ft	155,556	207,407	181,481
Mine Pit 5	350 Ft	150 Ft	80 Ft	155,556	207,407	181,481
Mine Pit 6	350 Ft	150 Ft	80 Ft	155,556	207,407	181,481
Total:				622,222	829,630	725,926

Haul Roads:

Area	2.8 Ac		
Cut Length for Ripper	121,968 Sq Ft	349 Ft	

Soil Volumes (top-and sub-soil):	Area (sq ft)	Area (ac)	Depth (ft)	BCY
Soil Volume (Pit and Spoil Area) =	787,500 Sq ft	18.08 ac	0.5 Ft	14,583
Soil Volume (Haul Road Area) =	121,968 Sq ft	2.80 ac	0.5 Ft	2,259
Total:				16,842

Data Source:
Oxford Mining Company, LLC. Permit D-2325

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Load spoil for filling open pits

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

Description of Loader Use (origin, destination, grade, haul distance, etc.):
Load spoil from stockpile
Quantity 725,926 CY

Productivity Calculations:

Cycle Time = 0 (haul time loaded (min)) + 0 (return time empty) + 0.65 (basic cycle time (min)) = **0.65 min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) x 0.87 (bucket fill factor*) = **13.05 LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) ÷ 0.65 (cycle time (min)) x 0.83 (efficiency factor) x 60 (hr) = **1004 LCY/hr**

Hours Required = 725,926 (volume to be moved (LCY)) ÷ 1004 (net hourly production (LCY/hr)) = **723.1 hr**

use 724.0 hr

*** See loader section of equipment manual.**

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 9
PRODUCTIVITY AND HOURS REQUIRED FOR TRUCK USE

Earthmoving Activity:
Haul spoil to open pit

Characterization of Truck Use (type, size, etc.):
Caterpillar 777F (2 trucks)

Description of Truck Use (origin, destination, grade, haul distance, etc.):
Haul spoil from stockpile to open pit area

Volume to be moved (lcy):	725,926	Density (lb/lcy):	2100	Distance (ft):	1500	Grade (%):	0
		Rolling Resistance (%):	3			Total Resistance (%):	3

Productivity Calculations:

No. Loader Passes/Truck = 66.8 (truck capacity* (LCY)) ÷ 13.05 (loader bucket net capacity (LCY)) = **5.12** passes
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Loading Time/Truck = 0.65 (loader cycle time (min) (From WS 8 or WS 10)) x 5.00 (number of loader passes/ truck) = **3.25** min

Truck Cycle Time = 0.8 (haul time (min)) + 0.42 (return time (min)) + 3.25 (loading time (min)) + 2 (dump and maneuver time (min)) = **6.5** min.

No. Trucks Required = 6.47 (truck cycle time (min)) ÷ 3.25 (total loading time (min)) = **1.99** trucks
(round down to the nearest whole number; reduce net truck capacity and weight accordingly in calculations below)

Production Rate = 65.25 (net truck capacity **) x 2.00 (number of trucks) ÷ 6.47 (truck cycle time (min)) = **20.2** LCY/min

Hourly Production = 20.2 (production rate (LCY/min)) x 60 min (hr) x 0.83 (efficiency factor) = **1008.5** LCY/hr

Hours Required = 725,926 (volume to be moved (LCY)) ÷ 1008.5 (hourly production (LCY/hr)) = **720.0** hr

Use whichever is higher from Worksheets 8 & 9 **724.0** hr

* **Use the average of the heaped and struck capacities.**
** **Net truck capacity = loader bucket net capacity x no. loader passes/truck.**

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Grade spoil in open pits
Regrade area over pits
Regrade area where spoil stored

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 725,926 Density (lb/lcy): 2100 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.80 (grade factor) **x** 1.10 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.38**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.38 (operating adjustment factor) **=** **1073** **LCY/hr**

Hours Required = 725,926 (volume to be moved (LCY)) **/** 1073 (net hourly production (LCY/hr)) **=** 676.3 hrs

use **677** **hrs**

Use whichever is higher from Worksheets 5, 8 & 9 **724.0** **hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to pit and spoil area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	14,583 CY		Distance (ft):	500		Grade (%):	10
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		13
Productivity Calculations:					Total Resistance (%):		-7

