



State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Solicitation

NUMBER

DEP16124

PAGE

1

ADDRESS CORRESPONDENCE TO ATTENTION OF:

FRANK WHITTAKER
304-558-2316

RFQ COPY

TYPE NAME/ADDRESS HERE

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ENVIRONMENTAL PROTECTION
DEPT. OF
OFFICE OF SPECIAL RECLAMATION
105 S. RAILROAD STREET
PHILIPPI, WV
26416-9998 304-457-3219

DATE PRINTED

07/29/2013

BID OPENING DATE:

08/07/2013

BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
ADDENDUM NO. 1						
THIS ADDENDUM IS ISSUED TO:						
1) PROVIDE THE ATTACHED ADDENDUM: ADDITIONAL TERMS & CONDITIONS.						
2) PROVIDE THE ATTACHED TECHNICAL QUESTIONS & ANSWERS.						
3) PROVIDE THE ATTACHED REVISED TECHNICAL SPECIFICATIONS.						
4) PROVIDE THE ATTACHED MANDATORY PRE-BID SIGN IN SHEETS.						
0001	1	JB		962-73		
RECLAMATION: RESTORATION OF WATER						

SIGNATURE

TELEPHONE

DATE

TITLE

FEIN

ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

SOLICITATION NUMBER: DEP16124

Addendum Number: 01

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

- ☐ Modify bid opening date and time
- ☒ Modify specifications of product or service being sought
- ☒ Attachment of vendor questions and responses
- ☒ Attachment of pre-bid sign-in sheet
- ☐ Correction of error
- ☒ Other

Description of Modification to Solicitation:

- 1) Provide Addendum: Additional Terms and Conditions.
- 2) Provide technical question and answers.
- 3) Provide the revised technical specifications including 12 drawings.
- 4) Provide the attached Mandatory Pre-Bid Sign in Sheets.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

ADDENDUM: ADDITIONAL TERMS AND CONDITIONS

Legislative acts passed in the 2013 session require inclusion of certain provisions in all state contracts. Accordingly, this addendum will add the provision listed below to the solicitation and resulting contract entered into between the State of West Virginia and the vendor. Anything contained in the current solicitation that conflicts with this provision shall be replaced with this provision listed below.

SUBCONTRACTOR LIST SUBMISSION: In accordance with W. Va. Code § 5-22-1, The apparent low bidder on a contract for the construction, alteration, decoration, painting or improvement of a new or existing building or structure valued at more than \$250,000.00 shall submit a list of all subcontractors who will perform more than \$25,000.00 of work on the project including labor and materials. This provision shall not apply to any other construction projects, such as highway, mine reclamation, water or sewer projects. Additionally, if no subcontractors who will perform more than \$25,000 of work are to be used to complete the project it will be noted on the subcontractor list.

a. Required Information. The subcontractor list shall contain the following information:

- i. Bidder's name
- ii. Name of each subcontractor
- iii. License numbers as required by W. Va. Code § 21-11-1 et. seq.
- iv. Notation that no subcontractor will be used to perform more than \$25,000 of work, when applicable.

b. Submission. The completed subcontractor list shall be provided to the Purchasing Division within one business day of the opening of bids for review. Failure to submit the subcontractor list within one business day after the deadline for submitting bids shall result in disqualification of the bid.

c. Substitution of Subcontractor. Written approval must be obtained from the State Spending Unit before any subcontractor substitution is permitted. Substitutions are not permitted unless:

- i. The subcontractor listed in the original bid has filed for bankruptcy;
- ii. The subcontractor in the original bid has been debarred or suspended; or
- iii. The contractor certifies in writing that the subcontractor listed in the original bill fails, is unable, or refuses to perform his subcontract.

**Addendum #1 - Questions During Pre-Bid Conference
For DEP 16124
Omega Mining Co., Inc.
Permit # D-79-82**

The following questions were identified at the Pre Bid Conference (PBC). The answers provided herein take precedence over verbal answers at the PBC should there be any conflicts between the two.

- 1.) Q. Does the project require a WVDOH Permit to upgrade the Access Road Entrance?
A. The contractor shall coordinate with the WVDOH on any required traffic control. The road already has an established access off of US Route 119 and does not require a permit.
- 2.) Q. Is removing the electric poles and wire incidental to Bid Item 26?
A. Yes, the poles and wiring shall remain property of the WVDEP. The wire shall be properly rolled and placed onsite at a location approved by the WVDEP. The electric poles shall be placed onsite at a location approved by the WVDEP. Pole transformers shall be placed at a location approved by the WVDEP.
- 3.) Q. Who is responsible for the conductors, conduit, transformers and wire from the point of connection to the treatment plant?
A. The contractor shall be responsible for conduit and transformer pad installation to the power company's specifications from the junction as designated on the plans to the facility. The contractor is responsible for all electrical components after the main step down transformer.
- 4.) Q. Does the power company need to be contacted for service to the site?
A. The WVDEP is making application to the power company locate the meter and ground transformer at facility. The contractor shall be responsible for conduit and transformer pad installation to the power company's specifications.
- 5.) Q. Who is responsible for sizing electrical components?
A. The contractor (The contractor's master electrician or electrical engineer)
- 6.) Q. What is the electrical service capacity to the site?
A. 12,470V, 3-Phase, 4-Wire, Y-Connect
- 7.) Q. What does the electrical service currently serve and will the same equipment be served or will there be new equipment?
A. Currently servicing a 50 hp sludge pump and office building. The site will have a new control building and equipment. The WVDEP has verified with Power Company that there is sufficient power to the site to operate the facility.
- 8.) Q. Will the new system have the same 50 hp motor and will there be more than 50 hp?
A. Refer to question and answer #8.
- 9.) Q. Is the contractor responsible for removing the sludge from the area for the geo tube dewatering pad and loading the sludge into trucks provided by the WVDEP?
A. Yes

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- 10.) Q. Do the electrical boxes need to be stainless steel?
A. There are different applications of the electrical boxes on the project. See Sections 12.54 and 12.47 for description of the type of electrical boxes.
- 11.) Q. Will sludge continue to be pumped to the sludge cells at the top of the hill?
A. Yes, until the existing sludge pump is taken out of service based on sequence of construction.
- 12.) Q. Are the sludge cells at the top of the hill going to be removed?
A. No
- 13.) Q. Does the 12,000 gallon anhydrous ammonia tank, which is being converted to a water storage tank, stay in the same location?
A. Yes
- 14.) Q. How is water supplied to the converted 12,000 gallon anhydrous ammonia tank?
A. Water shall be supplied by a water booster station withdrawing water from the final pond.
- 15.) Q. Is there water coming out of mine portals that require the dry seals?
A. No
- 16.) Q. Is there emergency power required and if so, what type of fuel is required?
A. Yes, LP operated backup generator per specification Section 12-77
- 17.) Q. Are there spare components or replacements parts to be supplied?
A. No, unless otherwise listed in the specifications
- 18.) Q. Any additional spare components to be supplied for the water booster station?
A. No
- 19.) Q. Is there enough electric capacity to operate the water booster station and the lime silo equipment?
A. Yes
- 20.) Q. Will there be a final cap placed on the new road?
A. Yes, see Plan Sheet 68 for road details. The details provide all the layers of the road.
- 21.) Q. Can the incidental stone be used to cap the new road?
A. No
- 22.) Q. Can we come and see the property?
A. Yes, arrange with staff member Scott McElwayne 304-203-4048 or Owen Mulkeen 304-203-7660
- 23.) Q. Will all of the bypass pipes be HDPE?
A. Yes

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- 24.) Q. Does WVDEP provide the aerator?
A. Yes, See Section 12-31 of the Specifications.
- 25.) Q. When pond liner is installed, will the water need to be diverted to the next pond?
A. Yes, it is up to the contractor to make those provisions.
- 26.) Q. Will the sludge pond water be relocated?
A. The water will be collected and sent to the treatment facility.
- 27.) Q. How is the sludge to be disposed?
A. The sludge should either be disposed of by means of a vacuum truck to a specified location, or trucked to an off-site location. WVDEP will provide trucking if the sludge cannot be transported by vacuum truck.
- 28.) Q. Is there a disposal area onsite for the cleaned out sludge?
A. No, not for sludge on site; some of the un-fit material will need to be taken to WVDEP disposal areas. Any material to be used as fill material must be pre-approved by the WVDEP to be placed onsite.
- 29.) Q. Do you have cross-sectional profiles on the roadway in the plans?
A. No, but AutoCAD drawings are provided if contractor possesses the means to have those generated.
- 30.) Q. Will the current access road be cut off?
A. The access road will be revised in accordance with the plans, and cut off near the new electrical tie-in location.
- 31.) Q. Is there buried electrical installed at this site?
A. Yes, electrical was installed to the first electrical pole; WVDEP will provide specifically electrical provision requirements. WVDEP will require electrical line to be marked every 100' with fiberglass markers.
- 32.) Q. Are you introducing new pipe for collection above the treatment facility?
A. No, connections are required to meet existing pipe.
- 33.) Q. Is the slurry line HDPE?
A. Specifically, the slurry line is a 1.0" diameter poly-flex line.
- 34.) Q. Is it up to the contractor to perform tank refurbishment?
A. Yes, both ammonia tanks shall be refurbished.

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- 35.) Q. Where is the specific 1380' elevation located?
A. Technical report will be provided in the addendum with this information; control points are included in the plans and AutoCAD Drawings. NOTE: Approximate location physically shown to pre-bid participants.
- 36.) Q. What line item does the final pond work fall under?
A. The final pond work falls under Pay Item 26.0 AMD Treatment Facility.
- 37.) Q. Where is the discharge to go when modifying final pond?
A. The contractor must install pipe in order to bypass to the local receiving stream during construction.
- 38.) Q. What is the size of the silo?
A. The size of the silo is 14' in diameter, approximately 59.60' of height, and a 100 ton capacity.
- 39.) Q. Does there need to be solid or fill material under the treatment facility foundation?
A. Unreinforced 2000 psi concrete shall be used under the concrete foundations; there are no exceptions.
- 40.) Q. Is the basis of the treatment facility design on the geotechnical report?
A. Yes, please refer to Section 19.0 of the Specifications.
- 41.) Q. If the geotechnical report is with error, and further depth is required, will the contractor be compensated for it?
A. The WVDEP is confident the report is correct. The slope of the bedrock based on the borings is consistent with the coal seam slope. The contractor shall be responsible for all excavation necessary to install footings on all structures as given in the plans based on the geotechnical report.
- 42.) Q. Will approved shop drawings be provided to the contractor for the silo, and if so, when?
A. Yes, generally, in less than three months.
- 43.) Q. Will approved shop drawings be provided to the contractor for the clarifier, and if so, when?
A. Yes, generally, a suggested time frame of 14 weeks from the supplier.
- 44.) Q. Are the manholes to be removed along the original AMD treatment line?
A. The manholes not listed for demolitions that are a part of the existing AMD collection line, and will no longer be in service at the end of the project shall either be removed off site or demolished and buried on site at an area designated by the WVDEP.
- 45.) Q. Does the collection ditch require half or open pipe?
A. Yes, on the new access road alignment, it gets cut all the way to the new plant pad location.
- 46.) Q. Will the pipe be in a casing when crossing the road?
A. No

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- 47.) Q. Does the access road require a combination of cut and fill?
A. Yes
- 48.) Q. How long is the access road out to the Marshall House location?
A. Approximately 3700' with a 2% grade.
- 49.) Q. Can the original AMD 12" collection pipe be removed; also, could it be reused?
A. Yes, it can be removed or left in place; it could also be reused for the 12" culvert.
- 50.) Q. Will the ditch need to be stoned when performing the punch mine access upgrade?
A. Yes, if needed, incidental stone can be used.
- 51.) Q. Do all of the clean outs get joined into the new ditch?
A. They get removed or knocked out while the new road is constructed; they can also be left as found if not impeded upon during road construction.
- 52.) Q. Can the Marshall House remnants be buried?
A. Yes
- 53.) Q. Do you have a list of suppliers that you accept; for example, on items such as the silo, etc.?
A. Yes, those gentlemen were on site today; for instance, a representative for the Smart Ditch item from HD Supply was present.
- 54.) Q. On the silo, do you have to use the supplier's silo, or can the contractor build his or her own?
A. Section 15.0 of the Specifications explains the criteria and protocol for the use of alternative equipment. The bid shall be based on equipment listed in the specifications. Alternative equipment can only be submitted for approval after the award of the bid.
- 55.) Q. Is there an equivalent specification to supplied items?
A. The steps that a contractor must take in order to establish and warrant an alternative are in Section 15.0 of the Project Specifications.
- 56.) Q. Is Frank Whitaker a part of the WVDEP?
A. No, Mr. Whitaker is a part of the West Virginia Purchasing Division in Charleston, WV; thus, all questions should be directed to the attention of the purchasing division after pre-bid conclusion.
- 57.) Q. Specification 12.57 main switchboard standards section 2.1C requires a 2000 amp switchboard. Contractor needs clarification that this is correct?
A. The site will not require a main switchboard and the Specification 12.57 shall be removed from the specifications. The contractor will be responsible for sizing a main distribution panel and subsequent panels for individual motor control panels and step down transformer to single phase for 240-120V service.

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- 58.) Q. Specifications 12.57 main switchboard standards section 2.1L request a Hoist System for pulling breakers. Contractor needs clarification that this is correct?
A. Specification 12.57 has been removed.
- 59.) Q. Plans call for contractor to bury electric in conduit and telephone in conduit. Does this site require a third conduit to be buried for communication, cable, internet services?
A. No
- 60.) Q. Contractor request what the maximum time the existing facility can be De-energized?
A. Once the primary treatment pond has been cleaned and construction on the treatment pad begins, power will not be required for treatment operations. The contractor may wish to maintain power service to the office for their use.
- 61.) Q. Contractor does not find any specification on Federal Aviation warning lights to be mounted on the top of the silo of the Treatment Facility; are these deemed NOT necessary?
A. There nothing at this time that indicates warnings lights are required. If warning lights become necessary, a change order will be issued at that time.
- 62.) Q. Contractor needs clarification on what size the Generator and Transfer Switch need to be specific to run the Treatment Facility?
A. Specification's Section 12-77 pages 1 & 4 provide sizing information for the Generator and Transfer Switch.

CLARIFICATION FOR SPECIFICATIONS: The attached specifications listed (Section 12-23, 12-26, 12-31, 12-33, 12-91, 17-0, 18-0, and revise Table of Contents removing Section 12-57) have been revised for this project.

CLARIFICATION FOR PLANS: The attached plans listed (Sheet 13A, Sheet 21R, Sheet 23R, Sheet 24R, Sheet 33R, Sheet 53R, Sheet 56R, Sheet 58R, Sheet 67R, Sheet 68R, Sheet 71R, and Sheet 72R) have been revised for this project.

CLARIFICATION: The lime silo location is not located where it was initially designed when core borings were taken. However, based on the Geo Technical Engineer, the new location has the same soil characteristics.

CLARIFICATION: The existing 6" HDPE pipe located between the office and the upper sludge cells may be used by the contractor. Fittings, valves, etc. must be used prior to using the pipe.

CLARIFICATION: Specification 12.57 Main Switchboard shall be removed from the specifications and will not be used in this project.

CLARIFICATION: The WVDEP shall approve final excavation elevations prior to placement of the concrete footings or structure for the Silo, Clarifier, and Mix Tank.

CLARIFICATION: The 30hp mixer for the sludge pond starter shall be a soft-start starter.

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CLARIFICATION: A detailed description for the exact operation of the control system will be given to the contractor at the after the bid has been awarded. A general description is provided as follows:

1. The 035 and 040 lime slurry feed rates shall be controlled by flow meters on their respective AMD source.
2. The system must have the ability to combine the AMD flow rates and control the slurry feed rate at the injection point on 040 AMD source. Note: Under this scenario, lime slurry will only be fed at the 040 injection point and NOT the 035 injection point.
3. The pH monitoring is strictly for monitoring purposes with no ability to control processes.
4. The progressive cavity pumps shall have two modes of operation (Hand or Automatic). In hand mode, the pump operates continuously. In automatic mode, the pump is controlled by a sludge level indicator located at the clarifier. The Sludge Level device shall have the ability to communicate with the progressive cavity pump controls (VFDs) and have adjustable on and off set points.
5. The non-potable water booster shall be controlled by a float system located in the non-potable water storage tank.
6. The polymer pump receptacle shall be energized when either sludge pump is operating.
7. A "Dummy" panel shall be located in the control building which duplicates the panel readout in the lime silo unit. Shall include but not limited to flows and pH readings.

CLARIFICATION: The plans originally indicate the underground power to the treatment plant was to originate at a power pole approximately 800' from the facility. The meter was to be located at the said power pole. The WVDEP has decided to request service from the local power company, which would move the electric metering location to the plant site. The contractor shall be responsible for installing the underground conduit from the power pole to the facility site and the transformer pad with required appurtenances. The installation of all conduit and transformer pad must meet power company installation specifications. The existing overhead power shall remain intact until such time as the new underground service is available and operational.

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18-0	LIME SYSTEM
19-0	GEOLOGICAL TECHNICAL REPORT

12.23 Center Flocculating Center-Feed Clarifier Mechanism

12.1 DESCRIPTION

Under this section, the Contractor shall furnish and install one Smith & Loveless clarifier as shown on the plans and hereinafter specified in a complete and operational system.

12.2 WORK INCLUDED

- Description
- Qualifications
- Submittals
- General
- Operating Conditions
- Construction
- Structural Members
- Drive Mechanism-
- Torque Tube and Scraper Arms
- Influent Feedwell
- Access Bridge
- Effluent Weirs
- Anchor Bolts
- Surface Preparation and Painting (Primer)
- Installation and Operating Instructions
- Start Up
- Guarantee

12.3 DESCRIPTION OF WORK

12.3.1 Provide all labor, material and equipment to furnish and install the circular scraper collector type clarifier.

12.3.2 This specification covers the general requirements for the design, fabrication and installation of one (1) clarifier.

12.3.3 The Equipment Manufacturer shall furnish the items listed below

- Clarifier drive mechanism complete with reducer, motor, and overload device
- Mixers with drive components
- Influent trough and supports

- Influent baffle
- Torque tube
- 90° Fiberglass weirs
- Access bridge including center platform, hand railing, and toe plate
- Pickets
- Associated attachment bolts and anchor bolts for above.
- Sludge collecting arms
- Operating instructions
- Start-up training

12.4 QUALIFICATIONS

12.4.1 Manufacturer

12.4.1.1 It is the intention of this specification to cover minimum acceptable quality for a complete installation with the exception of the motor controls, electrical work and piping requirements.

12.4.1.2 Part numbers or trade names are used in this specification only to facilitate the general configuration and description of the equipment desired and in no way implies that equal equipment of other manufacturers cannot be used. Products of other manufacturers will be considered in accordance with the Alternate Equipment section of this specification.

12.4.2 Manufacturer's Experience

12.4.2.1 The equipment Manufacturer shall have not less than five (5) successful years experience in the design, construction and operation of the type of specified at ten (10) different plants.

12.4.2.2 The Engineer may require evidence, in the form of operating records, from these plants to substantiate any claims concerning the ability of the equipment to perform as required.

12.4.3 Post Start-up Maintenance

12.4.3.1 The equipment manufacturer is required to have a factory authorized service representative located within a 100 mile radius of installation site. The representative shall be able to provide assistance such as trouble shooting, maintenance and/or repair of manufacturer supplied equipment with state of the art equipment 24 hours a day 7 days a week.

12.5 SUBMITTALS

12.5.1 Operating instructions, manuals and shop drawings shall be submitted in accordance with the Contract Specifications.

12.5.2 Alternate Equipment

12.5.2.1 If the Contractor desires to offer equipment as an alternate to the specified equipment, he shall submit, within 14 days after the bid opening, substantial descriptive information in order that the Engineer may determine if the proposed alternate is equal or superior quality to that specified.

12.5.2.2 No alternate will be considered unless, in the opinion of the Engineer, it conforms to the specifications in all respects except manufacturer and model and minor details. Material variances will not be allowed.

12.5.2.3 The Owner reserves the right to decide whether or not the proposed alternate will be acceptable.

12.5.3 The Contract, if awarded, will be on the basis of material and equipment specified without consideration of alternate equipment. In the event an alternate is allowed, the Contract price bid for Acid Mine Drainage Treatment Facility shall be full compensation for construction of the clarifier herein specified or approved alternative no adjustment will be made for the approved alternative regardless of the price.

12.5.3.1 By submitting a bid, the Contractor agrees and understands that Contract award will be made on the basis of the specified equipment.

12.5.3.2 If an alternate is found to be not acceptable, the Contractor shall be responsible for supplying the equipment specified.

12.5.4 Descriptive information shall include the following

12.5.4.1 List of ten (10) installations of equipment in successful operation of the design in all essential regards as specified.

