Norlite, LLC

Tradebe Environmental Services, LLC

FUGITIVE DUST PLAN

Prepared for:

Norlite, LLC

A Division of Tradebe Environmental Services, LLC

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1.0 Introduction and Background

In 1990, the New York State Department of Environmental Conservation (NYSDEC) requested Norlite to submit a plan for a comprehensive fugitive dust emission control program. The original Fugitive Dust Plan (Plan) was written in 1990 by Sci-Tech, Inc., including then-current calculations for fugitive dust emissions from a variety of identified potential fugitive dust sources across the Norlite facility. Since the document's creation in 1990, there have been updates made to the Plan in 1995, 2002, and 2010, to account for changing equipment and/or processes at the facility. According to the Plan, Norlite was acquired by American NuKEM in 1992, and as a result, many of the proposed changes from 1990 were not implemented by the time of the 1995 Plan update. The 1995 Addendum included updated fugitive dust emissions calculations, reflecting proposed changes to emission control methods, and elimination of select fugitive dust sources.

NYSDEC issued an Order on Consent (R4-2000-0420-27) in July 2000, requesting Norlite re-evaluate the existing Plan to ensure it was being properly implemented and to include any recommendations for revisions to the Plan to address new emission sources or changes in operations. Sci-Tech, Inc., on Norlite's behalf, submitted a Fugitive Dust Control Evaluation report, dated August 18, 2000, to NYSDEC. After a NYSDEC August 31, 2001, comment/response letter; a NYSDEC October 30, 2001, bucket loader procedure letter; and a NYSDEC November 26, 2001, bucket loader procedure revision letter (all responses to the August 18, 2000, report), Norlite included a 2002 Addendum to their Plan. This 2002 Addendum included a December 14, 2001, letter from Sci-Tech, Inc., which addressed the 2000 Evaluation results. In 2002, the results were revised or additional controls were recommended at the facility to further control fugitive dust emissions, including the implementation of recommendations from the 1995 Plan update. Sketches of various proposed control changes around the facility are part of this 2002 Addendum, along with copies of NYSDEC correspondence with Norlite. A December 31, 2002, letter from Sci-Tech, Inc. was included at the end of the 2002 Addendum to confirm a recent inspection of the facility verified that the changes from the December 14, 2001, letter were implemented. None of these letters or addenda included a recalculation of fugitive dust emissions to account for changes to the facility or process modifications to reduce potential dust emissions. As in 1995, the 2002 and 2010 Addenda did not include re-calculations of estimated fugitive dust emissions.

The 2010 Addendum, with a detailed photograph log, includes a February 9, 2011, letter from Norlite to NYSDEC in response to NYSDEC not approving the July 16, 2010, Fugitive Dust Plan Addendum submittal. The Addendum itself discusses additional changes that were made at the facility since the 2002 Addendum, including the 2007 addition of a lightweight fines wind screen, control methods used for the block mix processing area, and the discussion of road watering at the Southern Overburden Storage Area to reduce potential dust emissions.

The Norlite facility, which was acquired by Tradebe Environmental Services, LLC (Tradebe) on April 15, 2011, was inspected by the NYSDEC in early 2012 and a Notice of Violation (NOV) letter was issued on May 9, 2013. As part of this NOV letter, NYSDEC requested upgrades to the facility's Fugitive Dust Plan due to purported inadequacies in the existing plan and Addenda. Norlite retained the services of SPEC Engineering, PLLC to reanalyze dust sources at the facility. This report describes SPEC's analysis of the site and presents the results of the current study.

2.0 Plan Objective

Several State and Federal regulations provide standards and guidance for the control of emissions and fugitive dust from aggregate quarries and aggregate kilns. These regulations, standards and guidance documents include, but are not limited to:

- Title 40 - Protection of Environment Subpart EEE - National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors
  Title 40 - Protection of Environment. Chapter I - Environmental Protection Agency Subchapter C - Air Programs Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories
- New York State NYCRR Chapter III, all applicable subparts
- New York State NYCRR Part 211
- US EPA AP-42, Chapter 13
- US EPA-450/3-77-010 Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions (1977)
- US EPA-450/2-92-004 Fugitive Dust Background Document and Technical Information Document For Best Available Control Measures (1992)

From AP-42, Chapter 13 defines Fugitive Dust as atmospheric dust that arises from the mechanical disturbance of granular materials exposed to the air that is not discharged to the atmosphere in a confined flow stream. AP-42 goes on to state that common sources of fugitive dust include unpaved roadways, agricultural tilling operations, aggregate storage piles, and heavy construction operations. Norlite currently has an active quarry operation and lightweight aggregate manufacturing and processing facility on-site. Sources of fugitive dust across Norlite's facility are consistent with the AP-42 definition of fugitive dust and its potential sources.

The purpose of this Fugitive Dust Plan is to provide a review of current aggregate processes, potential fugitive dust emission sources, and existing fugitive dust control practices at the Norlite facility. The current review project, culminating in this Fugitive Dust Plan, is a continuation of work started in 1990, continued in 1995 and supplemented in 2002 and 2010. The review project brings the current Plan into general compliance with AP-42 guidance standards for calculating and estimating potential fugitive dust sources. The facility review conducted and descriptions provided in this current Plan present an account of the facility and aggregate processing for current, existing operations only and does not address past practices or future conditions should processes change. When calculations are presented in this review, the input data for which each formula/calculation is based is derived from historic averages over the past five years (2009-2013). Previous fugitive dust plans are retained for reference purposes and are available at the facility for review.

3.0 Site Description

The Tradebe Environmental Services, LLC (Tradebe) Norlite facility, in the City of Cohoes, Albany County, New York, is located approximately 0.25 miles to the west of New York State Route 787 and 0.9 miles to the west of the Hudson River. It is also 0.7 miles north of New York State Route 7 and 3 miles east of Interstate 87. The facility produces expanded shale aggregate in two dry process rotary kilns. Raw materials are quarried on-site and transported to the kilns via a mobile fleet, crushing, screening, and conveyor systems. The output from the kiln is then further crushed, screened, and conveyed to various storage piles according to material size. The finished product is then transferred to trucks for transportation off-site to various consumer markets.

The storage and handling of the raw materials and products, as well as vehicular traffic throughout the site, result in the potential for the emission of fugitive dust, as defined in AP-42, Chapter 13.

4.0 Technical Background: Dust Generation and Control

The following is a general discussion of the basic theory and mechanics of dust generation at an aggregate processing site like Norlite, as well as general dust control methodologies.

4.1 Dust Generation

Fugitive dust can be generated in several different ways at an aggregate processing site. The three main sources of generation are wind erosion, vehicle re-entrainment, and material handling.

4.1.1 Wind Erosion

Dust emissions can be generated by wind erosion of open aggregate storage piles and exposed areas within a facility. This occurs when wind pressure against surface particles overcomes the force of gravity on the particles as well as the force of adhesion between dust particles and/or the surface upon which the particles rest. The threshold wind velocity, or the wind velocity required to cause wind erosion, is dependent on particle type and size. Wind erosion is the main dust source off material stockpiles and unvegetated surfaces.

The following factors affect the threshold velocity of dust particles:

- Particle size – Particle size affects the threshold velocity because particle size is correlated with particle weight. Larger, and therefore heavier, particles require more force in order to become airborne. Particles that are 75 microns or smaller are generally considered to be suspendable in air due to wind because silt is typically considered to be particles that are 75 micros or smaller, silt content is often used in calculations for fugitive dust emissions.
- Moisture content – Higher moisture content of material correlates to stronger cohesive forces between particles. Therefore, materials with high moisture content are less likely to produce fugitive dust emissions. Conversely, when the material moisture content is low, cohesive forces are reduced and dust emission potential increases.
- Surface crust – If a material storage pile has a natural or man-made crust on its outer surface, the cohesive forces between surface particles is stronger and less material is released into the air by wind erosion.
- Wind speed – Wind speed is a significant variable for dust emissions due to wind erosion. Dust is generated only if the wind speed is high enough to dislodge dust particles from aggregate storage piles by the processes described above.

4.1.2 Vehicle Re-entrainment

Once the cohesive forces between particles are overcome and a particle becomes airborne, the wind velocities necessary to transport these particles are significantly less than those required to dislodge them from a surface. Therefore, once particles are airborne, wind is not necessarily needed in order to generate fugitive dust. The most significant means of mechanical dust generation is the passing of vehicles over dusty surfaces. This is called vehicle re-entrainment and is the result of the action of the tires on the road surface as well as the turbulence of the "wake" that results from the vehicle moving through the air.

The following factors affect dust emissions that result from vehicles traveling on facility roadways:

- Vehicle speed – Higher tire speeds result in greater forces being exerted upon surface dust particles. Higher speeds also result in greater turbulence in the "wake" zone around the vehicle.

- Vehicle weight – Heavier vehicles result in greater forces being exerted upon surface dust particles.
- Surface loading – The amount of silt present on top of a paved road surface affects the amount of dust generated as a result of vehicle re-entrainment. The same is true for unpaved surfaces.
- Surface material silt and moisture content – As with wind erosion, the number of small particles contained in a sample as well as the moisture content of the sample contribute to different amounts of fugitive dust emission. This is mainly applicable to unpaved roads only.

4.1.3 Material Handling

Material handling is another major source of fugitive dust emissions and includes a wide range of activities (crushing, screening, loading, unloading, and transferring material), types of equipment (trucks, front end loaders, railcars, ships, conveyors, etc.), and final or intermediate product destinations (storage piles, hoppers, conveyors, etc.). Dust emissions are produced when the cohesive forces between the dust particles are overcome by the force of impact onto a surface. Dust can also be emitted due to windstripping of material as it falls through an airstream, the displacement of material from an area due to boil-up, and the windstripping of material from a container/vehicle as it moves through the environment.

The following factors affect dust emissions that result from material handling.

- Material silt and moisture content – As with wind erosion and vehicle re-entrainment, material silt and moisture content have an effect on the amount of dust generated.
- Drop height of the material – Greater drop heights result in greater potential dust emissions because of greater impact force and because the material is subject to windstripping for a longer period of time.
- Quantity of material being handled – Potential fugitive dust emissions increase as more material is handled.

4.2 Fugitive Dust Control

There are a number of methods to control the amount of fugitive dust generated from the aforementioned categories of emission sources. The following are brief descriptions of some common control methodologies for each category.

4.2.1 General Control Methods

Potential dust emissions due to wind erosion can be controlled by reducing the wind speed, by reducing the exposed surface area, or by increasing the cohesive forces between material particles. Slowing down the wind can be accomplished by natural windbreaks (trees, shrubs, or berms) or artificial windbreaks (windscreens and fences). Reducing the exposed surface area can be accomplished by pile shaping, lowering pile heights, constructing enclosures, and increasing cohesive forces by watering, the use of chemical stabilizers, or compacting the material to reduce the spaces between particles. The following are brief descriptions of some of these methods.

- Windbreaks – Porous windbreaks are able to reduce wind speed. Trees and shrubs are examples of natural windbreaks. Windscreens are an example of artificial windbreaks and the use of an artificial windbreak allows for porosity control.

- Chemical stabilizers – Chemical stabilizers can be applied to storage piles in order to form a crust on an exposed surface. Although this method is able to control dust emissions, it can also contaminate a product. There are several classes of chemical stabilizers that differ in cost, application rate and frequency, crust thickness, water permeability, and durability.
- Pile height – Because wind velocities tend to be greater at higher elevations, it is preferable to have low pile heights.
- Watering – The addition of water to storage piles can reduce potential dust emissions by increasing the cohesive forces between dust particles. Furthermore, dust suppression can be accomplished by using sprayers that disperse water particles into the air. These water drops collide with dust particles that are already airborne and then weigh down the dust particles so that they are returned to the material source or the ground, adjacent to a stockpile.

4.2.2 Controls for Vehicle Re-entrainment

Control methods for vehicle re-entrainment fall into three categories: preventing silt material from getting onto the road surface, removing the material once it is on the road surface, or reducing the impact of the vehicles on the surface material.

Keeping a product, and therefore dust, contained to its source can prevent dust emissions from vehicle re-entrainment. This means that reducing dust emissions from storage piles and material handling can indirectly reduce the dust emissions from vehicle re-entrainment on roadways close to storage areas.

Broom sweepers, vacuum sweepers, or flushing are methods that can be used to remove dust particles from paved road surfaces. Coarse aggregate placed on roadways helps reduce dust from unpaved surfaces.

Road emissions can also be reduced by reducing vehicle loads and reducing the number of vehicles using the roads. Paving, gravel, and chemical stabilizers can also be used for unpaved roads.

4.2.3 Controls for Material Handling

The controls used for handling dust sources are similar to the controls for wind erosion and include reducing wind speeds, the use of chemical stabilizers, watering, etc. Other controls specific to material handling include reduction in drop point height, material chutes, conveyor covers and transfer point enclosures.

5.0 Control Methodology Implementation Summary

The original 1990 Plan and its Addenda included recommendations for control strategies for improved control of fugitive dust. The control methodologies that were subsequently instituted at the facility were based, in part, on these recommendations. The following controls have been implemented by Norlite in the past ten to twenty years.

5.1 Kiln Feed Area

5.1.1 Kiln Rear Chamber System Upgrade

Improvements were made to the kiln feed rear chamber system in 2010 and 2011. On the back end of the kiln (the feed end), a second seal system was installed behind the existing seal system and both systems were enclosed. The space between the two seal systems is under a low pressure vacuum system at approximately -0.12" water column that enables the capture of emissions that may escape from the back of the kiln during system upsets. The system then feeds the emissions back into the front (flame end) of the kiln. This negative pressure is maintained by an automated control valve that is connected to a pressure monitor and a PLC logic program. The current kiln rear chamber now consists of the following: a double seal system at the back end (feed end) and a single seal system at the front end. Engineering drawings of this system are attached as Appendix G.

5.2 Kiln Area

5.2.1 Kiln Clinker Storage Pile Operational Changes

The spray headers at the heads of the Kiln 1 and Kiln 2 clinker conveyors were angled outwards approximately 45 degrees to maximize water coverage on the piles themselves rather than to just the material dropping from the conveyor. Front end loader operating procedures were put in place and operators were trained to minimize product drop heights during product transfers between the two clinker piles. Finally, procedures to keep the water sprays active all weekend-long while the clinker piles rebuild were put in place to reduce "dry spots" that formed previously.

5.3 Finish Plant Area

5.3.1 New Windscreen

A windscreen was installed northwest of the enclosed fines storage structure in order to mitigate dust generation from the open fines storage pile, located north of the enclosed fines storage structure. The windscreen measures approximately 25 feet high and approximately 60 feet long. Each rubber strip is 5 inches wide with about 6 or 7 inches between strips. This wind screen has a porosity range of 55 to 58 percent due to the spacing between the strips.

Figure 1. Wind Screen in Finish Plant Area
The 50%-60% porosity wind screen is in place to the northwest of the fines storage structure, which can be seen on the left side of this photograph. The piping shown above the wind screen is used to pneumatically convey dust from the kiln baghouses to the baghouse dust silos, which sit to the east of the fines storage structure. This system is completely enclosed.

5.3.2 New Anemometer

An anemometer was installed approximately ten feet above the top of the fines storage structure in order to monitor wind speeds in the Finish Plant Area. Meteorological readouts were installed in the finish plant control room with alarms set at 10 mph, 15 mph, and 20 mph and a logsheet for recording meteorological parameters and alarm occurrences was established. This has allowed Norlite personnel to monitor wind speeds and shut down Finish Plant operations if wind speeds are deemed to be too high.

5.3.3 Block Mix Conveyor to Radial Stacker Transfer Point Redesign

The transfer point between the block mix conveyor, which carries material from the baghouse dust silos and the radial stacker, was improved by installing a new tailings hopper with a circular outlet and rotating seal. These improvements were made in order to reduce the amount of material spilled onto the ground at this transfer point. Some of the spillage was due to block mix material sticking to the underside of the conveyor, so a new “Gorden” belt scraper designed for ultrafine screening was installed in place of the old belt scrapers. In addition to these improvements, 600 feet of uncovered conveyors in the finish plant conveyor system were eliminated, the shipping tower was removed, and several drop points related to the old conveyor configuration were also eliminated. Operators were also trained to prevent “end-of-run” situations by stopping the block mix run after a set length of time rather than waiting for the material to run out.

5.3.4 Drop Distance Rod on Radial Stacker

An 18-inch long rod coated with fluorescent paint was installed on the bottom of the radial stacker with a short section of chain. This improvement was made to assist operators in keeping the radial stacker at an appropriate height relative to the height of the block mix pile forming underneath it. The operators were trained to keep the drop distance less than the length of the rod in order to minimize potential dust emissions as a result of unnecessarily high drop distances.

5.4 Fines Processing Area

5.4.1 New Covered Storage Structure

Installation of a new covered storage structure in the fines processing area was completed in June 2010 to store the 8x0 product. This structure helps minimize potential fugitive dust from wind erosion. The storage structure is 55 feet wide by 80 feet long with an arch height of 25 feet and is comprised of a steel tube arch structure covered in a rubberized canvas. The storage capacity of the structure is approximately 1,200 tons. As the 8x0 product is produced in the fines processing area, it is moved directly into the storage structure to reduce exposure.

5.5 Roads

5.5.1 Closing Saratoga Street Entrance to Heavy Vehicles

Since the 1990 Plan, heavy vehicles are no longer allowed to enter the facility from the Saratoga Street entrance and are exclusively using the Elm Street entrance. There are defined, dedicated roads for large equipment travel at the facility. All LGF and aggregate trucks enter and exit from the Elm Street entrance (Gate 1) on the south-western portion of the facility. These actions moved all heavy traffic away from the residences on the eastern border of the facility and cut down on the potential distance (in miles) heavy traffic may travel on the facility. Cutting down on miles traveled by heavy vehicles helps mitigate the potential fugitive dust emissions at the facility.

5.5.2 Increased Road Watering Frequency

Since the 2002 Fugitive Dust Plan Addendum, two full-time drivers are now dedicated to road watering, as conditions may dictate, in order to reduce fugitive dust emissions from roads. These drivers are on a schedule but provide additional watering as necessary.

5.6 Conveyors

5.6.1 Covers on Conveyors

Covers were added to conveyors at the facility to shield material from wind erosion and particulate entrainment.

5.7 Trees

5.7.1 Tree Barrier

As of the 1995 Plan Update, a tree line has been added to the eastern side of the facility to mitigate fugitive dust near a neighboring residential area.

5.8 Baghouses

5.8.1 Elimination of Baghouse Dust Pile and Transfer Points

Since the 1995 Plan Update, Norlite no longer collects dust from baghouses onto an open pile, and any related activities, such as loading onto trucks and on-site open transport, no longer occur.

5.9 Coal

5.9.1 Elimination of Coal Pile and Transfer Points

Since the 1990 Plan, Norlite has ceased using coal in their operations. Due to this change, the following potential fugitive dust emission sources have been eliminated from the facility:

- Travel of coal delivery trucks;
- Unloading of coal onto coal pile;
- The coal pile itself; and
- Dumping coal into the coal mill hopper

Eliminating coal use at the facility removed 1,500 tons of coal storage on-site, as well as the processing equipment.

6.0 Current Operations, Dust Sources, and Controls

An overview of the Norlite facility can be seen in Figure 1 in Appendix A. For discussion and calculation purposes, the facility is divided into areas as follows:

- Quarry (QA)
- Primary (PR)
- Kiln Feed (KF)
- Kiln (KL)
- Finish Plant (FP)
- Fines Processing (FN)
- Block Mix (BM)
- Boneyard (BY)
- Southern Overburden Storage (OS)
- Island (IS)
- Roads (RD)

The current operations at the Norlite facility are summarized in the flowcharts presented in this report as Sheets 1 through 11 in Appendix B. The flowcharts are organized into the above areas and show the material flow through each area along with fugitive dust emission points, identified by unique source ID numbers. Figures 2 through 12 in Appendix A show the geographical locations of the emission points on a series of aerial photographs.

Information on operations in each area and their associated controls is based on site visits by SPEC and on conversations with facility employees. Information on each fugitive dust emission source, including existing controls and estimated annual emissions, can be found in the summary table in Section 9.0 below, as well as in Appendix C. A photo log that points out each emission source through a series of photographs is included as Appendix E.

6.1 Quarry Area

Raw shale is mined from the quarry by drilling and blasting. Haul trucks are loaded with raw shale that transport shale from the Quarry to the Primary Area for processing. On a daily basis, one to two haul trucks are in use, each making 10 to 15 trips per day, with a daily maximum of 30 to 40 trips per truck. The haul trucks operate every weekday from 6 AM to 2 PM, as well as some Saturday mornings when needed.

In addition to the mining operations in the rock quarry itself, overburden stripping occurs in order to expose new shale areas for mining. The overburden material, which consists primarily of clay and sand, is stripped using bulldozers and front end loaders, loaded onto haul trucks, and transported to the Southern Overburden Storage Area. In this operation, three to four haul trucks make 30 to 40 trips hauling overburden from the quarry to the Southern Overburden Storage Area.

Fugitive dust emission sources in the Quarry Area include drilling, blasting, overburden stripping, and handling of raw material shale and overburden.

6.2 Primary Area

The Primary Area consists of the shot rock pile, Canal pile, jaw crusher, double deck screens, shale fines pile, and kiln feed pile. Haul trucks deposit raw shale from the quarry onto the shot rock pile. The raw shale from this pile is then moved into the jaw crusher hopper via front end loader, goes through the double deck screen, goes through the primary cone crusher, and is sorted onto either the shale fines pile or the kiln feed pile. The material in the shale fines pile is later transported to the boneyard or the overburden storage area. Although some of the crushed raw shale immediately moves onto the Kiln Feed Area, a portion of it is often moved to the Canal pile where it waits to be added to the kiln feed.

The crushers in the Primary Area typically run only during the week, although they will run for 2 to 3 hours on Saturdays if the need arises. When the Primary Area is active, the crushed raw shale is taken directly from the kiln feed pile that forms at the output of the crushers. Otherwise, the crushed raw shale from the Canal stockpile is used to feed the kilns. It should be noted that up to 15% of the material introduced to the primary crusher can be rejected and is put back through the crusher for reprocessing.