Cycle Time = 0.85 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.95** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.95 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **335** **LCY/hr**

Hours Required = 14,583 (volume to be moved (LCY)) **÷** 335 (net hourly production (LCY/hr)) **=** **43.6** **hr**

use **44.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over pit and spoil areas

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 7,292 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.80 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.50**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.50 (operating adjustment factor) **=** **1409** **LCY/hr**

Hours Required = 7,292 (volume to be moved (LCY)) **/** 1409 (net hourly production (LCY/hr)) **=** 5.2 hrs

use **6 hrs**

Use whichever is higher from Worksheets 5 & 8 **44.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 7
PRODUCTIVITY AND HOURS REQUIRED FOR RIPPER-EQUIPPED DOZER USE

Ripping Activity:
Rip area of haul road area, 2.8 acres

Characterization of Dozer and Ripper Use:
Caterpillar D9T-SU Multishank

Description of Ripping (ripping depth, cut spacing, cut length, and material to be ripped):
BCY: 4,517 Cut Spacing (ft): 11.6 Cut Length (ft): 349 Area (ac): 2.80
Assumed ground speeed of 1 mph Speed (ft/min): 88

Productivity Calculation:

Cycle Time = 349 (cut length (ft)) ÷ 88 (ft/min) + 0.25 (fixed turn time* (min)) = **4.2 min/pass**

Passes/Hour = 60 min / hr ÷ 4.2 (cycle time (min/pass)) x 0.83 (efficiency factor) = **11.85 passes/hr**

Volume Cut/Pass = 1 (tool penetration (ft)) x 11.6 (cut spacing (ft)) x 349 (cut length (ft)) ÷ 27 cu ft / cu yd = **150 BCY/pass**

Hourly Production = 150 (volume cut/pass (BCY/pass)) x 11.85 (passes/hour) = **1778.3 BCY/hr****

Hours Required = 4,517 (volume to be ripped (BCY)) ÷ 1778.3 (hourly production (BCY/hr)) = 2.5 hours

use **3 hrs**

* **Fixed turn time depends upon dozer used. 0.25 min/turn is normal.**

** **Remember to use the swell factor to convert from bank cubic yards to loose cubic yards when applying these data to *Worksheet No. 5*. Calculate separate dozer hauling of ripped material for each lift on that worksheet.**

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 8
PRODUCTIVITY AND HOURS REQUIRED FOR LOADER USE

Earthmoving Activity:
Haul topsoil to haul road area

Characterization of Loader Use (type, size, etc.):
Caterpillar 992K

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

Quantity	2,259 CY		Distance (ft):	500		Grade (%):	5
	Density (lb/lcy):	1600	Rolling Resistance (%):	3	Total Resistance (%):		8
Productivity Calculations:					Total Resistance (%):		-2

Cycle Time = 0.55 (haul time loaded (min)) **+** 0.45 (return time empty) **+** 0.65 (basic cycle time (min)) **=** **1.65** **min**

Net Bucket Capacity = 15.0 (heaped bucket capacity (LCY)) **x** 0.87 (bucket fill factor*) **=** **13.05** **LCY**

Hourly Production = 13.05 (net bucket capacity (LCY)) **÷** 1.65 (cycle time (min)) **x** 0.83 (efficiency factor) **x** 60 (hr) **=** **395** **LCY/hr**

Hours Required = 2,259 (volume to be moved (LCY)) **÷** 395 (net hourly production (LCY/hr)) **=** **5.7** **hr**

use **6.0** **hr**

*** See loader section of equipment manual.**

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 5
PRODUCTIVITY AND HOURS REQUIRED FOR DOZER USE

Earthmoving Activity:
Spread topsoil over haul road area

Characterization of Dozer Used (type, size, etc.):
Caterpillar D-10 Semi-U blade

Description of Dozer Use (origin, destination, grade, haul distance, material, etc.):

Volume (lcy): 1,129 Density (lb/lcy): 1600 Distance (ft): 50 Grade (%): 0

Productivity Calculations:

Operating Adjustment Factor = 0.75 (operator factor) **x** 0.70 (material factor) **x** 0.83 (efficiency factor) **x** 0.80 (grade factor) **x** 1.44 (weight correction factor) **x** 1.00 (production method/ blade factor) **x** 1.00 (visibility factor) **x** 1.00 (elevation factor) **=** **0.50**

Net Hourly Production = 2800 (normal hourly production (lcy/hr)) **x** 0.50 (operating adjustment factor) **=** **1409** **LCY/hr**

Hours Required = 1,129 (volume to be moved (LCY)) **/** 1409 (net hourly production (LCY/hr)) **=** 0.8 hrs

use **1 hrs**

Use whichever is higher from Worksheets 5 & 8 **6.0 hr**

Note: Use twice the hours calculated, since one dozer will have to help loader, and one will spread topsoil in final area

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39

WORKSHEET 13
SUMMARY CALCULATION OF EARTHMOVING COSTS

Equipment *	Ownership & Operating Cost ($/hr)	Labor Cost ($/hr)	Total Hours Required **	Total Cost *** ($)
Caterpillar D-10 Semi-U blade	$ 220.33	$ 38.76	1454	$ 376,716.86
Caterpillar 992K	$ 269.67	$ 38.76	774	$ 238,724.82
Caterpillar 777F (2 trucks)	$ 254.24	$ 28.94	1448	$ 410,044.64
Caterpillar D9T-SU Multishank	$ 176.53	$ 38.76	3	$ 645.87
			Grand Total of Earthmoving	**$ 1,026,132.19**

*** Be sure to include all necessary attachments and accessories for each item of equipment. Also, add support equipment such as water wagons and graders to match total project time as appropriate.**

**** Account for multiple units in truck and/or scraper teams**

***** Calculate the total cost for each item of equipment by adding the second and third columns (the ownership and operation and labor costs) and then multiplying that number by the fourth column (the total hours required).**

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Caterpillar Performance Handbook, Edition 39
Custom Cost Evaluator, http://www.equipmentwatch.com
Bureau of Labor Statistics, http://www.bls.gov/oes/current/oes_3710.htm
Society of Mining Engineers (SME) Mining Reference Handbook

WORKSHEET 14
REVEGETATION COSTS

Name and Description of Area To Be Revegetated:
Revegetate all disturbed areas

Description of Revegetation Activities:

Revegetate 333.3 ac with a pasture seed mix

Cost Calculation for Individual Revegetation Activities:

Initial Seeding

333.3	x (	0	+	1200	) =	$	399,960
area to be seeded (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)			

Planting Trees and Shrubs

	x (		+		) =	$	-
area to be planted (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)			

Reseeding *

83.3	x (	0	+	1200	) =	$	99,990
area anticipated to need reseeding (ac)		seedbed preparation costs ($/ac)		seeding, fertilizing, and mulching costs ($/ac)			

Replanting Trees and Shrubs *

	x (		+		) =	$	-
area anticipated to need replanting (ac)		planting costs ($/ac)		herbicide treatment costs ($/ac)			

Other Necessary Revegetation Activities

(Examples of other activities that may be necessary include soil sampling, irrigation, and rill and gully repair. Describe each activity and provide a cost estimate with documentation. Use additional worksheets if necessary.)

TOTAL REVEGETATION COST = $ 499,950

* **Generally, the proportion of the area initially seeded and planted that is anticipated to need reseeding or replanting is determined on the basis of historic failure rates for similar sites and conditions. The same principle applies to determining the extent of seedbed preparation and soil amendments that may be needed as part of any reseeding or replanting effort. If anticipated failure rates vary within the area proposed for disturbance, use a separate worksheet for the area subject to each failure rate.**

Assumptions:

$_____ per acre includes seed mix, 2T/ac. mulch, 3T/ac. Lime, 50 lb/ac. Nitrogen, 100 lb/ac. Phosphorous, and 100 lb/ac. Potassium.
Second seeding at $____ per acre.
Assume 25% failure for second seeding.

Data Sources:
Oxford Mining Company, LLC. Permit D-2325
Per acre cost obtained from consultation with AML programs in surrounding states.