12.5.4.2 Written certification that the proposed drive meets AGMA standards. Drive mechanisms calculations prepared by the manufacturer shall be submitted for approval along with published torque value of the proposed drive.

- 12.5.4.3 General arrangement of drive unit verifying AGMA torque, overload protection system, housing and gear materials and horsepower.
- 12.5.4.4 Complete test procedures for torque testing the collector mechanism for the AGMA torque specified.
- 12.5.4.5 Complete assembly drawing of the collector components giving
- 12.5.4.6 Type of material used for each component.
- 12.5.4.7 Dimension, thickness and weights of each component.

12.6 MATERIALS

- 12.6.1 The design and layout shown on the drawings are based on the manufacturer shown in the plans. If equipment other than that of the manufacturer shown is submitted to the Engineer for consideration as an equal, it shall be the responsibility of the Bidder wishing to make the substitution to submit with the request a revised drawing of the mechanical equipment and basin layouts acceptable to the Engineer. This revised drawing shall show the proposed location of the substitute unit, and area required for withdrawal space of replacement or serviceable components. This drawing shall also show clearances of adjacent equipment and service area required by that equipment.
- 12.6.2 Changes in architectural, structural, electrical, mechanical and plumbing requirements for the substitution shall be the responsibility of the Bidder wishing to make the substitution. This shall include the cost of redesign by affected designers. Any additional cost incurred by affected subcontractors shall be the responsibility of the Bidder and not the Owner.
- 12.6.3 The Contractor shall provide and install one (1) sludge collection mechanism as manufactured by Smith & Loveless, Inc., Lenexa, KS, U.S. or Engineer's approved equal.

12.7 OPERATING CONDITIONS

- 12.7.1 Hydraulics shall be designed to handle per basin:

	Max.
Influent Flow (GPM)	600

	Max.
Solids Loading(GPM/SF)	1.0

12.8 CONSTRUCTION

- 12.8.1** Furnish and deliver scraper type sludge collectors for installation in one (1) new concrete clarifier.

- 12.8.1.1** Tank inside diameter to be 35 feet.
- 12.8.1.2** Tank side water depth to be 15 feet.
- 12.8.1.3** Tank freeboard to be 1 ft. minimum.
- 12.8.1.4** Floor slope to be 1 inch per foot.

12.8.2 Clarifier

- 12.8.2.1** Bridge supported, center feed type with peripheral overflow.
- 12.8.2.2** Provide a center drive mechanism that supports and rotates a torque tube to which two (2) structural steel type scraper arms are attached.
- 12.8.2.3** Structural steel bridge shall span the tank diameter and shall support the entire collector mechanism.
- 12.8.2.4** Fabricated steel structures shall be shipped in the largest sub-assemblies permitted by carrier regulations, properly match marked and identified for ease of field erection.
- 12.8.2.5** Influent trough size 12" dia. X 12" depth.

12.9 STRUCTURAL MEMBERS

- 12.9.1** Structural steel to conform to ASTM A36.
- 12.9.2** Structural steel components shall have minimum thickness of 1/4" unless noted in the specification.
- 12.9.3** All welding to conform to American Welding Society Standard AWS D1.1. Structural support members shall be shop welded for bolted field assembly. A minimal amount of field welding shall be required.
- 12.9.4** Design components so that stresses developed do not exceed allowable stress, as

defined by current AISC standards when designed for the AGMA rated torque.

- 12.9.5** Panel lengths and member sizes shall be selected such that slenderness ratios do not exceed 200 for compression and 240 for tension. For strength, the controlling member force shall be used to determine member size.
- 12.9.6** Maximum deflection in a span under combined live and dead loads shall not exceed $L/360$.

12.10 DRIVE MECHANISM

- 12.10.1** The drive mechanism shall be designed for a rated torque of 10,000 foot-pounds. It shall consist of a primary gear motor and a secondary speed reducer. Power shall be transmitted from the primary to the secondary unit by means of a roller chain drive, which shall be enclosed for protection from the weather and for operator safety.
- 12.10.2** The torkmatic drive control shall be actuated by the torque bearing plate as it rotates and exerts its force against a calibrated compression spring. Spring deflection will be transmitted to the drive torque control through a lever and adjustable cam-type limit switch actuators. The lever shall also indicate relative torque load on a scale graduated from 0 to 100 percent.
- 12.10.3** The drive shall be equipped with two factory adjusted limit switches to sound an alarm and stop the drive motor at predetermined torque settings. All cams and switches shall be mounted in a weather-proof enclosure. Switches shall be rated for 10 amps at 125 volts.
- 12.10.4** The limit switches shall be set as follows:

12.10.4.1 Alarm at 100 percent of continuous torque	10,000 ft. - lbs.
12.10.4.2 Motor cut-out at 120%	12,000 ft. - lbs.
12.10.4.3 Also, 160% of torque indicator	16,000 ft. - lbs.

12.11 TORQUE TUBE AND SCRAPER ARMS

- 12.11.1** The steel torque tube shall be bolted to the final reduction gear and shall support two (2) structural steel rake arms.
- 12.11.2** Equip sludge collecting arms with scraper blades set and spaced to scrape settled sludge from the tank bottom to a sludge hopper located at the center of the tank. The collecting arms shall attach to and rotate by the torque tube.
- 12.11.3** Fabricate the collecting arms of structural steel with a minimum thickness of $\frac{1}{4}$ "

and adequately brace with struts.

- 12.11.4 Space blades so that the entire tank bottom is scraped twice for each revolution for the mechanism.
- 12.11.5 Provide adjustable spring brass squeegees, for all blades, that project 1½" below the bottom of the blade.
- 12.11.6 Provide vertical picket assembly for attachment to the scraper arms.
- 12.11.7 The torque tube shall be furnished in one piece.

12.12 INFLUENT TROUGH

- 12.12.1 The influent trough shall be fabricated from ¼" 316 stainless steel plate.
- 12.12.2 Support the influent trough from the Access Bridge and concrete side wall.
- 12.12.3 Influent trough shall be 12" W x 12" H.
- 12.12.4 The influent trough shall enter across the top of the tank, and shall direct the flow into the flocculation hood.

12.13 FLOCCULATION HOOD AND MIXERS

- 12.13.1 A flocculation hood of 15' diameter by 10.5 feet deep shall be fabricated from structural steel support members with fiberglass wall. The flocculation hood is supported from the access bridge and/or other structural supports provided the manufacturer. Port openings shall be provided at the water surface to direct any floating material out of the hood.
- 12.13.2 Two mixers shall be mounted on the access walkway with their impellers oriented in the flocculation well so as to provide gentle flocculation of the incoming process stream.
- 12.13.3 The drive mechanism shall be a worm gear drive utilizing bearings generously dimensioned spans to minimize shaft vibrations, deflections and hydraulically induced bending moments. Drywell construction shall be provided to eliminate lubricant leakage into the flocculation well. The motor shall be 2 horsepower, suitable for operation on 460 volt, 3 phase, 60 hertz current and suitable for operation with VFD's supplied by others for 10-1 turndown capability.

- 12.14.4** Each impeller shall be designed to provide flocculation within the well. Each impeller shall be statically balanced. Individual blades shall be bolted to a central hub to provide easy removal. The impeller assembly shall be attached to a solid shaft which yields low stress levels and low percentages of the first critical speed. Impeller and wetted part of shaft to be 316 stainless steel.

12.14 ACCESS BRIDGE

- 12.14.1** Provide a bridge, of wide flange beam construction, that spans the tank and is supported from the tank walls.
- 12.14.2** The bridge, consisting of two (2) structural steel members, shall be braced to assure rigidity.
- 12.14.3** Bridge to be designed for the dead load and a live load of 50#sq ft., with a deflection not exceeding 1/360 of the span.
- 12.14.4** Provide a 3' wide walkway of 1¼" x 3/16" aluminum grating extending over the entire bridge length.
- 12.14.5** Provide a 2-rail handrail consisting of 1½" diameter, Sch. 40 welded pipe for rails and posts.
- 12.14.6** Provide a 4" high toe plate along both sides of bridge and bridge extension.
- 12.14.7** Provide a minimum 8' x 8' platform to provide working clearance around the drive.

12.15 EFFLUENT WEIRS

- 12.15.1** Fabricate weirs from 3/16" thick x 9" fiberglass reinforced polyester resin laminate as per the drawing. Laminate shall contain ultra-violet inhibitors added to protect the laminate from sunlight.
- 12.15.2** Weir shall have 90°, 2.5 inch deep "V" notches spaced 6" on centers.
- 12.15.3** The weir sections shall be curved and fastened to the launder wall with special large washers, bolts and hex nuts to allow vertical adjustment. All fasteners shall be 316 stainless steel.

12.16 ANCHOR BOLTS

12.16.1 All equipment anchor bolts shall be Type 316 stainless steel.

12.16.2 Anchors shall be set by the General Contractor in accordance with the Manufacturer's instruction.

12.17 SURFACE PREPARATION AND PAINTING (PRIMER)

12.17.1 Submerged parts - A SSPS-SP10 - near white sandblast surface preparation followed by a TNEMEC 66-1211 primer, 3 to 5 mils thickness.

12.17.2 Above water parts - A SSPS-SP6 - commercial sandblast surface preparation followed by a TNEMEC 66-1211 primer, 3- 5 mils thickness.

12.18 EXECUTION

12.18.1 INSTALLATION AND OPERATING INSTRUCTIONS

12.18.1.1 The Manufacturer shall install the mechanical components of the clarifier as shown on the drawings.

12.18.1.2 Equipment shall be installed in accordance with GENERAL MECHANICAL REQUIREMENTS, and in accordance with the Manufacturer's recommendations to provide a complete installation.

12.18.1.3 The Contractor shall adjust for true plane of rotation and grout the floor in accordance with the Manufacturer's recommendation.

12.18.1.4 Wiring and conduits for electrical power, control and instruments shall be installed according to specifications listed in this section.

12.19 START UP

12.19.1 Torque Test

12.19.1.1 Test by anchoring both sludge collector arms.

12.19.1.2 Start collector drive to demonstrate the structure's ability to withstand loads resulting from at least 120% of Sludge Thickener drive design torque.

12.19.1.3 Demonstrate proper operation of high torque alarm and cut-off.

12.19.1.4 Repeat test to verify results.

12.19.2 Installation Assistance

12.19.2.1 Provide for installation assistance as required for the equipment supplied.

12.19.3 Operating Instructions and/or Operator Training

12.19.3.1 Provide for one (1) four (4) hour working period total to instruct plant Operators for the equipment supplied. The training period will be integrated by the Owner with overall training.

12.19.3.2 An additional one (1) trip not less than one-half day shall be provided for operation assistance of the equipment supplied.

12.20 GUARANTEE

12.20.1 The manufacturer of the clarifier shall guarantee for one year from date of start-up that the structure and all equipment he provides will be free from defects in material and workmanship. Warranties and guarantees of the suppliers of various component in lieu of a single source responsibility by the manufacturer will not be accepted. The manufacturer shall assume prime responsibility for the guarantee of the system and all components.

12.20.2 In the event a component fails to perform as specified or is proven defective in service during the guarantee period, the manufacturer shall repair or replace, at his discretion, such defective part. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the steel structure, compressor, receiver, and main piping manifold. After start-up service has been performed, the labor to replace accessory items, such as the belts, motors, etc., shall be the responsibility of the supplier or Contractor.

12.20.3 The repair or replacement of those items normally consumed in service, such as seals, grease, light bulbs, etc., shall be considered as part of routine maintenance and upkeep.

12.20.4 It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material, workmanship or delays in delivery, replacement or otherwise.

12.21 METHOD OF MEASUREMENT

- 12.21.1** The method of measurement for determining the quantity of clarifier as described above is to be included in the lump sum bid price for **Acid Mine Drainage Treatment Facility**, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

12.22 BASIS OF PAYMENT

- 12.22.1** The quantity of clarifier completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

12.23 PAY ITEM

- 12.23.1** "Acid Mine Drainage Treatment Facility", per lump sum.

END OF SECTION

12.26 GEOTUBE DEWATERING TUBES

PART 1 - GENERAL INFORMATION

1.1 Description

A. Scope. The work covered by this section consists of furnishing and installing seven (7) each measuring 45' diameter by minimum of 135' length geotextile tubes on the Geotube Concrete Slab for dewatering of water treatment sludge.

B. General. The Contractor shall furnish the Geotube dewatering tubes by positioning them as shown on the plans.

1.2 Quality Assurance

Manufacturer Qualifications. All Geotube dewatering tubes and ancillary products shall be the standard product of a manufacturer who has been regularly engaged in the integral design, manufacture, and fabrication of the products, and whose product has proven reliable in similar service for 5 years. The Geotube dewatering tubes manufacturer must be ISO 9001 certified and can provide a current ISO certification. The Geotube dewatering tubes manufacturer must have an internal testing lab that has a current A2LA accreditation.

1.3 Submittals

A. Plan of Construction

The contractor must submit prior to award of contract:

1. A detailed Plan of Construction. This plan shall include, but not be limited to, site plan, dewatering containment cell, Geotube dewatering tubes layout, etc.
2. A copy of the manufacturer's installation instructions detailed for this project.
3. A copy of the (RDT) Rapid Dewatering Test or (GDT) Geotube Dewatering Test report for the specific material to be dewatered.
4. Submit shop drawings of the materials, equipment, and method of installation details for the complete system.
5. Submit manufacturer's product literature and specifications for materials) utilized to construct Geotube dewatering tubes, including Filling Port details, connection details, site layout, piping, manifold, and related components.
6. Provide a mass balance of the pumping flow rates, chemical make-down, amount of dilution water, filtrate volume, density measurement, and percent solids — all integrated into a real time control system, showing a method of collection, and discharge point.
7. Details and layout of the dry or emulsion polymer make-down and metering system, if required.

B. Materials Certification

Submit a signed certification from the Geotube dewatering tubes manufacturer indicating that the materials utilized meet the project specification requirements and are designed specifically for this purpose. The manufacturer must be ISO 9001 certified and have an internal A2LA accredited laboratory.

1.4 Product Delivery, Handling, and Storage

A. Product Delivery

Geotube dewatering tubes and related components shall be delivered to the project site in a protective wrap or cover. Each tube shall be clearly labeled for easy identification. All Geotube dewatering tubes greater than 1,000 lbs. gross weight or to be installed in water shall be rolled on a steel pipe with the ends fitted with protective caps.

B. Product Handling

No hooks, tongs, or other sharp instruments shall be used for handling Geotube dewatering tubes. Also, the dewatering tubes should not be dragged along the ground. Geotube dewatering tubes should be unrolled into position as recommended by the manufacturer.

C. Product Storage

Geotube dewatering tubes shall be stored in areas where water cannot accumulate, elevated off of the ground, and protected from conditions that will affect its properties or performance. Geotube dewatering tubes should not be exposed to temperatures in excess of 180° F. Duration of storage time shall not exceed manufacturer's recommendation.

PART 2 - PRODUCTS

2.1 Geotube Dewatering Tubes

- A.** Geotube Dewatering Tube Material: The Geotube dewatering tubes material shall be fabricated from GT500, a "Specially Engineered Dewatering Textile" manufactured from high tenacity polypropylene multifilament and monofilament yarns, which are woven into a stable network such that the yarns retain their relative position. The Geotube dewatering tubes material shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.
- B.** The Geotube dewatering tubes shall be fabricated by sewing together mill widths of the GT500 woven engineered textile to form a tubular shape. The sewn seams shall be two parallel rows of 401 "lockstitch" with 3/8" to 1/2" spacing between rows. The sewing thread shall be multi-ply polyester.

- C. Geotube dewatering tubes 45 ft. or greater in circumference must be fabricated with the mill roll length of the GT500 woven engineered textile and the adjacent seams being in the circumferential direction with the closure of the Geotube dewatering tubes having a longitudinal seam on the bottom of the dewatering tubes. Each Geotube dewatering tubes shall be fabricated with one or more PVC filling ports located along the top centerline of the Geotube dewatering tubes. The filling port is comprised of approx. 1.5" thick (inside and outside) flange rings that sandwich the Geotube GT500 woven engineered textile between 1/8" thick rubber gaskets and secured with 3/4" bolts. The resulting connection strength exceeds that of a traditional sewn-in, textile filling port. In addition to the flanges, the fill port shall include a fabric sleeve that may be secured around the feed line to prevent leakage.
- D. PVC Fill Ports are for the attachment of the dredge or pump discharge line to the Geotube dewatering tubes and shall be located at intervals of no more that 100 feet, or as recommended by the manufacturer. Fill ports shall be ridged PVC with an inner port body and outer port body each comprising one or more cellular surfaces capable of distributing a force caused by the clamping of the inner port body and outer port body together with steel bolts and nuts. Fill ports shall be either 4" (GP4) or 8" (GP8) in diameter with a 30-inch long, flexible non-woven 8 oz. geotextile sleeve.
- E. "Specially Engineered Dewatering Textile" material and factory-sewn seams utilized in the construction of the Geotube dewatering tubes shall meet or exceed the values shown in Table 1.

Table 1:
GT500 Polypropylene - "Specially Engineered Dewatering Textile"

GT500 is composed of high-tenacity polypropylene yarns, which are woven into a stable network such that the yarns retain their relative position. GT500 is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Wide Width Tensile Strength (at ultimate)	ASTM D4595	kN/m (lbs/in)	78.8 (450)	109.4 (625)
Wide Width Tensile Elongation	ASTM D4595	%	20 (max.)	20 (max.)
Factory Seam Strength	ASTM D4884	kN/m (lbs/in)	70 (400)	
CBR Puncture Strength	ASTM D6241	N (lbs)	8900 (2000)	
Apparent Opening Size (AOS)	ASTM D4751	mm (U.S. Sieve)	0.43 (40)	
Water Flow Rate	ASTM D4491	l/min/m ² (gpm/ft ²)	813 (20)	
UV Resistance (% strength retained after 500 hrs)	ASTM D4355	%	80	

Filtration Properties	Test Method	Unit	Typical Value
Pore Size Distribution (O ₅₀)	ASTM D6767	Micron	80
Pore Size Distribution (O ₉₅)	ASTM D6767	Micron	195

Physical Properties	Test Method	Unit	Typical Value
Mass/Unit Area	ASTM D5261	g/m ² (oz/yd ²)	585 (17.3)
Thickness	ASTM D5199	mm (mils)	1.8 (70)

PRODUCT AND MANUFACTURER

Geotube dewatering tubes provided by: TenCate™
 3680 Mount Olive Road
 Commerce, GA 30529
 Phone: (706) 693-1897
 Fax: (706) 693-1896

Or: Engineer Approved Equal

PART 3 - PLAN OF CONSTRUCTION AND EXECUTION

Prior to performing any work, the contractor shall submit a "Plan of Construction" describing the sequences of operations for the installation of the Geotube dewatering tubes. The plan shall address site preparation, deployment, chemical/polymer selection, mixing, injection, and filling of the Geotube dewatering tubes. Anchoring or securing Geotube dewatering tubes using the white handling straps attached to dewatering tubes are not to be used during filling. Equipment used for these operations shall also be outlined.

3.1 Site Preparation

- A. Areas in which Geotube dewatering tubes are to be placed shall be constructed according to the lines and grades shown on the Drawings. Where such areas are below the allowable grades, they shall be brought to grade. All obstructions that could damage the Geotube dewatering tubes, such as roots and projecting stones, shall be removed. The site surface is best if it can be designed with a level grade 0° slope across the width of the Geotube dewatering tubes and a maximum slope positioning it on a prepared surface that is level across the width of the Geotube dewatering tubes with a maximum slope of 0.5% in the overall length direction of the Geotube dewatering tubes. This will require a drainage system such as an aggregate system on a sloped cover that drains to a sump or lower outlet, or a three-dimensional filtration fabric with a ditch system around the perimeter that allows the filtrate to flow unobstructed. It is preferred that the perimeter of the dewatering cell be complete with a 2 ft. high containment berm with 1:1 side slopes.
- B. The site must have an impervious surface or membrane placed on the prepared surface to underlay the entire Geotube dewatering site and to cover the perimeter containment berms.

- C. A drainage medium shall be required on top of the impervious membrane and under the Geotube dewatering tubes, as described in paragraph A. Acceptable materials would be Geotube Filtration Fabric (GFF) or sufficient washed crush stone to create voided area for drainage. If used, the three-dimensional, GFF shall be installed prior to placement of the Geotube dewatering tubes and may be installed in between each layer. The GFF provides drainage beneath the Geotube dewatering tubes for each layer especially when stacking.
- D. The impervious membrane shall have a thickness of at least 17 mils.
- E. The GFF must meet the specification shown in Table 2.
- F. Immediately prior to placing the Geotube dewatering tubes, the ENGINEER shall inspect the prepared area, and no dewatering tubes shall be placed thereon until the area has been favorably reviewed and approved by the engineer.