Fugitive dust emissions sources in the Primary Area include the jaw crusher, double deck screen, cone crusher, conveyor belts, material transfer points, material stockpiles, and material handling by front end loaders.

Figure 2. Primary Area Equipment

The Primary Area consists of a jaw crusher (off of the photo to the right), conveyor belts to carry raw shale, a double deck screen (contained within the housing), and a cone crusher (also contained within the housing) to crush material further. Two conveyor belts (not pictured) are used to transport material from the screen/crusher housing onto the kiln feed and shale fines piles.

6.2.1 Current Fugitive Dust Control Methodology

There are coarse water sprayers installed at the primary crusher and double deck screens in order to reduce fugitive dust emissions. Although fine water sprayers were initially installed, the fine nozzles were replaced by coarse nozzles because fine nozzles cannot be properly maintained in this area; fine sprayer nozzles have a tendency to get clogged. The current sprayers are garden hose type nozzles. A majority of the equipment in this area is contained within the housing seen in Figure 2.

6.3 Kiln Feed Area

Crushed raw shale from the Primary Area has two methods of entering the Kiln Feed Area. The first method is through the kiln feed pile that forms as the raw shale exits the primary crusher. The kiln feed pile has an underground drop point beneath it that transfers the raw shale onto the #4 conveyor. This drop point onto #4 conveyor in located underground. Alternately, crushed raw shale from the Canal pile can be added to the kiln feed process by loading the material directly onto the #4 conveyor via front end loader.

At the end of the #4 conveyor, the material is dropped onto the #5 conveyor and then onto the kiln feed storage pile. A drop point exists underneath the kiln feed storage pile, giving the pile a concave shape that keeps pile height to a minimum.

Figure 3. #4 and #5 Conveyors in the Kiln Feed Area
The #4 conveyor, #5 conveyor, and drop point onto the kiln feed storage pile can be seen in this photograph. The #4 conveyor originates underground under the kiln feed pile in the Primary Area, shown at the far left. The drop point onto the kiln feed storage pile is enclosed in a chute, shown at the far right.

From the drop point underneath the kiln feed storage pile, the raw shale is transferred onto two underground conveyors (Kiln 1 feeder belt and Kiln 2 feeder belt), each feeding one of the two kilns. The raw shale is transported to Kiln 1 via a total of three conveyors (Kiln 1 feeder belt, Kiln 1 lower belt, and Kiln 1 top belt), while the raw shale is transported to Kiln 2 using four conveyors (Kiln 2 feeder belt, Kiln 2 lower belt, Kiln 2 middle belt, and Kiln 2 top belt). The feeder belts are completely underground and the lower belts are partially underground, but contain dust covers throughout. All other conveyors are aboveground and have dust covers to partially enclose them.

The raw shale is fed into the back end of the kilns by AccuRate feeders, which also have dust covers, acting as partial enclosures. From this point the shale passes through a chute into each kiln, respectively. The material is heated inside the kiln to 2000°F to 2100°F and then transferred to the clinker coolers. It then exits the clinker coolers and is added to the clinker piles near the Finish Plant Area. The double seal rim seals at the back of the kilns are typically cleaned out once a day. This is done through a hopper on the underside of the back end of the two kilns. This hopper is connected to both seals and has a hinged chute door. When the door is opened, rim seal dust drops onto the ground and Norlite personnel manually move it to the muck pile for later reincorporation into the product stream. See Appendix G for an engineering drawing of the chute and seal system.

Fugitive dust emission sources in the Kiln Feed Area include conveyor belts, material transfer points, the kiln feed storage pile, and maintenance work, including cleaning out the rim seals and the use of vacuum trucks to clean out baghouse plugs.

6.3.1 Removal of Kiln Feed Silo and Installation of New Enclosure

A new wind wall and metal overhang were installed around the kiln feed storage pile after the former kiln feed silo was removed. The kiln feed silo was removed in March-April 2012 based on a structural review conducted at that time. The majority of the wind wall is located to the north of the pile and small lengths of it wrap around towards the east and west sides. The metal overhang angles up from north to south and an enclosed material chute transfers material from the #5 conveyor, through the overhang, and onto the pile. A pile height sensor was also installed, which alerts Norlite personnel to stop feeding the pile via a light above the chute. An automated system is also in place that stops feed to the kiln feed stockpile when the pile height sensor is tripped. Because the shale is transferred to the kiln feeder belts through a drop point underneath the storage pile, the kiln feed storage pile has a concave shape, which can be seen in Figure 4.

Figure 4. New Kiln Feed Storage Pile Enclosure

The new kiln feed storage pile enclosure consists of a wind wall and a metal overhang. An enclosed chute guards the drop point from the #5 conveyor against wind erosion. A height sensor is located beneath the metal overhand and an alert light (located on top of the chute, off the picture) is used to notify personnel when the pile height approaches its maximum.

6.3.2 Current Fugitive Dust Control Methodology

All aboveground conveyors in the Kiln Feed Area have dust covers on them to help reduce potential fugitive dust emissions by eliminating or reducing wind exposure. A more in-depth description of this structure is included as Appendix H. Figure 3 shows dust covers on both the #4 and #5 conveyors. These are typical of the conveyor dust covers found throughout the site.

When crushed raw shale is added to the #4 conveyor from the Canal pile, water is added to the #4 belt as a method of dust suppression. This is due to the fact that the material dries out while being stored in the Canal pile and therefore has the potential to generate dust. Water is not added to the #4 belt when crushed raw shale is taken directly from the kiln feed pile because the material in that pile is already wet from the water sprayers in the Primary Area. Operators may add water if this pile is excessively dry.

A pile height sensor that hangs down from the metal overhang triggers an alarm light at the top of the kiln feed storage pile to alert facility personnel to stop feeding the kiln feed storage pile. Keeping the pile from overflowing aids in controlling potential fugitive dust by keeping pile height to a minimum.

Both of the kiln feeder belts that transport material from the kiln feed storage pile are located underground, which significantly reduces dust emissions. The Kiln 1 lower belt and Kiln 2 lower belt are both partially located underground, with dust covers over the conveyors after they transition to an area aboveground. Additionally, the entrance to the underground enclosure for the feeder and lower belts is covered in a "meat-locker style" curtain to prevent dust from escaping the enclosure. All conveyor-to-conveyor drops in the Kiln Feed Area are conducted through chutes, which also reduces potential dust emissions.

Figure 5. Chute for Cleaning Kiln Rim Seal
The kiln rim seals are cleaned out manually through chutes on the undersides of the back of each kiln. When the chute door opens, material drops onto the ground to be picked up by plant personnel.

A rear chamber system is in-place at the feed of each kiln. This consists of a double seal at the feed end of the kiln, a single seal at the discharge end, and piping and instrumentation connecting the two ends. The rear chamber system is kept at a negative pressure of approximately -0.12" water column in order to prevent emissions from escaping through the feed end. The primary fan is located at the front end of the kiln and air dampers are located at the front and back ends of the kiln in order to maintain the system at the appropriate pressure.

6.4 Kiln Area

The Kiln Area consists of the clinker coolers, clinker material exiting the kiln, and the clinker piles. Material exits the kilns and enters the clinker coolers through grizzlies. Each clinker cooler contains a grate conveyor that transports the clinker material towards the output of the clinker coolers. The material is piled approximately one foot high on this conveyor and fans provide cooling air from underneath. Because the clinker coolers are enclosed systems, operators monitor the clinker coolers through windows mounted inside the clinker coolers.

After the material goes through the kilns and clinker coolers, it is transferred onto conveyors (Kiln 1 clinker belt or Kiln 2 clinker belt) and deposited onto clinker piles (Kiln 1 clinker pile or Kiln 2 clinker pile). The drop point between each kiln and conveyor, which ends underground, exists on the outside of the kiln building and is open to the outside. This transfer point contains a grizzly and can be seen in Figure 6.

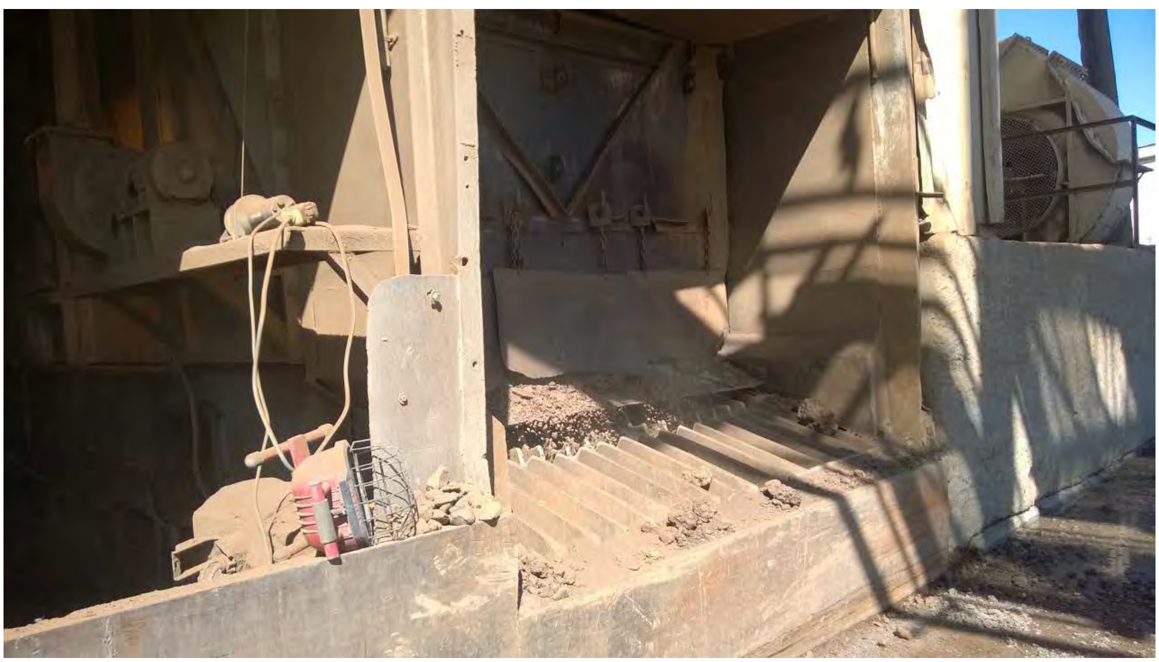

Figure 6. Kiln Clinker Cooler to Clinker Belt Drop Point
The drop point between the clinker cooler and clinker belt exists outside of the clinker cooler building and the material passes through a grizzly.

A front end loader is used to transfer clinker from the Kiln 2 clinker pile onto the Kiln 1 clinker pile. From there, it is transferred via an underground drop point onto the #1 conveyor that marks the beginning of the Finish Plant Area. Because this drop point exists under the material pile, the southern portion of the Kiln 1 clinker pile has a concave shape.

The Kiln Area also contains the muck pile, which is a collection of material including baghouse dust, aggregate fines, and other rejected or off-spec product. When material is added to the pile, it is typically from a vacuum truck and is in the form of a wet slurry. Norlite actively feeds back this material into the beginning of the finish plant. The kilns are operational 24 hours a day, 7 days a week, 365 days a year, except during maintenance.

Fugitive dust emission sources in the Kiln Area include the conveyor belts, material transfer points, material stockpiles, material handling by front end loaders, the kilns, and clinker coolers.

6.4.1 Current Fugitive Dust Control Methodology

Fugitive dust emissions are reduced in the Kiln Area by placing the beginning of the clinker belts underground. After the belts emerge from the ground, they are partially enclosed by dust covers. There is also an option of adding water to the clinker belts, although it is at the operators' discretion (dependent on material source). There are also water sprayers at the discharge end of the clinker belts that spray the material dropping from the belts to the clinker piles as well as at the clinker piles themselves.

All dust collected by the baghouses is pneumatically conveyed to the dust silos in the Finish Plant Area. Because this system is an enclosed system, there are no dust emissions from the baghouses and pneumatic conveyance system, with the exception of maintenance work to clean out the baghouses.

6.5 Finish Plant Area

The #1 conveyor takes clinker material from the Kiln 1 clinker pile and deposits the material onto a grizzly that sorts out material that is considered to be too large. This oversize, consisting of material that is greater than 3 or 4 inches in diameter, collects on the grizzly pile for later reincorporation into the product stream. The material that passes through the grizzly is then transported to the screens building for screening by product size. From here, material is deposited onto various conveyors depending on material size. Material that passes through the screens building ends up in one of the following categories and is sorted onto its corresponding conveyor: 3/4" aggregate, 3/8" aggregate, oversized material, or fines. The 3/4" and 3/8" aggregate materials are deposited onto short term storage piles and are then moved to long term storage piles by front end loader. The material that is sorted onto the fines conveyor is transported to the enclosed fines storage structure for future addition into block mix. The oversized material is passed through the El Jay crusher and then returned to the grizzly located between the #1 and #2 conveyors via the #2 return conveyor. From there, it passes through the screens building again and is sorted by product size. Approximately half of the material that originally enters the Finish Plant Area is passed through the El Jay cone crusher before being appropriately sized to proceed onto size-specific short term storage piles. Of the 50% that passes through the El Jay crusher, 15% will pass through it a second time.

Material from the two baghouse dust silos (baghouse dust silo 1 and baghouse dust silo 2) are dropped onto a conveyor in the underground shipping tunnel (shipping belt) and are then deposited onto a short term block mix pile by way of the stationary belt and radial stacker. Norlite personnel are able to control the drop height off of the radial stacker.

The enclosed fines storage pile is located where a fines silo previously existed. This structure consists of a square base of concrete blocks roughly 8 feet high and 30 feet long. There are two tiers of metal bracing above this base that are covered by fabric tarps. A guarded material chute drops in from above, through the roof, and down into the fines enclosure. Material is removed from this structure from the north end, where the material spills out onto the ground to form the open fines pile. A wind screen is in place to the west of the open fines pile to protect the pile from wind erosion. This material can also be fed to its terminal point through the bottom of the pile via the shipping tunnel, which is below grade. This structure is discussed in greater detail in Appendix H.

The Finish Plant operates two 8 hour shifts every weekday and one 8 to 10 hour shift on Saturdays. This schedule can be adjusted slightly to accommodate customer demand as needed.

Fugitive dust emissions sources in the Finish Plant Area include the conveyor belts, material transfer points, material stockpiles, and material handling by front end loaders.

6.5.1 Current Fugitive Dust Control Methodology

All of the drop points onto conveyors after material passes through the triple deck finish mill screen occur within the screen building and are therefore enclosed drop points. Once each conveyor emerges from the screen building, a dust cover is in-place to reduce dust emissions.

The following emission points in the Finish Plant Area have baghouse dust control: triple deck finish mill screen, 3/4” discharge conveyor, 3/8” discharge conveyor, oversize discharge conveyor, El Jay crusher, fines to silo conveyor, stationary belt, and radial stacker. However, the baghouse unit located adjacent to the screen building is currently not operational, leaving everything but the stationary belt and radial stacker without any baghouse dust control. Most of the conveyors have dust covers on them to reduce dust emissions. Larger aggregate fractions are also mixed into the process in this area, which helps mitigate the potential for fugitive dust.

The drop point to the 3/4” short term storage pile is enclosed by a watered chute, which can be seen in Figure 7. The water trickles down the entire length of the chute and onto the storage pile, thus providing dust suppression to the storage pile itself as well.

The 3/8” short term storage pile has a water sprayer that sprays both the drop point onto the pile and the pile itself.

The enclosed fines storage pile structure provides the storage pile protection from wind erosion, while the chute above it provides fugitive dust emission reduction during the transfer of material from the conveyor to the storage pile. The banded wind screen northwest of the structure provides some emission control for the open fines pile.

The radial stacker that transports material from the baghouse silos to the short term block mix short term storage pile can be adjusted in height in order to control the material drop height. This is manually controlled by facility personnel.

All of the short term storage piles that the various conveyors load onto are cleared by front end loader onto customer trucks as they are being formed. Thus, the size of each pile stays relatively constant throughout the day. In the event that there is extra inventory, the front end loaders transport the excess material to long term storage piles in the 8x0 long term storage enclosure.

Figure 7. 3/4" Aggregate Drop Point
The drop point onto the 3/4" short term storage pile is enclosed in a watered chute. Water runs down the entire length of the chute and is able to flow onto the storage pile itself through the holes along the length of the chute. The 3/4" product also gets deposited onto the piles through these holes.

6.6 Fines Processing Area

The Fines Processing Area is located at the southeastern portion of the Norlite facility and was put into operation in the fall of 2007. The area is equipped with a Cedarapids hopper and an Astec 2618 fines screen to process lightweight aggregate fines and separate the 8x0 product from the 4x0 product. The 8x0 product is stored in the covered storage pile area just north of the Astec screen. Rejected material from this process is sent back to the Finishing Plant for re-incorporation into the product stream. There may be a reduction in the volume of material that goes through this process in the future based on current customer analysis.

Figure 8. Fines Processing Area
The Fines Processing Area consists of a fines screen and several conveyors in order to sort material into 8x0 product and 4x0 product. The 8x0 product is moved into the storage structure to the north of the area and the 4x0 product is moved back to the Finish Plant Area for reincorporation into product streams.

The covered storage structure was installed in June 2010 and is 55 feet wide, 80 feet long, and has an arch height of 25 feet. The frame is a steel tube arch structure with a rubberized canvas covering. Approximately 1,200 tons of material can be stored in the structure, which is approximately a two week supply based on 2013 demand for the product. The supply this represents may fluctuate with market conditions. This structure is a significant mitigation measure for minimizing potential fugitive dust.

The Fines Processing area typically operates one shift per day, Monday through Friday. During peak demand periods, additional run hours may be required, including weekends.

6.6.1 Current Fugitive Dust Control Methodology

The covered storage structure provides wind erosion protection for the 8x0 long term storage pile in the Fines Processing Area. This area does not have any other structural emission reduction methods currently installed. However, there are routine maintenance activities to remove belt tailings and spillage in order to reduce dust emissions from this area.

6.7 Block Mix Processing Area

The Block Mix Area is located to the west of the Fines Processing Area and is used for both long term storage of block mix product and screening of the block mix prior to shipping to customers. Prior to shipment, two portable screens, the Reade screen and the Astec 710T screen, are used to remove clumped material caused by excess surface moisture from precipitation or intentional watering activities. The

Reade screen has been in-place since 2001 and the Astec 710T screen was added in 2007 as a backup to the Reade screen. These two screens can be used interchangeably, but rarely simultaneously.

Figure 9. Portable Screens in the Block Mix Processing Area
The Reade and Astec screens in the block mix processing area are used interchangeably to screen block mix material before loading onto customer delivery trucks. This screening step is necessary in order to remove any ice, contamination, or chunks of material that may have formed while being stored in the long term block mix storage piles. Front end loaders are used to load material into and out of these portable screens.

6.7.1 Current Fugitive Dust Control Methodology

Fugitive dust control in this area consists of proper loading and unloading procedures conducted by Norlite personnel. A copy of Norlite's Loader Operator Procedures, which outlines a protocol to minimize dust "boil-up" to prevent fugitive dust during material transfer, is included as Appendix J.

6.8 Island Area

The Island Area is used to store aggregate product before customer shipping. Several long term storage piles exist in this area and front end loaders are used to load and unload the storage piles. As of December 2013, when a stockpile inventory was performed by Spectra Environmental Group, Inc., the following storage piles were present in the Island Area.

- 3/4" aggregate long term storage pile (four piles)
- 3/8" aggregate long term storage pile (one pile)
- block mix long term storage pile (one pile, not typical)

The size of the piles in this area fluctuates based on customer product demand and the output rate of the kilns. Therefore, there are times when one or more of these storage piles is non-existent. The stockpile inventory is attached as Appendix F.

6.8.1 Current Fugitive Dust Control Methodology

Fugitive dust control in this area consists of proper loading and unloading procedures conducted by Norlite personnel. A copy of Norlite's Loader Operator Procedures, which outlines a protocol to minimize dust "boil-up" to prevent fugitive dust during material transfer, is included as Appendix J.

6.9 Boneyard Area

The Boneyard Area is located north of the Block Mix Processing Area and contains two shale piles, boneyard shale pile 1 and boneyard shale pile 2. These piles consist of raw shale fines that are produced in the Primary Area, a portion of which will eventually be taken to the Southern Overburden Storage area. The remainder will be sold or utilized around the plant. Aside from these two piles, there are miscellaneous items such as oversized equipment parts and tires that are stored in the area as spare parts.

6.9.1 Current Fugitive Dust Control Methodology

Fugitive dust control in this area consists of proper loading and unloading procedures conducted by Norlite personnel and maintenance of low stockpile heights. A copy of Norlite's Loader Operator Procedures, which outlines a protocol to minimize dust "boil-up" to prevent fugitive dust during material transfer, is included as Appendix J.

6.10 Southern Overburden Storage Area

The Southern Overburden Storage Area is located to the west of the Block Mix Processing Area and has an area of 34 acres. The overburden that is removed from the Quarry Area is moved to this area under Norlite's Mine Permit. The overburden is placed in a series of compacted berms with a fill area behind each berm. The active work area is normally less than five acres. This project has been ongoing since 2008 and is planned to go for at least a total of ten years. Once complete, this project will be terminated and the entire area will be revegetated and no further fugitive dust will be generated from this area.

6.10.1 Current Fugitive Dust Control Methodology

One bulldozer runs when the area is receiving stripped overburden from the Quarry. Material is laid down and a sheepsfoot compactor is used immediately to compact the overburden material down to almost full compaction. This ensures that all rainwater runs across the area rather than soaking into the soil. At the end of the day, there is no material that is placed in the Southern Overburden Storage Area that does not get compacted. Areas that have reached final grade and have been stabilized are seeded to control erosion and fugitive dust.

6.11 Roads

Various roads are present at the Norlite facility, most of which are unpaved. These roads connect the various areas to each other and are used by haul trucks, front end loaders, customer delivery trucks, a water truck, maintenance trucks, LFG delivery trucks, and passenger vehicles.