WORKSHEET 15
OTHER RECLAMATION ACTIVITY COSTS

(Includes subsidence damage repair costs, water supply replacement costs, and funds required to support long-term treatment of unanticipated acid or ferruginous mine drainage.)

Description of Reclamation, Repair or Pollution Abatement Activity:

Construction of channel as mentioned in the permit

Assumptions:

Cost Estimate Calculations:

	Volume	Unit Cost ($/unit)	Cost
Crushed Rock D50 between 6-18 inches (cubic yds)	235	31	$ 7,285
Removal of 29 sediment ponds	29	$ 5,000	$ 145,000
Dewatering cost = $0.005 per gallon	32,004,759	$ 0.005	$ 160,024
Water Treatment cost = $0.01 per gallon	9,601,428	$ 0.010	$ 96,014
Maintenance costs ($/acre)	333.3	$ 368.14	$ 122,701
TOTAL COSTS =			**$ 531,024**

Other Documentation or Notes:

State of Ohio estimates dewatering cost at $0.005/gallon, and then that 1/3 of the water removed from the ponds will need treatment at $0.01/gallon

Data Sources:
Oxford Mining Company, LLC. Permit D-2325

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 213,206	
2	**Total Earthmoving Costs**		$ 1,026,132	
3	**Total Revegetation Costs**		$ 499,950	
4	**Total Other Reclamation Activities Costs**		$ 531,024	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 2,270,312	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 2,270,312**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 68,109.37	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 68,109.37	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 68,109.37	
10	**Contractor Profit/Overhead** (See Graph 1)	**19.5% of line 6**	$ 442,710.90	
11	**Project Management Fee** (See Graph 2)	**4.0% of line 6**	$ 90,812.49	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 737,852**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 3,008,164**

*Inflation factor = ENR Construction Cost Index (CCI) for current mo/yr / ENR CCI for mo/yr 3 years prior to current mo/yr = 1 / 1 = 1.00

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

***** This calculation does not reflect an inflation factor because the purpose of the calculation is to determine if the posted bond is sufficient for the current conditions.

Data Sources:

Oxford Mining Company, LLC. Permit D-2325

WORKSHEET 16
RECLAMATION BOND SUMMARY WORKSHEET

1	**Total Facility and Structure Removal Costs**		$ 213,206	
2	**Total Earthmoving Costs**		$ 1,026,132	
3	**Total Revegetation Costs**		$ 499,950	
4	**Total Other Reclamation Activities Costs**		$ 531,024	
5	**Total Direct Costs** (Sum of Lines 1 through 4)		$ 2,270,312	
6	**Inflated Total Direct Costs** (Line 5 times inflation factor*)			**$ 2,581,345**
7	**Mobilization/Demobilization** (1%-10% of Line 6	**3% of line 6**	$ 77,440.35	
8	**Contingencies** (3%-5% of Line 6)	**3% of line 6**	$ 77,440.35	
9	**Engineering Redesign Fee** (2.5%-6% of Line 6)	**3% of line 6**	$ 77,440.35	
10	**Contractor Profit/Overhead** (See Graph 1)	**19.0% of line 6**	$ 490,455.57	
11	**Project Management Fee** (See Graph 2)	**4.0% of line 6**	$ 103,253.80	
12	**Total Indirect Costs** (Sum of Lines 7 through 11)			**$ 826,030**
13	**Grand Total Bond Amount** (Sum of Lines 6 and 120			**$ 3,407,376**

*Inflation factor = 1.137

Identify current mo/yr used in formula above _____

Identify prior mo/yr used in formula above _____

ENR = Engineering News Record, McGraw-Hill Construction Information Group, New York, NY; http://www.enr.com

Data Sources:

Oxford Mining Company, LLC. Permit D-2325

Appendix C
Ohio's Comments on Draft Report

Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR — SEAN D. LOGAN, DIRECTOR

John F. Husted, Chief
Ohio Department of Natural Resources
Division of Mineral Resources Management
2045 Morse Road, Building H-3
Columbus, OH 43229-6693
Phone: (614) 265-6633 Fax: (614) 265-7998

May 21, 2010

George J. Rieger,
United States Department of the Interior
Office of Surface Mining Reclamation & Enforcement
Pittsburgh Field Division Office
Three Parkway Center
Pittsburgh, PA 15220

Re: "Determination of Required Bond Amounts"

Dear Mr. Rieger:

In response to the draft report on "Determination of Required Bond Amounts" as provided for in the EY 2010 Performance Agreement with Ohio, I would like to express my appreciation to you and OSM staff for a detailed summarization of the comparison between Ohio's new procedures and the estimate criteria in OSM's Bonding Handbook.