Table 2:
GFF – Geotube Filtration Fabric

Mechanical Properties	Test Method	Unit	Typical Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	kN (lbs)	1.891 (425)	1.558 (350)
Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	0.935 (210)	0.690 (155)
Puncture Strength	ASTM D 4833	kN (lbs)	0.734 (165)	
Mullen Burst Strength	ASTM D 3786	kPa (psi)	5511.112 (800)	
Air Flow	ASTM D 737	cfm	1300	
Thickness	ASTM D 5199	mm (mils)	4.826 (190)	

Physical Properties	Test Method	Unit	Typical Value
Weight	ASTM D 5261	g/m ² (oz/y ²)	342.390 (10.1)
Fiber Content			100% PP
Construction		EPI x PPI	26 x 18

GFF provided by:

TenCate
3680 Mount Olive Road
Commerce, GA 30529
Phone: (706) 693-1897
Fax: (706) 693-1896

Or: Engineer Approved Equal

3.2 Testing

Rapid Dewatering Test (RDT) or Geotube Dewatering Test (GDT) should be conducted to help determine proper drainage, volume reduction, and type and dosage of conditioners and or polymers. The RDT or GDT can assist in determining filtration rates that can be compared to full-scale material flow rates. Conditioner and/or polymer are generally used to achieve the desired rate of dewatering and the clarity and quality of the effluent water. The Project Engineer must approve the chemical program.

3.3 Placement of Geotube Dewatering Tubes

- A. The Geotube dewatering tubes shall be placed within the limits shown on the plans or drawings.
- B. The unrolled Geotube dewatering tubes should be placed on top of the drainage media and be unrolled down the length direction of the dewatering site, then unfolded if required.
- C. Fill ports should be located along the top, centerline of the unrolled Geotube dewatering tubes. The dimensions of the feed pipe and the opening of the ports should be measured prior to connecting the flanges.

3.4 Filling Process

- A. Following the tube placement, filling with materials from the source shall be accomplished in accordance with the approved Plan of Construction. The discharge line of the dredge or pump shall be fitted with a valve or manifold system to allow for control of the rate of filling or which Geotube dewatering tubes will be filled. The manifold system shall be fitted with an internal mechanism such as a pinch valve to allow the contractor to regulate the filling rate and pressure into the Geotube dewatering tubes. The manifold must also be fitted with a sampling port installed close to the first point of connection to the first Geotube dewatering tubes to enable the contractor to sample the material being pumped to insure the proper flocculation if conditioner and or polymer are being used. Any excess discharge shall be directed away from the tubes into a designated area. Before filling, the fill ports not being used for filling shall be closed according to the manufacturer's recommendations to prevent loss of material during filling of the Geotube dewatering tubes.
- B. The dredge or pump discharge pipe shall be free of protrusions that could tear the Geotube surface. The dredge or pump discharge pipe shall be supported in a manner which reduces stress on the PVC fill port. Excessive movement of the dredge or pump discharge pipe during filling can result in damage to the Geotube dewatering tubes or to the PVC fill port. The Connection Detail supplied by the manufacturer should be followed for the best method to affix the dredge or pump discharge pipe to the fill port. The dredge or pump discharge flow rate shall not change abruptly causing hydraulic pulse action in the tube that would temporarily exceed fabric maximum tensile force design.
- C. The Geotube dewatering tubes shall be filled as evenly as possible until the design height has been achieved. Effluent water shall be allowed to adequately drain away from the Geotube dewatering tubes.
- D. After the initial filling cycle, allow Geotube dewatering tubes to dewater, then the Geotube dewatering tubes may be filled again to the recommended height. This process can be repeated until the Geotube dewatering process is completed. Upon completion of filling the Geotube dewatering

tube, the Fill Port sleeves shall be closed by rolling the sleeve down to the top of the port flange and closing with a clamp.

- E. Geotube dewatering tubes recommended filling heights will be supplied by the manufacturer.
- F. Overall compliance with the manufacturer's installation instructions is required.

3.5 Manufacturer's Representative

A manufacturer's representative shall be present for the installation of the first Geotube dewatering tubes unless the contractor can prove adequate, successful experience with this technology, with the Project Engineer's approval.

3.6 Terminology

- A. **Geotube dewatering tube** - A large tube [greater than 7.5 ft. (2.3 m) in circumference] fabricated from high strength engineered textiles in lengths greater than 20 ft. (6.1 m). Geotube dewatering tubes are used for containment and dewatering of high moisture content sludge and other fine grain material. Also, Geotube dewatering tubes are used for coastal and riverine erosion control, and cores for marine structures such as sand dunes and levees. The tubes can also be filled by a combination mechanical and hydraulic method.
- B. **The Filling Port**, also known as "Injection Port", are PVC flanges which the inner port body and outer port body each comprise one or more cellular surfaces capable of distributing a force caused by the clamping of the two bodies together. Once bolted to the top of the Geotube dewatering tubes, the dredge or pump discharge line can be attached. Ports are typically 4 to 12 inches in diameter with a 3 to 5 feet long flexible sleeve attached. Ports are spaced along the top of the tube to provide access by the contractor. Spacing is usually between 50 and 100 ft. Additional ports may be added to accommodate high sand content slurry in dredged or pumped materials.
- C. **"Specially Engineered Dewatering Textile"** - A woven synthetic textile used to construct the Geotube dewatering tubes.
- D. **Polymers** - Polyacrylamide polymers can be non-ionic, anionic, or cationic.
- E. **Polymer Systems** - The components of the dry or emulsion system shall include as a minimum: polymer storage, metering pump, static mixer, calibration cylinder, flow control valve, and piping as required.
- F. **Flow, Percent Solids, and Density Measurement** - A flow meter and a density meter are required in order to pace the polymer with the pumping rate and the solids in the line. Ideally they should be paced electronically with the polymer system.
- G. **Bench-Scale** - Geotube Rapid Dewatering Test (RDT) is a fast and easy test to determine how well a particular sludge dewater through the GT500 textile. The test is designed to: evaluate the efficiency of the polymer, measure the volume of effluent filtered from the sludge, record the time of filtration, and analyze the quality of the effluent water.
- H. **Geotube Dewatering Test (GDT)** - is a demonstration of the methodology of the sludge dewatering by means of a Geotube dewatering tubes. The purpose of the test is to: visualize the dewatering

methodology, evaluate the efficiency of the selected polymer, analyze the clarity and quality of the effluent, and indicate achievable percent solids.

4.0 METHOD OF MEASUREMENT

The method of measurement for determining the quantity of Geotextile Tubes as described above is to be included in the lump sum bid price for **Acid Mine Drainage Treatment Facility**, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

A. BASIS OF PAYMENT

The quantity of Geotextile Tubes completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

B. PAY ITEM

"Acid Mine Drainage Treatment Facility", per lump sum.

End of Section

12.31 FLOATING AERATOR (GPE) **GOVERNMENT PROVIDED EQUIPMENT**

1.1 SUMMARY

A. SCOPE OF WORK

- 1) This specification defines an electric motor-driven propeller-type, horizontal, aspirating aerator. The aerator induces the flow of atmospheric air below the surface of the water and provides a complete mix system within the tank design. The aerator is mounted on a flotation assembly.
- 2) The aerator and flotation assemblies will be provided by the Owner to the contractor for assembly and installation.
- 3) The contractor shall provide all electrical wiring, conduit, and disconnects for the assemblies.

B. SYSTEM DESCRIPTION

- 1) The aerator shall consist of an electric motor drive above the water surface. The motor is connected to a hollow shaft within a protective housing positioned at an angle downward into the water, depending on minimum water depth.
- 2) The shaft shall be connected to and drive a propeller beneath the water surface. The propeller shall thrust water past a diffuser to induce a pressure differential, drawing air through intake holes above the water surface down through the rotating hollow shaft and diffuser into the water.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Aerator assembly is stored at a WVDEP treatment facility 6.8 miles North of Kingwood on State Route 26. It shall be the contractor's responsibility to transport the aerator assembly to the Omega Mining project.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. The equipment will be manufactured by Aeration Industries International, LLC ;

AERATOR: 1 each
Model number P28G5068A.
230 / 460 VAC

60 Hz, 3 Phase
 74.0 / 37.0 Amps
 TEFC Continuous Duty

FLOTATION ASSEMBLY: 1 each
 Three (3) molded, low-density polyethylene, closed cell foam filled pontoons
 Measurements not to exceed 11 feet long X 2.5 Feet wide X 2 feet high
 Galvanized Steel Rails and mounting hardware
 Floating Vortex Shield cabled to frame

Aeration Industries International, LLC
 4100 Peavey Road
 Chaska, MN 55318
 (952) 448-6789
 www.aireo2.com

2.2 AIRE-O₂[®] ASPIRATOR AERATOR COMPONENTS:

A. AERATOR DRIVE MOTOR

- 1) The IEEE 841 TEFC motors shall deliver 3 horsepower at 3600 RPM nominal and shall be rated for 230/460/480 volts, 60cycle, 3phase service. Motors shall be specifically designed for operating at an angle.
- 2) The motor shall be totally enclosed, fan cooled.
- 3) The motor shall, in all cases, equal or exceed current NEMA specifications.
- 4) The motor windings shall be nonhygroscopic.
- 5) Insulation shall equal or exceed NEMA Class F with Class B temperature rise.
- 6) A service factor of 1.15 shall be furnished.
- 7) A condensate drain shall be located at the lowest point in the lower end-bell housing.
- 8) A stainless steel nameplate shall be provided with each motor and shall be securely fastened thereto. Information shall include voltage, speed, phase, insulation class, amperage, service factor, wiring diagram, and motor serial number.
- 9) The motor shaft shall be balanced to within 1 mil to be measured on any part of the motor frame including the C-face.
- 10) The motor terminal box shall be firmly bolted to the motor frame at four points. The terminal box shall be sized to meet the NEMA standards.

- 11) The terminal box shall be drilled and tapped to receive one compression watertight fitting to accommodate the appropriate electrical service cables.
- 12) Complete internal rotating assembly and stator winding shall be epoxy coated to maximize corrosion protection of electrical components.
- 13) The motor must be supplied with premium insulation for extended life in harsh environments.
- 14) The motor must use thrust bearings. Conrad-type bearings are not acceptable.

B. MOUNTING FLANGE

- 1) The mounting flange shall be 316 stainless steel.

C. SHAFT/UNIVERSAL JOINT COUPLING

- 1) The shaft shall be 316 stainless steel, full-welded to a forged carbon steel universal joint coupling. The shaft must be hollow to promote maximum airflow and oxygen transfer. Units with solid shafts are not acceptable. This shaft shall be dynamically balanced. Units that utilize vibration dampeners to control fatigue stress failures due to vibration are not acceptable.
- 2) The universal joint coupling shall include a standard grease fitting for maintenance lubrication. Units that utilize flexible couplings to attach the shaft to the motor are not acceptable.
- 3) The shaft shall be stabilized by a replaceable water lubricated bearing located within one inch from the propeller hub.
- 4) Units supplied with couplings that require alignment are not acceptable.
- 5) Any shafts requiring factory replacement to validate warranty requirements are not acceptable.

D. HOUSING

- 1) The housing shall be 316 stainless steel, non-corrosive, and flanged for mounting to the aerator. The housing shall form a guard around the hollow shaft and support a field replaceable, water-lubricated bearing, press-fitted into the housing lower end. Water lubrication holes shall penetrate the housing in the area surrounding the bearing.

E. BEARING

- 1) The aerator shall be supplied with a field replaceable chemical resistant, water lubricated lower support bearing. The bearing shall be constructed of an appropriate

material for the application inside a fiber backing. The bearing shall be press-fitted into the housing to allow ease of replacement.

- 2) Units utilizing a cantilever design without a lower support bearing or re-greasable tapered roller bearings are not allowed.
- 1) Bearings requiring factory replacement to validate warranty requirements are not acceptable.

F. SLEEVE

- 1) The replaceable sleeve shall be the only moving part in contact with the bearing and shall spin with the shaft as one unit. The sleeve shall be solid and homogeneous. Units supplied without sleeves are not acceptable.

G. PROPELLER

- 1) The propeller shall be 316 stainless steel specifically designed to maximize oxygen transfer and mixing characteristics. Propellers shall be self-tightening such that the propeller threads tighten on the shaft threads during normal operation. The entire flow of aspirated air shall pass through the propeller via the hollow drive shaft along the axis of the propeller hub. Aluminum and standard marine type propellers are not acceptable.
- 2) The propeller design shall be tested in clean water and shown to draw a minimum of 85% of the recommended full motor amperage load at nameplate voltage and power factor.
- 3) The propeller shall be designed to allow easy removal in the field.

H. DIFFUSER

- 1) Aerator shall be equipped with a 316 stainless steel, self-tightening, diffuser threaded to the drive shaft. The aspirated air shall flow through the diffuser in one direction parallel with the axis of the diffuser. The entire flow of aspirated air shall exit at the diffuser opening.

I. VORTEX SHIELD

- 1) An Anti vortex shield shall be furnished with each unit to eliminate the formation of vortices, maximize shaft airflow, and prevent cavitation damage to the propeller during operation. Units without vortex shields are not acceptable.

J. WALL MOUNT

- 1) The aerators wall mount assemblies shall be constructed of 316 stainless steel structural members to prevent corrosion.
- 2) To allow for inspection by not removing the aerator, the wall mount assemblies shall be designed so the aerators may be pivoted out of the water to a horizontal position. Structural aluminum is not acceptable.

K. ELECTRICAL SERVICE CABLE

- 1) Cable shall be CSA/UL approved for severe environments, and shall be one continuous length.
- 2) The cable shall be jacketed, flexible stranded cable with individually wrapped conductors rated SEOOW or equal.

PART 3 EXECUTION

3.1 LOCATION, SUPPORT, AND MOORING

- A. The aerator placement, installation, and operation shall be per contract drawings.

3.2 FIELD SERVICES

- A. N/A

BASIS OF PAYMENT

The quantity of floating aerator completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

PAY ITEM

"Acid Mine Drainage Treatment Facility", per lump sum.

END OF SECTION

12.33 Progressive Cavity Pumps

1.0 GENERAL

1.0 SLUDGE PUMP

- 1) The Contractor shall furnish one (2) Progressive Cavity Pumps with variable frequency drive as described herein. The pump shall be capable of delivering 140 GPM at 75 psi. The pump shall be as manufactured by Liberty Process Equipment Inc., or approved equal.
- 2) The pump shall be sized as shown on the Plans and shall be supplied with a variable frequency controller.
- 3) The sludge pump shall be positive displacement progressing cavity and shall have a minimum of one stage. The pumps will be of the compact, close-coupled design. The gearbox shall be sized for a minimum service factor based on AGMA Specifications.
- 4) The pump will be designed to allow the suction port to rotate in 90 degree increments perpendicular to the pump centerline. Pump casting will be cast iron with cleanout ports on each side. The castings are to be free of sandholes, blow holes and other defects. A drain plug will be located in the suction casing.
- 5) Suction and discharge flanges shall be raised face 150 lb. flanges meeting ANSI B16.5 standards and casing shall be tapped to accept appropriate gages. The bearings shall be sized to provide a minimum service life of 50,000 hours when operating at the rated capacity and head.
- 6) The rotor shall be AISI D-6 tool steel machined and hardened to 62-64 HRc and treated for corrosion protection (316 stainless steel may be substituted for tool steel). Additionally, to prolong the service life, a non-porous coating, which diffuse deep into the base metal and is fissure free, will be applied. Chrome plating is not acceptable due to hydrogen embrittlement of hardened metals.
- 7) The stator shall be vulcanized in a metal tube and have a shore hardness of 70. The stator shall be Buna N and shall extend beyond the stator sleeve ends forming a collar to prevent the material from contacting the metal stator sleeve.
- 8) Additionally, the stator shall be designed that a bonded and split one piece adjustable sleeve can be fitted over the stator and tightened in an even manner so as to evenly clamp the stator and prolong stator life up to 300%.

- 9) The universal joints are to be of the type which uses an oversized hardened bolt and companion bushing assembly. These parts are to be hardened to 70 and 74 HRc correspondingly. The joint is so designed that only replacement of the bolts and bushings are required and not the drive shaft or coupling rod. The "U" joints are to be packed with high quality synthetic grease and will be protected by an elastomeric sleeve which is secured by two stainless steel bands. This positive seal prevents the ingress of liquid into the joint area. The "U" joint shall be further equipped with a stainless steel cover to encompass the joint and shall be guaranteed for 10,000 operating hours. Each joint is to be designed to transmit the maximum torque at the maximum speed and at the maximum pressure rating of the pump.
- 10) The pump shaft shall be manufactured of solid bar stock and shall be solid shaft design of chrome steel and shall be coated with a metalized surface that exceeds 75 HRc - chrome plating is not sufficient. Hollow drive shafts are not acceptable because of material settling in that area which affects rod movement and increases wear on bearing and joints.
- 11) The shaft will also incorporate a plug-in arrangement which expedites disassembly and eases maintenance. This design allows quick replacement of the rotating assembly through the gland area without disturbing the suction piping or pump driver. Disassembly shall be front-pull-out design, allowing rotor, both "U" joints and shaft to be removed as one unit.
- 12) The stuffing box shall be removable, should modification be desired. It shall be of sufficient size and design to incorporate packing with lubrication as specified.
- 13) To protect the pump from dry-run operation, a thermal sensor shall be installed in the stator sleeve which measures the temperature between rotor and stator and automatically shuts down the drive motor.
- 14) Materials of construction for the casing shall be cast iron and the shaft shall be chrome, surface coating shall be 80 HRc, and rotor shall be tool steel.
- 15) Maximum operating speed of the pump shall be 300 RPM. Minimum motor size shall be 7.5 HP, 3 pole design. Unit is to be operated by a variable frequency drive within a range of 50-60 Hz. Motor shall have Class F insulation and shall be protected from high temperature damage by PTC thermistors imbedded in each motor phase winding. Motor shall have a service factor of 1.15.
- 16) The pumps shall have hand-off-auto switch. Automatic mode the pumps shall operate from a 4-20MA signal from the Sludge Level Probe located at the clarifier.

- 17) The local panels with the VFDs and other necessary electrical components shall be located on the outside wall adjacent to the pumps

2.0 METHOD OF MEASUREMENT

The method of measurement for determining the quantity of Sludge Thickener Feed Pump as described above is to be included in the lump sum bid price for **Acid Mine Drainage Treatment Facility**, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

2.1 BASIS OF PAYMENT

The quantity of Progressive Cavity Pump completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

2.2 PAY ITEM

"Acid Mine Drainage Treatment Facility", per lump sum.

END OF SECTION

12.91 Fiberglass Metering Manhole

PART ONE - GENERAL INFORMATION

- 1.01 The Fiberglass Metering Manhole with a Palmer Bowlus Flume shall be a Virtual Polymer Compounds, LCC or equivalent. The manhole shall be a 48 inch diameter fiberglass reinforced vinyl ester composite metering manhole system that meets both the project specification and the standards established by ASTM D3753-81.
- 1.02 The Manhole shall include a 48inch hinged fiberglass top lid with stainless restraining chain or cable.
- 1.03 The Metering Manhole System will include a fiberglass 12 inch Palmer Bowlus flume for Outlet 040 and an 8 inch Palmer Bowlus flume for Outlet 035. The Flume will include an integral converging section end adapter terminating with a fiberglass pipe stub with the same diameter as the flume (12 inch and 8 inch). The Flume will also include a diverging section end adapter that will terminate with fiberglass pipe stub. Sections of the Flume and end adapters that extend beyond the Manhole will be covered with a core composite laminate that will meet the same load requirements as the manhole structure itself. Flumes must be integral to the manhole floor and body.
- 1.04 Fiberglass pipe stubs will be fitted with neoprene rubber slip over couplers. Couplers will be secured in place with stainless steel clamping rings.
- 1.05 The Manhole will be fitted with an 18" wide fiberglass ladder. The ladder will extend from the man way reducer to the top flange of the integral flume. The ladder will be attached to a fiberglass mounting bracket that is integral to the manhole. No penetration to the Manhole body will be required for ladder installation.
 - 1.05.01 The fiberglass ladder will meet all current OSHA requirements for ladders of this nature.
- 1.06 The Manhole will be fabricated with an integral fiberglass floor. The floor will be 1/2" thick laminate. The floor will extend beyond the manhole body to form a continuous base mounting flange.
- 1.07 The wall laminate is 1/2" thick. The glass reinforcing content of the laminate is a nominal 30%.
- 1.08 The outside Manhole body will be painted white. The interior surface of the manhole will be a smooth, resin rich finish.