The Saratoga Street entrance, located at the northeast area of the facility, is paved and is used by employees and visitors to access the site. The other paved road at the facility is the beginning of the Elm Street Access Road, used by customer delivery trucks, although this paved portion's length is negligible.

The Norlite facility uses four front end loaders during day-to-day operations. The loader used in the Quarry operates for 3 to 4 hours each day and transports shot rock between the quarry wall and haul truck. Another loader is used in the Primary Area to transport shot rock from the shot rock pile to the jaw crusher. The loader travels 200 feet back and forth between the pile and the hopper and operates in 3- to 4- hour shifts. The loader that operates near the guard shack also does multiple trips of approximately 200 feet each day. The front end loader with the most mileage is the 988F loader, used for loading product onto customer trucks, moving the clinker piles, and moving material from short term storage piles to long term storage piles. The 988F covers approximately 15 miles each day.

6.11.1 Current Fugitive Dust Control Methodology

Fugitive dust control on unpaved roads is achieved by watering the roads. Water truck activity is greater during the summer months when the potential for fugitive dust emissions is greater. Typically, there is one water truck running all day on a schedule, with a second truck added during especially hot and dry days. On a typical 10-hour work day, a water truck will generally use 10 to 12 loads of water while watering the roadways, and the shot rock pile, and clinker piles, as needed. The piles in the Fines Screening Area are also watered as necessary. Although the water truck(s) normally run on a schedule, there are times when the trucks run more frequently in response to dry conditions.

6.12 Loading Trucks and Piles

Front end loaders and trucks are used throughout the site in order to move material. Haul trucks are used to transport shot rock from the Quarry to the Primary Area, as well as to transport overburden from the Quarry to the Southern Overburden Storage Area. Front end loaders are used to load and unload all of the storage piles on-site, including preparing product for customer pickup.

6.12.1 Current Fugitive Dust Control Methodology

Norlite has truck loading procedures that operators are required to follow when loading material onto trucks and piles. This procedure (Appendix J) uses a method for rolling material onto the receiving surface in order to minimize dust boil up.

6.13 Current Conditions of Existing Controls

According to Norlite personnel, all controls that are in-place around the facility are functional with the exception of the baghouse located in the Finish Plant Area. This baghouse is currently out of service because the bottom of it is compromised. However, all of the ductwork for the baghouse are still intact and connect to the triple deck finish mill screen, the El Jay crusher, and all of the conveyor belts that transport product out of the finish plant building where the triple deck finish mill screen is housed. There are also other areas where spray bar piping is non-functional.

7.0 Fugitive Dust Emission Calculations Methodology

Emission rates were estimated for each emission point at the Norlite facility. The sources were identified by a combination of the following activities: observations during site visits, discussions with Norlite personnel, review of Norlite's process flow diagrams and piping and instrumentation diagrams, preparation of simplified process schematics, and review of schematics by Norlite personnel.

To calculate potential fugitive dust emissions, SPEC primarily used equations from AP-42 Compilation of Air Pollutant Emission Factors, Fifth Edition [1]. These equations are industry standards for calculating emissions in the aggregate industry. The following is the general equation for emissions estimation.

$$E = (EF)(A)\left(1 - \frac{ER}{100}\right) \tag{1}$$

E = emissions (ton/yr)
A = activity rate
EF = emission factor
ER = overall emission reduction efficiency (%)

The emission factor (EF) is a representative value that relates the quantity of a material released to the atmosphere with an activity associated with the release of that material. The factors are usually expressed as the weight of material divided by a unit weight, volume, distance, or duration of the activity emitting the material. Most of the emission factors contained in this report have the units pounds of dust emitted per ton of material processed, i.e., lb/ton. The activity rate's units are dependent on the emission factor's units.

The overall reduction efficiency (based on facility controls) can be a combination of one or more efficiency value resulting from one or more control measures applied to a potential fugitive dust emission source. In the case with multiple emission reduction efficiencies, the following equation is used to compound them into one overall emission factor.

$$ER = 1 - \left(1 - \frac{ER_1}{100}\right)\left(1 - \frac{ER_2}{100}\right)\left(1 - \frac{ER_3}{100}\right)\ldots \tag{2}$$

This overall reduction efficiency can then be used in Equation (1) to determine the emissions from a single source.

When an equation for the emission factor was available, SPEC used it to calculate a site-specific emission factor, and then used it in Equation (1), along with an activity rate, in order to estimate the emissions from the source. In the case that an equation is not available, or if SPEC deemed the equation not applicable to the Norlite site, a general emission factor provided by AP-42 was used. These general emission factors were obtained from the United States Environmental Protection Agency's (EPA) WebFIRE online emissions factor repository, retrieval, and development tool [2]. SPEC chose to favor the use of site-specific equations over the use of AP-42 emission factors because the AP-42 emission factors are generalized factors based on EPA studies that may not be suitable for all processes and locations. Conversely, equations using site-specific information are preferred because they use site- or process-specific values to calculate the emission factors, and are therefore more accurate.

The following are the equations provided by AP-42 that SPEC used to calculate emission factors for use in the general emission equation. For emission sources that do not fit any of the following categories, such as fines screening or crushing operations, the emission factors from WebFIRE were used to calculate estimated emissions.

7.1 Drop Point Emissions

Drop points are points in a process where material is dropped from one location to another. This can be batch operations, such as a front end loader depositing material onto a storage pile, or continuous operations, such as a conveyor dropping material onto another conveyor. The emissions from both types of drop operations can be estimated using the following equation obtained from AP-42 Section 13.2.4 [1]. Note that superscripted numbers relate to an equivalent numbered reference in Section 11.0 References of this Plan.

$$EF = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \tag{3}$$

EF = emission factor (lb/ton)
k = particle size multiplier (dimensionless)
U = mean wind speed (mph)
M = material moisture content (%)

The particle size multiplier varies with aerodynamic particle size range according to the following table.

Table 1. AP-42 Drop Point Emissions Aerodynamic Particle Size Multiplier [1]

< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053

However, rather than using one of the listed aerodynamic particle size multipliers, SPEC has used $k=1$ in order to account for larger total suspended particulate matter (TSP), which results in a conservative estimate of emissions by capturing particles larger than 30 µm.

7.2 Storage Pile Wind Erosion Emissions

All outdoor storage piles are subject to wind erosion, which is a source of potential fugitive dust. SPEC has used the emission factor equation for wind erosion from section 11.2.3 of the fourth edition of AP-42 [3] rather than the equation given in the fifth edition. This is due to the availability of site-specific data; SPEC does not have reliable data to calculate emissions based on the equations in the fifth edition of AP-42 but has reliable data for use in the fourth edition equation.

$$EF = 1.7\left(\frac{s}{1.5}\right)\left(\frac{365-p}{235}\right)\left(\frac{f}{15}\right) \tag{4}$$

EF = total suspended particulate emission factor (lb/day/acre)
s = silt content of aggregate (%)
p = number of days with 0.01 in of precipitation per year
f = percentage of time that the unobstructed wind speed exceeds 12 mph at the mean pile height

The values used for s, p, and f are site-specific values that are detailed in Section 8.0 Site-Specific Values. The units for the emission factor for wind erosion are not the typical lb/ton but are in lb/day/acre. Therefore, calculating the emissions from storage piles requires information on the number of days each stock pile is present annually as well as the surface area of the stockpile.

Most of the stockpile surface areas have been estimated using the surface area of a cone. However, some stockpiles required different estimation methods. An example of a deviation from the conical assumption is the open fines storage pile whose surface area has been estimated using a wedge shape.

7.3 Vehicular Traffic on Unpaved Roads

The emission factor equation for vehicular travel on unpaved roads from section 13.2.2 of AP-42 [1] takes into account road silt content, mean vehicle weight, and the number of days in a year with at least 0.01 inches of precipitation. It does not take into account vehicle speed, because AP-42 has found that it does not have a significant impact on emission calculations.

$$EF = k\left(\frac{s}{2}\right)^{a}\left(\frac{W}{3}\right)^{b}\left(1-\frac{p}{365}\right) \tag{5}$$

k,a,b = empirical constants dependent on particle size
EF = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (ton)
p = number of days in a year with at least 0.01 in of precipitation

SPEC has used the empirical constants provided by AP-42 for PM-30 on industrial roads because PM-30 is assumed to be equivalent to total suspended particulate matter [1]. These values can be seen in the following table.

Table 2. Empirical Constants for Unpaved Industrial Roads [1]

	PM 2.5	PM 10	PM 30
k (lb/VMT)	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

This emission factor has the units of pounds of emission per vehicle mile traveled (VMT), or lb/VMT. When plugging the emission factor into the general equation for emissions estimation, the activity rate is then the total number of miles that the particular vehicle type travels annually.

7.4 Vehicular Traffic on Paved Roads

Although most of the roads at the Norlite facility are unpaved, the site contains small segments of paved roads. In order to calculate the fugitive dust emissions from these roads, SPEC used the following equation from section 13.2.1 of AP-42 [1].

$$EF = k(sL)^{0.91}(W)^{1.02}\left(1-\frac{p}{4N}\right) \tag{6}$$

EF = particulate emission factor (same units as k)
k = particle size multiplier for particle size rage and units of interest
sL = road surface silt loading (g/m^2)
W = average weight of vehicles traveling the road (ton)
p = number of days with at least 0.01 in of precipitation
N = number of days in the averaging period

Table 3. Particle Size Multiplier for Paved Roads [1]

	PM 2.5	PM 10	PM 15	PM 30
k (lb/VMT)	0.00054	0.0022	0.0027	0.011

Similar to the calculations for unpaved roads, SPEC used the particle size multiplier for PM-30 because it is assumed to be equivalent to total suspended particulate matter. Unlike the equation for unpaved road emission factor, the paved road equation takes into account silt loading of the road rather than the silt content of the road. Although the silt loading value has units of grams per square meter, the particle size multiplier k includes unit conversions in order to obtain results in lb/VMT. Like calculating emissions from unpaved roads, the activity rate to determine the tons of annual emissions from paved roads is required to be in miles.

Because SPEC wanted estimated annual emissions from the Norlite facility, a value of 365 days was used for N, the number of days in the averaging period.

The value for silt loading used in SPEC's calculations is 70 g/m^2. This is the average value listed in AP-42 [1]. An average value was used because an actual site measurement was not available. However, Norlite personnel stated that silt loading on paved surfaces is minimal and therefore the value used should provide a conservative estimate of potential fugitive dust emissions from these surfaces.

7.5 Overburden Stripping Emissions

In order to estimate the fugitive dust emissions from overburden stripping in the quarry, SPEC has used the following equation from section 11.9 of AP-42 [1].

$$EF = \frac{0.0021(H)^{1.1}}{(M)^{0.3}} \tag{7}$$

EF = emission factor (lb/yd^3)
H = drop height (ft)
M = material moisture content (%)

Because this equation produces an emission factor in pounds per cubic yard (lb/yd^3), the volume of overburden stripped annually was required to calculate the annual emissions from overburden stripping using the general equation for emissions estimation.

7.6 Overburden Storage Area Bulldozing Emissions

SPEC has used the following equation from section 11.9 of AP-42[1] to estimate the fugitive dust emissions from bulldozing the overburden storage area.

$$EF = \frac{5.7(s)^{1.2}}{(M)^{1.3}}$$

EF = emission factor (lb/hr)
s = material silt content (%)
M = material moisture content (%)

An estimated number of hours during which bulldozing activities occur is used in calculating the annual emissions from bulldozing.

7.7 Emission Reduction Efficiencies

SPEC used AP-42, EPA-450/3-77-010, and EPA-450/2-92-004 as references for assigning control efficiencies to the various emission sources at the Norlite facility.

Table 4. Emission Reduction Efficiencies

Emission Points	Controls	Efficiency (%)
Unpaved roads	Watering	50 [4]
Loading onto piles	Enclosure	70-99 [4]
	Adjustable chutes	75 [4]
Movement of pile	Enclosure	95-99 [4]
	Watering	50 [4]
Wind erosion	Enclosure	95-99 [4]
	Windscreens	Very low [4]
Overburden removal	Watering	50 [4]
Truck dumping	Watering	50 [4]
Crushing	Addition of water to material to be crushed and venting to baghouse	95 [4]
Transfer/conveying	Enclosed conveyors	90-99 [4]
Paved road	Vacuum sweeping	0-58 [5]

A 20% reduction is applied for low stockpile heights.

It should be noted that the same AP-42 equations discussed above are used by other organizations to estimate their fugitive dust emissions. An example of such an agency is the Texas Commission on Environmental Quality, Air Permits Division, in their New Source Review (NSR) Emission Calculations [11]. This document (Appendix I) contains sample calculations for drop operations using the same equations that SPEC used to calculate emissions from all drop points, Equation (3).

8.0 Site-Specific Values

All of the equations in the previous section require site-specific values in order to calculate emission factors. The following are the values SPEC used to calculate fugitive dust emissions as well as the sources of the values. Note that superscripted numbers relate to an equivalent numbered reference in Section 11.0 References of this Plan.

8.1 Meteorological Data & Topography

Climate data required in some of the equations was obtained from daily weather data for Albany International Airport in Albany, New York, which is 5.2 miles from the Norlite facility [6]. Ten years of daily weather data for 2004 through 2013 were analyzed in order to obtain the value for *p*, the number of days per year with more than 0.01 inches of precipitation; the value for *U*, the average wind speed at the site; and the value for *f*, the fraction of time with wind speeds greater than 12 miles per hour.

The value for *p* was obtained by counting the number of days with a total precipitation greater than 0.01 inches and dividing by the number of years in the sample, i.e., ten years. The value for *U* was determined by taking the average of the daily wind speeds. The value for *f* was calculated in a similar manner to *p*: the number of days with average wind speeds greater than 12 miles per hour were counted and then divided by the total number of days in the sample. Airport anemometers are typically located at heights of 20 feet to 50 feet [7] while the average storage pile height at the Norlite facility is 10-15 feet. This results in conservative fugitive dust emission values obtained from SPEC's calculations because wind speed is typically lower at lower elevations.

Table 5. Site-Specific Climate Data [6]

	Variable	Value
Number of days with >0.01 in precipitation	p	139.4 days
Average wind speed	U	7.15 mph
Fraction of time with wind speeds >12 mph	f	11.6%

The topography around the Norlite facility is dominated by low hills to the west and the Hudson River to the east. Small hills and ridges occur on either side of the river and elevations are approximately 50 to 300 feet above sea level within a mile of the facility. The elevation within half a mile of the facility is approximately 150 feet above sea level. There is a gradual increase in elevation with increased distance from the river. The highest elevation in the area is five miles northwest of the facility on the west-northwest side of Mt. Rafinesque at approximately 600 to 700 feet above sea level. The prevalent wind direction is from west to east year-round.

8.2 Product Characteristics

In order to calculate fugitive dust emissions from aggregate handling processes, it was necessary to define site- and process- specific product characteristics. This information was provided to SPEC by Norlite in the form of sieve analyses. Although silt is typically defined as material that passes through the No. 200 sieve [8, 9], SPEC has used a higher percentage for the value of material silt content in order to obtain conservative estimates of potential emissions. SPEC has used the median of the material passing through the No. 100 sieve and No. 200 sieve to obtain this conservative estimate of material silt content. Material moisture content was also obtained from the sieve analysis data. Furthermore, material passing through the No. 100 and No. 200 sieves can be both silt and clay [8, 9]. However, SPEC has assumed that all of the material passing through these two mesh sizes is silt in order to obtain conservative values for emissions.

Table 6. Norlite Product Characteristics

Product	Silt content, %	Moisture content (in process), %	Moisture content (post process), %
Raw shale	0.25%	2.00%	2.00%
Shale fines	0.20%	8.00%	8.00%
Clinker	3.30%	≤1.00%	5.00%
3/4"	1.35%	2.50%	7.50%
3/8"	1.48%	2.50%	7.50%
Block mix	9.30%	2.50%	7.50%
3/16"	1.35%	2.50%	7.50%
4x0	6.95%	2.50%	7.50%
8x0	8.95%	2.50%	7.50%
Overburden	61.13%	40.00%	40.00%
Kiln baghouse dust	100.00%	≤1.00%	30.00% (in muck pile)
Kiln rear chamber seal dust	14.65%	≤1.00%	30.00% (in muck pile)
Kiln clinker cooler multiclone dust	32.90%	≤1.00%	30.00% (in muck pile)

Overburden silt content was determined through sieve analysis data collected on the various layers of overburden (see summary table in Appendix D).

8.3 Mean Vehicle Weights

The equations for unpaved and paved roads require mean vehicle weights in order to calculate the emission factors. Using information provided by Norlite, SPEC has used the following as mean vehicle weights. Mean vehicle weight takes into account both empty and full vehicles, such as fuel delivery trucks and quarry haul trucks.

Table 7. Mean Vehicle Weights

Vehicle Type	Mean Weight (ton)
Quarry haul truck	42.5
Lightweight shipment truck (customer)	40
LGF delivery truck	40
Maintenance truck	10
Passenger vehicle	2
Front end loader	12
Water truck	15.2

SPEC has made the assumption that water trucks can hold an average of 2,500 gallons of water, which has been factored into the mean weight.

8.4 Production Rates

Information provided by Norlite was used to determine the production rates used in various parts of the emission calculations. SPEC took the averages of 2009-2013 production rates in order to obtain a facility-wide average over the last five years.

Table 8. Production Rates

Product	Average Production Rate (2009 2013)	Units
Shot rock from quarry	246,000	ton/yr
Overburden	161,000 (206,265)	yd^3/yr (ton/yr)
Kiln 1	121,000	ton/yr
Kiln 2	112,000	ton/yr
Shale fines	13,000	ton/yr
3/4" aggregate	69,000	ton/yr
3/8" aggregate	46,000	ton/yr
Block mix	92,000	ton/yr
Aggregate fines	28,000	ton/yr

Because the amount of overburden stripped annually was given to SPEC in volume (cubic yards per year), it was necessary to convert the average annual volume into average annual weight. The composition of overburden can vary greatly within the mine site, so SPEC made the assumption that 60-70% of the overburden is clay and the remainder is sand. This is supported by work conducted in the Southern Overburden Storage Area. The clay portions are made of up several different layers of clay, so SPEC used the average density of various clays from *Pocket Ref*[10]. The sand layers are also made up of several layers of sand types, so an average density was used for sand as well.

Table 9. Overburden Densities [10]

Material	Density (lb/yd^3)	Average Density (lb/yd^3)
Clay, compacted	2,943	
Clay, dry excavated	1,836	
Clay, dry lump	1,809	
Clay, wet excavated	3,078	2,417
Sand, damp	3,240	
Sand, dry	2,700	
Sand, loose	2,430	
Sand, water filled	3,240	2,903
Overburden		**2,562.30** **(1.28 ton/yd^3)**

The following values were used as the production rates of the El Jay cone crusher and the grizzly oversize pile at the Finish Plant.

Table 10. Other Production Rates

Location	Average Production Rate	Units	Information Provided by Norlite Personnel
Primary	282,900	ton/yr	Of the material that passes through the Primary crusher, 15% passes through a second time.
El Jay cone crusher	133,975	ton/yr	50% of clinker entering Finish Plant is screened off naturally while the other 50% passes through the El Jay crusher. Of the material that passes through the El Jay crusher, 15% passes through a second time.
Grizzly oversize pile	1,167	ton/yr	5 tons per 12 hour shift on average.

9.0 Fugitive Dust Emission Calculations

The estimated fugitive dust emission calculations are conservative estimates and are not absolute values. Furthermore, separate emission estimates for PM-10-particulate matter were not performed, as controls for total suspended particulate matter (TSP) are generally effective in reducing PM-10 emissions as well. The following table summarizes estimated emissions from each emission source at the Norlite facility.