Staff has reviewed the draft report and has some concerns in that there appear to be some inconsistencies in the methodology overview of Ohio's program when compared to that of OSM, and perhaps that speaks to the merit of ongoing training as is recommended in the draft report. There were also concerns in that the specific estimates cited as examples in the report did not appear to account for current unit costs as updated by Ohio when making comparisons to OSM's calculations.

A list of comments on the general report information, as well as summary comments on reviewing the two bond computation methodologies, has been enclosed with this letter. Staff has recommended that perhaps it would be beneficial to meet with OSM engineering staff that performed the comparison to discuss the differences in methodologies.

If you have any questions or would like to meet to discuss staff's comments, please feel free to contact me.

Sincerely,

John F. Husted, Chief
Enclosures

Cc: Dan Schrum, OSM, Columbus
Lanny Erdos, Deputy Chief, Coal & IM Programs
Brent Heavilin, Permitting Manager
Sue Grant, Administrative Officer

Summary comments on reviewing the two bond computation methodologies.

- Only one OSM computation (permit D-2286) was examined in detail because it had the largest difference at 32%. This was to identify differences and similarities in quantities and results on a line-item basis.

- A cursory review of D-2325 was performed since it had the next largest difference at 20%. This was to establish any trends between the D-2286 examination and the methods used in the D-2325 analysis.

- It would be suggested OSM review some of the computations. Quantities derived for pit volumes appear to be substantially different than those in the Ohio PSE. Perhaps the dimensions in the OSM method are defined differently than those in Ohio, such as an area-wide pit is measured at the top of the pit, rather than at the coal seam as it is in the PSE.

- Major differences are found related to "the purpose of the computations". It appears resoiling areas and therefore quantities, revegetation and maintenance are based on "current" conditions and may be as much as only one-tenth the Ohio quantities. Ohio has to project its estimate to what a low bidder may bid 12 to 18 months from the present, for worse case scenarios allowed by permit, but may not yet have occurred.

- We would suggest improved communications between those completing these estimates for this study. Once OSM has had a chance to correct some of the volume related computations, a meeting to discuss simple issues such as estimating for the present or estimating for 18-months in the future, would be time well spent. There is no doubt, more detailed discussions concerning swell, tree and shrub plantings, and other individual line item considerations may help improve the Ohio PSE.

- Understanding that the OSM form has been used for decades, Ohio is extremely interested in how successful OSM has been in predicting the future cost of sites that had estimates, but ultimately were forfeited and reclaimed. Any such information about such results would help Ohio learn what pitfalls to prepare for.

Reviewing the notes from the detailed examination of the OSM computations will help reveal causes for the differences between the two methodologies.

Comparison of DMRM and OSM methods on D-2286

Review the Description in the OSM report and consider the following:

The PSE has only the 2 area-wide pits showing. Typically such "maximum allowable number of pits and dimensions" are reviewed and confirmed with staff and company. The OSM description mentions these have two area wide pits as well as 2 contour pits. The documentation on the "Material Handling Plan Summary" states 3 of each type although the calcs that follow appear to go back to the two of each scenario.

OSM calculates the BCY of the area-wide cut as (L) x (W) x (D). An additional 49% was applied to get the LCY. Numbers were 74,074 BCY and 110,558 LCY per each of the two area wide cuts. The Spoil Swell % at 49 seems pretty extreme but DMRM does not consider swell at this point.

DMRM calculation considers most area-wide cuts are not perfect boxes with vertical sides. An assumption was made that the face-up and leading face are both vertical as they have yet to be cut. The trailing face or typical entrance would not be as steep as a 1H:1V slope but that was assumed considering the ramp for

access may be just a portion of that side, so a 45-degree (rough friction angle) was used. The low wall side assumed some material may be pushed back but for the most part a 1.5H to 1V was used. Therefore the DMRM formula is:

(L + ½ D) x (W x D + 1.5 x D x D x ½). This yields (per pit) 178,240 BCY.