- 1.09 A Confined Space Entry Warning Sign will be mounted to a removable secondary cover. This will provide warning and removal demonstrates acknowledgment prior to entry.
- 1.10 The surface of the Flume will be finished with a high grade vinyl ester chemical resistant resin.
- 1.11 The Flume is to include the following standard option(s)
 - 1.11.01 SS Ultrasonic Transducer Mounting Bracket.
 - 1.11.02 Fabricate with integral Staff Gauge graduated in feet and tenths of a foot.
 - 1.11.03 FRP Grating to cover flume.
- 1.12 The Manhole will be fabricated with two 2" diameter integral NPT couplings to be used as cable passes. The location of this coupling will be provided to the manufacturer by the Contractor prior to manhole fabrication.

PART TWO - MATERIALS

- 2.01 All interior surfaces of the Manhole will be smooth and free of surface defects.
- 2.02 Fiberglass laminate will include high grade vinyl ester resin and multiple layers of 1.5 ounce chopped strand mat.
- 2.03 Manhole ladder will be fabricated by the manufacturer and integral to the manhole.
- 2.04 The neoprene pipe coupling will be manufactured by Fernco Company.
 - 2.04.01 Couplers will accept a maximum of 5% deflection.
 - 2.04.02 The couplings will meet the following standards:

Tensile	ASTM D 412	1200psi 300% elongation
Hardness	ASTM D2240	Shore A 55min. 65max.
Compression	ASTM D 395	25% deflection
Tear Strength	ASTM D 624	125 lb./inc.
- 2.05 Structural Load rating of the manhole is to have a minimum dynamic-load rating of 16,000 lbf. when tested according to part 8.4.1 and 8.4.1.1 of ASTM 3753. The complete manhole will not leak, crack, or suffer other damage when loaded to 40,000 lbf. The unit will not deflect downward more that 0.25 inches when point loaded at 24,000 lbf.
 - 2.05.1 Sections of the Flume may extend beyond the manhole body. These sections of flume will be covered and sealed with a core

composite fiberglass cover. These covers will meet equivalent load ratings as those of the manhole body. They will be completely leak free and will deflect less than 0.125 inches at full load.

- 2.05.2 Typical flume cover laminate will include a 1/2" internal fiberglass skin (tension skin), a 2" thick - 8lb density foam core and a 1/2" external skin (compression skin).
- 2.06 The circular cylinder of the manhole will meet stiffness standard as defined by ASTM D 2412 with a value of 2.01 for a manhole length 3 to 20 feet.
- 2.07 All metallic hardware will be 316 Grade Stainless Steel.
- 2.08 The fiberglass laminate used for fabrication will have been tested and exhibit following properties at 1/8" laminate thickness.
- | | | |
|---------|-----------------------------------|------------|
| 2.08.01 | Specific Gravity | 1.20 |
| 2.08.02 | Percent of Glass | 30% |
| 2.08.03 | Flexural Strength (ASTM D790) | 11,300 psi |
| 2.08.04 | Flexural Modulus (ASTM D638) | 0.88 |
| 2.08.05 | Tensile Strength (ASTM D638) | 9,700 psi |
| 2.08.06 | Barcol Hardness (ASTM D25832) | 40 |
| 2.08.07 | Heat Distortion Temp. (ASTM D648) | 148(F) |
- 2.09 The Metering Manhole Structures will be fabricated according to ANSI/ASTM D-3753.
- 2.10 The Flume will meet the design standards for this type flume as published in US Department of Commerce publication PB-250 371 (Nov. 1975) and/or as established by industry standards and submitted herein.

PART THREE - INSTALLATION

- 3.01 The Metering Manhole System is to be installed in accordance with the installation recommendations provided by the Manhole Manufacturer. Deviation from these specifications must be approved in advance by the Engineer and the Manhole Manufacturer.

PART FOUR - METHOD OF MEASUREMENT

The method of measurement for determining the quantity of Fiberglass Metering Manhole as described above is to be included in the lump sum bid price for Acid Mine Drainage Treatment Facility, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools,

equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

4.01 BASIS OF PAYMENT

The quantity of Fiberglass Metering Manhole completed will be paid at the contract lump sum price bid for Acid Mine Drainage Treatment Facility. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

4.02 PAY ITEM

"Acid Mine Drainage Treatment Facility", per lump sum.

END OF SECTION

17-0 ADJUSTABLE FREQUENCY DRIVES

This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

The VFD package as specified herein shall be UL listed as a complete assembly and enclosed in an integrated UL type 1 enclosure, assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.

The keypad shall include Hand-Off Auto selections and manual speed control. The drive shall incorporate bumpless transfer of speed reference when switching between Hand and Auto modes. There shall be fault reset and Help buttons on the keypad. The Help button shall include on-line assistance for programming and troubleshooting.

There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

The VFDs shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide on command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.

The VFD shall have cooling fans that are designed for easy replacement. Operating temperature will be monitored and used to cycle the fans on and off as required. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).

The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

The overloading rating of the drive shall be 110% of its normal duty current rating for one (1) minute every ten (10) minutes, 130% overload for two (2) seconds. The minimum FLA

rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.

The VFD shall have an integral 5% impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC buss) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add AC line reactors.

The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOVs (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.

The VFD shall be capable of sensing a loss of load (broken belt/broken coupling) and signal the loss of load condition. Relay outputs shall include programmable time displays that will allow for drive acceleration from zero speed without signaling a false underload condition.

If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user.

The VFD shall have programmable Sleep and Wake up functions to allow the drive to be started and stopped from the level of process feedback signal.

All VFDs to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.
2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control.
3. Two (2) programmable analog inputs shall accept current or voltage signals.
4. Two (2) programmable analog outputs (0-20mA or 4-20mA).
5. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices.
6. Three (3) programmable digital Form-C relay outputs.
7. Seven (7) programmable preset speeds.
8. Two (2) independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.
9. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
10. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
11. The VFD shall include password protection against parameter changes.

The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values shall be capable of being displayed at all times.

The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Each individual drive shall have the protocol in the base VFD. All protocols shall be certified by the governing authority. Serial communications capabilities shall include, but not be limited to; run-stop control, speed set adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), percent torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output valves. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible. The following additional status indicates and settings shall be transmitted over the serial communications buss - keypad Hand or Auto selected, bypass selected, the ability to change the PID setpoint. A minimum of 15 field parameters shall be capable of being monitored. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any VFD function.

All VFDs shall include EMI/RFI filters. The onboard filters shall allow the VFD assemble to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level.

All VFDs through 50 HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad.

1.0 METHOD OF MEASUREMENT

The method of measurement for determining the quantity of Cast-in-Place Concrete as described above is to be included in the lump sum bid price for **Acid Mine Drainage Treatment Facility**, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

1.1 BASIS OF PAYMENT

The quantity of the Cast-in-Place Concrete completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the

final total contract amount or for any other cause.

1.2 PAY ITEM

“Acid Mine Treatment Facility”, per lump sum.

END OF SECTION

18.0 LIME SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. General provisions of the Contract, including the Agreement and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The work covered by this section shall consist of providing all labor, materials and equipment to furnish and install one 1 complete lime slurry systems for receiving, storage, mixing and feeding 35-40% HDLCH (High Density Liquid Calcium Hydroxide) slurry as specified herein and as shown on the drawings. The system shall be factory assembled, piped and wired as a complete package prior to shipping. Any component exceeding shipping restrictions may be shipped loose and field installed.
- B. The system includes Lime Hydrate Storage Silos, Bin Activators, Lime Feeders, Slurry Tanks and Mixers, Slurry Pumps and Delivery Systems, complete electrical controls and instrumentation, as described herein.
- C. All Lime System electrical equipment, except eyewash water heaters, shall be powered from the panels provided by the equipment manufacturer. External power cables shall be provided by the Contractor.
- D. The lime system supplier shall be responsible for the design and performance of the lime system and all its components. If the system, or any major component of it, is covered by U.S. Patent or Patents, and the manufacturer requires licensing of the equipment, the system supplier shall provide a License Agreement to the Owner at no additional charge.
- E. One System Supplier shall be responsible for furnishing the equipment of this Section and for coordination of design, assembly, testing, and installation.

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes:
 - 1. Uniform Building Code (IBC)
 - 2. National Electrical Code (NEC)
 - 3. NFPA (National Fire Protection Association)
 - 4. OSHA, Life-Safety
- B. The lime system and all supporting and ancillary structures shall be designed to include the following parameters: Occupancy Category: III, I: 1.25, Soil Site Class: D, Ss: 0.440, and S1: 0.140, and for items outdoors, wind load of 90 mph, I: 1.15, and Exposure: C. Design concentration roof load is 300 lbs. and roof uniform live load (snow) is 30 psf.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
1. Commercial Standards:
 - ASTM A 36 - Specification for Structural Steel
 - ASTM A 283 - Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
 - AISI 8620 - Alloy Steel, Hot Rolled and Cold Finished
 - AWS D1.1 - Structural Welding Code – Steel
 - ASTM A48 - Iron Castings
 - SSPC-SP No. 6 - Commercial Blast Cleaning
 - SSPC-SP No. 10 - Near-White Metal Blast
 - ANSI/ASME B20.1 - Safety Standards for Conveyors and Related Equipment
 2. System Supplier's Standards:
 - a. Conveyor Equipment System Suppliers Association (CEMA) standards
 - b. American Gear System Suppliers Association (AGMA) standards
 - c. Institute of Electrical and Electronics Engineers (IEEE) standards
 - d. National Electrical Manufacturers Association (NEMA)
 3. The following service factors shall be applied:

a. Pumps	1.5
b. Compressors	2.0
c. Mixers	1.25
 4. Bearings, unless otherwise noted or required, shall have a minimum L-10 of 5 years or 20,000 hours. Continuous service equipment units (pumps, mixers, etc.) shall have a bearing life of 60,000 hours (L-10).

1.5 SYSTEM DESCRIPTION

- A. Service Conditions
1. The lime feed systems shall be suitable for use in potable water treatment and designed to handle hydrated lime in conformance to AWWA B202. The lime silos will receive hydrated lime in bulk from self-unloading trucks equipped with pneumatic conveying equipment.
 2. The lime slurry tanks and feed system will be installed beneath the silo lime storage compartment as an integral part of the lime system. The silo will be free-standing, self-supporting and located outdoors.
 3. Water supply service to the lime slurry tank will be at 50° F to 65° F temperature.
- B. Sizing Criteria
1. Process Flow: The AMD treatment plant consists of a mixer, clarifier, and final pond with aggregate filter. The system flows vary from 5 GPM to 600 GPM, with a typical rate of 200 GPM. The system capacity is 6.0 MGD with both primaries in operation.
 2. Lime Dose: design Ca(OH)_2 dose is 0.9 g/L, with a range of 0.23 g/L to 1.13 g/L across the entire range of flows.
 3. The lime system maximum capacity is feeding 1,300 lbs/hr of hydrated lime to both primaries together.
 4. The lime system shall be capable of feeding lime at design dose at minimum flow through design dose at maximum flow.

5. The lime system (silo, lime feeder, slurry tank, and slurry pump) will have the ability to dose separate AMD sources at the same time.

1.6 SUBMITTALS

A. Submit for approval:

1. Submit Product Data to completely describe all proposed products, components, materials of construction, and accessories as to manufacturer, model, function, materials of construction, and installation and operation requirements.
2. Submit details of all components, accessories, layout dimension clearances for installation, operation, and maintenance. Include clear illustrations of NEC required clearances.
3. System process and instrumentation drawings illustrating, at a minimum, equipment items, instrumentation, controls, valves, PLC interfaces, piping (size and materials), flow directions, and clear delineation of items supplied by the system supplier.
4. Details of electrical grounding connections.
5. System with dimensioned locations of all anchors and details of each anchor showing, at a minimum, anchor type, diameter, length, and embedment. Plan shall indicate design foundation loads.
6. Dimensioned system general arrangement drawing illustrating lime storage, lime slurry tank, pumping equipment, and mezzanine, and stair tower, platforms and ladders.
7. Dimensioned lime distribution piping system layout drawing.
8. Lime storage volume calculations.
9. Equipment list including capacities, sizes, parts nomenclature, and materials of construction (including capacity calculations).
10. Detailed electrical wiring diagrams for power, instrumentation, controls, panel arrangement drawings, P&ID drawing for the entire system, drive and motor sizes and specifications.
11. Detailed, dimensioned, panel arrangement drawings.
12. Manufacturer's product data sheets for each component, including catalog cat sheets.

B. Within 30 days of Drawing approval, submit:

1. Ladder Logic for control of the lime system.
2. Submit a tags list (registers / data tables) for SCADA interface, listing the tag name (if applicable), I/O address, and I/O description for Submittal Review.
3. All anchors and anchors layout.
4. Sheet metal templates for the precise and accurate installation of cast-in anchors.
5. Detailed system installation manual (erection, adjustments, inspections, and testing).
6. Structural calculations for lime equipment and support structures sealed by a Registered Professional Engineer, licensed in the State of Missouri, for the record.
7. Recommended spare parts list with current pricing

C. Submit with the equipment:

1. Operations and Maintenance Manual including, at a minimum:
 - a. Complete system operating instructions
 - b. A complete, written control narrative, defining the functions and operating sequences and interlocks for all instruments, automated valves, analytical devices, and programmable logic controllers.
 - c. Troubleshooting guide
 - d. System supplier contact information (names, telephone, and fax numbers).
 - e. Recommended preventive maintenance program with schedule

f. Safety guide specific to this installation

D. Submit after acceptance of the system:

1. Documentation of system programming, on paper print-out and CD.
2. Certificate of Proper Installation and inspection, start-up, and acceptance test reports.

1.7 SERVICES OF SYSTEM SUPPLIER

- A. An authorized service representative of the System Supplier shall visit the site and provide the following services. A minimum of 8 days of field service shall be provided as described herein.
 1. Assistance with installation of the equipment: four (4) trips of two (2) days each.
 2. Inspection, checking, and adjusting the equipment: two (2) days.
 3. Startup and field testing for proper operation: four (4) days.
 4. Approximately 12 months after start-up, an additional field service trip consisting of two days on-site shall be provided to inspect the equipment and provide additional training.
- B. The authorized service representative shall also furnish training and instruction of the Owner's personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment for not less than two (2) day. Times indicated above are excluding travel time.
- C. The system supplier shall provide data sheets for the collection of data during the performance test (see Section 14-16).

1.8 QUALITY ASSURANCE

- A. The lime system and all related controls described in this section shall be the product of a single System Supplier qualified and experienced in the production of similar equipment. Manufacturers must have at least 10 years experience and at least 10 (ten) systems of like HDLCH, High Density Liquid Calcium Hydroxide in 37.5% slurry design. Alternate designs will not be considered. INSTALLATIONS FEEDING LIME DENSITIES OF LESS THAN 33% WILL NOT BE CONSIDERED ACCEPTABLE EXPERIENCE.
- B. The Lime System supplier will be responsible for the design and performance of the system and all components, including the lime distribution piping system.

1.9 REGULATORY REQUIREMENTS

- A. All equipment furnished under this division shall meet the requirements of the Federal Occupation Safety and Health Act of 1970 (OSHA) latest edition.
- B. The equipment, as designed and properly maintained shall prevent the release of exhaust air from the silo with particulate substances exceeding 0.15 grains per cubic meter for a normal truck unloading rate of 550 ACFM and an empty tank blow out rate of 1250 ACFM.

1.10 SPARE PARTS

- A. Furnish a complete set of spare parts according to the Standard Spare Parts List provided by the system supplier. Furnish any special tools required for system operation or maintenance.

1.11 WARRANTY

- A. Provide system supplier's standard one-year warranty against defects in materials and workmanship. Any such defects discovered and reported within the warranty period shall be repaired or replaced at no cost to the Owner. "Incidental" charges for warranty service such as shipping or travel are not acceptable.
- B. Provide a system supplier's special one-year performance warranty in which the system supplier guarantees the lime system will produce the design slurry concentration and deliver the design slurry flow to each feed point when operated under design conditions and per the system supplier's written instructions. The system supplier shall further warrant the slurry will be non-settling, non-scaling when operated per supplier's written instructions. The system supplier agrees to repair, modify, or replace equipment and correct, alter, or change the process to enable it to produce the design results at no cost to the Owner. Charges for labor, shipping, travel etc., associated with warranty service are not acceptable.
- C. The Warranty Period shall begin immediately after the successful completion of the Performance Test described in Section 14-16 of this specification .

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Base Bid: CONSECO Division of MERRICK Industries, Lynn Haven, Florida.
 - 2. Alternates: Others as approved in accordance with the Division 00 and Division 01 requirements.
- B. Design Criteria:

Hydrated lime	AWWA B-202 standard
Average bulk density	25 lb/cf (for silo volumetric design)
Average bulk density	40 lb/cf (for silo structural design)
Slurry Concentration	35% - 40%
Minimum usable storage capacity	5200 Cu. Ft. (each silo)
Wind Load	See paragraph 1.3
Uniform Roof live Load (snow)	See paragraph 1.3
Seismic	See paragraph 1.3
Diameter (maximum)	14 ft
Height to eve (maximum)	60 ft
- C. The HDLCH System shall be designed to receive granular lime hydrate delivered by bulk pneumatic trucks and shall store the lime in the new Storage Silo. The systems shall discharge the lime at a controlled rate without bridging, clogging or flooding of the Slurry Tanks. The HDLCH System shall control the addition of lime and water in order to provide a hydrated lime slurry at concentration and quantity specified in paragraph 1.5 B. The Slurry Tanks shall store the hydrated lime slurry for pumping by the lime slurry pumps.
- D. The Bulk Lime Hydrate Storage Silo shall be designed to store the volume of lime hydrate as specified. The System Supplier shall demonstrate by submission of calculations that the silo

meets the required capacity.

- E. The Slurry Tank shall provide sufficient capacity for safe operation at maximum projected lime delivery rates specified in paragraph 1.5 B. The System Supplier shall demonstrate by submission of calculations that the slurry tanks meet the required capacity.
- F. The Slurry Pump and Delivery System shall dose lime slurry to the process points at the rates as described in paragraph 1.5. B.
- G. The lime system shall provide for dust-free operation.

2.2 EQUIPMENT SCHEDULE

- A. Subject to compliance with the sizing criteria in Paragraph 1.5.B, provide the following:
 - 1. The storage silo shall be welded steel, skirted bulk lime silo designed in accord with EPA clean air standards, BOCA, ASTM, NEC, and NEMA standards.
 - 2. The silo shall be designed to provide two completely enclosed compartments, an upper compartment for hydrated lime storage, a lower compartment for housing the conical bottom section, bin activator, feeder, loss-in-weight scale, HDLCH slurry make up tank, feed pumps, controls, and valves. The silo shall conform to ASTM 36 construction, it shall be welded of mild steel plate with interior and exterior welds ground smooth, free of weld spatter prior to sandblast and prime. The plate thickness shall be determined by the manufacturer, as required for the storage capacity, size, material density, and seismic zone but shall be submitted for structural review prior to fabrication. The bottom of the silo shall be welded to the foundation on which it will rest. It shall also include grounding lugs per NFPA 780. Grounding rods and connections shall be provided by the installation Contractor.
 - 3. All material, general design, design loads, allowable stresses, joint design, shop fabrication, and field erection shall be in accordance with all the latest applicable local, state, or federal standards, codes, governing this type of construction. All welds shall provide dust and moisture tight joints. At the time shop drawings are submitted, the contractor shall submit to the Engineer a copy of the design for the silo and structural supports. Field welding when required shall be performed by a certified welder.
- B. Silo Accessories
 - 1. Lower equipment compartment:
 - a. Aluminum access doors in the skirt shall be located as shown on the drawings. The compartment door shall be 3' - 0" wide × 6' - 8" high double access type with hardware and locking device.
 - b. Eight (8) 100 watt incandescent vapor - tight lights
 - c. Dual socket 115 v utility outlet GFI type
 - d. 1600 cfm exhaust fan with thermostat control. The exhaust fan shall be located near the top of the compartment area
 - e. Automatic gravity type wall louver sized for exhaust fan and located near the floor of the compartment area.
 - f. 15 KW heater with thermostat control
 - g. Insulated walls with 1-inch thick ArmaFlex elastomeric insulation
 - h. Insulate under floor with spray on polyurethane foam
 - i. Air compressor and Receiver with integral pressure switch control
 - j. 2" Back flow preventer for each silo – reduced pressure zone (RPZ) type
 - k. 6" floor drain for slurry tank overflow
 - l. Electric tepid water heater and eye-washing station in each silo, with flow rate

- capacity and flow duration complying with ANSI Z-358.1 2004 requirements
- m. The floor of the silo is elevated off the silo foundation and sits on load cells. Mounting hardware for installation of a sealing skirt panel to seal off the space between silo's floor and concrete foundation shall be provided by the Manufacturer. The materials of the skirt panel and the sealing gasket shall be provided and installed by the Contractor.