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
QA1	Drilling	246,000	tpy	Water suppression, mist	50%	--	8.00E-05	lb/ton	0.00492
QA2	Blasting	246,000	tpy	None	0%	--	8.00E-02	lb/ton	9.84000
QA3	Quarried stone pile	246,000	tpy	Water suppression	50%	5.10E-03	4.00E-02	lb/ton	0.31336
QA4	Load stone into truck	246,000	tpy	None	0%	5.10E-03	2.37E-03	lb/ton	0.62671
QA5	Overburden stripping	161,000	cu yd/yr	None	0%	3.48E-02	6.00E-02	lb/yd3	2.80154
QA6	Load overburden into truck	206,265	tpy	None	0%	7.69E-05	3.70E-02	lb/ton	0.00793
PR1	Loading onto shot rock pile (Canal)	246,000	tpy	None	0%	5.10E-03	--	--	0.62671
PR2	Shot rock pile (Canal)	246,000	tpy	None	0%	1.05E-04	--	--	0.00000
PR3	Unloading shot rock pile	246,000	tpy	None	0%	5.10E-03	--	--	0.62671
PR4	Loading onto shale stockpile	246,000	tpy	Water suppression	20%	5.10E-03	3.00E-03	lb/ton	0.50137
PR5	Shale stockpile	246,000	tpy	Water suppression	50%	2.10E-01	--	--	0.00264
PR6	Unloading shale stockpile	246,000	tpy	None	0%	5.10E-03	--	--	0.62671
PR7	Drop point, raw shale drop to jaw crusher	282,900	tpy	None	0%	5.10E-03	3.00E-03	lb/ton	0.72072
PR8	Jaw crusher	282,900	tpy	Partially enclosed	75%	--	2.80E-01	lb/ton	9.90150
PR9	Drop point, jaw crusher to crusher belt	282,900	tpy	Enclosed	90%	5.10E-03	3.00E-03	lb/ton	0.07207
PR10	Crusher belt	282,900	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.02166
PR11	Drop point, crusher belt to screen belt	282,900	tpy	Enclosed	90%	5.10E-03	3.00E-03	lb/ton	0.07207
PR12	Screen belt	282,900	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.02829
PR13	Drop point, screen belt to primary double deck screen	282,900	tpy	None	0%	5.10E-03	3.00E-03	lb/ton	0.72072
PR14	Primary double deck screen	282,900	tpy	Water suppression, spray bar; Partially enclosed	85%	--	2.20E-03	lb/ton	0.04668
PR15	Drop point, primary double deck screen to primary cone crusher	282,900	tpy	Enclosed	0%	5.10E-03	3.00E-03	lb/ton	0.72072
PR16	Primary cone crusher	282,900	tpy	Partially enclosed	50%	--	3.00E-03	lb/ton	0.21218
PR17	Drop point, primary cone crusher to primary double deck screen	282,900	tpy	None	0%	5.10E-03	--	--	0.72072
PR18	Drop point, primary double deck screen to shale conveyor	282,900	tpy	Enclosed	90%	5.10E-03	3.00E-03	lb/ton	0.07207
PR19	Shale conveyor	233,000	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.06191
PR20	Drop point, shale conveyor to kiln feed pile	233,000	tpy	None	0%	5.10E-03	3.00E-03	lb/ton	0.59360

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
PR21	Kiln feed pile	233,000	tpy	None	0%	2.10E-01	--	--	0.00332
PR22	Drop point, double deck screen to shale fines conveyor	13,000	tpy	Enclosed	90%	5.10E-03	3.00E-03	lb/ton	0.00331
PR23	Shale fines conveyor	13,000	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.00255
PR24	Drop point, shale fines conveyor to shale fines pile	13,000	tpy	None	0%	7.32E-04	3.00E-03	lb/ton	0.00476
PR25	Shale fines pile	13,000	tpy	Low pile height/wetted material	20%	1.68E-01	--	--	0.00088
PR26	Loading from shale fines pile to trucks	13,000	tpy	None	0%	7.32E-04	3.00E-03	lb/ton	0.00476
KF1	Drop point, shale pile to #4 conveyor	116,500	tpy	Enclosed	99%	5.10E-03	3.00E-03	lb/ton	0.00297
KF2	Drop point, loader to #4 conveyor	116,500	tpy	None	0%	5.10E-03	--	--	0.29680
KF3	#4 conveyor	233,000	tpy	Partially underground; Dust cover; Water suppression, spray bar	85%	--	3.00E-03	lb/ton per 300 ft	0.01419
KF4	Drop point, #4 conveyor to #5 conveyor	233,000	tpy	Enclosed	90%	5.10E-03	3.00E-03	lb/ton	0.05936
KF5	#5 conveyor	233,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.04349
KF6	Drop point, #5 conveyor to shale storage pile	233,000	tpy	Enclosed	97%	5.10E-03	3.00E-03	lb/ton	0.01781
KF7	Kiln feed storage pile	233,000	tpy	Partially enclosed; Low pile height	90%	2.10E-01	--	--	0.00034
KF8	Drop point, shale storage pile to kiln 1 feeder belt	121,000	tpy	Underground	99%	5.10E-03	3.00E-03	lb/ton	0.00308
KF9	Kiln 1 feeder belt	121,000	tpy	Underground	90%	--	3.00E-03	lb/ton per 300 ft	0.00149
KF10	Drop point, kiln 1 feeder belt to kiln 1 lower belt	121,000	tpy	Enclosed	80%	5.10E-03	3.00E-03	lb/ton	0.06165
KF11	Kiln 1 lower belt	121,000	tpy	Dust cover; Partially underground; Meat locker curtain	70%	--	3.00E-03	lb/ton per 300 ft	0.01104
KF12	Drop point, kiln 1 lower belt to kiln 1 top belt	121,000	tpy	Enclosed	80%	5.10E-03	3.00E-03	lb/ton	0.06165
KF13	Kiln 1 top belt	121,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.00381
KF14	Drop point, kiln 1 top belt to kiln 1 feed	121,000	tpy	Chute	90%	5.10E-03	3.00E-03	lb/ton	0.03083
KF15	Kiln 1 feed (AccuRate feeder)	121,000	tpy	Dust cover	0%	5.10E-03	3.00E-03	lb/ton	0.30826
KF16	Kiln 1 rear chamber system (rim seal)	121,000	tpy	Dust cover	99%	--	8.40E-01	lb/ton	0.50820
KF17	Kiln 1 front seal	121,000	tpy	Vacuum	99%	--	8.40E-01	lb/ton	0.50820
KF18	Drop point, shale storage pile to kiln 2 feeder belt	112,000	tpy	Underground	99%	5.10E-03	3.00E-03	lb/ton	0.00285
KF19	Kiln 2 feeder belt	112,000	tpy	Underground	90%	--	3.00E-03	lb/ton per 300 ft	0.00138

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
KF20	Drop point, kiln 2 feeder belt to kiln 2 lower belt	112,000	tpy	Enclosed	90%	5.10E-03	3.00E-03	lb/ton	0.02853
KF21	Kiln 2 lower belt	112,000	tpy	Dust cover; Partially underground; Meat locker curtain	70%	--	3.00E-03	lb/ton per 300 ft	0.01065
KF22	Drop point, kiln 2 lower belt to kiln 2 middle belt	112,000	tpy	Chute	80%	5.10E-03	3.00E-03	lb/ton	0.05707
KF23	Kiln 2 middle belt	112,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.00449
KF24	Drop point, kiln 2 middle belt to kiln 2 top belt	112,000	tpy	Chute	80%	5.10E-03	3.00E-03	lb/ton	0.05707
KF25	Kiln 2 top belt	112,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.00564
KF26	Drop point, kiln 2 top belt to kiln 2 feed	112,000	tpy	Chute	80%	5.10E-03	3.00E-03	lb/ton	0.05707
KF27	Kiln 2 feed (AccuRate feeder)	112,000	tpy	Dust cover	0%	5.10E-03	3.00E-03	lb/ton	0.28533
KF28	Kiln 2 rear chamber system (rim seal)	112,000	tpy	Dust cover	99%	--	8.40E-01	lb/ton	0.47040
KF29	Kiln 2 front seal	112,000	tpy	Vacuum	99%	--	8.40E-01	lb/ton	0.47040
KF30	Opening of kiln rim seals for cleaning	438	tpy	None	0%	--	3.00E-03	lb/ton	0.00066
KF31	Removal of bag house plug (vacuum truck unloading)	338	tpy	Water suppression; Baghouse	0%	--	3.00E-03	lb/ton	0.00051
KL1	Drop point, kiln 1 to kiln 1 clinker cooler	121,000	tpy	Enclosed	99%	--	3.00E-03	lb/ton	0.00182
KL2	Kiln 1 clinker cooler	121,000	tpy	Enclosed	90%	--	3.00E-01	lb/ton	1.81500
KL3	Drop point, kiln 1 clinker cooler to kiln 1 clinker belt	121,000	tpy	Partially enclosed	80%	--	3.00E-03	lb/ton	0.03630
KL4	Kiln 1 clinker belt	121,000	tpy	Partially underground; Dust cover; Water suppression, as needed	70%	--	3.00E-03	lb/ton per 300 ft	0.02122
KL5	Drop point, kiln 1 clinker belt to kiln 1 clinker pile	121,000	tpy	Water suppression	50%	1.34E-02	3.00E-03	lb/ton	0.40675
KL6	Kiln 1 clinker pile	121,000	tpy	Water suppression	50%	2.78E+00	--	--	0.01549
KL7	Drop point, kiln 2 to kiln 2 clinker cooler	112,000	tpy	Enclosed	99%	--	3.00E-03	lb/ton	0.00168
KL8	Kiln 2 clinker cooler	112,000	tpy	Enclosed	90%	--	3.00E-01	lb/ton	1.68000
KL9	Drop point, kiln 2 clinker cooler to kiln 2 clinker belt	112,000	tpy	Partially enclosed	80%	--	3.00E-03	lb/ton	0.03360
KL10	Kiln 2 clinker belt	112,000	tpy	Partially underground; Dust cover; Water suppression, as needed	70%	--	3.00E-03	lb/ton per 300 ft	0.01895
KL11	Drop point, kiln 2 clinker belt to kiln 2 clinker pile	112,000	tpy	Water suppression, mist	50%	1.34E-02	3.00E-03	lb/ton	0.37650

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
KL12	Kiln 2 clinker pile	112,000	tpy	Water suppression, mist	50%	2.78E+00	--	--	0.01549
KL13	Transfer kiln 2 clinker pile to kiln 1 clinker pile	112,000	tpy	Loader Operator Protocol	0%	1.34E-02	3.00E-03	lb/ton	0.75300
KL14	Muck pile	8,160	tpy	Moisture; Pile shaping; Compaction	50%	8.42E+01	--	--	1.05615
KL15	Loading onto muck pile	8,160	tpy	None	0%	1.15E-04	--	--	0.00047
KL16	Unloading muck pile	8,160	tpy	None	0%	1.15E-04	--	--	0.00047
FP1	Drop point, kiln 1 clinker pile to transfer to #1 conveyor	233,000	tpy	Underground	90%	--	3.00E-03	lb/ton	0.03495
FP2	#1 conveyor	233,000	tpy	Dust cover; Partially underground	70%	--	3.00E-03	lb/ton per 300 ft	0.01599
FP3	Drop point, #1 conveyor to grizzly	233,000	tpy	None	80%	1.34E-02	3.00E-03	lb/ton	0.31330
FP4	Grizzly on lightweight aggregate feed platform	233,000	tpy	Partially enclosed	70%	1.34E-02	3.00E-03	lb/ton	0.46995
FP5	Drop point, grizzly to grizzly pile	233,000	tpy	None	0%	1.34E-02	3.00E-03	lb/ton	1.56651
FP6	Grizzly reject pile	1,167	tpy	None	0%	2.78E+00	--	--	0.00510
FP7	Drop point, grizzly to #2 conveyor	233,000	tpy	Enclosed	90%	1.34E-02	3.00E-03	lb/ton	0.15665
FP8	#2 conveyor	233,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.03155
FP9	Drop point, #2 conveyor to triple deck finish mill screen	233,000	tpy	Enclosed	90%	1.34E-02	3.00E-03	lb/ton	0.15665
FP10	Triple deck finish mill screen	233,000	tpy	Baghouse	0%	--	2.20E-03	lb/ton	0.25630
FP11	Drop point, triple deck finish mill screen to 3/4" discharge conveyor	69,000	tpy	Enclosed	90%	3.73E-03	3.00E-03	lb/ton	0.01286
FP12	3/4" discharge conveyor	69,000	tpy	Dust cover; Baghouse	70%	--	3.00E-03	lb/ton per 300 ft	0.00647
FP13	Drop point, 3/4" discharge conveyor to 3/4" to stockpile conveyor	69,000	tpy	Enclosed	80%	3.73E-03	3.00E-03	lb/ton	0.02572
FP14	3/4" to stockpile conveyor	69,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.01273
FP15	Drop point, 3/4" to stockpile conveyor to 3/4" short term storage pile	69,000	tpy	Tube; Water suppression	95%	3.73E-03	3.00E-03	lb/ton	0.00643
FP16	3/4" short term storage pile	98,185	tpy	Water suppression	50%	1.14E+00	--	--	0.00449
FP17	Drop point, triple deck finish mill screen to 3/8" discharge conveyor	46,000	tpy	Enclosed	80%	3.73E-03	3.00E-03	lb/ton	0.01715
FP18	3/8" discharge conveyor	46,000	tpy	Dust cover; Baghouse	70%	--	3.00E-03	lb/ton per 300 ft	0.00289

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
FP19	Drop point, 3/8" discharge conveyor to 3/8" to stockpile conveyor	46,000	tpy	Enclosed	0%	3.73E-03	3.00E-03	lb/ton	0.08575
FP20	3/8" to stockpile conveyor	46,000	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.00660
FP21	Drop point, 3/8" stockpile conveyor to 3/8" short term storage pile	46,000	tpy	Water suppression, spray head	50%	3.73E-03	3.00E-03	lb/ton	0.04287
FP22	3/8" short term storage pile	25,550	tpy	Water suppression, spray head	70%	1.24E+00	--	--	0.05191
FP23	Drop point, triple deck finish mill screen to oversize discharge conveyor	133,975	tpy	Enclosed	90%	1.34E-02	3.00E-03	lb/ton	0.09007
FP24	Oversize discharge conveyor	133,975	tpy	Partially covered; Baghouse	70%	--	3.00E-03	lb/ton per 300 ft	0.01122
FP25	Drop point, oversize discharge conveyor to oversize hopper	133,975	tpy	None	0%	1.34E-02	3.00E-03	lb/ton	0.90074
FP26	Oversize hopper	133,975	tpy	None	0%	--	3.00E-03	lb/ton	0.20096
FP27	Drop point, oversize hopper to El Jay crusher speed conveyor	133,975	tpy	Partially enclosed	70%	1.34E-02	3.00E-03	lb/ton	0.27022
FP28	El Jay crusher speed conveyor	133,975	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.01151
FP29	Drop point, El Jay crusher speed conveyor to El Jay crusher	133,975	tpy	Enclosed	90%	1.34E-02	3.00E-03	lb/ton	0.09007
FP30	El Jay crusher	133,975	tpy	Baghouse	90%	--	2.50E-02	lb/ton	0.16747
FP31	Drop point, El Jay crusher to El Jay discharge conveyor	133,975	tpy	Enclosed	90%	1.34E-02	3.00E-03	lb/ton	0.09007
FP32	El Jay discharge conveyor	133,975	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.00804
FP33	Drop point, El Jay discharge conveyor to #2 return conveyor	133,975	tpy	Enclosed	80%	1.34E-02	3.00E-03	lb/ton	0.18015
FP34	#2 return conveyor	133,975	tpy	Dust cover	70%	--	3.00E-03	lb/ton per 300 ft	0.01398
FP35	Drop point, #2 return conveyor to #2 conveyor	133,975	tpy	Enclosed	80%	1.34E-02	3.00E-03	lb/ton	0.18015
FP36	Drop point, triple deck finish mill screen to fines to silo conveyor	28,000	tpy	Enclosed	90%	3.73E-03	3.00E-03	lb/ton	0.00522
FP37	Fines to silo conveyor	28,000	tpy	Dust cover; Baghouse	70%	--	3.00E-03	lb/ton per 300 ft	0.00840
FP38	Drop point, fines to silo conveyor to enclosed fines storage pile	85,000	tpy	Chute	94%	3.73E-03	3.00E-03	lb/ton	0.00951
FP39	Enclosed fines storage pile	85,000	tpy	Roof; Concrete enclosure at bottom; Tarps	80%	5.85E+00	--	--	0.03001
FP40	Open fines storage pile	85,000	tpy	Enclosed; Concrete wall to south; Wind screen	80%	5.85E+00	--	--	0.00981
FP41	Baghouse dust silo 1	85,000	tpy	Enclosed	97%	7.83E+00	9.90E-03	lb/ton	0.00153

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
FP42	Drop point, baghouse dust silo 1 to shipping belt	85,000	tpy	Enclosed	99%	3.73E-03	3.00E-03	lb/ton	0.00158
FP43	Baghouse dust silo 2	85,000	tpy	Enclosed	97%	7.83E+00	9.90E-03	lb/ton	0.00153
FP44	Drop point, baghouse dust silo 2 to shipping belt	85,000	tpy	Enclosed	99%	3.73E-03	3.00E-03	lb/ton	0.00158
FP45	Shipping belt	27,094	tpy	Partially underground; Dust cover	90%	--	3.00E-03	lb/ton per 300 ft	0.00102
FP46	Drop point, shipping belt to stationary belt	27,094	tpy	Enclosed	90%	3.73E-03	3.00E-03	lb/ton	0.00505
FP47	Stationary belt	27,094	tpy	Dust cover; Baghouse; Improved maintenance	70%	--	3.00E-03	lb/ton per 300 ft	0.00369
FP48	Drop point, stationary belt to radial stacker	27,094	tpy	Enclosed	90%	3.73E-03	3.00E-03	lb/ton	0.00505
FP49	Radial stacker	27,094	tpy	Dust cover; Spray head adjustment	70%	--	3.00E-03	lb/ton per 300 ft	0.00301
FP50	Drop point, radial stacker to block mix short term storage pile 1	27,094	tpy	Baghouse; Water suppression; Adjustable discharge height	99%	3.73E-03	3.00E-03	lb/ton	0.00063
FP51	Block mix short term storage pile 1	15,133	tpy	Low pile height/bldg	20%	7.83E+00	--	--	0.07249
FP52	Block mix short term storage pile 2	14,764	tpy	Low pile height/bldg	20%	7.83E+00	--	--	0.07249
FP53	Block mix short term storage pile 3	2,147	tpy	Low pile height/small pile/bldg	50%	7.83E+00	--	--	0.03096
FP54	Block mix short term storage pile 4	13,421	tpy	Low pile height/bldg	20%	7.83E+00	--	--	0.11829
FP55	Block mix short term storage pile 5	33,788	tpy	Low pile height	20%	7.83E+00	--	--	0.27841
FP56	Block mix short term storage pile 6	2,550	tpy	Low pile height/small pile	50%	7.83E+00	--	--	0.05963
FP57	3/4" long term storage pile 5	37,531	tpy	Low pile height	20%	1.14E+00	--	--	0.01717
FP58	Loading 3/4" onto trucks	69,000	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.02763
FP59	Loading 3/8" onto trucks	46,000	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.01842
FP60	Loading clinker onto trucks	233,000	tpy	Loader Operator Protocol	0%	1.41E-03	3.00E-03	lb/ton	0.16458
FP61	Loading block mix onto piles	92,000	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.03684
FP62	Loading block mix onto trucks	92,000	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.03684
FN1	8 X 0 long term storage pile	27,094	tpy	Enclosed	85%	7.83E+00	--	--	0.02218
FN2	4 X 0 fines feed pile	66,839	tpy	Low pile height	20%	5.85E+00	--	--	0.01975

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
FN3	Loading of block mix into Cedarapids feed hopper (surge bin)	66,839	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.12459
FN4	Cedarapids feed hopper (surge bin)	66,839	tpy	None	0%	--	3.00E-03	lb/ton	0.10026
FN5	Drop point, Cedarapids feed hopper to feeder belt	66,839	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.12459
FN6	Feeder belt	66,839	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.01702
FN7	Drop point, feeder belt to screen feed belt	66,839	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.12459
FN8	Screen feed belt	66,839	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.01154
FN9	Drop point, screen feed belt to Astec 2618 fines screen	66,839	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.12459
FN10	Astec 2618 fines screen	66,839	tpy	None	0%	--	2.00E-03	lb/ton	0.06684
FN11	Drop point, fines screen to #4s belt	66,839	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.12459
FN12	#4s belt	66,839	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.01421
FN13	Drop point, #4s belt to 4 mesh reject pile	66,839	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.12459
FN14	4 mesh reject pile	27,094	tpy	Low pile height	20%	5.85E+00	--	--	0.01975
FN15	Drop point, fines screen to fines #8s belt	27,094	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.05050
FN16	#8s belt	27,094	tpy	None	0%	--	3.00E-03	lb/ton per 300 ft	0.00580
FN17	Drop point, #8s belt to fines 8 X 0 pile	27,094	tpy	None	0%	3.73E-03	3.00E-03	lb/ton	0.05050
FN18	8 X 0 pile	27,094	tpy	Low pile height	20%	7.53E+00	--	--	0.02543
FN19	3/4" long term storage pile 6	9,847	tpy	Low pile height	20%	1.14E+00	--	--	0.00384
FN20	Loading screened fines onto trucks (8 X 0, 4 X 0, 4 mesh reject)	27,094	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.01085
BM1	Block mix long term storage pile 1	8,376	tpy	None	0%	7.83E+00	--	--	0.25272
BM2	Block mix long term storage pile 2	8,376	tpy	Low pile height	20%	7.83E+00	--	--	0.01598
BM3	Block mix long term storage pile 3	8,376	tpy	Low pile height	20%	7.83E+00	--	--	0.01862
BM4	Block mix long term storage pile 4	11,341	tpy	Low pile height	20%	7.83E+00	--	--	0.20980
BM5	Loading block mix into portable screen	89,118	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.03568
BM6	Astec 710T	44,559	tpy	None	0%	--	2.00E-03	lb/ton	0.04456
BM7	Reade screen	44,559	tpy	None	0%	--	2.00E-03	lb/ton	0.04456

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
BM8	Loading onto temporary block mix pile	89,118	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.03568
BM9	Temporary block mix pile for customer pickup	89,118	tpy	Low pile height	20%	7.83E+00	--	--	0.04084
BM10	Loading block mix onto trucks	89,118	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.03568
BM11	Loading onto block mix pile	89,118	tpy	None	0%	8.01E-04	3.00E-03	lb/ton	0.03568
IS1	3/4" long term storage pile 1	2,840	tpy	Low pile height	20%	1.14E+00	--	--	0.00719
IS2	3/4" long term storage pile 2	70,138	tpy	Low pile height	20%	1.14E+00	--	--	0.01052
IS3	3/4" long term storage pile 3	4,014	tpy	Low pile height	20%	1.14E+00	--	--	0.02381
IS4	3/4" long term storage pile 4	10,528	tpy	Low pile height	20%	1.14E+00	--	--	0.04041
IS5	3/8" long term storage pile	45,642	tpy	Low pile height	20%	1.24E+00	--	--	0.01876
IS6	Block mix long term storage pile 5	2,147	tpy	Low pile height	20%	7.83E+00	--	--	0.02643
IS7	Loading onto 3/4" pile	69,000	tpy	None	0%	8.01E-04	3.00E-03	lb/ton	0.02763
IS8	Loading 3/4" onto trucks	69,000	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.02763
IS9	Loading onto 3/8" pile	46,000	tpy	None	0%	8.01E-04	3.00E-03	lb/ton	0.01842
IS10	Loading 3/8" onto trucks	46,000	tpy	Loader Operator Protocol	0%	8.01E-04	3.00E-03	lb/ton	0.01842
BY1	Boneyard shale pile 1	9,446	tpy	None	0%	1.68E-01	--	--	0.00410
BY2	Boneyard shale pile 2	9,446	tpy	None	0%	1.68E-01	--	--	0.00410
BY3	Loading shale fines onto boneyard shale piles	9,446	tpy	None	0%	7.32E-04	3.00E-03	lb/ton	0.00346
BY4	Loading boneyard shale piles onto trucks	9,446	tpy	Loader Operator Protocol	0%	7.32E-04	3.00E-03	lb/ton	0.00346
OS1	Bulldozing	206,265	tpy	None	0%	6.56E+00	3.00E-03	lb/ton	2.88506
OS2	Receiving overburden from quarry	206,265	tpy	None	0%	7.69E-05	2.00E-03	lb/ton	0.00793
OS3	Wind erosion in overburden storage area	--	--	None	0%	--	3.80E-01	ton/acre-year	1.90000
RD1	Transport of stone from quarry to primary	15,504	mi	Water	50%	5.68E-01	6.20E+00	lb/mi	2.20290
RD2	Transfer of overburden from quarry to overburden storage area	15,875	mi	Water	50%	5.68E-01	6.20E+00	lb/mi	2.25566
RD3	Transport of shales fines to boneyard	1,043	mi	Water	50%	5.68E-01	6.20E+00	lb/mi	0.14819
RD4	Transport of product off-site by truck	7,992	mi	Water	50%	5.53E-01	6.20E+00	lb/mi	1.10499
RD5	Travel of LGF delivery trucks	550	mi	Water	50%	5.53E-01	6.20E+00	lb/mi	0.07598

Table 11. Fugitive Dust Emissions Estimate

Source ID	Source Description	Production Rate	Units	Control Methods	Overall Control Efficiency	Emission Factor, Calculated	Emission Factor, AP-42	EF Units	Emission Rate, tpy
RD6	Maintenance traffic	2,914	mi	Water	50%	2.96E-01	6.20E+00	lb/mi	0.21589
RD7	Passenger vehicle traffic	5,952	mi	Water	50%	9.69E-01	--	--	1.44230
RD8	Transport of shale fines to overburden storage area	1,427	mi	Water	50%	5.68E-01	6.20E+00	lb/mi	0.20276
RD9	Water truck movement	3,686	mi	Water	50%	3.58E-01	6.20E+00	lb/mi	0.32983
RD10	On-site product movement via front end loader	4,493	mi	Water	50%	3.22E-01	6.20E+00	lb/mi	0.36139
Total									**61.40307**

10.0 Discussion

The calculations shown in Table 11 are based on the most recent emission factors provided in AP-42 or WebFIRE, the EPA's online emission factor database, or calculated from the latest appropriate versions of emission factor estimation equations. The total estimated potential fugitive dust emissions from the Norlite facility are on the order of 61 tons/year. Actual fugitive dust emissions are likely less than this estimate for the following reasons:

- Material silt content was estimated based on both 100 and 200 sieve data for each product;
- General EPA AP-42 factors were used for several sources, which provide inherently conservative emission estimates;
- Re-processed material was included each time it went through a particular process without reduction in estimated silt content; and
- Conservatively low control factors were used for covered conveyors and low stockpile height.