For just Area Wide pits the comparison is therefore:

OSM total 148,148 BCY and 221,117 LCY DMRM was 356,481 BCY

OSM then added in the two contour pits for a total of 51,852 BCY / 77,391 LCY
DMRM does not have these two pits, but if the operator were to add more pits than what the maximum is on the PSE, the PSE would be adjusted.

If there were contour cuts, DMRM uses a simple ½ x W x D x L which would have yielded 12,963 BCY for the 100 x 100 x 70 ft contour pits. It appears from the worksheet that OSM's BCY values are all double, as if calculated using their Area Wide method. This would be an apparent error in the OSM computations.

The coal processing area ripping was not considered as a separate item in the DMRM PSE so there is no comment on this.

The "Open Channel Spillway (EWI-23R)" was in both the OSM computations and the DMRM spreadsheet. OSM value was 47,656 CYD while the DMRM value was 4,793 CYD. This is about a one order of magnitude difference so it's worth examining. This reviewer is not familiar with this spillway configuration, but for the dimensions used in both methods, consider that any object 200-feet-long with an average height of 7.4 feet, minimum width at 64.4 feet and assumed 3H: 1V sides, and ignoring the small decrease in cross section over the ends (14.8 feet for each end), the 4,793 CYD figure appears more correct. OSM will need to check that computation.

Refer to the OSM calculations "Soil Volumes (top-and sub-soil)". There is a stray number of 6,727 BCY which is the sum of then individual BCY's minus the 3,333 BCY. This is most likely a non-issue since the 3,333 is part of the continuing computations, but the total quantity of resoiling material (10,060 BCY) reveals a drastic difference between the logic behind these calculations and those done by Ohio. Refer to the asterisked comment on worksheet 16 (Reclamation Bond Summary Worksheet). It states:

"This calculation does not reflect an inflation factor because the purpose of the calculation is to determine if the posted bond is sufficient for the current conditions".

With regard to the topsoil quantity, Ohio must assume all areas that may be affected per the permit will require resoiling. The amount of resoiling is only reduced for those areas that have been resoiled, even though a Phase release of the area may not have been granted. At 6-inches of resoil over the 300.2 acres results in Ohio's quantity of 242,161 CYD. This is obviously substantially more than the 10,060 CYD dictated by the OSM "purpose".

Ohio's purpose could be stated:

"The purpose of the calculation (PSE) is to determine the amount of bond that will be sufficient to reclaim the site if, over the next 12 to 18 months, the company were to cause the maximum affectment possible according to the approved permit."

With this understanding, Ohio extrapolates from past yearly trends to develop unit prices to account for this 12-month to 18-month future occurrence. Likewise, to compare these two methods of bond calculation, applying an inflation rate would therefore be appropriate.

Skipping over the next 13 worksheets brings us to the Worksheet 13. The OSM total cost for both the earthwork and resoiling components was $602,459.56. Adding the O & P recommended by OSM at the 18.6% brings that to $717,066.

Adding the LCY values for earthwork and resoiling would result in (298,508 + 10,060)= 308,568 which then equates to a unit cost of $2.32/CYD.

Comparing Earthwork PLUS Resoiling, with the understanding that the unit costs were somewhat similar, we see the following:

	OSM	Ohio
Earthwork Quantity	298,508.	361,274.
Resoiling Quantity	10,060.	252,567.
Total Earthmoving Quantity	308,568.	613,841.
Unit Cost	$2.32/CYD	$2.00/CYD
Total Cost	$717,066.	$1,227,582.

The additional earthwork would also add the following to Ohio's total PSE amount:

Means 20% $122,109.
NPDES 5% $30,527.
Admin costs 15% $91,582.

The PSE would therefore have a total cost related to earthwork and resoiling of $1,471,800. or $754,734 more than the OSM computation.