C. Roof

1. The top of the silo shall be equipped with a toeboard and 1-1/4" aluminum handrailing around the silo periphery.
2. The silo roof must be provided with a 24" square manhole with an integral eight inch pressure/vacuum relief valve and a 34" x 54" square filter flange. The silo shall have one set of (4) lifting lugs.
3. Silo roof shall be coated with a non-skid surface.
4. Weatherproof dual 115V GFI utility outlet on roof

D. Access Ladder

1. Provide one access ladder. The single ladder shall provide an access to the silo roof by means of a bridge equipped with handrails and kickboards.
2. Access ladder with rest platforms and safety cages, shall be provided on the side of the silo. Ladder and cage shall be of 6061-T6 aluminum construction. All ladders, rest platforms, cages, railings and toeboards shall conform to the requirements of the federal occupational safety & health act of 1970.
3. The Access ladder shall have a rigid rail type fall prevention system attached to it. It shall include a rail and sleeve that can be removed and attached at each platform and shall provide a pivot dismount on the silo roof. Unit to be North safety Products "Saf-T-Climb".
4. The ladder cage will support an RF (SCADA) antenna (provided and installed by others) as shown on Drawings M-02 and M-04.
5. Support brackets for fill pipe and conduits shall be factory installed. All fasteners shall be Stainless steel.

E. Lightning Protection

1. Provide a lightning protection system in accordance with UL96A and NFPA 780 2008 edition of Lightning Protection Systems. The System will not be required to be site specific certified.
2. The Conductors shall be copper, sized as required and shall provide a path from each air terminal horizontally or downward to the connection to the ground rod terminals. Other materials shall be bronze or bronze-copper and listed for intended use. The contractor shall be responsible for providing and installing the down conductors.
3. Ground electrodes or grounding grid shall be provided and installed by the field contractor. Depending on site conditions there shall be at least one 5/8" x 120" buried ground electrode for each down conductor. The connection shall be via exothermic weld.

F. Level Switches

1. The silo shall be provided with (3) motor operated paddle-type level switches. High, High-High, and Low shall be mounted near the access ladder or landing platform in the straight wall for ease of service.
2. The level switches shall be interconnected to the truck unloading panel and the low level shall also be connected to the Operator Control Panel.

G. Silo Weigh System

1. The silo support system shall be furnished complete with weighing modules to provide weight indication for inventory control. Each weigh module shall include a sealed load cell, top and bottom mounting plates, suspension and anti-uplift restraints, and completely factory assembled and not requiring field adjustment of the assembly. The system shall be completely self-checking requiring no additional check rods, links or stays.
2. The Load cell shall be constructed of 17-4PH stainless steel. The top and bottom mounting plates shall be 304 stainless. Each cell shall be rated for 113,000 Lbs NTEP and factory wired to the terminal box.
3. The terminal box shall be rated NEMA 4X stainless steel with gasketed cover. The terminal box shall include a summing board with trimming pots for fine adjustment. The terminal shall provide a 4-20 Ma output to a remote weight indicator in the Silo.

2.3 PNEUMATIC TRUCK UNLOADING SYSTEM

A. Fill line

1. A pneumatic truck unloading system shall be included with the storage silo and shall be complete with a 4-inch Sch. 40 black steel fill pipe, pipe supports, long radius wearback 90-degree elbow, compression couplings, quick disconnect with position proof switch, and dust cap. The fill pipe shall terminate approximately 4 feet above the base of the silo. A 14-inch diameter target box with 4-inch Sch. 40 black steel pipe inlet stub, 6-inch diameter clean-out opening and flange gasket shall be provided. The target box and fill pipe shall be shipped loose. The fill pipe and pipe supports shall be prepared and painted in like manner as the silo.

B. Dust filter

1. The silo shall be equipped with a minimum 1250 cfm capacity bag-type dust filter mounted on the silo roof and designed to exhaust the conveying air while the silo is being filled. The dust filter shall be completely shop assembled and include filter bags, shaking mechanism, roof-mounted fan and drive, side access doors, and duct work from collector to fan. The dust filter shall be furnished with sufficient filter bags giving a total cloth area of 375 sq.ft. The dust filter shall be equipped with a 5 hp, 460 volt, 3 phase, 60 hertz, TEFC blower motor complete with damper assembly and bird and weatherproof exhaust hood. The bags are to be mechanically shaken by a 1/4 hp, 1800 rpm, 460 V, TEFC shaker motor.

C. Truck unloading and fill control panel

1. The truck fill control panel shall consist of the following:
 - a. A Nema 4 enclosure mounted firmly on the silo near the termination point of the lime silo fill pipe. All operators shall be Nema 4
 - b. A power on-off selector switch, Key operated
 - c. An auto-off-manual selector for Dust filter fan
 - d. An auto-off-manual selector for Dust filter shaker
 - e. Push button Alarm silence
 - f. Indicating lights for:
 - 1) Power "On"
 - 2) Dust filter fan "On"
 - 3) Dust filter shaker "On"
 - 4) Bin level "High"
 - g. An alarm horn mounted on the panel face.

- h. Motor starters to be provided within the lime silo control panel

D. Function

1. The Pneumatic truck unloading panel shall be prewired to function as follows:
 - a. With the dust filter fan and shaker selectors in the "auto" position the fan will start when the cap is removed by a limit switch on the end of the fill pipe. The fan shall run and the shaker shall be held off until the truck hose is disconnected and the cap is replaced.
 - b. When the truck hose is disconnected, the limit switch shall deactivate thus initiating shutdown sequence. The fan will continue to run 3 minutes before stopping. After the fan stops the dust filter shaker starts. The shaker running time shall be controlled by an adjustable timer.
 - c. If material in the bin reaches the high level indicator the "high" level light shall come on and the alarm horn shall sound.

E. Assembly

1. The truck fill panel ships detached from the lime station. The silo manufacturer shall be responsible for furnishing prefabricated mounting brackets for mounting the truck fill control panel on the silo near the end of the lime fill pipe. All wiring for the panel shall be completed by the silo manufacturer. Field wiring for remote items between the junction boxes and the panel shall be by the installing contractor.

2.4 LIME FEED SYSTEM

A. Bin activator

1. To assure uniform density and flow, a minimum 8-ft diameter bin activator constructed of carbon steel shall be connected to the silo discharge cone. The bin activator shall have a 3 hp, TEFC, 460 V - 3 ph - 60 Hz vibrator motor. Forged vibration isolator hangers, and integral baffle, mounting ring, hanger brackets, nordel beaded flexible sleeve with clamp retainer, 304 SS clamps, 3/16-inch wire clamping beads for the bin activator and mounting ring shall be included. Bin activator shall come complete with 10-inch diameter flanged outlet and maintenance type manually operated 10-inch diameter slide gate. The bin activator assembly shall be shipped premounted and wired.

B. Shut off Gate Valve and Operator

1. Provide a vortex clear action stainless steel knife gate with pneumatic operator. The operator shall include limit switches for position status indication and open close stops. The valve shall connect directly to the bin activator discharge.
2. An air compressor and receiver shall be located near the valve operator. The system shall be designed and sized by the manufacturer to provide sufficient air volume and pressure for quick opening and closing of the valve. The control shall be integrated into the batching operation of the make down system.

C. Lime feeder

1. The volumetric feeder shall be constructed with galvanized frame, painted steel housing, and a stainless steel helix and spout terminating above the slurry mix tank inlet and connected by a dust tight drop pipe. The feed screw shall be driven by a minimum of 1/2hp, DC, TEFC, variable speed motor, through oil lubricated gear reduction unit. The feeder shall start and stop from the plant run switch but shall operate automatically to batch the lime to the slurry tank as determined by the level sensors, pump feed rates in proportion to the make up water to maintain a 37.5% or operator selected concentration.

- D. Hoppering and support frame
1. There shall be furnished by the system manufacturer a structural steel support frame to support the feeder, hopper, and accessories. Provide a 10 cu.ft. vibrating densification hopper to bring the material to uniform bulk density. It shall include a bolted steel cover, inspection door, breather filter and 10-inch inlet nozzle. A 10-inch outlet with flexible connector shall be connected to the inlet of the variable speed volumetric screw feeder. The assembly shall be constructed of painted carbon steel and mounted on the maintenance and support platform.
- E. Weigh Deck
1. The support frame shall include a bolted painted steel scale base with leveling legs. The load cells shall be sealed against dirt and water and sized for the entire weight of the lime, hopper, feeder, support stand, receiver and connectors. The load cells shall be connected to the Scale.
- F. Loss-in-Weight Scale
1. Furnish a digital Loss-in-Weight scale capable of summing the weight of the lime transfer batches. The scale will include a 4-line LCD indicator in a remote Nema 4 housing. Powered by 120VAC the scale shall include an analog signal and alarm relay outputs.
- G. Maintenance and support
1. A structural platform with walkway and handrails shall be provided to support the feeder assembly above the slurry tank and provide for maintenance access to the back and sides of the dry feeder system. The assembly shall be constructed of painted carbon steel as shown.
- H. Slurry tank
1. The lime feeder shall be mounted adjacent to a slurry mix tank of 500-gallons or larger. The slurry tank shall be designed to maintain a 37.5% slurry concentration (or concentration selected by the operator) regardless of withdrawal rates. It shall be fabricated of reinforced heavy gauge epoxy coated carbon steel with bolted and gasketed cover. It shall include an access door, Ultrasonic level monitor, vent, and breather assembly, and a 1-1/2 hp flanged mounted, 460 V, 3-phase TEFC, Mixer, with stainless steel shafts and dual propellers.
- I. Fittings
1. Threaded connections shall be provided for 3-inch make-up water, 2-inch overflow, two, 2-inch slurry discharge, 4-inch drain, and piped as shown on the plans. A brass solenoid with 120 VAC coil shall be connected to the control panel to start and stop the make-up water. The water manifold shall include an inlet strainer, flow meter with programmable controller, 4-20ma output and a throttling control valve to adjust the water/slurry concentration.
- J. Ultrasonic Control
1. A Nema 4 ultrasonic level control shall provide Hi and Lo level alarms, operating levels, and 4-20ma output signal proportional to slurry tank levels to the system Logic controller.
- K. Silo Control system
1. The system shall include, mounted in the lower equipment chamber a prewired NEMA-4 control panel with main disconnect, NEMA rated starters, overload protection, pilot

lights and switches, for all motors, including, feeders, pumps, mixers, bin activator, dust collector, and ventilators. Main and branch circuit breakers for heaters, lights, receptacles, solenoids, level meters, feeders, heat tracing on lime slurry lines and all other electrical items within the silo. The internal wiring and terminations shall conform to NEC standard, latest addition. The panel shall include terminal for all remote connections. No more than (2) two wires shall be allowed per terminal. The Heater and ventilator shall be controlled by built-in thermostats.

2. The panel shall be equipped with a face mounted full function PLC to provide all Control logic and all necessary Inputs and Outputs. It shall pre-programmed and tested prior to shipment to assure that all components are operating as designed. The PLC shall be disconnected before shipment to protect it from damage in shipping or installation.
 3. Required PLC Inputs and Outputs: Each of the two PLCs shall be capable of communication via Ethernet over IP with the existing plant SCADA system (Intellution iFix). The PLCs shall communicate the following:
 - a. Status of each motor to the SCADA (running, not running, fault condition).
 - b. Slurry metering pump flow rates (in gpm) to the SCADA.
 - c. Silo levels to the SCADA.
 - d. Lime mass (tons) stored in each silo to the SCADA (from loads cells' signals).
 - e. Status of each silo level switch (when activated) to the SCADA.
 - f. Slurry tank levels to the SCADA.
 - g. Water flow rates to the slurry tanks (in gpm) to the SCADA.
 - h. All system alarms (individually) to the SCADA.
 - i. Receive a run permissive for each lime system from the SCADA (can also be set locally at the PLC panel).
 - j. Receive slurry metering pump rates (set point) from the SCADA (can also be set locally at the PLC panel).
 - k. Operator input and status signals (such as hand switches, selector switches, potentiometers, pilot lights, etc.) to the SCADA.
 - l. Pump selection to the SCADA.
 - m. Local / Remote (L/R) selector switch to allow the SCADA to control the metering pump flow rate and lime system run permissive when in Remote. Local position allows the operator to control the metering pump flow rate at the local PLC panel.
 - n. Watchdog timer to detect communications failures.
 - o. All current set points on silos PLCs to the SCADA.
 4. Submit a tags list (registers / data tables) for SCADA interface, listing the tagname (if applicable), I/O address, and I/O description for Submittal Review.
 5. Coordinate communications protocol, data table interface, and system tweaking with the System Integrator.
 6. In addition to the control panel, the manufacturer shall include:
 - a. Intermediate galvanized rigid steel conduit with wire and fittings between all equipment and junction boxes, light fixtures, and switches, convenience outlets, motors, level sensors, and truck fill panel.
 - b. Local disconnects for dust filter shaker and any other remote motor.
 - c. Local disconnect for dust filter
- L. Lime slurry feed pumps.
1. Provide three (3) pre mounted and pre-piped Verder model DURA 25 close coupled, vertical gear drive, Peristaltic type, heavy duty hose pumps in each train. Pumps shall be designed for pumping 37.5% lime slurries at the rate that covers dosage ranges and flows in Paragraph 1.5 B.

2. Pump rotor, shoes and hose shall operate in food grade Glycerin and the housing shall include a polycarbonate inspection window with a fluid level leak detection sensor to monitor high or low fluid levels.
3. The pumps shall be driven by a mechanical gear drive with a variable-speed motor. Maximum pump rpm shall be less than 100 rpm. The pumps shall be capable of running both forward and reverse. Motors shall be Inverter duty TEFC, 460 volt 3-phase 60 hertz. Local controls shall be mounted in the main control panel and provide for run status report back, Hand-off-auto and forward-reverse switching.
4. The pumps shall start and stop from the Manual ON and OFF switches, but shall also include a variable frequency drive to allow for automatic proportional operation from a 4-20 ma flow demand signal furnished from the plant SCADA or a set point provided by the Operator on plant PLC.
5. The pump shall include piping and ball valve type shut off valves for independent operation, Pressure gauge, and a high pressure cut out switch in the discharge line shall provide an alarm output.
6. The discharge manifold shall allow either pump to pump to either Outlet 035 or Outlet 040 and to allow one pump to split feed both sources if necessary.
7. Pumps shall be capable of dosing lime to each feed point over the full range of operations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Field erection and field installation of the required equipment shall in accordance with manufacturer's recommendations and as on the drawings. "Field requirements" shall include, but not be limited to, the following:
 1. The Lime system supplier shall furnish contractor with all anchor bolts and anchor layout. Contractor shall install anchor bolts in reinforced concrete foundation per the lime system manufacturers certified shop drawings.
 2. Set the silo unit on the foundation, grout and anchor.
 3. Install the dust filter on the silo roof. Caulk adapter flange and bolt on filter. Connect cord to roof junction box.
 4. Install roof handrail and toeboard
 5. Ladders and cages are factory assembled as practical, removed and shipped inside silo. The contractor shall remove and mount the ladders before setting the silo upright.
 6. Connect water supply and drain to silo unit
 7. Coordinate with electrical contractor, equipment terminal numbers, equipment location and operation
 8. Attach fill pipe and make electrical connections between limit switch on one end of fill pipe and the truck fill control panel
 9. After the silo is sitting on the foundation and leveled, remove the dummy load cells and install the live cells and run the cables to the summing box.
- B. Controls and Interfaces Wiring shall be provided by the Contractor.

3.2 SYSTEM PRE-WIRING AND TESTING

- A. After the system is factory wired the equipment is to be "dry run" at the factory to check wiring and component function. Motors are to be provided with direction arrows.

3.3 FINISHING

- A. All painting of silo, slurry tank and other equipment and associated silo appurtenances integral to the lime feeding system shall be done at the silo manufacturing site. Silo manufacturer shall provide touch up paint to the Contractor for field touch up.
- B. The exterior of the silo and interior of the equipment sections of the silo shall be sandblasted to SSPC SP6 and painted as follows:
 - 1. Interior and exterior prime: 1.8 to 2.2 mils D.F.T. Sherwood Williams Epoxy primer E61W284-3497- V66V282 (white)
 - 2. Interior finish equipment chamber: Epoxy Sherwood Williams B62 system 2 to 4 mils D.F.T. (grey)
 - 3. Exterior finish: Epoxy Sherwood Williams Polane Urethane 1.25 to 1.5 mils D.F.T. (white)
 - 4. The interior lime storage area does not require painting
- C. All shop fabricated items shall be provided with smooth ground welds, removal of weld spatter, SSPC-6 blast cleaning, 1 to 2.0 Mils dry, epoxoline primer and one coat finish epoxy prior to shipping.
- D. All purchased items shall be furnished with manufacturer's standard coating as designed for use in a water treatment facility. Touch up painting shall be done by the contractor as directed by the engineer.
- E. The Interior portion of the equipment chamber shall be insulated with hard backed 1-inch closed cell rubber. The insulation shall be taped and finished painted as an interior wall.

3.4 SPARES:

- A. Furnish Uninstalled:
 - 1. Feeder motor, and screw
 - 2. One complete slurry tank mixer
 - 3. Slurry pump Hoses and 4 gallons of pump lube
 - 4. Spares as required by Paragraph 1.10.A

3.5 INSTALLATION

- A. All sections and loose items shall be match-marked prior to shipping.
- B. Installation shall be in accordance with the System Supplier's installation requirements.

3.6 FIELD TESTS

- A. The equipment shall be field tested after installation to demonstrate satisfactory operation without causing excessive noise, vibration, and overheating. The field testing shall be performed by an experienced field representative of the System Supplier of each major item of equipment, who shall supervise the installation and shall certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation.

3.7 PERFORMANCE TEST

- A. The Lime Slurrying System shall be capable of running, fully automatic, and maintain a constant slurry concentration of a set point in the range 37.5% within 1% set point slurry concentration. The system shall be tested over a three (3) day period and shall meet the following criteria:
 - 1. The Lime Slurry System shall be run for 72 continuous hours without any adjustments made by operating personnel.
 - 2. During the 72 hours test, the final slurry concentration shall be within + or - 1% point of the set point.
- B. During the 72-hour performance test, samples shall be taken from each lime slurry feed point every 6 (six) hours. The samples shall be tested by the plant laboratory, for total solids concentration. All samples shall comply with the requirements listed herein.
- C. In the event the testing does not demonstrate acceptable performance, the Contractor shall be allowed to make revisions to the equipment and perform additional tests, at the Contractor's expense, until acceptable performance is verified.

4.0 METHOD OF MEASUREMENT

The method of measurement for determining the quantity of Lime System as described above is to be included in the lump sum bid price for **Acid Mine Drainage Treatment Facility**, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

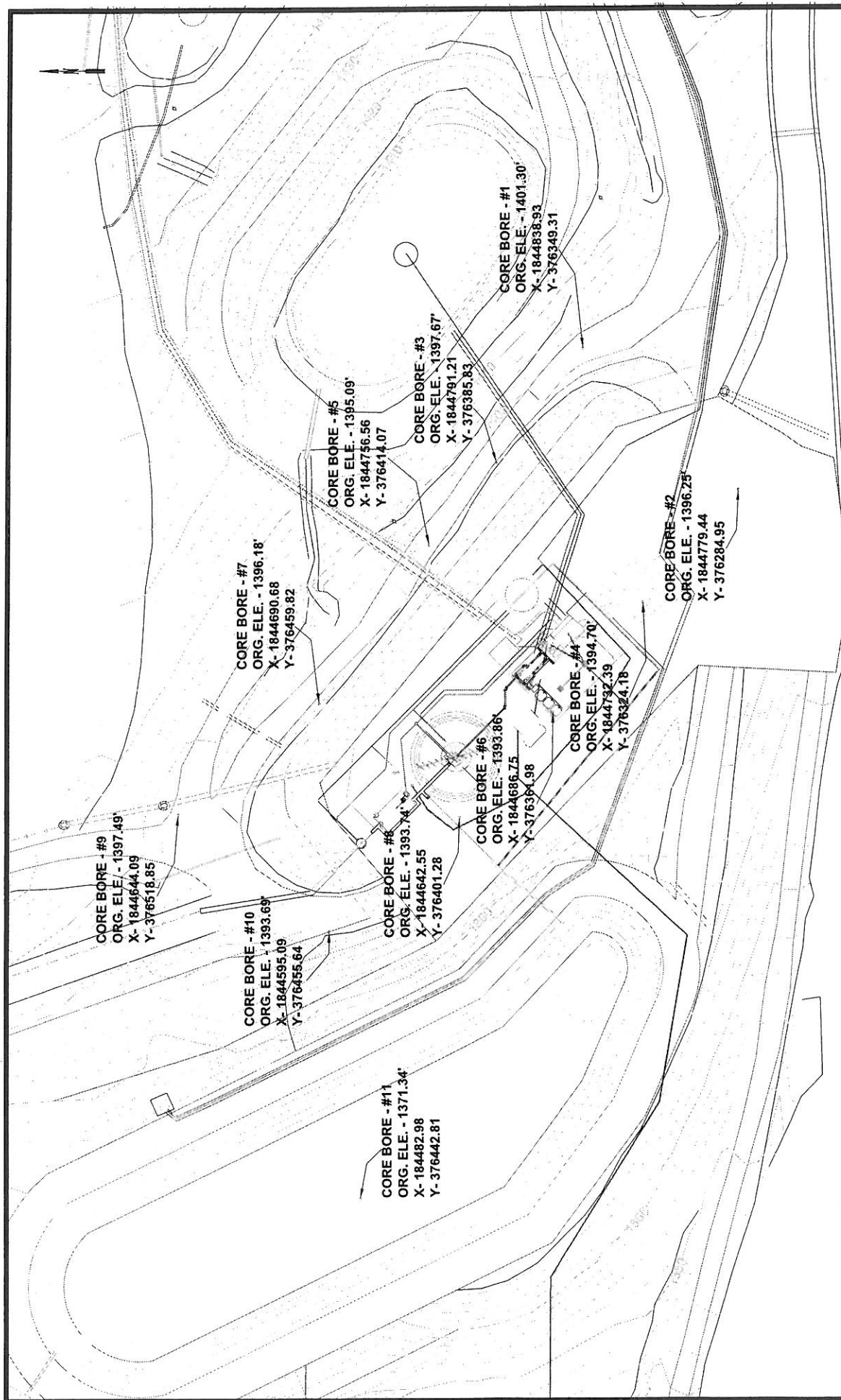
4.1 BASIS OF PAYMENT

The quantity of the Lime System completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

4.2 PAY ITEM

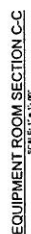
"Acid Mine Treatment Facility", per lump sum.