Areas within the Norlite facility that contribute the largest amount of potential fugitive dust emissions are:

- Quarry Blasting;
- Primary Jaw Crushing;
- Southern Overburden Storage Area earthwork and transport of material;
- Movements along internal roadways;
- Material drop points associated with the clinkers; and
- Wind erosion off select areas, including the Southern Overburden Storage Area and muck pile.

Quarry blasting emissions have a conservatively high estimate because the calculation is based on an AP-42 emission factor, which provides consistently high emission estimates when applied in an aggregate setting. Potential dust emissions, as estimated, are not a significant concern due to the location of the quarry excavation relative to the facility property line and thick vegetative buffer surrounding the active blasting area.

Primary jaw crushing and fines screening represent a significant fraction of the calculated potential fugitive dust emissions at the Norlite facility. Potential dust emissions, as estimated for these sources, are not of significant concern due to the location of the primary area relative to the facility property line, and the conservative particle size range used to generate the emissions estimate. A vast majority of the potential fugitive dust generated from the primary and screens settles within the quarry and facility itself. These estimates, however, can be reduced by improved water spray application and/or wind screens in both areas.

Excavation and transportation of overburden in the quarry, transportation of overburden to the Southern Overburden Storage Area, and mobile equipment moving along internal roadways is another major source of potential fugitive dust. Continued watering with on-site water trucks effectively manages this potential source of fugitive dust. As with the discussions above, potential dust emissions, as estimated, are not of significant concern due to the location of the roadways relative to the facility property line. AP-42, Chapter 13, specifically discusses fugitive dust from unpaved surfaces and clearly states that dust from these sources settles in the vicinity of the source itself.

Wind erosion from material drop points and open stockpiles represent the last of the major potential fugitive dust sources. Continued use of water control devices, conveyor covers, low pile height, and good housekeeping practices can effectively manage these potential sources of fugitive dust.

The following table (Table 12) identifies each control device for each identified emission source across Norlite's facility along with a statement of the functionality of each control device. The table also identifies when or where additional controls may be useful in reducing potential fugitive dust emissions.

Table 12. Evaluation of Existing Controls

Source ID	Source Description	Control Methods	Control Condition	Not Warranted	Effective As Is	Modifications Needed	Controls Needed
QA1	Drilling	Water suppression, mist	Functional		X		
QA2	Blasting	None	None	X			
QA3	Quarried stone pile	Water suppression	Functional		X		
QA4	Load stone into truck	None	None	X			
QA5	Overburden stripping	None	None	X			
QA6	Load overburden into truck	None	None	X			
PR1	Loading onto shot rock pile (Canal)	None	None	X			
PR2	Shot rock pile (Canal)	None	None	X			
PR3	Unloading shot rock pile	None	None	X			
PR4	Loading onto shale stockpile	Water suppression	Functional		X		
PR5	Shale stockpile	Water suppression	Functional		X		
PR6	Unloading shale stockpile	None	None	X			
PR7	Drop point, raw shale drop to jaw crusher	None	None	X			
PR8	Jaw crusher	Partially enclosed	Functional			X	X
PR9	Drop point, jaw crusher to crusher belt	Enclosed	Functional				X
PR10	Crusher belt	None	None	X			
PR11	Drop point, crusher belt to screen belt	Enclosed	Functional		X		
PR12	Screen belt	None	None	X			
PR13	Drop point, screen belt to primary double deck screen	None	None	X			
PR14	Primary double deck screen	Water suppression, spray bar; Partially enclosed	Functional; Functional			X	
PR15	Drop point, primary double deck screen to primary cone crusher	Enclosed	Functional		X		
PR16	Primary cone crusher	Partially enclosed	Functional		X	X	
PR17	Drop point, primary cone crusher to primary double deck screen	None	None	X			
PR18	Drop point, primary double deck screen to shale conveyor	Enclosed	Functional		X		
PR19	Shale conveyor	None	None		X		
PR20	Drop point, shale conveyor to kiln feed pile	None	None		X		
PR21	Kiln feed pile	None	None		X		
PR22	Drop point, double deck screen to shale fines conveyor	Enclosed	Functional		X		
PR23	Shale fines conveyor	None	None				X
PR24	Drop point, shale fines conveyor to shale fines pile	None	None				X
PR25	Shale fines pile	Low pile height/wetted material	Functional		X		
PR26	Loading from shale fines pile to trucks	None	None	X			
KF1	Drop point, shale pile to #4 conveyor	Enclosed	Functional		X		
KF2	Drop point, loader to #4 conveyor	None	None	X			
KF3	#4 conveyor	Partially underground; Dust cover; Water suppression, spray bar	Functional; Functional; Functional		X		
KF4	Drop point, #4 conveyor to #5 conveyor	Enclosed	Functional		X		
KF5	#5 conveyor	Dust cover	Functional		X		
KF6	Drop point, #5 conveyor to shale storage pile	Enclosed	Functional		X		

Table 12. Evaluation of Existing Controls

Source ID	Source Description	Control Methods	Control Condition	Not Warranted	Effective As Is	Modifications Needed	Controls Needed
KF7	Kiln feed storage pile	Partially enclosed; Low pile height	Functional; Functional		X		
KF8	Drop point, shale storage pile to kiln 1 feeder belt	Underground	Functional		X		
KF9	Kiln 1 feeder belt	Underground	Functional		X		
KF10	Drop point, kiln 1 feeder belt to kiln 1 lower belt	Enclosed	Functional		X		
KF11	Kiln 1 lower belt	Dust cover; Partially underground; Meat locker curtain	Functional; Functional; Functional		X		
KF12	Drop point, kiln 1 lower belt to kiln 1 top belt	Enclosed	Functional		X		
KF13	Kiln 1 top belt	Dust cover	Functional		X		
KF14	Drop point, kiln 1 top belt to kiln 1 feed	Chute	Functional		X		
KF15	Kiln 1 feed (AccuRate feeder)	Dust cover	Functional		X		
KF16	Kiln 1 rear chamber system (rim seal)	Vacuum annular space	Functional		X		
KF17	Kiln 1 front seal	Vacuum	Functional		X		
KF18	Drop point, shale storage pile to kiln 2 feeder belt	Underground	Functional		X		
KF19	Kiln 2 feeder belt	Underground	Functional		X		
KF20	Drop point, kiln 2 feeder belt to kiln 2 lower belt	Enclosed	Functional		X		
KF21	Kiln 2 lower belt	Dust cover; Partially underground; Meat locker curtain	Functional; Functional; Functional		X		
KF22	Drop point, kiln 2 lower belt to kiln 2 middle belt	Chute	Functional		X		
KF23	Kiln 2 middle belt	Dust cover	Functional		X		
KF24	Drop point, kiln 2 middle belt to kiln 2 top belt	Chute	Functional		X		
KF25	Kiln 2 top belt	Dust cover	Functional		X		
KF26	Drop point, kiln 2 top belt to kiln 2 feed	Chute	Functional		X		
KF27	Kiln 2 feed (AccuRate feeder)	Dust cover	Functional; Functional		X		
KF28	Kiln 2 rear chamber system (rim seal)	Vacuum annular space	Functional		X		
KF29	Kiln 2 front seal	Vacuum	Functional		X		
KF30	Opening of kiln rim seals for cleaning	None	None			X	X
KF31	Removal of bag house plug (vacuum truck unloading)	Water suppression; Baghouse	Functional; Functional		X		
KL1	Drop point, kiln 1 to kiln 1 clinker cooler	Enclosed	Functional		X		
KL2	Kiln 1 clinker cooler	Enclosed	Functional		X		
KL3	Drop point, kiln 1 clinker cooler to kiln 1 clinker belt	Partially enclosed	Functional			X	
KL4	Kiln 1 clinker belt	Partially underground; Dust cover; Water suppression, as needed	Functional; Functional; Functional		X		
KL5	Drop point, kiln 1 clinker belt to kiln 1 clinker pile	Water suppression	Not functional			X	
KL6	Kiln 1 clinker pile	Water suppression	Partially functional			X	
KL7	Drop point, kiln 2 to kiln 2 clinker cooler	None	None	X			
KL8	Kiln 2 clinker cooler	Enclosed	Functional		X		
KL9	Drop point, kiln 2 clinker cooler to kiln 2 clinker belt	Partially enclosed	Functional			X	
KL10	Kiln 2 clinker belt	Partially underground; Dust cover; Water suppression, as needed	Functional; Functional; Functional		X		
KL11	Drop point, kiln 2 clinker belt to kiln 2 clinker pile	Water suppression, mist	Not functional		X		
KL12	Kiln 2 clinker pile	Water suppression, mist	Partially functional			X	
KL13	Transfer kiln 2 clinker pile to kiln 1 clinker pile	Loader operator protocol	Functional		X		

Table 12. Evaluation of Existing Controls

Source ID	Source Description	Control Methods	Control Condition	Not Warranted	Effective As Is	Modifications Needed	Controls Needed
KL14	Muck pile	Moisture/Pile shaping/Compaction	Functional; Functional; Functional		X		
KL15	Loading onto muck pile	None	None	X			
KL16	Unloading muck pile	None	None	X			
FP1	Drop point, kiln 1 clinker pile to transfer to #1 conveyor	Underground	Functional		X		
FP2	#1 conveyor	Dust cover; Partially underground	Functional; Functional		X		
FP3	Drop point, #1 conveyor to grizzly	None	None	X			
FP4	Grizzly on lightweight aggregate feed platform	Partially enclosed	Functional		X		
FP5	Drop point, grizzly to grizzly pile	None	None	X			
FP6	Grizzly reject pile	None	None	X			
FP7	Drop point, grizzly to #2 conveyor	Enclosed	Functional		X		
FP8	#2 conveyor	Dust cover	Functional		X		
FP9	Drop point, #2 conveyor to triple deck finish mill screen	Enclosed	Functional		X		
FP10	Triple deck finish mill screen	Baghouse	Not functional			X	
FP11	Drop point, triple deck finish mill screen to 3/4" discharge conveyor	Enclosed	Functional		X		
FP12	3/4" discharge conveyor	Dust cover; Baghouse	Functional; Not functional			X	
FP13	Drop point, 3/4" discharge conveyor to 3/4" to stockpile conveyor	Enclosed	Functional		X		
FP14	3/4" to stockpile conveyor	Dust cover	Functional		X		
FP15	Drop point, 3/4" to stockpile conveyor to 3/4" short term storage pile	Tube; Water suppression	Functional; Functional		X		
FP16	3/4" short term storage pile	Water suppression	Functional		X		
FP17	Drop point, triple deck finish mill screen to 3/8" discharge conveyor	Enclosed	Functional		X		
FP18	3/8" discharge conveyor	Dust cover; Baghouse	Functional; Not functional			X	
FP19	Drop point, 3/8" discharge conveyor to 3/8" to stockpile conveyor	Enclosed	Functional		X		
FP20	3/8" to stockpile conveyor	Dust cover	Functional		X		
FP21	Drop point, 3/8" stockpile conveyor to 3/8" short term storage pile	Water suppression, spray head	Functional		X		
FP22	3/8" short term storage pile	Water suppression, spray head	Functional		X		
FP23	Drop point, triple deck finish mill screen to oversize discharge conveyor	Enclosed	Functional		X		
FP24	Oversize discharge conveyor	Partially covered; Baghouse	Functional; Not functional			X	
FP25	Drop point, oversize discharge conveyor to oversize hopper	None	None	X			
FP26	Oversize hopper	None	None	X			
FP27	Drop point, oversize hopper to El Jay crusher speed conveyor	Partially enclosed	Functional		X		
FP28	El Jay crusher speed conveyor	Dust cover	Functional		X		
FP29	Drop point, El Jay crusher speed conveyor to El Jay crusher	Enclosed	Functional		X		
FP30	El Jay crusher	Baghouse	Not functional			X	
FP31	Drop point, El Jay crusher to El Jay discharge conveyor	Enclosed	Functional		X		
FP32	El Jay discharge conveyor	None	None	X			
FP33	Drop point, El Jay discharge conveyor to #2 return conveyor	Enclosed	Functional		X		
FP34	#2 return conveyor	Dust cover	Functional		X		
FP35	Drop point, #2 return conveyor to #2 conveyor	Enclosed	Functional		X		
FP36	Drop point, triple deck finish mill screen to fines to silo conveyor	Enclosed	Functional		X		
FP37	Fines to silo conveyor	Dust cover; Baghouse	Functional; Not functional			X	

Table 12. Evaluation of Existing Controls

Source ID	Source Description	Control Methods	Control Condition	Not Warranted	Effective As Is	Modifications Needed	Controls Needed
FP38	Drop point, fines to silo conveyor to enclosed fines storage pile	Chute	Functional			X	
FP39	Enclosed fines storage pile	Roof; Concrete enclosure at bottom; Tarps	Functional; Functional; Functional			X	X
FP40	Open fines storage pile	Enclosed; Concrete wall to south; Wind screen	Functional; Functional; Functional			X	
FP41	Baghouse dust silo 1	Enclosed	Functional		X		
FP42	Drop point, baghouse dust silo 1 to shipping belt	Enclosed	Functional		X		
FP43	Baghouse dust silo 2	Enclosed	Functional		X		
FP44	Drop point, baghouse dust silo 2 to shipping belt	Enclosed	Functional		X		
FP45	Shipping belt	Partially underground; Dust cover	Functional; Functional; Functional		X		
FP46	Drop point, shipping belt to stationary belt	Enclosed	Functional		X		
FP47	Stationary belt	Dust cover; Baghouse; Improved maintenance	Functional; Functional		X	X	
FP48	Drop point, stationary belt to radial stacker	Enclosed	Functional		X		
FP49	Radial stacker	Dust cover; Spray head adjustment	Functional; Partially functional		X	X	
FP50	Drop point, radial stacker to block mix short term storage pile 1	Baghouse; Water suppression; Adjustable discharge height	Functional; Functional; Functional			X	
FP51	Block mix short term storage pile 1	Low pile height/bldg	Functional		X		
FP52	Block mix short term storage pile 2	Low pile height/bldg	Functional		X		
FP53	Block mix short term storage pile 3	Low pile height/small pile/bldg	Functional		X		
FP54	Block mix short term storage pile 4	Low pile height/bldg	Functional		X		
FP55	Block mix short term storage pile 5	Low pile height	Functional		X		
FP56	Block mix short term storage pile 6	Low pile height/small pile	Functional		X		
FP57	3/4" long term storage pile 5	Low pile height	Functional		X		
FP58	Loading 3/4" onto trucks	Loader operator protocol	Functional		X		
FP59	Loading 3/8" onto trucks	Loader operator protocol	Functional		X		
FP60	Loading clinker onto trucks	Loader operator protocol	Functional		X		
FP61	Loading block mix onto piles	Loader operator protocol	Functional		X		
FP62	Loading block mix onto trucks	Loader operator protocol	Functional		X		
FN1	8 X 0 long term storage pile	Enclosed	Functional		X		
FN2	4 X 0 fines feed pile	Low pile height	Functional		X		
FN3	Loading of block mix into Cedarapids feed hopper (surge bin)	None	None	X			
FN4	Cedarapids feed hopper (surge bin)	None	None	X			
FN5	Drop point, Cedarapids feed hopper to feeder belt	None	None		X		
FN6	Feeder belt	None	None		X		
FN7	Drop point, feeder belt to screen feed belt	None	None		X		
FN8	Screen feed belt	None	None		X		
FN9	Drop point, screen feed belt to Astec 2618 fines screen	None	None		X		
FN10	Astec 2618 fines screen	None	None	X	X		
FN11	Drop point, fines screen to #4s belt	None	None	X			
FN12	#4s belt	None	None		X		
FN13	Drop point, #4s belt to 4 mesh reject pile	None	None	X			
FN14	4 mesh reject pile	Low pile height	Functional	X			
FN15	Drop point, fines screen to fines #8s belt	None	None	X			

Table 12. Evaluation of Existing Controls

Source ID	Source Description	Control Methods	Control Condition	Not Warranted	Effective As Is	Modifications Needed	Controls Needed
FN16	#8s belt	None	None				X
FN17	Drop point, #8s belt to fines 8 X 0 pile	None	None	X			
FN18	8 X 0 pile	Low pile height	Functional		X		
FN19	3/4" long term storage pile 6	Low pile height	Functional		X		
FN20	Loading screened fines onto trucks (8 X 0, 4 X 0, 4 mesh reject)	Loader operator protocol	Functional		X		
BM1	Block mix long term storage pile 1	None	None	X			
BM2	Block mix long term storage pile 2	Low pile height	Functional	X			
BM3	Block mix long term storage pile 3	Low pile height	Functional	X			
BM4	Block mix long term storage pile 4	Low pile height	Functional	X			
BM5	Loading block mix into portable screen	Loader operator protocol	Functional		X		
BM6	Astec 710T	None	None	X			
BM7	Reade screen	None	None	X			
BM8	Loading onto temporary block mix pile	Loader operator protocol	Functional		X		
BM9	Temporary block mix pile for customer pickup	Low pile height	Functional		X		
BM10	Loading block mix onto trucks	Loader operator protocol	Functional		X		
BM11	Loading onto block mix pile	None	None	X			
IS1	3/4" long term storage pile 1	Low pile height	Functional		X		
IS2	3/4" long term storage pile 2	Low pile height	Functional		X		
IS3	3/4" long term storage pile 3	Low pile height	Functional		X		
IS4	3/4" long term storage pile 4	Low pile height	Functional		X		
IS5	3/8" long term storage pile	Low pile height	Functional		X		
IS6	Block mix long term storage pile 5	Low pile height	Functional		X		
IS7	Loading onto 3/4" pile	None	None	X			
IS8	Loading 3/4" onto trucks	Loader operator protocol	Functional		X		
IS9	Loading onto 3/8" pile	None	None	X			
IS10	Loading 3/8" onto trucks	Loader operator protocol	Functional		X		
BY1	Boneyard shale pile 1	None	None	X			
BY2	Boneyard shale pile 2	None	None	X			
BY3	Loading shale fines onto boneyard shale piles	None	None	X			
BY4	Loading boneyard shale piles onto trucks	Loader operator protocol	Functional		X		
OS1	Bulldozing	None	None	X			
OS2	Receiving overburden from quarry	None	None	X			
OS3	Wind erosion in overburden storage area	None	None	X			
RD1	Transport of stone from quarry to primary	Water	Functional		X		
RD2	Transfer of overburden from quarry to overburden storage area	Water	Functional		X		
RD3	Transport of shales fines to boneyard	Water	Functional		X		
RD4	Transport of product off-site by truck	Water	Functional		X	X	
RD5	Travel of LGF delivery trucks	Water	Functional		X		
RD6	Maintenance traffic	Water	Functional		X		
RD7	Passenger vehicle traffic	Water	Functional		X		

Table 12. Evaluation of Existing Controls

Source ID	Source Description	Control Methods	Control Condition	Not Warranted	Effective As Is	Modifications Needed	Controls Needed
RD8	Transport of shale fines to overburden storage area	Water	Functional		X		
RD9	Water truck movement	Water	Functional		X		
RD10	On-site product movement via front end loader	Water	Functional		X		

11.0 References

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4. U.S. Environmental Protection Agency, Office of Air and Waste Management, Office of Air Quality Planning and Standards, *EPA-450/3-77-010 Technical Guidance For Control Of Industrial Process Fugitive Particulate Emissions* (1977).