Referring to Appendix A, the total difference between the two computational methods is $1,424,792. The difference due primarily how the total quantities of earthwork and resoiling materials were computed, accounts for 53% of this difference.

This exercise also shows one can not simply compare the Ohio "overheads" (Means contingencies at 10% to 20%, NPDES 5% and Admin costs at 10% to 15%), by adding the "overheads" from both computational methods. This is because the overhead values are based on other line items, such as earthwork and resoiling. If those quantities differ by about 100% as in D-2286, then the dollar amounts will appear much higher, but due to other factors.

Referring to Worksheet 14 "Revegetation Costs". Ohio's unit costs for revegetation at $1,456/acre relate to the Worksheet for "Initial Seeding" at $1,200/acre. For the D-2286 example OSM adds a "reseeding" component over 25% of the area. This would raise the unit cost for both items combined over one area to 125% of $1,200 or $1,500 per acre.

Ohio uses a flat rate of $400 per acre to account for mowing, additional fertilizer and perhaps some spot seeding. This would make the total Ohio rate $1,856/acre to the OSM rate of $1,500/acre. The comment on Page 5 of this report, Item 7 states "Ohio's estimated costs for revegetation were generally higher than those estimated by OSM". Ohio's unit costs are higher but in line with the results from the past 6 years data and reflect a possible cost 12-months to 18-months in the future, at a minimum. If OSM were to apply an

inflation rate for 1.5 years to their unit cost, some increase would be realized but the unit cost would most likely still be lower.

The comment on Page 5 probably again, reflects the differences between the areas designated for resoiling used in either method. OSM indicates 269.7 acres and Ohio has listed 300.2 acres. Ohio assumes if up to 300.2 acres may be affected some time in the next 12 to 18-months, besides needing resoiling, those same acres need to be revegetated.

Rather than repeat the same exercise for resoiling as was done for "Earthmoving" just consider that the differences in areas resulted in the following differences in costs. OSM, after O & P was $ 477,369. The Ohio total was $557,171. $56,608 was due to the difference in acreage subject to seeding and $23,194 was due to the differences in unit prices. Again, these increased values would also affect the line item totals for the various overheads to the State.

Refer to Worksheet 15 for D-2286. The Crushed Rock values on Ohio's "General Input" sheet shows 3,300 CYD and 825 CYD. The "Results" sheet shows the quantities as well as unit prices and line item results. Unit prices for all rock are in tons and therefore the quantities are converted to tons. Ohio shows 4,950 and 1,238 tons for quantities of rock. OSM may wish to change the "Unit Cost" from $/CYD to $/ton. OSM used the $31/ton for both types of rock, but Ohio had $27/ton for the smaller rock size.

Considering the assumption stated on that worksheet page and examining the other items, the remainder of the items were very similar.

The only item that remains unaccounted for is Ohio's "Clearing and Grubbing/ Final Grading" which may be included in OSM's Earthmoving computations. Past forfeitures have some degree of clearing and grubbing and/or areas requiring just some back blading or light grading, the total of which typically was no more than 15% of the total area under consideration.

CURSORY REVIEW OF THE D-2325 ESTIMATES

This PSE, done on 10/16/2008 showed "Application Number 10372" so was done prior to the permit being issued and used unit prices with earthwork and resoiling at $1.32/CYD. The Ohio PSE also used the Maximum Operational Area (MOA) that limited the expected area of affectment (for PSE purposes only), for the upcoming 12 to 18 months to 200 acres. The MOA form is no longer used but comparisons between the two bond calculation methods can still be examined when keeping those limitations in mind.

Refer to Worksheet 4B BCY for 6 "open pits" was 622,222 and LCY at 33% swell was 829,630 CYD. Ohio has only 466,667 CYD because these 6 pits were all shown to be contour (Type 1) on the PSE. Again as explained in D-2286, Ohio feels contour cuts are probably more likely to be one-half the volume of the rectangular shape bounded by the three given dimensions.

Again, the PSE has $ 255,334 for clearing and grubbing/final grading, which is based on the entire permit area. The reviewer is unsure if that may be included in the OSM earthwork calculations.