END OF SECTION



DEP CONTRACT NO. 16124 DESIGNED BY: LLR DRAWN BY: DBM CHECKED BY: DBM APPROVED BY: DBM		REVISIONS DATE: BY: / /		SHT. NO. 13A TOTAL 74	
OFFICE OF SPECIAL RECLAMATION 105 SOUTH RAILROAD STREET, SUITE 201 PHOENIX, ARIZONA 85004 PHONE: (602) 442-3219 FAX: (602) 442-3613		DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF LAND RESTORATION OFFICE OF SPECIAL RECLAMATION		CORE BORING LOCATIONS SCALE: NTS DATE: MAY 2013	





SHT. NO.	21R
TOTAL	74

LIME SILO EQUIPMENT ROOM
SECTIONS B-B & C-C

DATE: MAY 2013

**OMEGA MINING INC.
PERMIT D-79-82
DEP 16124**

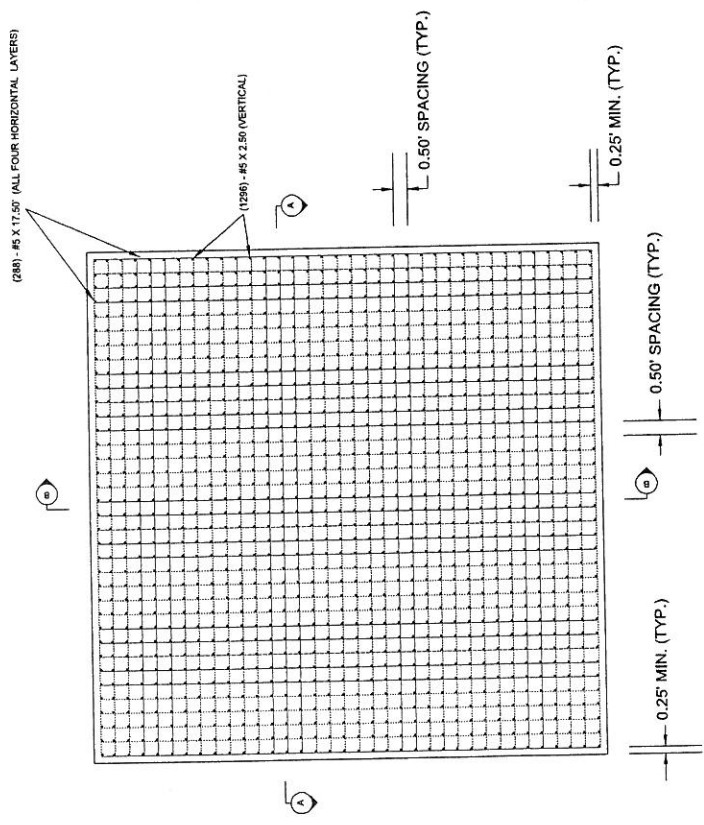
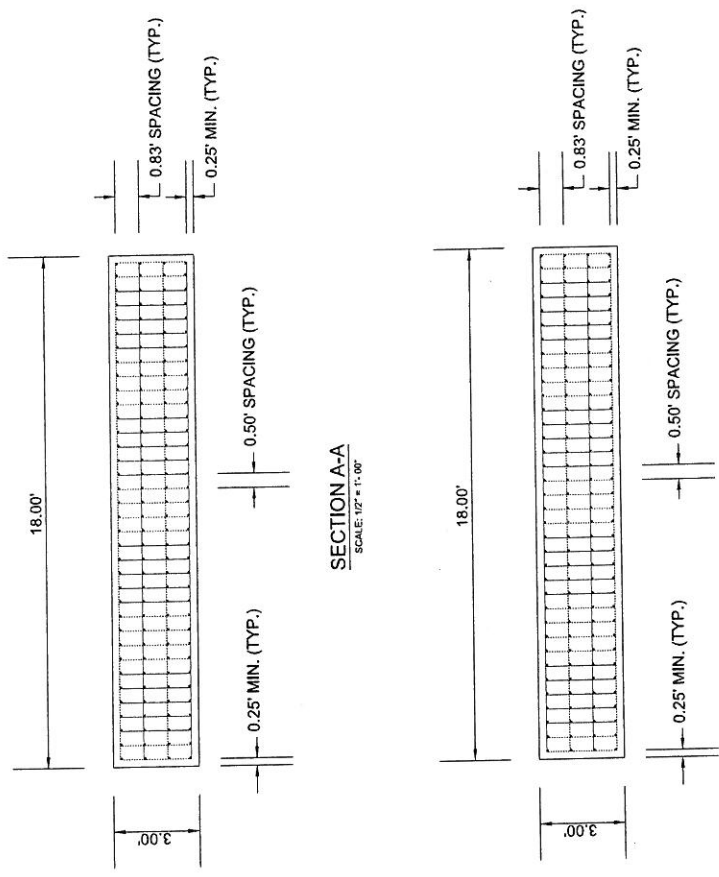
DEP-16124
MONONGALIA COUNTY, WEST VIRGINIA

REVISIONS	
DATE:	BY:
July 2013	LLR


 DEPARTMENT OF THE ENVIRONMENT
 Division of Land Restoration
 Office of Special Investigations

DESIGNED BY:	LLR
DRAWN BY:	LLR
CHECKED BY:	DBM

OFFICE OF SPECIAL RECLAMATION
105 SOUTH RAILROAD STREET, SUITE 301
PHILIPPI, WEST VIRGINIA 26416
OFFICE: 1-304-457-3219
FAX: 1-304-457-5813



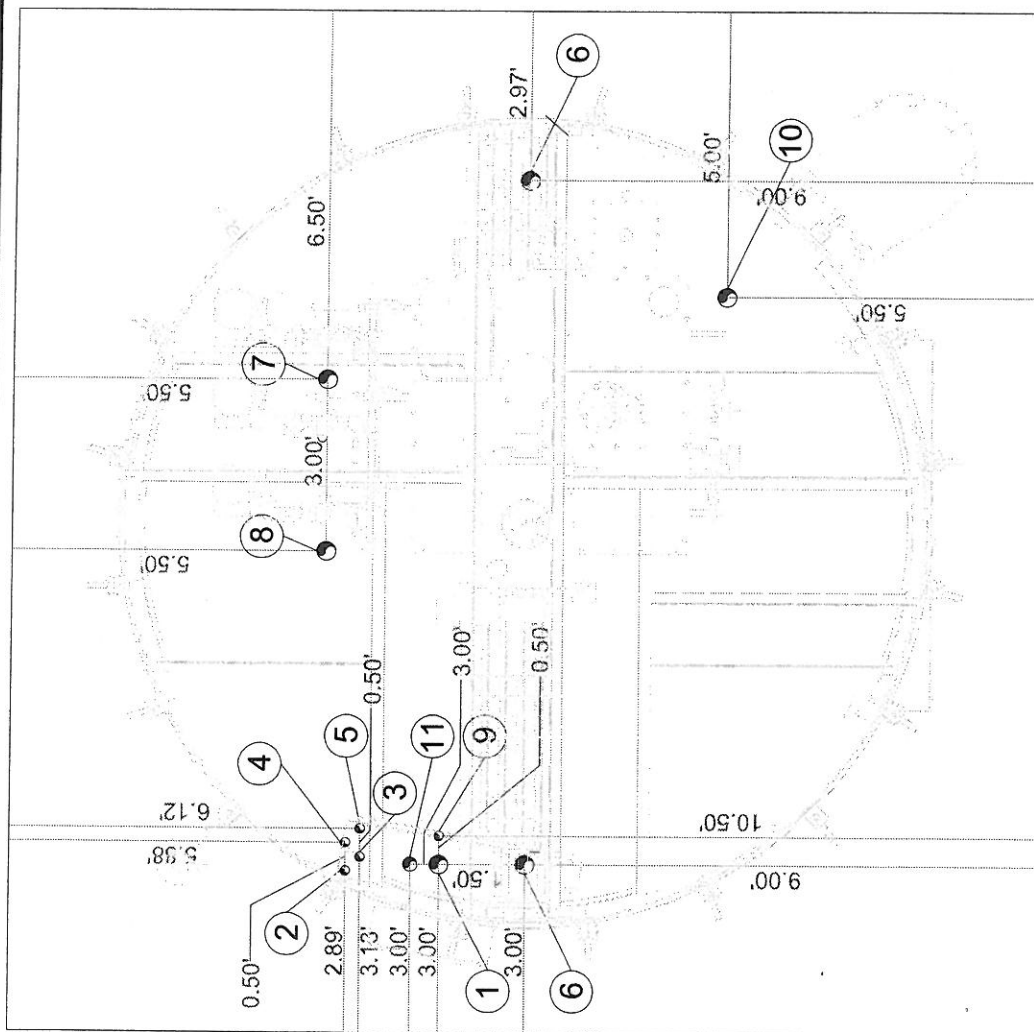
DEF CONTRACT NO. 16124 DESIGNED BY: LLR DRAWN BY: LLR CHECKED BY: DBM APPROVED BY: DBM		REVISIONS DATE BY JUL 2013 LLR		OMEGA MINING INC. PERMIT D-79-82 DEP 16124 MONONGALIA COUNTY, WEST VIRGINIA		LIME SILO PAD STRUCTURAL DETAIL SCALE: AS SHOWN DATE: MAY 2013		SHT. NO. 23R TOTAL 74
--	--	--------------------------------------	--	--	--	---	--	--------------------------------

NOTES:

1. ALL 90° ELBOWS SHALL BE LONG RADIUS TYPE. THE HDPE CONDUIT SHALL NOT REQUIRE AN ELBOW.
2. ALL CONDUITS SHALL TERMINATE AT THE PAD GRADE LEVEL WITH A FEMALE GLUE CONNECTION AVAILABLE FOR EXTENDING THE CONDUIT. THIS IS NOT INCLUSIVE OF THE NON-POTABLE WATER CONDUIT.
3. ALL CONDUITS SHALL BE SEALED BY USING A MINIMUM OF TWO LAYERS OF DUCT TAPE.
4. ALL CONDUITS SHALL EXTEND THROUGH THE FOUNDATION IN A MANOR AS WHERE NO REINFORCEMENT STEEL NEEDS CUT OR RELOCATED.
5. ALL CONDUITS NOT EXTENDING FROM THE SILO TO THE FINAL LOCATION, MUST EXTEND A MINIMUM OF 3-FEET FROM THE SILO PAD AND SEALED WITH A MINIMUM OF TWO LAYERS OF DUCT TAPE.
6. SEE TREATMENT FACILITY PLAN VIEW FOR PROPER ORIENTATION OF THE SILO.
7. PRIOR TO ORDERING SILO FROM MANUFACTURER, THE CONTRACTOR MUST HAVE WVDEP APPROVAL OF THE LOCATION OF ALL EXTERNAL SILO COMPONENT

CONDUIT LEGEND

#	DESCRIPTION	CONDUIT SIZE	CONDUIT TYPE
1	MAIN POWER	4-INCH	SCH 80
2	040 FLOW METER POWER	2-INCH	SCH 80
3	040 FLOW METER CONTROL	2-INCH	SCH 80
4	035 FLOW METER POWER	2-INCH	SCH 80
5	035 FLOW METER CONTROL	2-INCH	SCH 80
6	DRAIN	4-INCH	SCH 40
7	040 LIME SLURRY FEED	4-INCH	SCH 40
8	035 LIME SLURRY FEED	4-INCH	SCH 40
9	CONTROL TO BUILDING	2-INCH	SCH 80
10	NON-POTABLE WATER	4-INCH	HDPE SDR 17
11	SPARE TO BUILDING	3-INCH	SCH 80



CONDUIT LAYOUT

SCALE: 1" = 1'- 00"

OMEGA MINING INC.
PERMIT D-79-82
DEP 16124
 MONONGALIA COUNTY, WEST VIRGINIA

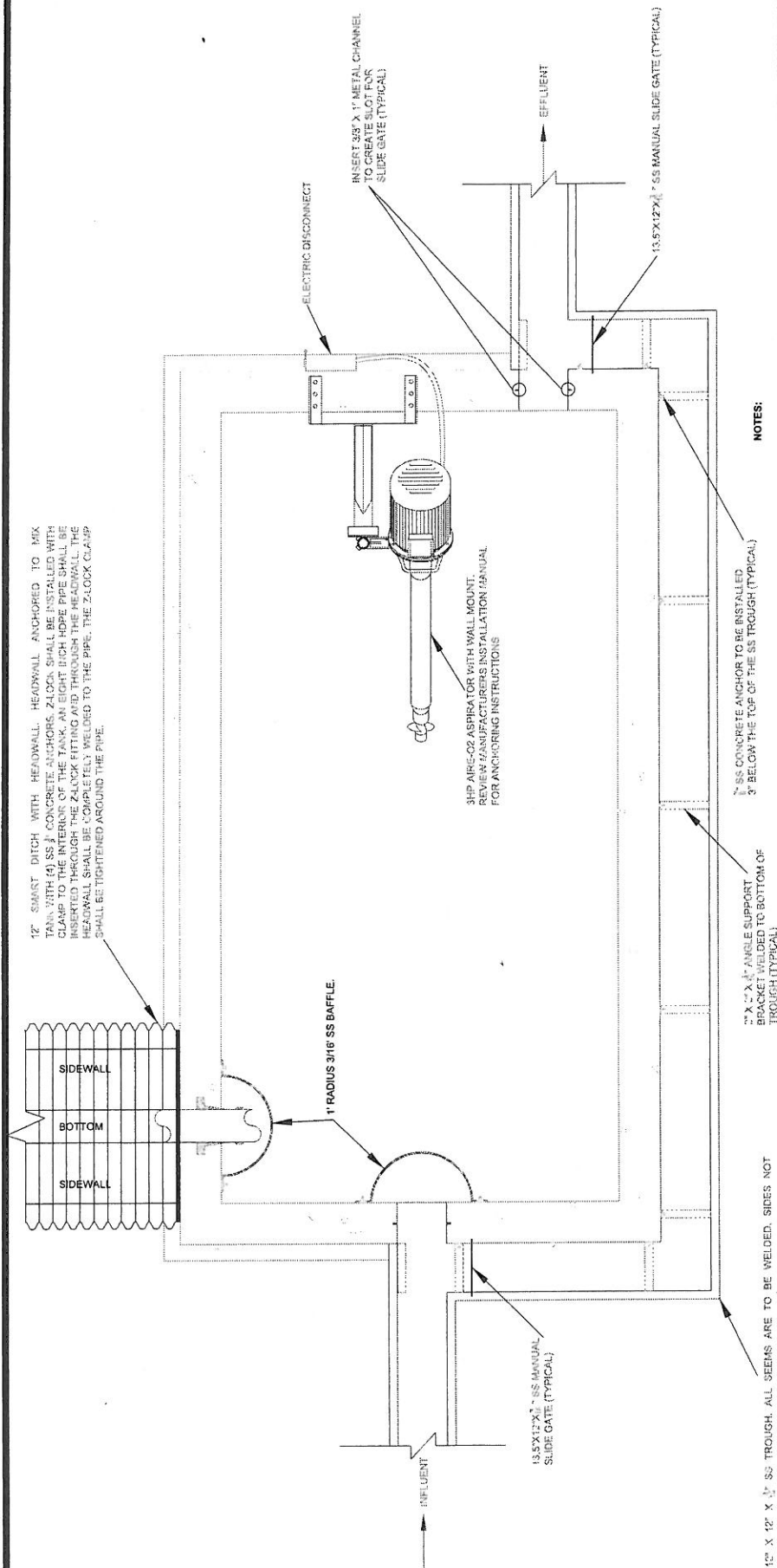
REVISIONS	DATE	BY	CHK
1	JUN 2013	LLR	Y

DEP CONTRACT NO. 16124	DESIGNED BY: LLR	CHECKED BY: DRM	APPROVED BY: DRM
DRAWN BY: LLR	CHECKED BY: DRM	APPROVED BY: DRM	

OFFICE OF SPECIAL RECLAMATION
 100 WEST VIRGINIA AVENUE, SUITE 301
 PHILADELPHIA, WEST VIRGINIA 26401
 PHONE: 304-457-5611
 FAX: 304-457-5613

SHT. NO.	24R
TOTAL	74

LIME SILO PAD
 CONDUIT LAYOUT
 SCALE: AS SHOWN
 DATE: MAY 2013



12" X 12" X $\frac{1}{4}$ " SS TROUGH. ALL SEAMS ARE TO BE WELDED. SIDES NOT ANCHORED TO THE WALL SHALL HAVE A 15° X 1.5" $\frac{1}{8}$ " ANGLE WELDED TO THE TOP OF THE TROUGH ON THE OPPOSITE SIDE. THE TROUGH SHALL BE ANCHORED TO THE WALL BY $\frac{1}{2}$ " SS ANCHORS WHERE SHOWN ON THE PLAN VIEW. AN ANGLE SUPPORT (SEE DETAIL) SHALL BE PLACED AS DEPICTED ON THE DRAWING.


BRACKET WELDED TO BOTTOM OF
3" X 4" X 1/4" ANGLE SUPPORT
2" BELOW THE TOP OF THE SS TROUGH (TYPICAL)

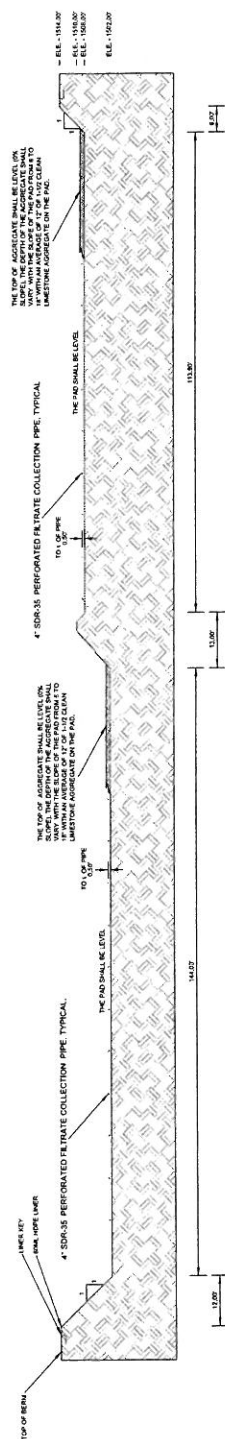
NOTES:

1. THE MIX TANK IS DESIGNED AS A PRECAST TANK. THE CONTRACTOR MAY CHOOSE TO CAST IN PLACE THE MIX TANK, BUT IS RESPONSIBLE FOR PROVIDING TO THE WDEP A STRUCTURAL STEEL REINFORCEMENT DETAIL TO BE APPROVED BY WDEP PRIOR TO CONSTRUCTION OF THE TANK.
2. THE PRECAST MANUFACTURER IS RESPONSIBLE FOR THE DESIGN OF THE STRUCTURAL STEEL REINFORCEMENT.
3. THE 24000 FLEXIBLE SLEEVE SHALL BE CAST INTO THE MIX TANK.
4. THE PRECAST SECTIONS SHALL BE HANDLED BY INSERTS OR OTHER MEANS WHICH WILL PERMIT THEM TO BE LIFTED AND TRANSPORTED WITHOUT INCURRING CRACKING AND SPLITTING.
5. THE PRECAST SECTIONS SHALL REACH A MINIMUM COMPRESSION STRENGTH OF 2500 PSI AFTER 24 HOURS AND HAVE A MINIMUM COMPRESSION STRENGTH OF 5000 PSI AFTER 30 DAYS.
6. THE CONCRETE SHALL HAVE A COMPLETE BOND TO THE REINFORCEMENT.
7. THE MANUFACTURER SHALL USE PORTLAND TYPE II CEMENT.
8. THE MANUFACTURER SHALL USE XPEC 07160 CEMENTITIOUS CRYSTALLINE OR EQUIVALENT ADDITIVE.
9. MINIMUM CLEARANCE OF #5 OR SMALLER REINFORCING BARS IS 1.5 INCHES.