5. U.S. Environmental Protection Agency, Office Of Air And Radiation, Office of Air Quality Planning And Standards, *EPA-450/2-92-004 Fugitive Dust Background Document And Technical Information Document For Best Available Control Measures* (1992).

6. National Oceanic and Atomspheric Administration, National Climate Data Center, Available at http://www.ncdc.noaa.gov/ (2014).

7. AWS Scientific, Inc., *Wind Resource Assessment Handbook* (1997).

8. U.S. Department of the Interior Bureau of Reclamation, *Engineering Geology Field Manual*, 2nd ed. (2001).

9. ASTM International, D2487-11 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). *ASTM International* (2011).

10. Glover, T. J., *Pocket Ref*, 4th ed. (Sequoia Publishing, Inc., Littleton, CO, 2012).

11. Texas Commission on Environmental Quality, Air Permits Division, *New Source Review (NSR) Emission Calculations* (2008).

APPENDICES

APPENDIX A

AERIAL PHOTOGRAPHS WITH PROCESS AREAS

- ALL AREA LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE

TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: AREA LOCATION MAP
JOB#: 13-094
SCALE: NTS

SPEC ENGINEERING, PLLC
349 NORTHERN BOULEVARD
ALBANY, NY 12204
PHONE: 518.487.4800
FAX: 518.438.8527

PREPARED BY: KAD
DATE: 8/28/14
REVIEWED BY: JCK
DATE: 8/28/14
FIGURE: 1

LEGEND

PHOTO

STORAGE PILE/
EMISSION POINT

EMISSION POINT

AREA DELINEATION

- ALL EMISSION POINTS ON THIS PAGE HAVE THE FOLLOWING PREFIX: QA
- ALL STORAGE PILE LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE

TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: QUARRY AREA
JOB#: 13-094
SCALE: NTS

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DATE: 8/28/14
FIGURE: 2

LEGEND

(X) PHOTO

XX STORAGE PILE/ EMISSION POINT

EMISSION POINT

AREA DELINEATION

- ALL EMISSION POINTS IN THE PRIMARY AREA, HAVE THE FOLLOWING PREFIX: PR
- ALL EMISSION POINTS IN THE KILN FEED AREA, HAVE THE FOLLOWING PREFIX: KF
- ALL STORAGE PILE LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE

TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: RAW SHALE AREA
JOB#: 13–094
SCALE: NTS

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DATE: 8/28/14
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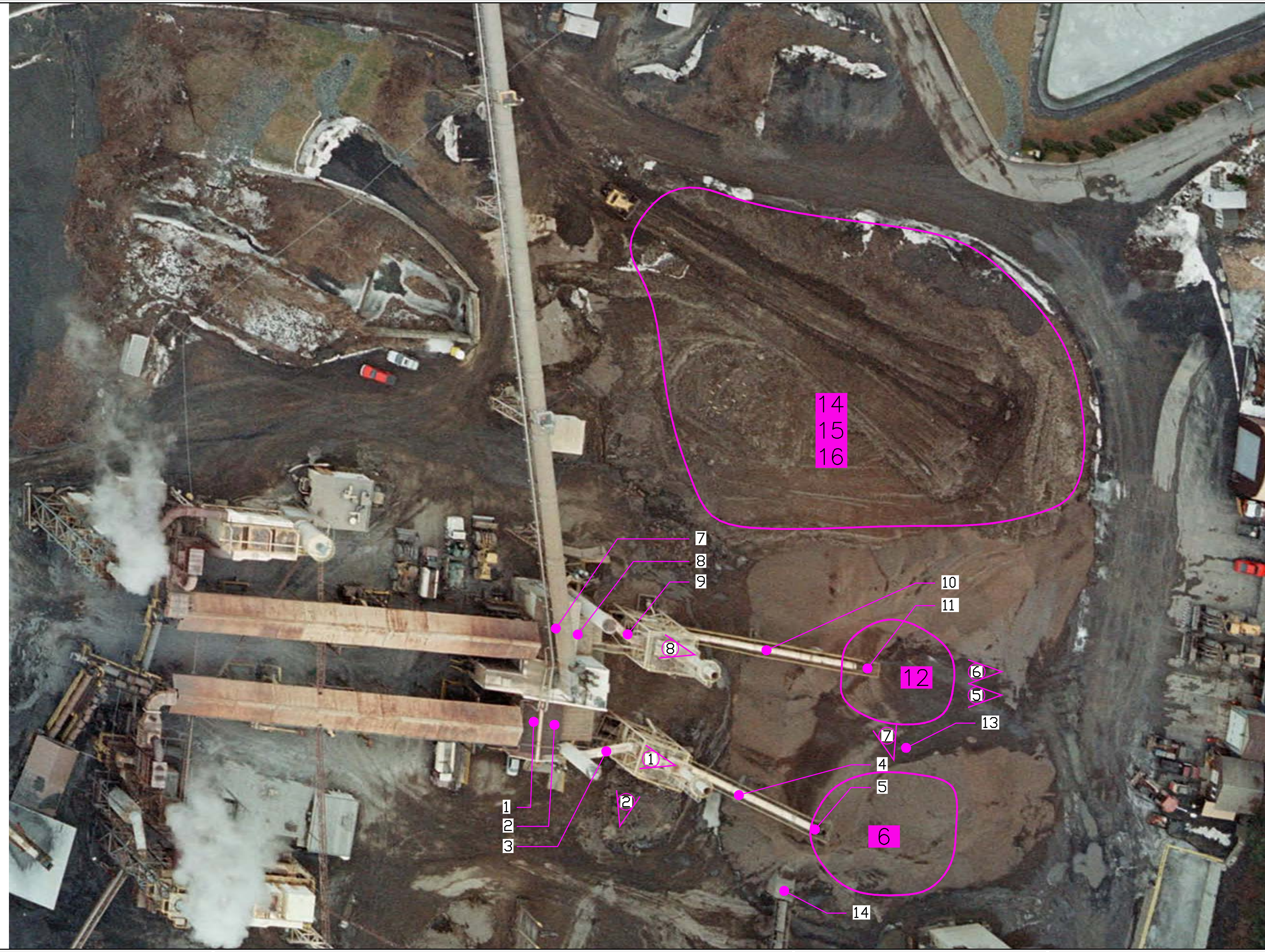

LEGEND

- PHOTO
- STORAGE PILE/ EMISSION POINT
- EMISSION POINT
- AREA DELINEATION

- ALL EMISSION POINTS ON THIS PAGE HAVE THE FOLLOWING PREFIX: KL
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TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: KILN AREA
JOB#: 13-094
SCALE: NTS

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FIGURE: 4

LEGEND

PHOTO

STORAGE PILE/ EMISSION POINT

EMISSION POINT

AREA DELINEATION

- ALL EMISSION POINTS ON THIS PAGE HAVE THE FOLLOWING PREFIX: FP
- ALL STORAGE PILE LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE
- EMISSION POINTS FP58–62 OCCUR THROUGHOUT HE FINISH PLAN AREA

TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: FINISH PLANT AREA
JOB#: 13–094
SCALE: NTS

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DATE: 8/28/14
FIGURE: 5

LEGEND

PHOTO

STORAGE PILE/ EMISSION POINT

EMISSION POINT

AREA DELINEATION

- ALL EMISSION POINTS IN THE BLOCK MIX STORAGE AREA HAVE THE FOLLOWING PREFIX: BM
- ALL EMISSION POINTS IN THE FINES PROCESSING AREA HAVE THE FOLLOWING PREFIX: FN
- ALL STORAGE PILE LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE

TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: BLOCK MIX STOCKPILE AREA & FINES PROCESSING AREA
JOB#: 13-094
SCALE: NTS

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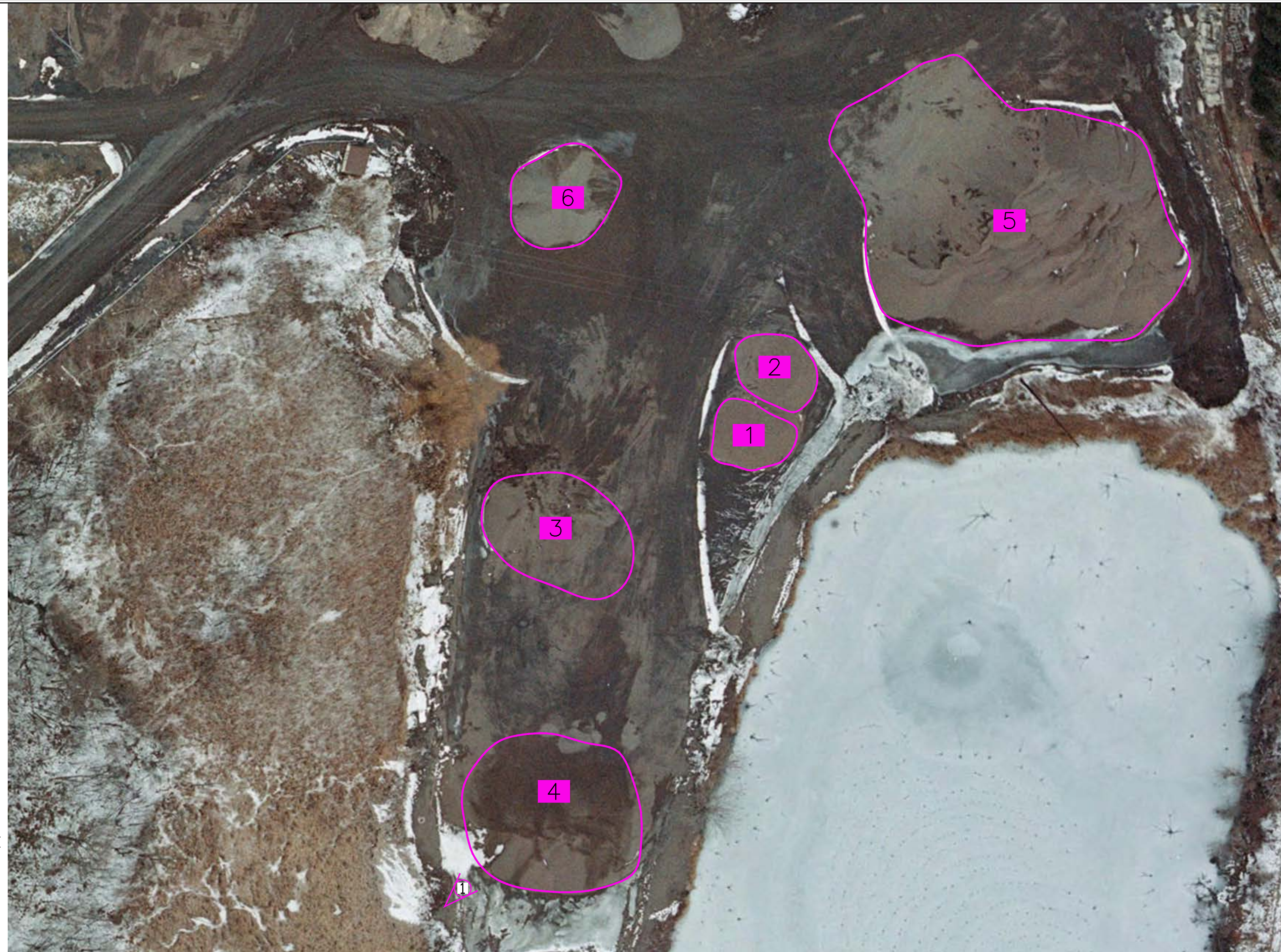
FIGURE: 6



LEGEND

PHOTO

STORAGE PILE/
EMISSION POINT

EMISSION POINT

AREA DELINEATION

- ALL EMISSION POINTS ON THIS PAGE HAVE THE FOLLOWING PREFIX: IS
- EMISSION POINT IS7–10 OCCUR THROUGHOUT THE ISLAND STOCKPILE AREA
- ALL STORAGE PILE LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE

TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: ISLAND STOCKPILE AREA
JOB#: 13–094
SCALE: NTS

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FIGURE: 7

LEGEND

PHOTO

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EMISSION POINT

AREA DELINEATION

- ALL EMISSION POINTS ON THIS PAGE HAVE THE FOLLOWING PREFIX: OS
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TRADEBE

A ROTARY KILN Norlite EXPANDED SHALE AGGREGATE

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: SOUTHERN OVERBURDEN STORAGE AREA
JOB#: 13-094
SCALE: NTS

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FIGURE: 8

LEGEND

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CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: BONE YARD
JOB#: 13-094
SCALE: NTS

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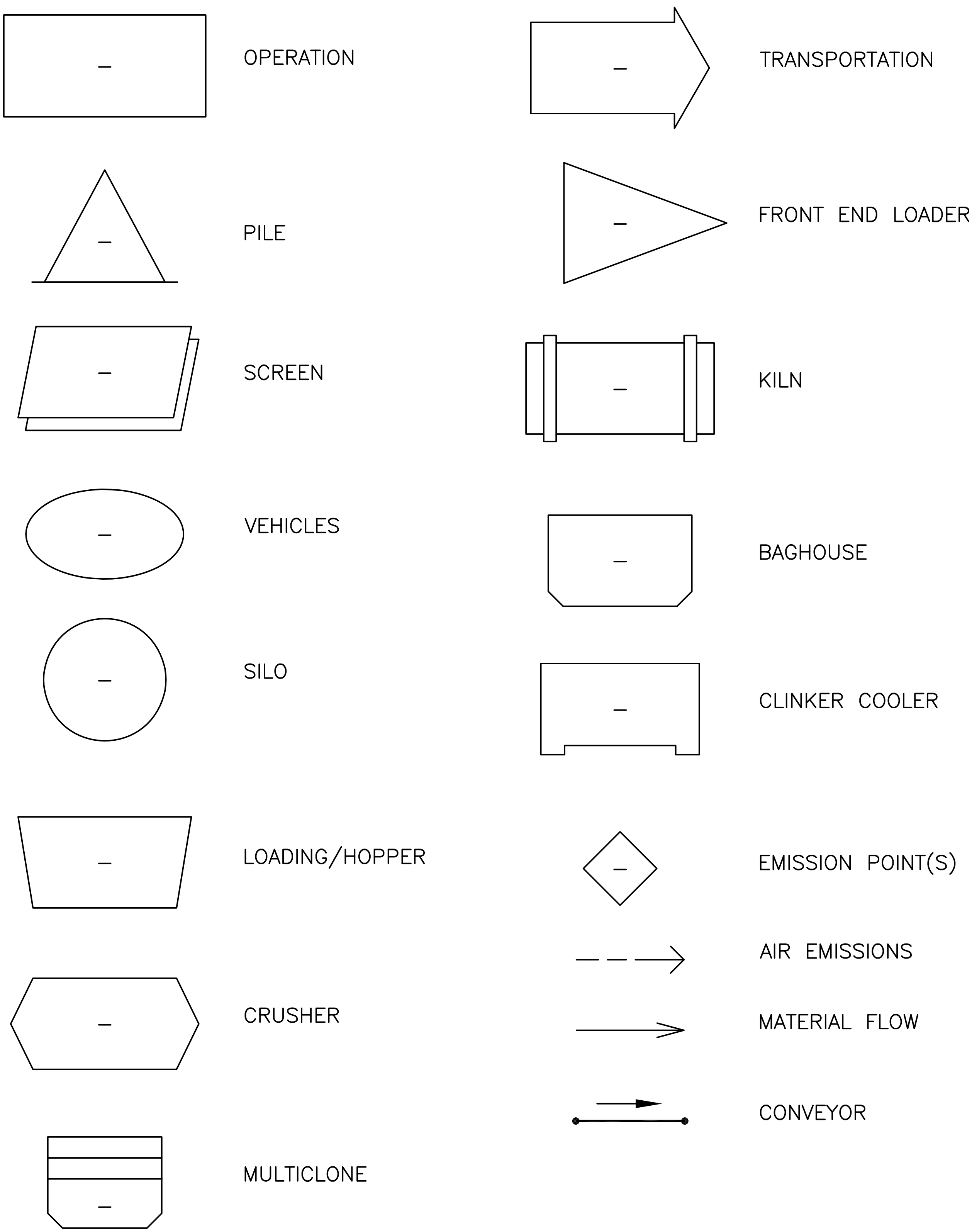
DATE: 8/28/14
FIGURE: 9

APPENDIX B
PROCESS FLOW DIAGRAMS



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SITE: COHOES QUARRY
TITLE: LEGEND
JOB#: 13–094
SHEET#: 1

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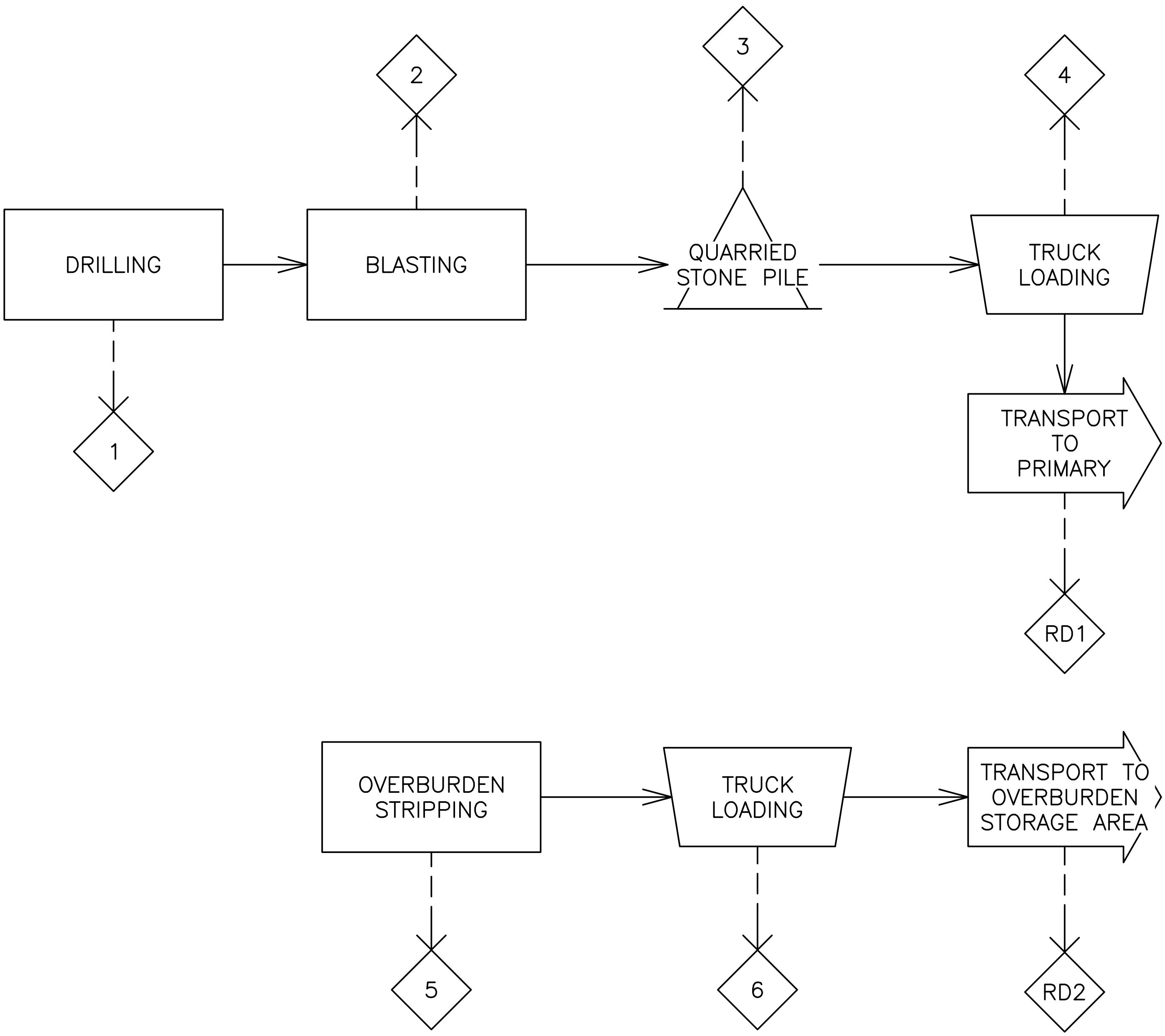