The OSM resoil quantity was 16,842 CYD for about 20 acres. The Ohio PSE assumes 197.2 acres may be affected within the next 12 to 18 months and would require a total of 161,333 CYD. (A math error had been corrected in this PSE form about 18 months ago and the actual numbers should have been 196.4 acres for 158,429 CYD). Unlike the earthwork numbers where the OSM figures are substantially higher, the resoiling quantities are lower than the Ohio PSE by a factor of 10.

Referring to Worksheet 15 the crushed rock was only showing 235 tons whereas the Ohio quantity was 7,050 tons. The PSE was $211,500 to the OSM $8,706 (includes O & P).

The dewatering and water treatment volumes were also lower than Ohio's PSE as seen on the Results Sheet. Remembering that the Ohio PSE had unit prices developed in 2007, they are substantially different than the D-2286 unit prices.

The Ohio PSE also included $87,000 from the Prep Plant Demolition sheet, which was the default hazardous waste value. This should not have been included because at the time of the PSE, no prep plant existed and the likelihood that the operator would have dumped hazardous waste on-site would be remote.

Comments on OSM draft report "Determination of Required Bond Amounts"

Page 5, Number 6. "…..contracts from the prior year." This should read "…from prior years. Ohio uses trends of unit prices to extrapolate the new unit prices."

Page 5, Number 6. "…include a 20 percent contingency…" Since this may be a point of industry concern, it would be good to revise this wording to "…include a 10- to 20- percent contingency…"

Page 5, Number 6. "…Guide; a 15 to 25 percent contingency for admin…" This should be revised to read "…a 10 to 15 percent contingency for admin…"

Page 5, Number 6. Use of the last two word "…..permitting fees" The 5% included in Ohio's estimates not only includes the cost to Ohio to pay the fees, but includes all costs incurred by the state to install, maintain and dismantle storm water (NPDES) related construction materials and structures. This includes items not required by the reclamation plan but that will be required by the OEPA. Such items typically include, but are not limited to, temporary items such as silt fence, storm water basins, temporary rock channels and temporary seeding. Also there are the administrative costs such as design and development of the Storm Water Pollution Prevention Plan, the (minimum) weekly inspections and maintenance issues throughout construction.

Page 5, Number 7. Not sure this is relevant, since OSM's costs for revegetation were not based on actual past bids in Ohio's coal bearing region. DMRM would just have to stand firm on its method of determining its unit prices.

Page 5, Number 9. (Third sentence) Since the percentage differences were not calculated correctly in the table on Page 10, the phrase "….3 percent to 24 percent." should be revised to read "…3 percent to 32 percent."

Page 5, Number 9. The fourth sentence referencing that Ohio's estimates were "higher" than OSM's in all five permits reviewed may not have the positive effect that is intended. The division has already had opportunity to defend DMRM's estimation process before the reclamation commission at which time it was stated that Ohio was using unsound engineering practices and numbers not necessarily deemed to be accurate or factual. The phrase "…..doing reclamation cost estimates is a very new process…." Perhaps should be written, "…..doing cost estimates to predict reclamation expenses that may be incurred 12- to 18-months into the future, is a very new process…." Ohio has a long history of preparing cost estimates for reclamation for actual on-the-ground circumstances and the only "new" part of this is predicting what may happen using a proposed plan.

Appendix A – "Difference" column. Since this column references the difference between the Ohio "higher" method of calculation to OSM's method of calculation, the differences should read 10%, 7%, 3%, 32% and 20% respectively.

Appendix D

OSM Response to Ohio's Comments

OSM revised the report in response to each of the specific comments/corrections on the last page of Ohio's comments in Appendix C.

In response to the specific comments regarding differences in the estimation procedures, OSM revised the report by acknowledging that Ohio's current unit-prices were not considered in the comparison. Four of the five PSEs considered were completed prior to Ohio's current unit-prices that were effective in August 2009. Ohio has updated the PSEs with current unit-prices. We have explained the effect on the differences in response to Question 9 on pages on page 6 – 8 and in the comparison chart in Appendix A. OSM and Ohio engineers have briefly discussed the difference in the processes, especially those regarding volume calculations, expressed by Ohio's comments. OSM made additional editorial and clarifying changes throughout the report based on OSM internal review comments.