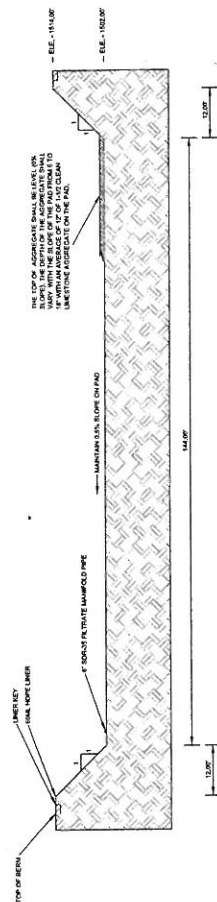
PLAN VIEW

SCALE: 1" = 1'-00"

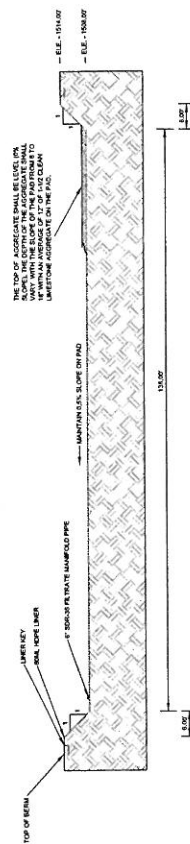
DEP CONTRACT NO. 16124 DESIGNED BY: LLR DRAWN BY: LLR CHECKED BY: DBM APPROVED BY: DBM		 <p> West Virginia Division of Land Restoration Office of Special Reclamation </p>		OMEGA MINING INC. PERMIT D-79-82 DEP 16124 MONONGALIA COUNTY, WEST VIRGINIA		MIX TANK PLAN VIEW		SHT. NO. 33R
		REVISIONS DATE BY JAN 2013 WJC 2				SCALE: 1" = 1' - 0" DATE: MAY 2013		TOTAL 74




GEO TUBE PAD
SECTION A-A

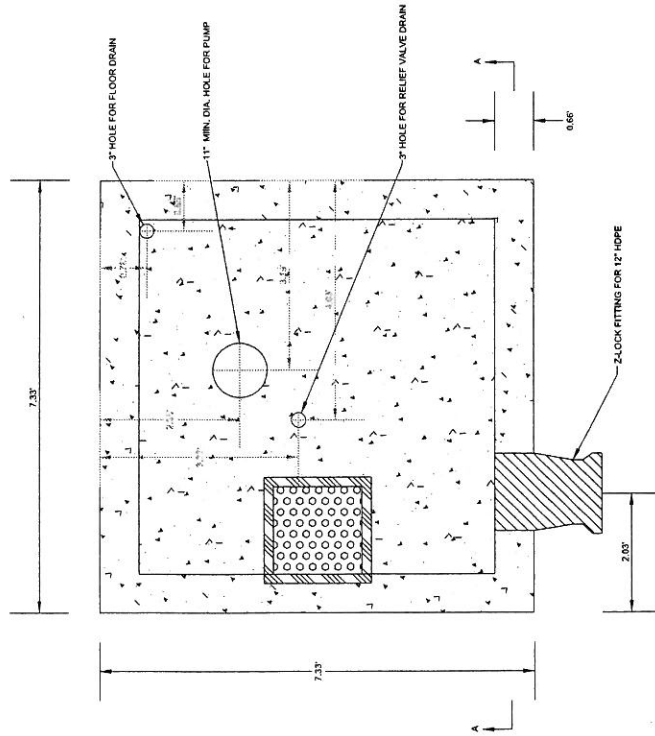


GEO TUBE PAD
SECTION C-C



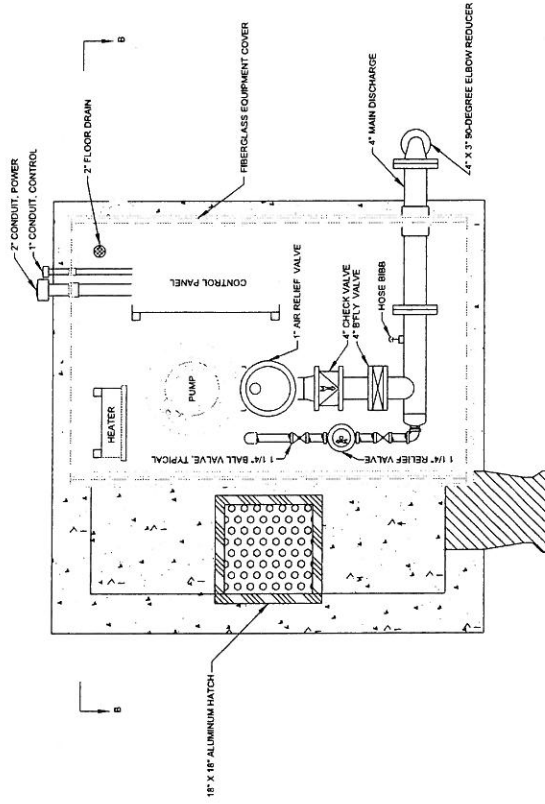
GEO TUBE PAD
SECTION B-B

DEP CONTRACT NO. 16124		 West Virginia		OMEGA MINING INC. PERMIT D-79-82 DEP 16124		GEO TUBE PAD CROSS SECTIONS		SHT. NO. 53R										
DESIGNED BY: LLR		LLR		REVISIONS				TOTAL 74										
DRAWN BY: DBM		DBM		<table><tr><th>DATE</th><th>BY</th><th>✓</th></tr><tr><td>JUN 2013</td><td>LLR</td><td></td></tr><tr><td></td><td></td><td></td></tr></table>		DATE	BY	✓	JUN 2013	LLR							DATE: MAY 2013	
DATE	BY	✓																
JUN 2013	LLR																	
CHECKED BY:						SCALE: NTS												
OFFICE OF SPECIAL REG. AND ENV. DIV. 25 SOUTH HANCOCK STREET, SUITE 301 PHILADELPHIA, WEST VIRGINIA 26106 TEL: 304-455-6600 FAX: 304-455-6613		DIVISION OF LAND RECLAMATION OFFICE OF LAND RECLAMATION 1000 MARKET STREET, SUITE 1000 CHARLOTTE, NORTH CAROLINA 28202 TEL: 704-259-4500 FAX: 704-259-4501						MONROVIA COUNTY, WEST VIRGINIA										



PLAN VIEW

NTS



PLAN VIEW WITH PUMP STATION

NTS

OFFICE OF SPECIAL RECLAMATION
105 SOUTH RAILROAD STREET, SUITE 201
PHILADELPHIA, PA 19106
TEL: 215-597-5611
FAX: 215-597-5612

DEP CONTRACT NO. 16124
DESIGNED BY: LLR
DRAWN BY: LLR
CHECKED BY: DBM
APPROVED BY: DBM

dep
Division of Land Restoration
Office of Special Reclamation

REVISIONS		
DATE	BY	LF
3-21-2013	LLR	1

OMEGA MINING INC.
PERMIT D-79-82
DEP 16124
MONONGALIA COUNTY, WEST VIRGINIA

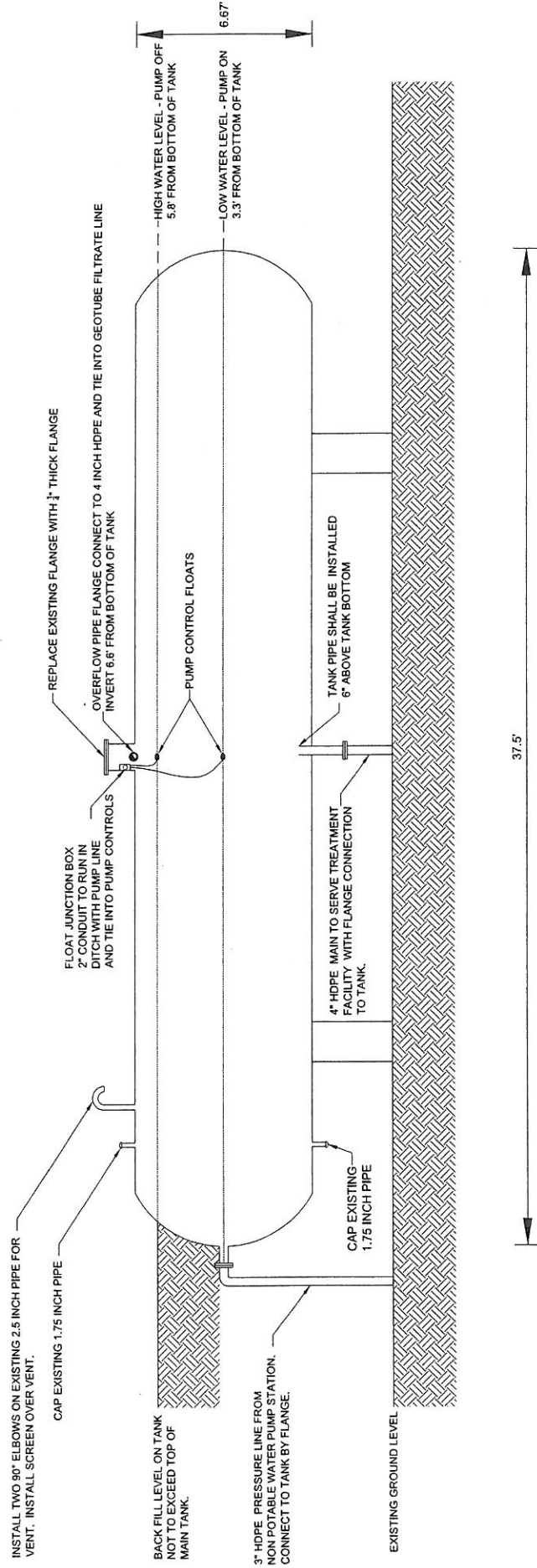
NON-POTABLE WATER PUMP STATION
SCALE: NTS
DATE: MAY 2013

SHT. NO.	55R	TOTAL
	74	

NOTES:

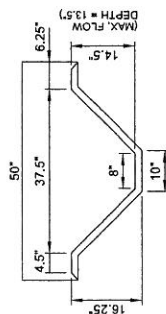
PRIOR TO ANY WORK PERFORMED ON THE TANK, THE TANK SHALL BE THOROUGHLY FLUSHED AS TO REMOVE ANY RESIDUAL ANHYDROUS AMMONIUM. EXTERIOR AREAS OF RUST SHALL BE WIRE BRUSHED AND PAINTED WITH A PRIMER COAT FOLLOWED BY EPOXY PAINT.

ANY ADDITIONAL PIPING NOT SHOWN ON THE DRAWING PROTRUDING FROM THE TANK SHALL BE CAPPED.



NON POTABLE WATER STORAGE TANK NTS

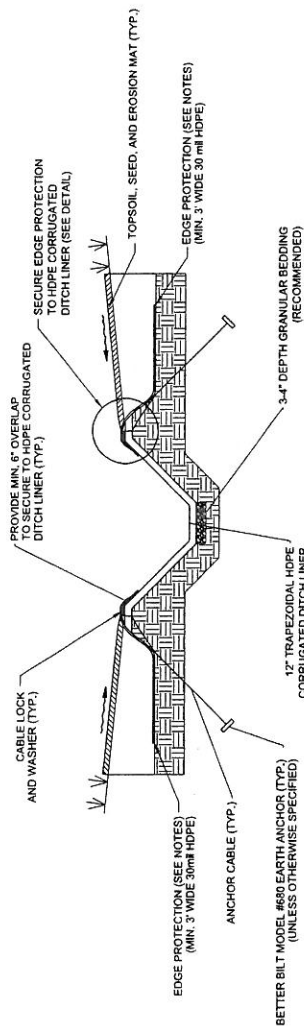
OMEGA MINING INC. PERMIT D-79-82 DEP 16124 MONONGALIA COUNTY, WEST VIRGINIA	SHEET NO. 74 TOTAL 74	
	NON-POTABLE WATER STORAGE TANK	DATE: MAY 2013 SCALE: NTS
DEPARTMENT OF ENVIRONMENTAL AND NATURAL RESOURCES DIVISION OF LAND RESTORATION OFFICE OF SPECIAL RECLAMATION	REVISIONS 1. L.R. 1/2/2013 2. L.R. 1/2/2013	DESIGNED BY: L.R. DRAWN BY: L.R. CHECKED BY: DBM APPROVED BY: DBM



12" TRAPEZOIDAL HDPE
CORRUGATED DITCH LINER
NTS

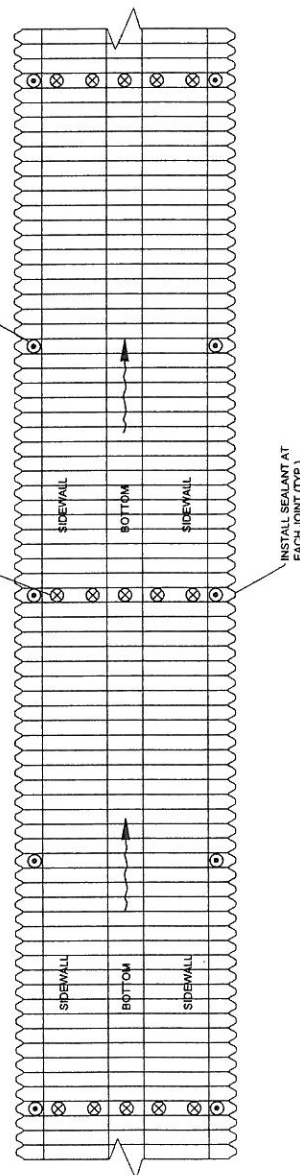
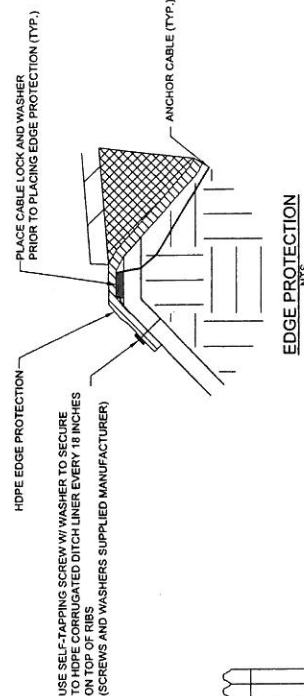
NOTES:

- EDGE PROTECTION IS RECOMMENDED WHERE HDPE CORRUGATED DITCH LINER RECEIVES LATERAL FLOWS.
- USE SELF-TAPPING SCREWS WITH WASHER TO ATTACH THE HDPE CORRUGATED DITCH LINER TO THE HDPE CORRUGATED DITCH LINER. SPACE SCREWS EVERY 18 INCHES. (SCREWS AND WASHERS SUPPLIED BY MANUFACTURER)
- ANCHOR SPACING AND DEPTH IS SITE SPECIFIC AND DEPENDS ON DITCH SLOPE, FLOWS, VELOCITIES, AND SITE SOILS. A TYPICAL INSTALLATION CONSISTS OF 6 ANCHORS PER SECTION (2 OVERLAP AT THE JOINT) WITH A MINIMUM ANCHOR DEPTH OF 30 INCHES.
- ANCHOR KITS (CABLE, EARTH ANCHOR, ANCHOR LOCK, AND WASHER) ARE SUPPLIED BY MANUFACTURER.
- GRANULAR BEDDING IS RECOMMENDED IF NECESSARY TO PROVIDE A SMOOTH UNIFORM BASE FOR PLACEMENT OF THE HDPE CORRUGATED DITCH LINER.
- IT IS RECOMMENDED THAT THE DITCH BE SHARPED TO THE DIMENSIONS OF THE HDPE CORRUGATED DITCH LINER PRIOR TO PLACEMENT.
- REFER TO THE MANUFACTURER'S TECHNICAL MANUAL FOR GENERAL INSTALLATION PRACTICES.
- HDPE CORRUGATED DITCH LINER SHALL BE AS MANUFACTURED AND PROVIDED BY PEXCO CORPORATION AS SMARTDITCH TM OR AN APPROVED EQUIVALENT.
- THE DITCH SHALL BE COVERED BY BLACK 3" X 3" SQUARE NETTING WITH POLYPROPYLENE ROPE ON BOTH SIDES. ANCHOR ON BOTH SIDES EVERY 4 FEET WITH STAINLESS STEEL "S" HOOKS.




12" TRAPEZOIDAL HDPE CORRUGATED
DITCH LINER TYPICAL SECTION DETAIL
NTS

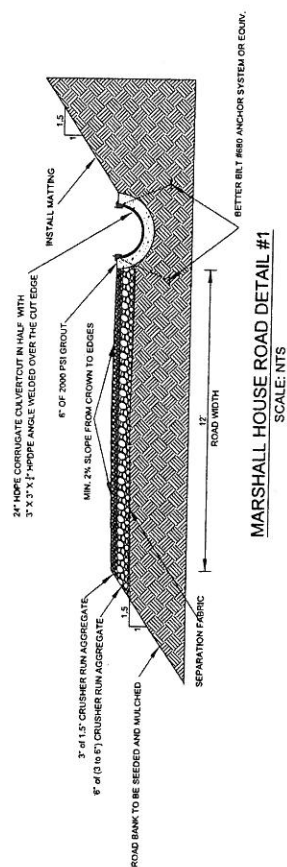
NOTE: THE EDGE PROTECTION SHALL BE SLOPED AWAY FROM THE SMARTDITCH TO REDUCE SURFACE WATER FROM ENTERING THE SMART DITCH.



STANDARD ANCHORING DETAIL
NTS

OFFICE OF SPECIAL RECLAMATION 105 SOUTH MAIN STREET, SUITE 301 PHOENIX, WEST VIRGINIA 26415 PHONE: 304.442.3919 FAX: 304.442.3613	DEP CONTRACT NO. 16124	 dep		Division of Land Restoration Office of Special Reclamation		OMEGA MINING INC. PERMIT D-79-82 DEP 16124 MONONGALIA COUNTY, WEST VIRGINIA		HPDE DITCH LINER DETAILS		SHT. NO. 67R														
	DESIGNED BY: LJR	LLR	<table><tr><th colspan="2">REVISIONS</th></tr><tr><th>DATE</th><th>BY</th></tr><tr><td>JUN 2013</td><td>LJR</td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></table>				REVISIONS		DATE	BY	JUN 2013	LJR									SCALE: NTS		DATE: MAY 2013	TOTAL 74
	REVISIONS																							
DATE	BY																							
JUN 2013	LJR																							
DRAWN BY: LJR	LLR	CHECKED BY: DBM																						
APPROVED BY: DBM	DBM																							

NOTE: EACH LAYER OF AGGREGATE AND FINAL SOIL GRADE SHALL BE COMPACTED AS DIRECTED BY SPECIFICATIONS.



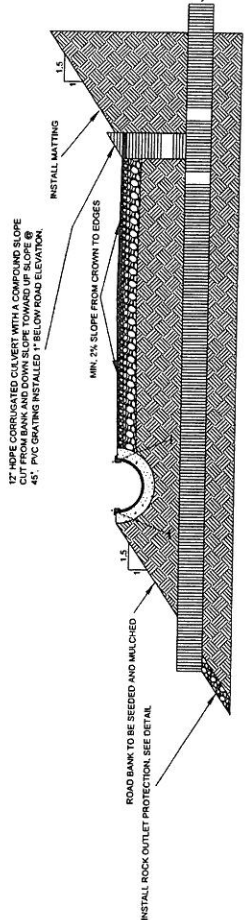
NOTE: DETAIL SHOWN WITH CULVERT CROSS SECTION. THE ROAD AND BANK SHALL INTERSECT WHERE THE CULVERT IS LOCATED. NO CULVERT EXTENDING ABOVE GROUND.

NOTE: ALL AND OTHER DIMENSIONS ARE GIVEN IN DETAIL #1. THE ROAD SHALL BE COMPACTED AS DIRECTED BY SPECIFICATIONS.

NOTE: EACH LAYER OF AGGREGATE AND FINAL SOIL GRADE SHALL BE COMPACTED AS DIRECTED BY SPECIFICATIONS.