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TITLE: QUARRY
JOB#: 13–094
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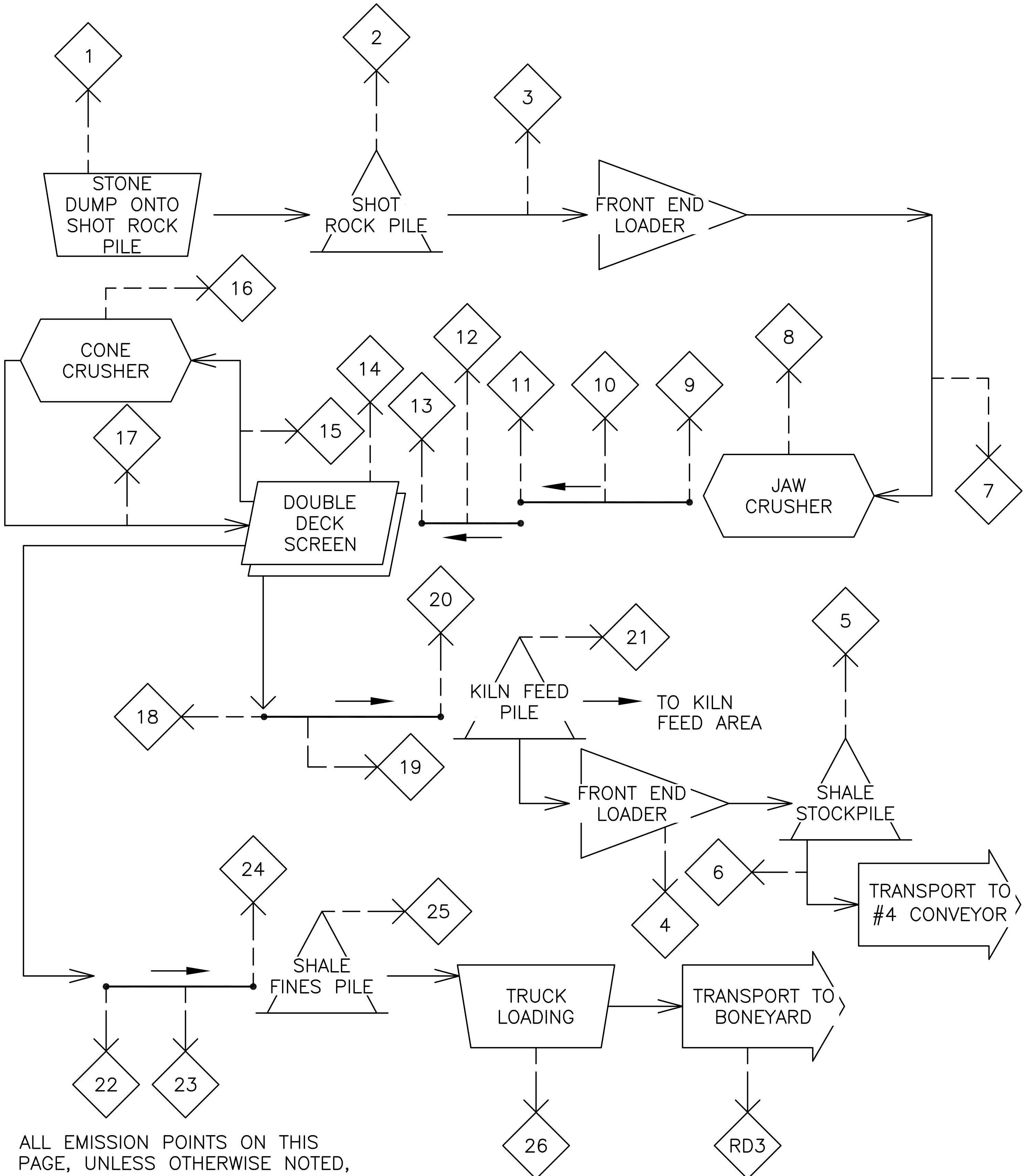

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CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: PRIMARY
JOB#: 13–094
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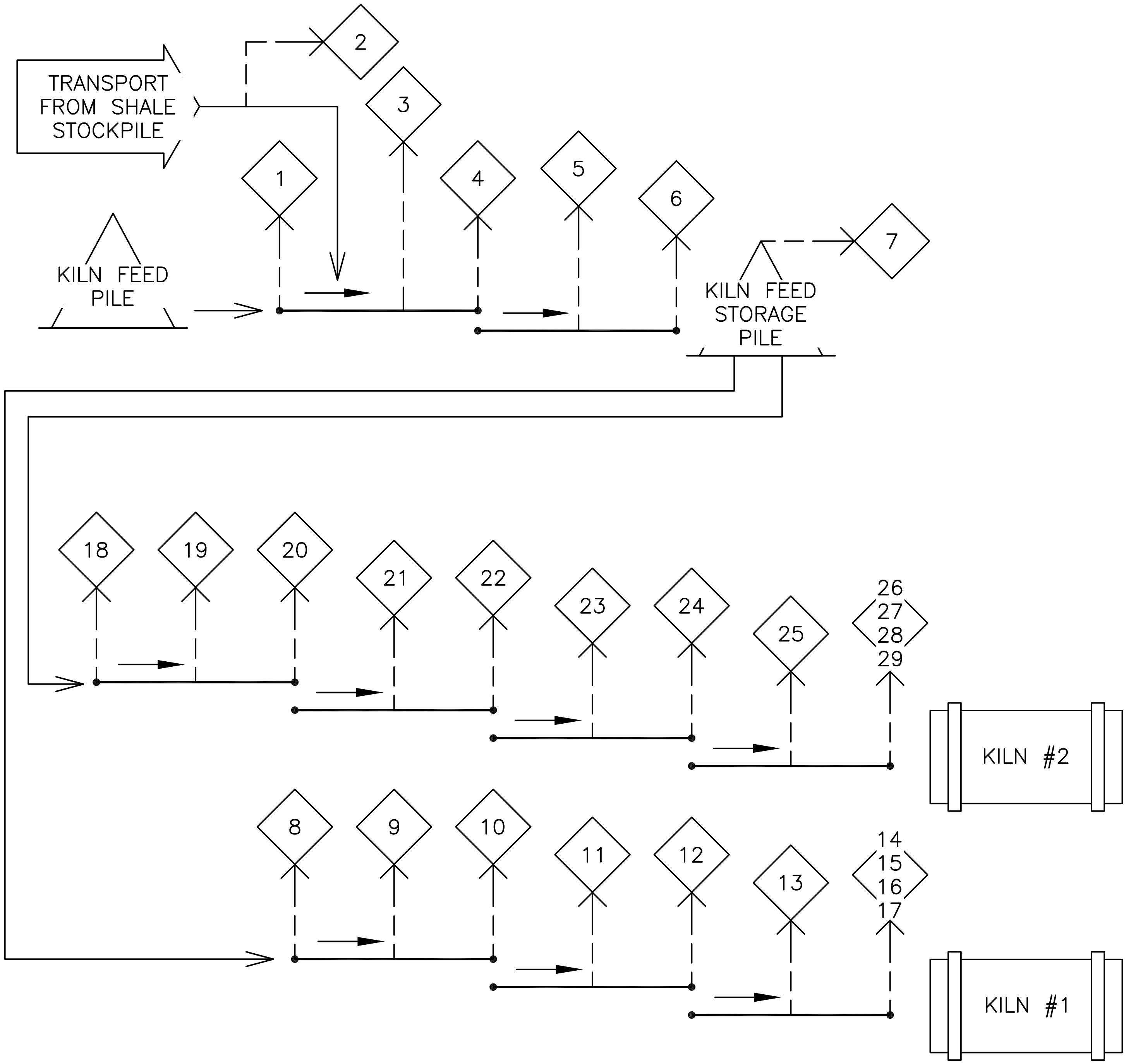

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JOB#: 13-094
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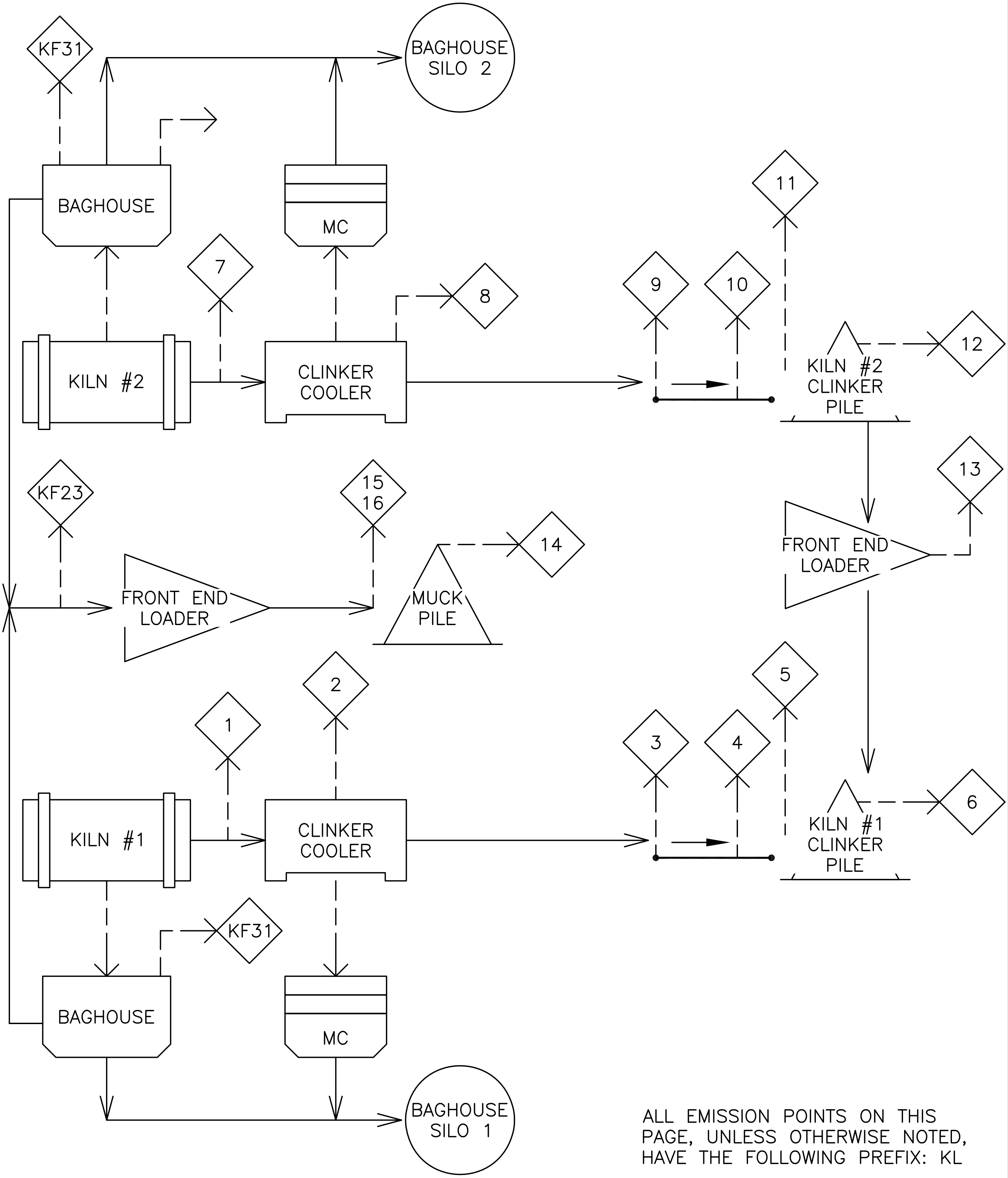

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TITLE: KILN
JOB#: 13-094
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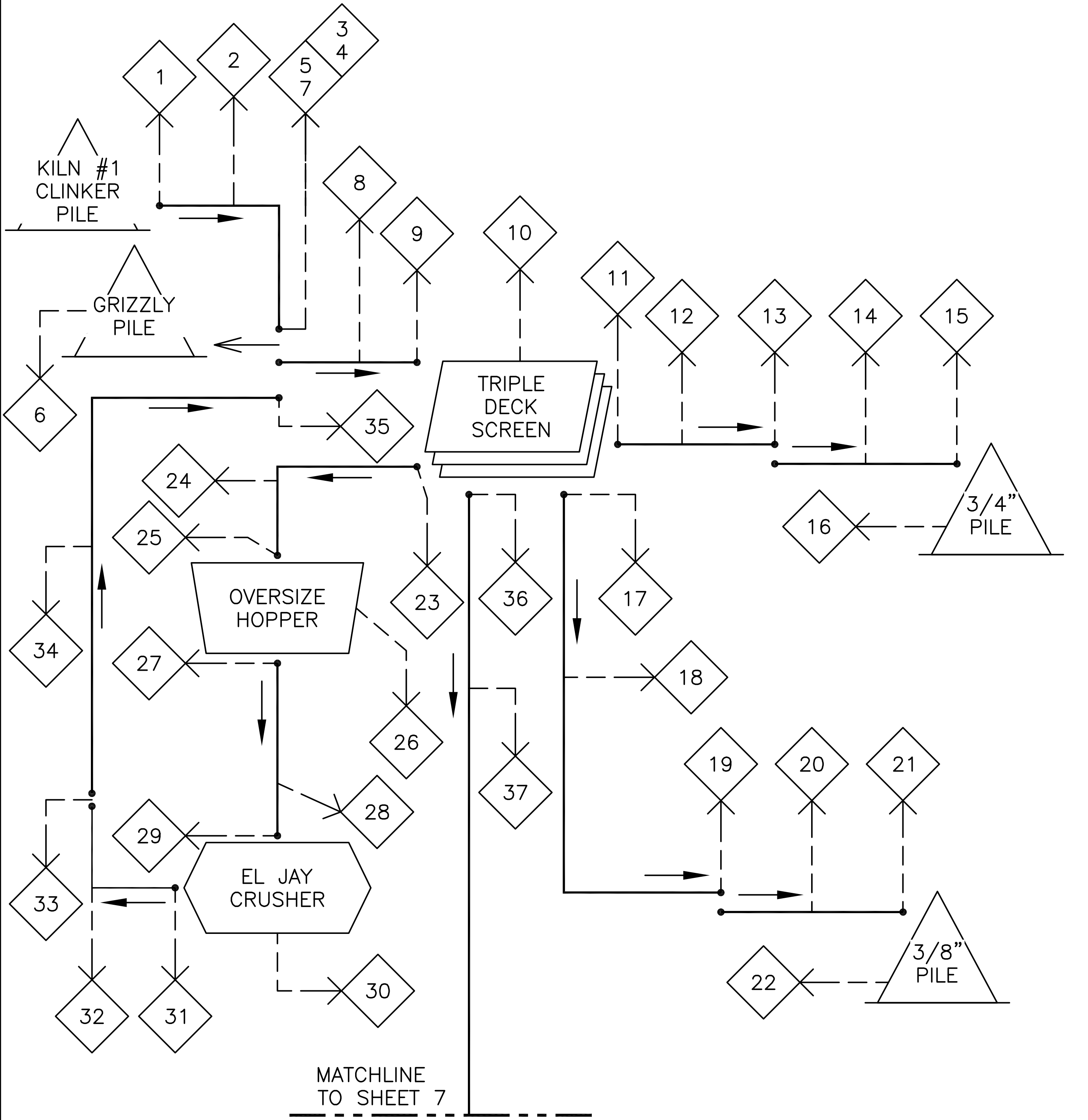

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TITLE: FINISHING PLANT
JOB#: 13-094
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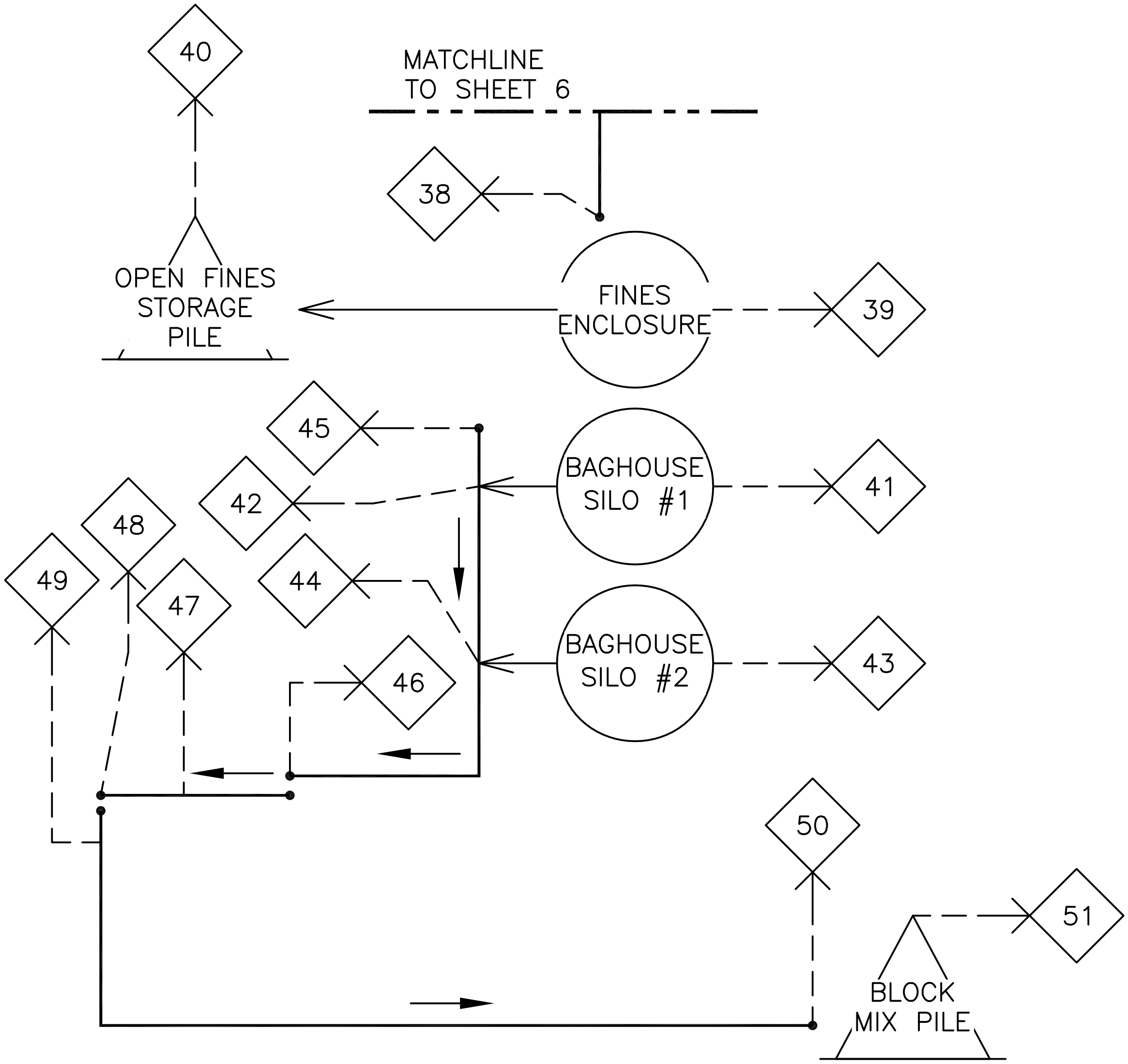

ALL EMISSION POINTS ON THIS PAGE, UNLESS OTHERWISE NOTED, HAVE THE FOLLOWING PREFIX: FP

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: FINISHING PLANT
JOB#: 13-094
SHEET#: 7

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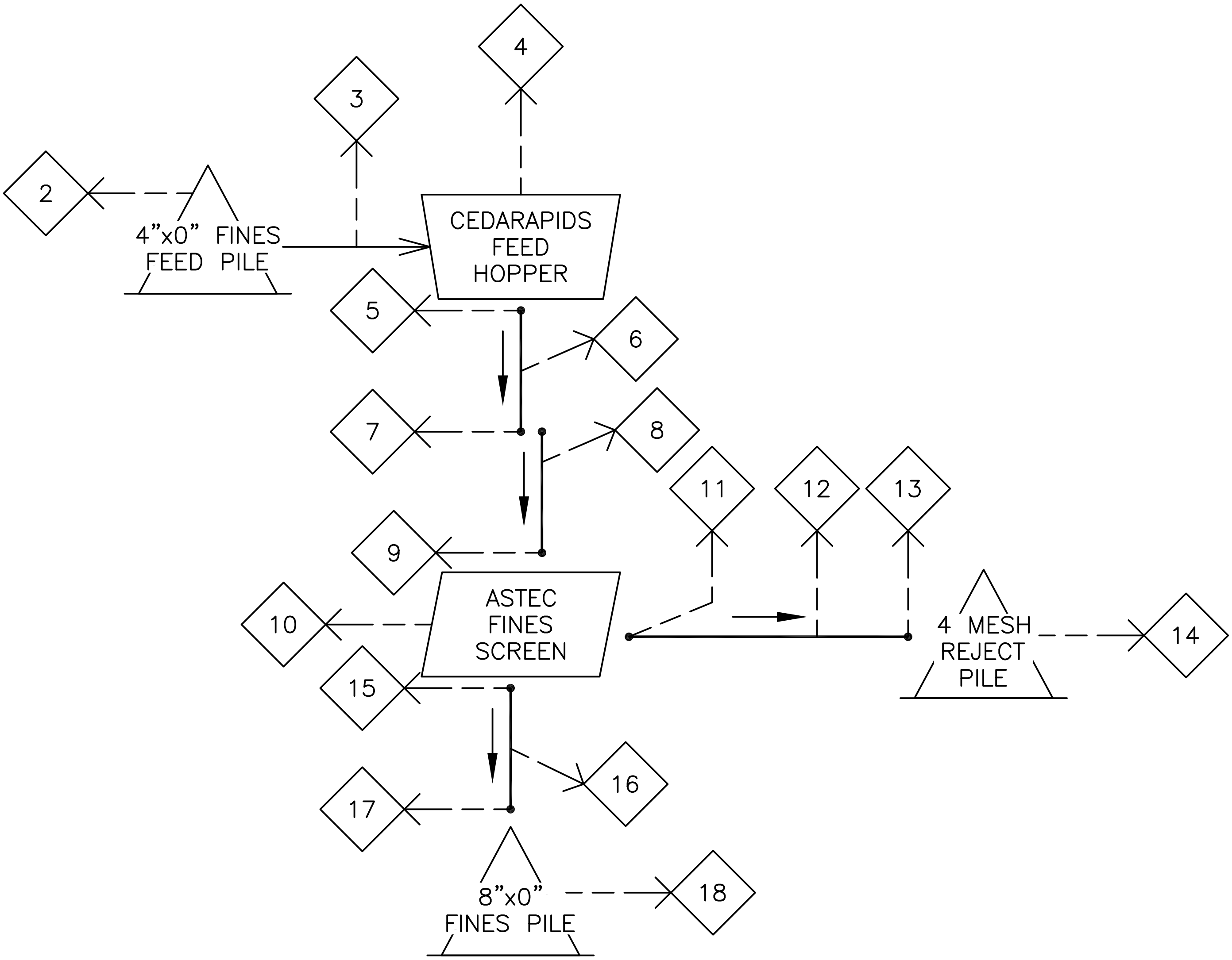

ALL EMISSION POINTS ON THIS PAGE, UNLESS OTHERWISE NOTED, HAVE THE FOLLOWING PREFIX: FN

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: FINES PROCESSING AREA
JOB#: 13–094
SHEET#: 8