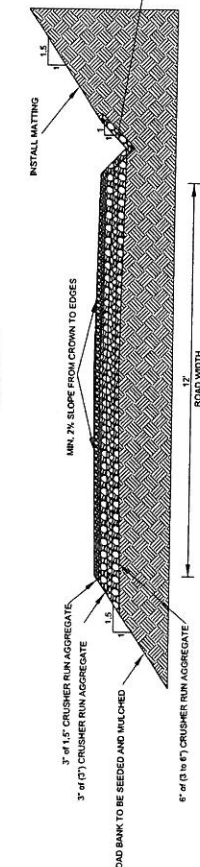
NOTE: THE 12" AND THE VERTICAL SECTION OF THE CORRUGATED CULVERT ARE INCIDENTAL TO THE ROAD CONSTRUCTION.

NOTE: 12" HOPE CORRUGATED CULVERT UNLESS DEPICTED OTHERWISE ON THE PLAN @ 1/4" = 1' SLOPE



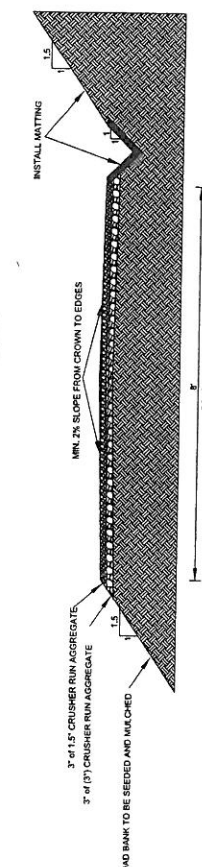
NOTE: EACH LAYER OF AGGREGATE AND FINAL SOIL GRADE SHALL BE COMPACTED AS DIRECTED BY SPECIFICATIONS.

NOTE: THE DITCH SHALL BE LINED WITH 3 TO 6" #4 CRUSHER RUN AGGREGATE.

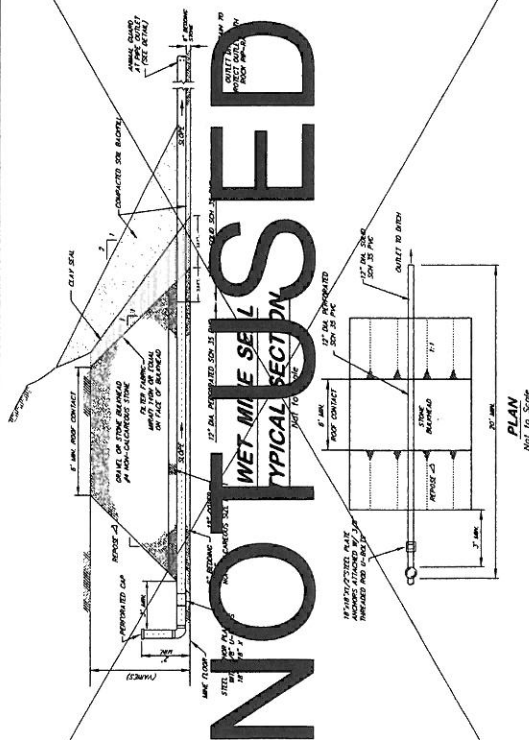
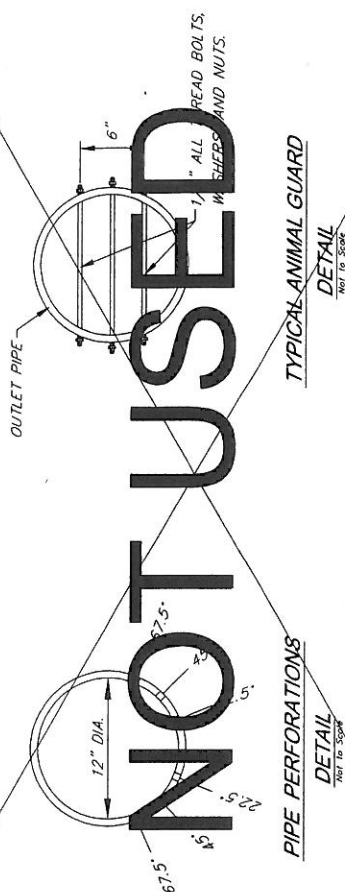


NOTE: EACH LAYER OF AGGREGATE AND FINAL SOIL GRADE SHALL BE COMPACTED AS DIRECTED BY SPECIFICATIONS.

NOTE: THE DITCH SHALL BE LINED WITH 3 TO 6" #4 CRUSHER RUN AGGREGATE.



DESIGNED BY: LLR		DRAWN BY: LLR		CHECKED BY: DBM		APPROVED BY: DBM		DESIGNED BY: LLR		DRAWN BY: LLR		CHECKED BY: DBM		APPROVED BY: DBM	
DEPARTMENT OF SPECIAL RECLAMATION 118 SOUTH MARSHALL STREET, SUITE 301 PHOENIX, ARIZONA 85004 PHONE: 602-442-2010 FAX: 602-442-2010															
DIVISION OF LAND RESTORATION OFFICE OF SPECIAL RECLAMATION															
WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION															
REVISIONS DATE: MAY 2013 BY: LLR FOR: LLR															
OMEGA MINING INC. PERMIT D-79-82 DEP 16124 MONONGALIA COUNTY, WEST VIRGINIA															
ROAD DETAILS SCALE: NTS DATE: MAY 2013															
SHEET NO. 698 TOTAL 74															



SHT. NO.	71R
TOTAL	74

MINE SEAL DETAILS

DATE: MAY 2013

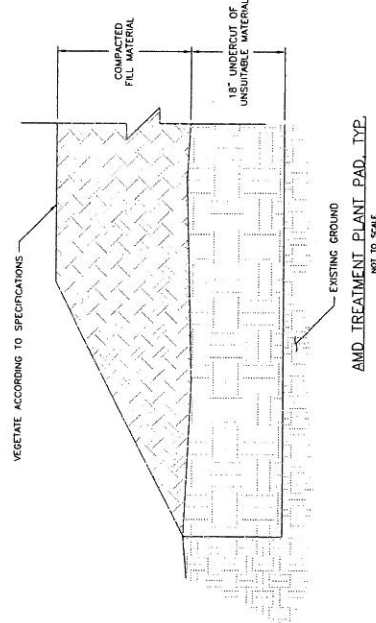
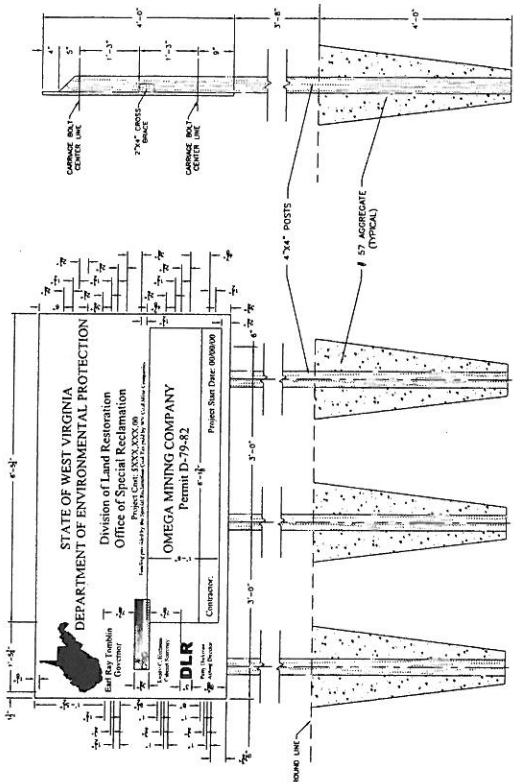
OMEGA MINING INC.
PERMIT D-79-82
DEP 16124

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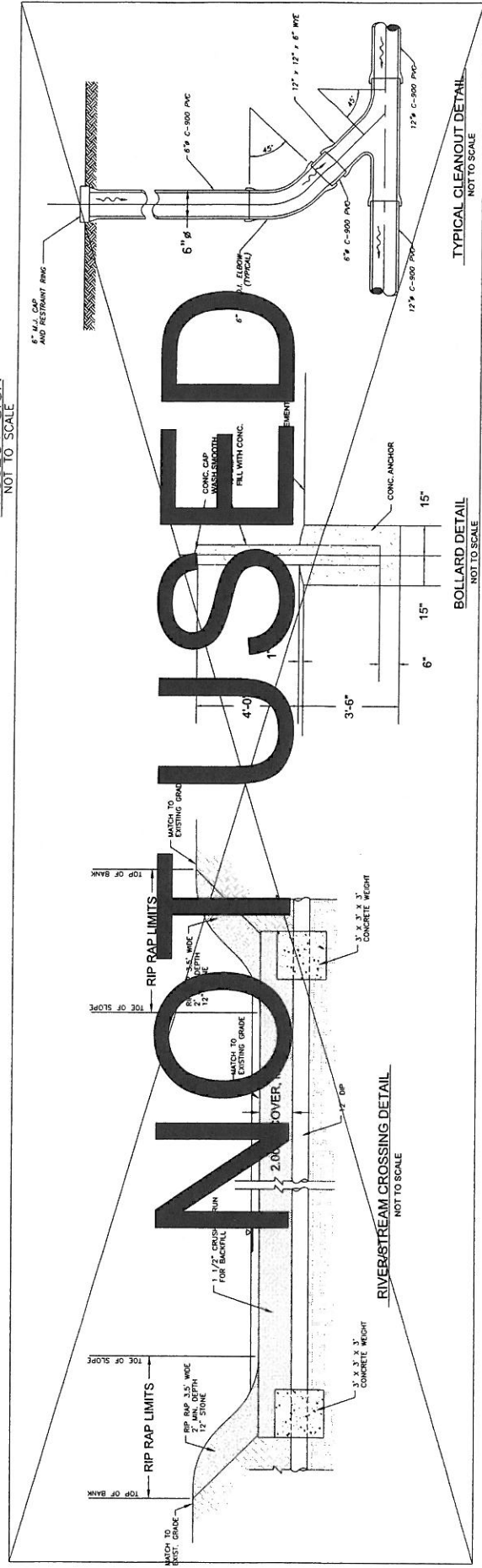
dep
 **West Virginia**
 Division of Land Restoration
 Office of Special Investigations

DEP CONTRACT NO.	16124
DESIGNED BY:	LLR
DRAWN BY:	LLR
CHECKED BY:	DBM

OFFICE OF SPECIAL RECLAMATION
105 SOUTH RAILROAD STREET, SUITE 301
PHILIPPI WEST VIRGINIA, 26416
OFFICE: 1-304-457-3219
FAX: 1-304-457-5613



PROJECT SIGN
NOT TO SCALE



TYPICAL CLEANOUT DETAIL
NOT TO SCALE

BOLLARD DETAIL
NOT TO SCALE

DEP CONTRACT NO. 16124 DESIGNED BY: LLR DRAWN BY: LLR CHECKED BY: DBM APPROVED BY: DBM		REVISIONS DATE BY JUN 2013 LLR		OMEGA MINING INC. PERMIT D-79-82 DEP 16124 MONONGALIA COUNTY, WEST VIRGINIA		STANDARD DETAILS SCALE: NTS DATE: MAY 2013		SHEET NO. 72R TOTAL 74
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SIGN IN SHEET

REQUEST FOR QUOTATION NO. 16124Page 1 of 5Date: July 9, 2013

PLEASE PRINT

* PLEASE BE SURE TO PRINT LEGIBLY - IF POSSIBLE, LEAVE A BUSINESS CARD

FIRM & REPRESENTATIVE NAME		MAILING ADDRESS	TELEPHONE & FAX NUMBERS
Company:	<u>Barnes Excl. Inc.</u>	<u>P.O. Box 13384</u>	PHONE <u>304-984-1725</u>
Rep:	<u>Robert L. Barnes</u>	<u>Sissonville</u>	TOLL FREE
Email Address:	<u>Barnes Excl. AOL.com</u>	<u>WV 25360</u>	FAX <u>304-984-0074</u>
Company:	<u>DCI Skires</u>	<u>1209</u>	PHONE <u>304-625-9362</u>
Rep:	<u>Bob Canterbury</u>	<u>Bluefield 27401</u>	TOLL FREE
Email Address:	<u>Bob.Canterbury@Barnes.com</u>		FAX <u>304-323-9037</u>
Company:	<u>H.D. Supply</u>		PHONE <u>304-477-2446</u>
Rep:	<u>Harold M. Barnes</u>		TOLL FREE
Email Address:	<u>Harold.M.Barnes@HDSupply.com</u>		FAX
Company:	<u>Foster Supply</u>	<u>RT 1 Box 444</u>	PHONE <u>204-326-0196</u>
Rep:	<u>Dion Williams</u>		TOLL FREE
Email Address:	<u>dwilliams@fostersupply.com</u>	<u>WV. Clinch WVN</u>	FAX <u>304-203-2351</u>
Company:	<u>Quafix / Preston Machine</u>	<u>301 Maple Lane</u>	PHONE <u>304-329-1056</u>
Rep:	<u>Mike Jenkins</u>	<u>Kingwood WV 26537</u>	TOLL FREE
Email Address:	<u>mjj@quafix.com</u>		FAX <u>304-329-1217</u>

*

*

*

REQUEST FOR QUOTATION NO. 16124

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Page 2 of 5Date: July 9, 2013

* PLEASE BE SURE TO PRINT LEGIBLY - IF POSSIBLE, LEAVE A BUSINESS CARD

FIRM & REPRESENTATIVE NAME	MAILING ADDRESS	TELEPHONE & FAX NUMBERS
Company: <u>Mountain Infrastructure LLC</u>	<u>2376 Laneville Rd</u>	PHONE <u>304 866 4953</u>
Rep: <u>Matt Evans</u>	<u>Dry Fork WV</u>	TOLL FREE
Email Address: <u>MEVANS4@LYCOS.COM</u>	<u>26203</u>	FAX <u>304 866 4329</u>
Company: <u>Merrick - Conserve</u>		PHONE
Rep: <u>Ron Plank</u>		TOLL FREE
Email Address:		FAX
Company: <u>Breakaway Inc</u>	<u>1075 Old Turnpike Rd.</u>	PHONE <u>304 765-5317</u>
Rep: <u>Don Vincent</u>	<u>Sutton Rd 26601</u>	TOLL FREE
Email Address: <u>doug@breakawaywv.com</u>		FAX <u>304 765 5389</u>
Company: <u>GREEN MOUNTAIN Co</u>	<u>511 50th St</u>	PHONE <u>304 925 5253</u>
Rep: <u>DAVID H. Bowman</u>	<u>Chas WV 25304</u>	TOLL FREE
Email Address: <u>DHB722@gho.com</u>		FAX <u>925-9230</u>
Company: <u>Central Contracting</u>		PHONE <u>304-722-4939</u>
Rep: <u>John Cvechko</u>	<u>515 6th Ave</u>	TOLL FREE
Email Address: <u>johnc@centralctrk.com</u>	<u>St. Albans, WV</u>	FAX <u>304-722-2679</u>

REQUEST FOR QUOTATION NO. 16124

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Page 3 of 5Date: July 9, 2013

* PLEASE BE SURE TO PRINT LEGIBLY - IF POSSIBLE, LEAVE A BUSINESS CARD

FIRM & REPRESENTATIVE NAME		MAILING ADDRESS	TELEPHONE & FAX NUMBERS
Company:	<u>Bear Contracting LLC</u>	<u>P.O. Box 1196</u>	PHONE <u>304-892-3202</u>
Rep:	<u>David Wilson</u>	<u>Bridgeport, WV 26330</u>	TOLL FREE
Email Address:	<u>Fbailey@Bear-Contracting.com</u>		FAX <u>304-326-0054</u>
Company:	<u>W.C. WEIL</u>	<u>P.O. Box 7144</u>	PHONE <u>304-776-5665</u>
Rep:	<u>DANNY LUSK</u>	<u>CHARLESTON, 25356</u>	TOLL FREE
Email Address:	<u>dlusk@wcweil.com</u>		FAX <u>304-776-8171</u>
Company:	<u>SUNRISE CONSTRUCTION</u>	<u>RR 1 Box 256</u>	PHONE <u>304-457-2109</u>
Rep:	<u>THOMAS MLOUSEK</u>	<u>MOATSVILLE WV 26405</u>	TOLL FREE
Email Address:	<u>TMLOUSEK@TRVBAND.COM</u>		FAX <u>304-457-2115</u>
Company:	<u>Green River Group LLC</u>	<u>P.O. Box 18039</u>	PHONE <u>304-594-3991</u>
Rep:	<u>Tracy Curtis</u>	<u>Morgantown, WV 26507</u>	TOLL FREE
Email Address:	<u>tracyscurtis@yahoo.com</u>		FAX <u>304-554-3892</u>
Company:	<u>Breckenridge Corp</u>	<u>P.O. Box 2497</u>	PHONE <u>304-472-9350</u>
Rep:	<u>Mike Chenoweth</u>	<u>Buckhannon WV</u>	TOLL FREE
Email Address:	<u>Carey@breckenridgecorp.com</u>	<u>26201</u>	FAX <u>304-472-8506</u>

REQUEST FOR QUOTATION NO. 16124

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FIRM & REPRESENTATIVE NAME		MAILING ADDRESS	TELEPHONE & FAX NUMBERS
Company:	<u>KAWANHA STONE CO</u>	<u>401 Jackson Dr.</u>	PHONE <u>304-355-8271</u>
Rep:	<u>MIKE EDWARDS</u>	<u>Poca, WV 25159</u>	TOLL FREE
Email Address:	<u>MIKE.EDWARDS@KAWANHA-STONE.COM</u>		FAX <u>304-355-8274</u>
Company:	<u>J F ALLEN CO</u>	<u>PO Box 2089</u>	PHONE <u>304-472-9890</u>
Rep:	<u>JAMES ALLEN</u>	<u>Buckhannon WV</u>	TOLL FREE
Email Address:	<u>JAMES.ALLEN@JFALLEN.CO.COM</u>	<u>26201</u>	FAX <u>304-472-8897</u>
Company:	<u>Collins Building & Contracting Inc.</u>	<u>3406 Corby Rd</u>	PHONE <u>304-765-3521</u>
Rep:	<u>Roger Collins Jr</u>	<u>Flintmire, WV</u>	TOLL FREE
Email Address:	<u>Collins Building & Highways.net</u>	<u>26621</u>	FAX
Company:	<u>J.L. Paretzel</u>	<u>13219 N Preston Hwy</u>	PHONE <u>304-379-7789</u>
Rep:	<u>GREG WATKINS</u>	<u>PO Box 240</u>	TOLL FREE
Email Address:	<u>C.PRETZEL@JAL.COM</u>	<u>Beckton MD 20855</u>	FAX <u>304-379-7788</u>
Company:	<u>Reclaim Company, LLC</u>	<u>PO Box 2162</u>	PHONE <u>304-366-7070</u>
Rep:	<u>BRETT CYLER</u>	<u>FAIRMONT, WV 26035</u>	TOLL FREE
Email Address:	<u>beckerc@reclaimco.com</u>		FAX <u>304-366-0194</u>

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FIRM & REPRESENTATIVE NAME		MAILING ADDRESS	TELEPHONE & FAX NUMBERS
Company:	<u>Cowgirl Up Inc</u>	<u>P O Box 243</u>	PHONE <u>304-739-4397</u>
Rep:	<u>SPENCER C. WOODDELL</u>	<u>Simpson WVa</u>	TOLL FREE
Email Address:	<u>SCW-Cowgirlup@earthlink.net</u>	<u>26435</u>	FAX <u>304-739-4401</u>
Company:	<u>Breckkenridge Corp</u>	<u>Po Box 249</u>	PHONE <u>304-472-3350</u>
Rep:	<u>Keith Skelton</u>	<u>Brickyard Rd</u>	TOLL FREE
Email Address:	<u>carver@breckenridgecorp.com</u>	<u>Buckhannan WV 26201</u>	FAX <u>304-472-8806</u>
Company:			PHONE
Rep:			TOLL
Email Address:			FREE
Company:			FAX
Company:			PHONE
Rep:			TOLL
Email Address:			FREE
Company:	<u>WU DEP</u>	<u>7/9/2013</u>	FAX
Rep:	<u>David McCarry</u>		PHONE
Email Address:			TOLL
			FREE
			FAX

* Denotes Suppliers

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: DEP16124

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

<input type="checkbox"/> Addendum No. 1	<input type="checkbox"/> Addendum No. 6
<input type="checkbox"/> Addendum No. 2	<input type="checkbox"/> Addendum No. 7
<input type="checkbox"/> Addendum No. 3	<input type="checkbox"/> Addendum No. 8
<input type="checkbox"/> Addendum No. 4	<input type="checkbox"/> Addendum No. 9
<input type="checkbox"/> Addendum No. 5	<input type="checkbox"/> Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Company

Authorized Signature

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

Revised 6/8/2012