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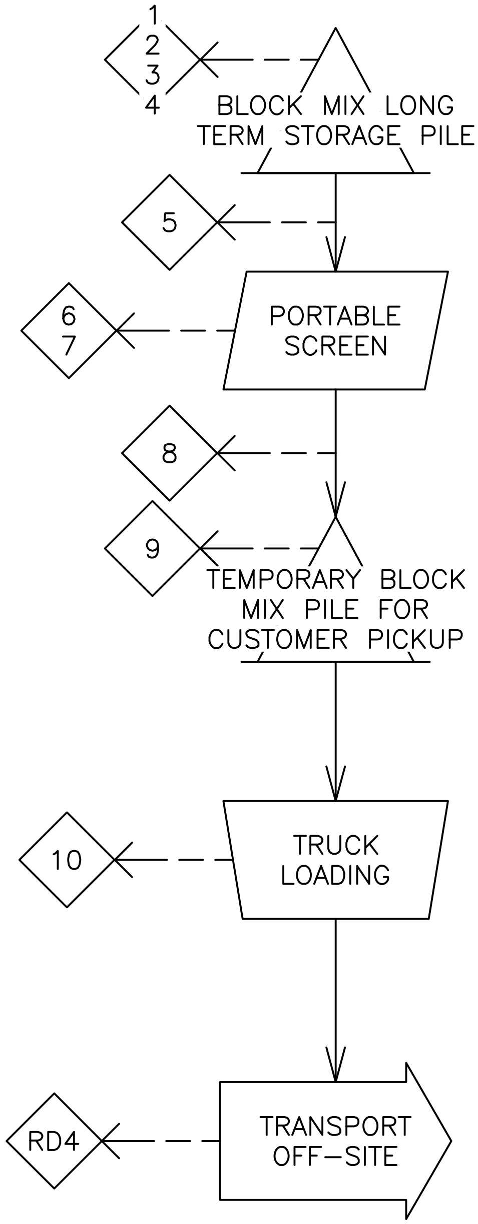

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CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: BLOCK MIX STORAGE AREA
JOB#: 13–094
SHEET#: 9

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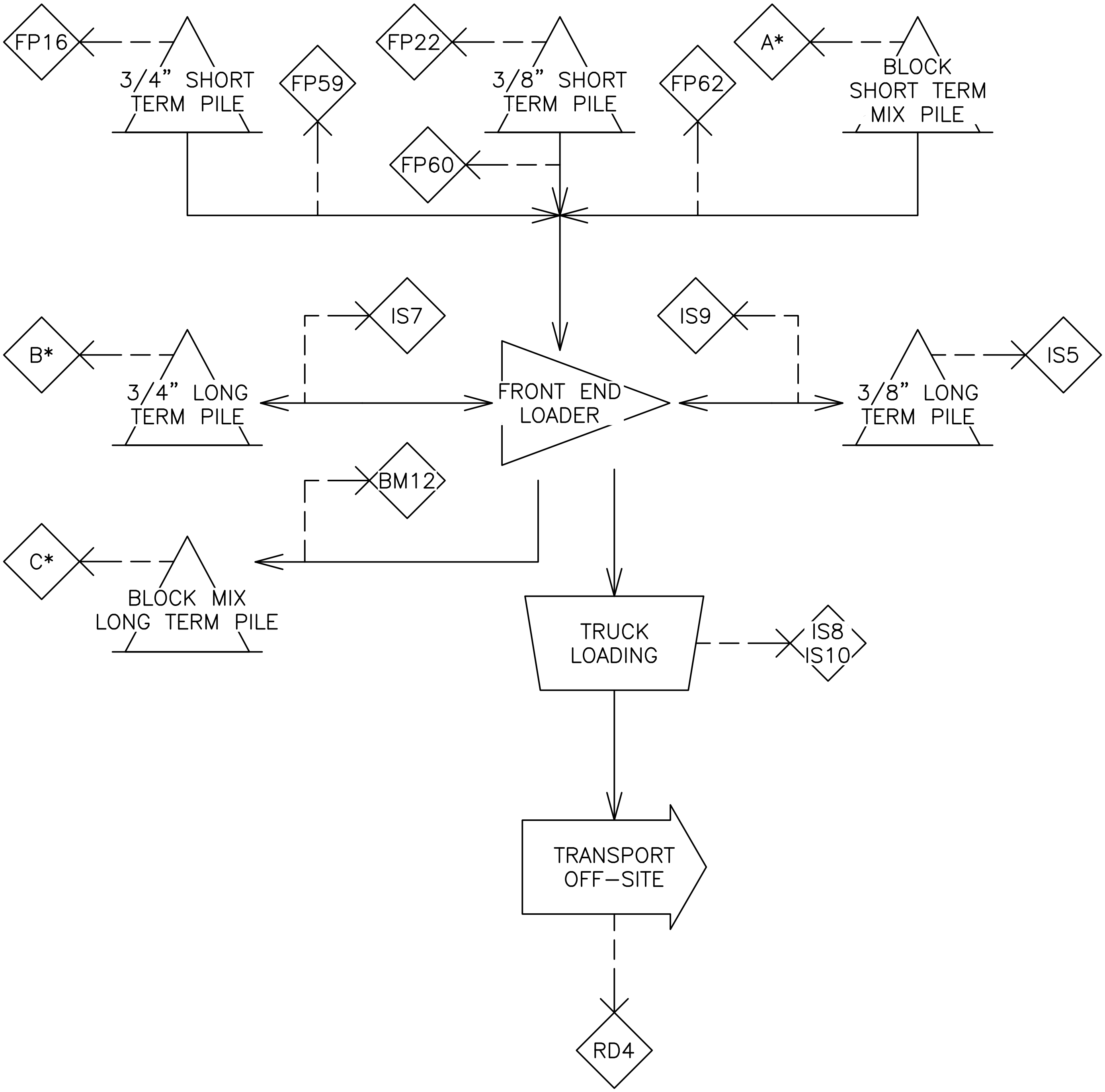

A* – FP51, 52, 53, 54, 55, 56
B* – FP57, IS1, 2, 3, 4
C* – BM1, 2, 3, 4, IS6

CLIENT: NORLITE, LLC
SITE: COHOES QUARRY
TITLE: PRODUCT SHIPPING
JOB#: 13–094
SHEET#: 10

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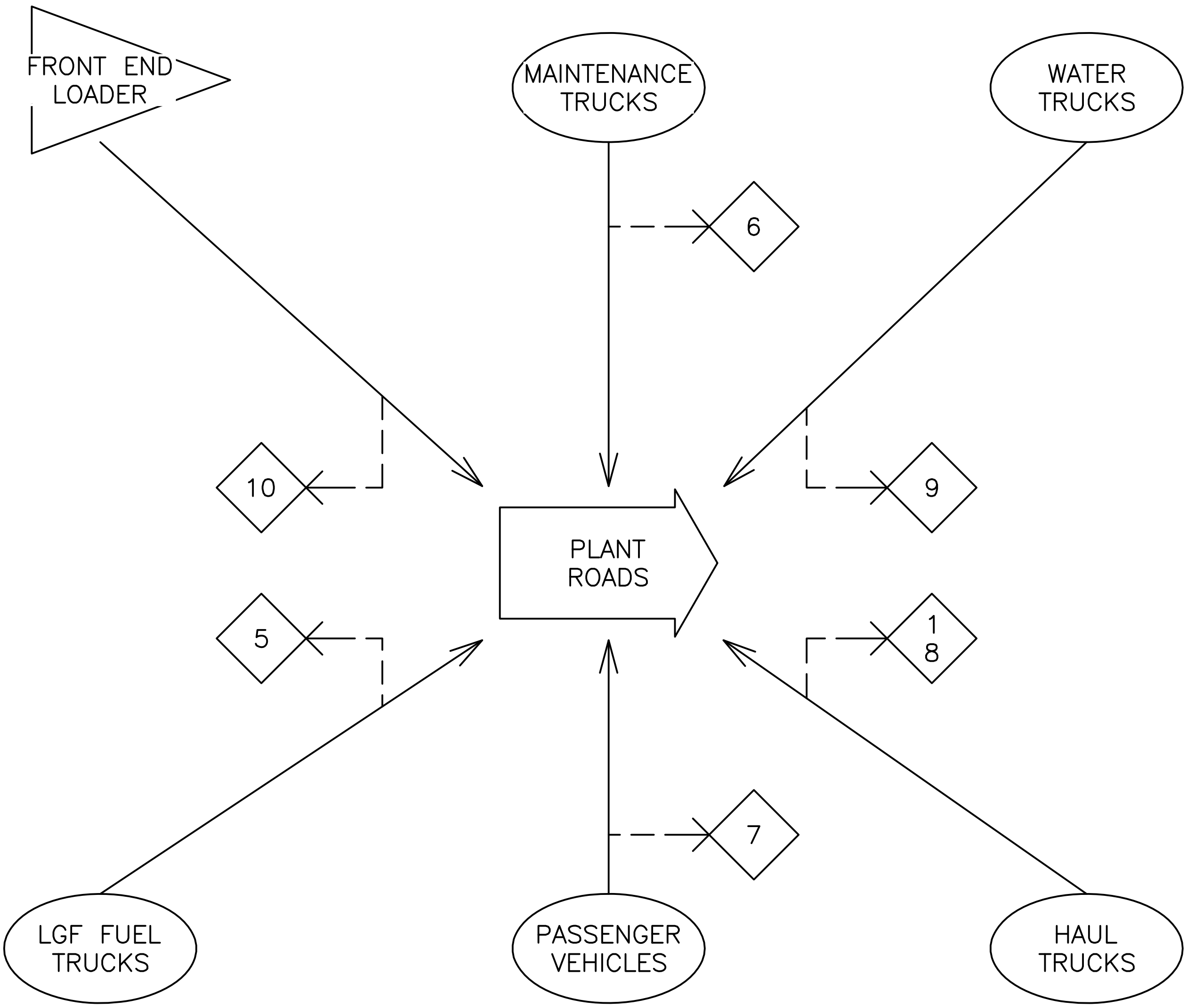


ALL EMISSION POINTS ON THIS PAGE, UNLESS OTHERWISE NOTED, HAVE THE FOLLOWING PREFIX: RD

CLIENT: NORLITE, LLC SITE: COHOES QUARRY TITLE: MISCELLANEOUS TRAFFIC JOB#: 13–094 SHEET#: 11	SPEC ENGINEERING, PLLC 349 NORTHERN BOULEVARD ALBANY, NY 12204 PHONE: 518.438.6809 FAX: 518.438.8527	PREPARED BY: DATE: REVIEWED BY: DATE:

APPENDIX C
FUGITIVE DUST EMISSION CALCULATIONS

Norlite Fugitive Dust Sources and Calculations

Area	Source ID	Source Name	Source Type	Product	In/Post Proces	P - Production Rate	Units	Control	Condition	ER - emissions reduction efficiency, %	Emission Factor Type	Emission Factor (EF)	EF Units	EF - Calculated Emission Factor	(1-ER/100)	E - Emissions, ton/yr via calculations	E - Emissions, ton/yr via AP-42 fa	Combined Emissions
Quarry	QA1	Drilling	General	Raw shale	In process	246,000	tpy	Water suppression, mist	Functional	50%	Controlled	8.00E-05	lb/ton	No calculated value	0.5	No calculated value	0.00492	0.00492
Quarry	QA2	Blasting	Blasting	Raw shale	In process	246,000	tpy	None	None	0%	Uncontrolled	0.08	lb/ton	No calculated value	1	No calculated value	9.84000	9.84000
Quarry	QA3	Quarried stone pile	Drop Operation	Raw shale	In process	246,000	tpy	Water suppression	Functional	50%	Uncontrolled	0.04	lb/ton	0.00510	0.5	0.31336	2.46000	0.31336
Quarry	QA4	Load stone into truck	Drop Operation	Raw shale	In process	246,000	tpy	None	None	0%	Uncontrolled	0.002368	lb/ton	0.00510	1	0.62671	0.29126	0.62671
Quarry	QA5	Overburden stripping	Dragline	Overburden	In process	161,000	cu yd/yr	None	None	0%	Uncontrolled	6.00E-02	lb/yd3	0.03480	1	2.80154	4.83000	2.80154
Quarry	QA6	Load overburden into truck	Drop Operation	Overburden	In process	206,265	tpy	None	None	0%	Uncontrolled	3.70E-02	lb/ton	0.00008	1	0.00793	3.81591	0.00793
Primary	PR1	Loading onto shot rock pile (Canal)	Drop Operation	Raw shale	In process	246,000	tpy	None	None					0.00510	1	0.62671	#N/A	0.62671
Primary	PR2	Shot rock pile (Canal)	Storage Pile	Raw shale	In process	246,000	tpy	None	None	0%				0.00011	1	0.00000	#N/A	0.00000
Primary	PR3	Unloading shot rock pile	Drop Operation	Raw shale	In process	246,000	tpy	None	None					0.00510	1	0.62671	#N/A	0.62671
Primary	PR4	Loading onto shale stockpile	Drop Operation	Raw shale	In process	246,000	tpy	Water suppression	Functional	20%		3.00E-03	lb/ton	0.00510	0.8	0.50137	0.29520	0.50137
Primary	PR5	Shale stockpile	Storage Pile	Raw shale	In process	246,000	tpy	Water suppression	Functional	50%				0.21047	0.5	0.00264	#N/A	0.00264
Primary	PR6	Unloading shale stockpile	Drop Operation	Raw shale	In process	246,000	tpy	None	None					0.00510	1	0.62671	#N/A	0.62671
Primary	PR7	Drop point, raw shale drop to jaw crusher	Drop Operation	Raw shale	In process	282,900	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00510	1	0.72072	0.42435	0.72072
Primary	PR8	Jaw crusher	General	Raw shale	In process	282,900	tpy	Partially enclosed	Functional	75%	Uncontrolled	0.28	lb/ton	No calculated value	0.25	No calculated value	9.90150	9.90150
Primary	PR9	Drop point, jaw crusher to crusher belt	Drop Operation	Raw shale	In process	282,900	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.07207	0.04244	0.07207
Primary	PR10	Crusher belt	Conveyor	Raw shale	In process	282,900	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.02166	0.02166
Primary	PR11	Drop point, crusher belt to screen belt	Drop Operation	Raw shale	In process	282,900	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.07207	0.04244	0.07207
Primary	PR12	Screen belt	Conveyor	Raw shale	In process	282,900	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.02829	0.02829
Primary	PR13	Drop point, screen belt to primary double deck screen	Drop Operation	Raw shale	In process	282,900	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00510	1	0.72072	0.42435	0.72072
Primary	PR14	Primary double deck screen	General	Raw shale	In process	282,900	tpy	Water suppression, spray bar	Functional	50%	Uncontrolled	0.0022	lb/ton	No calculated value	0.15	No calculated value	0.04668	0.04668
Primary	(PR14)							Partially enclosed	Functional	70%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Primary	PR15	Drop point, primary double deck screen to primary cone crusher	Drop Operation	Raw shale	In process	282,900	tpy	Enclosed	Functional			0.003	lb/ton	0.00510	1	0.72072	0.42435	0.72072
Primary	PR16	Primary cone crusher	General	Raw shale	In process	282,900	tpy	Partially enclosed	Functional	50%		3.00E-03	lb/ton	No calculated value	0.5	No calculated value	0.21218	0.21218
Primary	PR17	Drop point, primary cone crusher to primary double deck screen	Drop Operation	Raw shale	In process	282,900	tpy	None	None					0.00510	1	0.72072	#N/A	0.72072
Primary	PR18	Drop point, primary double deck screen to shale conveyor	Drop Operation	Raw shale	In process	282,900	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.07207	0.04244	0.07207
Primary	PR19	Shale conveyor	Conveyor	Raw shale	In process	233,000	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.06191	0.06191
Primary	PR20	Drop point, shale conveyor to kiln feed pile	Drop Operation	Raw shale	In process	233,000	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00510	1	0.59360	0.34950	0.59360
Primary	PR21	Kiln feed pile	Storage Pile	Raw shale	In process	233,000	tpy	None	None	0%				0.21047	1	0.00332	#N/A	0.00332
Primary	PR22	Drop point, double deck screen to shale fines conveyor	Drop Operation	Raw shale	In process	13,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.00331	0.00195	0.00331
Primary	PR23	Shale fines conveyor	Conveyor	Shale fines	In process	13,000	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.00255	0.00255
Primary	PR24	Drop point, shale fines conveyor to shale fines pile	Drop Operation	Shale fines	In process	13,000	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00073	1	0.00476	0.01950	0.00476
Primary	PR25	Shale fines pile	Storage Pile	Shale fines	In process	13,000	tpy	Low pile height/wetted material	Functional	20%				0.16838	0.8	0.00088	#N/A	0.00088
Primary	PR26	Loading from shale fines pile to trucks	Drop Operation	Shale fines	In process	13,000	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00073	1	0.00476	0.01950	0.00476
Kiln Feed	KF1	Drop point, shale pile to #4 conveyor	Drop Operation	Raw shale	In process	116,500	tpy	Enclosed	Functional	99%	Uncontrolled	0.003	lb/ton	0.00510	0.01	0.00297	0.00175	0.00297
Kiln Feed	KF2	Drop point, loader to #4 conveyor	Drop Operation	Raw shale	In process	116,500	tpy	None	None					0.00510	1	0.29680	#N/A	0.29680
Kiln Feed	KF3	#4 conveyor	Conveyor	Raw shale	In process	233,000	tpy	Partially underground	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.15	No calculated value	0.01419	0.01419
Kiln Feed	(KF3)							Dust cover	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	(KF3)							Water suppression, spray bar	Functional	50%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	KF4	Drop point, #4 conveyor to #5 conveyor	Drop Operation	Raw shale	In process	233,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.05936	0.03495	0.05936
Kiln Feed	KF5	#5 conveyor	Conveyor	Raw shale	In process	233,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.04349	0.04349
Kiln Feed	KF6	Drop point, #5 conveyor to shale storage pile	Drop Operation	Raw shale	In process	233,000	tpy	Enclosed	Functional	97%	Uncontrolled	0.003	lb/ton	0.00510	0.03	0.01781	0.01049	0.01781
Kiln Feed	KF7	Kiln feed storage pile	Storage Pile	Raw shale	In process	233,000	tpy	Partially enclosed	Functional	88%				0.21047	0.1	0.00034	#N/A	0.00034
Kiln Feed	(KF7)							Low pile height	Functional	20%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	KF8	Drop point, shale storage pile to kiln 1 feeder belt	Drop Operation	Raw shale	In process	121,000	tpy	Underground	Functional	99%		0.003	lb/ton	0.00510	0.01	0.00308	0.00182	0.00308
Kiln Feed	KF9	Kiln 1 feeder belt	Conveyor	Raw shale	In process	121,000	tpy	Underground	Functional	90%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.1	No calculated value	0.00149	0.00149
Kiln Feed	KF10	Drop point, kiln 1 feeder belt to kiln 1 lower belt	Drop Operation	Raw shale	In process	121,000	tpy	Enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	0.00510	0.2	0.06165	0.03630	0.06165
Kiln Feed	KF11	Kiln 1 lower belt	Conveyor	Raw shale	In process	121,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01104	0.01104
Kiln Feed	(KF11)							Partially underground	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	(KF11)							Meat locker curtain	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	KF12	Drop point, kiln 1 lower belt to kiln 1 top belt	Drop Operation	Raw shale	In process	121,000	tpy	Enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	0.00510	0.2	0.06165	0.03630	0.06165
Kiln Feed	KF13	Kiln 1 top belt	Conveyor	Raw shale	In process	121,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00381	0.00381
Kiln Feed	KF14	Drop point, kiln 1 top belt to kiln 1 feed	Drop Operation	Raw shale	In process	121,000	tpy	Chute	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.03083	0.01815	0.03083
Kiln Feed	KF15	Kiln 1 feed (AccuRate feeder)	Drop Operation	Raw shale	In process	121,000	tpy	Dust cover	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00510	1	0.30826	0.18150	0.30826
Kiln Feed	KF16	Kiln 1 rear chamber system (rim seal)	General	Kiln rear chamber seal d	In process	121,000	tpy	Dust cover	Functional	99%	Uncontrolled	8.40E-01	lb/ton	No calculated value	0.01	No calculated value	0.50820	0.50820
Kiln Feed	KF17	Kiln 1 front seal	General	Raw shale	In process	121,000	tpy	Vacuum	Functional	99%	Uncontrolled	8.40E-01	lb/ton	No calculated value	0.01	No calculated value	0.50820	0.50820
Kiln Feed	KF18	Drop point, shale storage pile to kiln 2 feeder belt	Drop Operation	Raw shale	In process	112,000	tpy	Underground	Functional	99%		0.003	lb/ton	0.00510	0.01	0.00285	0.00168	0.00285
Kiln Feed	KF19	Kiln 2 feeder belt	Conveyor	Raw shale	In process	112,000	tpy	Underground	Functional	90%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.1	No calculated value	0.00138	0.00138
Kiln Feed	KF20	Drop point, kiln 2 feeder belt to kiln 2 lower belt	Drop Operation	Raw shale	In process	112,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00510	0.1	0.02853	0.01680	0.02853
Kiln Feed	KF21	Kiln 2 lower belt	Conveyor	Raw shale	In process	112,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01065	0.01065
Kiln Feed	(KF21)							Partially underground	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	(KF21)							Meat locker curtain	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln Feed	KF22	Drop point, kiln 2 lower belt to kiln 2 middle belt	Drop Operation	Raw shale	In process	112,000	tpy	Chute	Functional	80%	Uncontrolled	0.003	lb/ton	0.00510	0.2	0.05707	0.03360	0.05707
Kiln Feed	KF23	Kiln 2 middle belt	Conveyor	Raw shale	In process	112,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00449	0.00449
Kiln Feed	KF24	Drop point, kiln 2 middle belt to kiln 2 top belt	Drop Operation	Raw shale	In process	112,000	tpy	Chute	Functional	80%	Uncontrolled	0.003	lb/ton	0.00510	0.2	0.05707	0.03360	0.05707
Kiln Feed	KF25	Kiln 2 top belt	Conveyor	Raw shale	In process	112,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00564	0.00564
Kiln Feed	KF26	Drop point, kiln 2 top belt to kiln 2 feed	Drop Operation	Raw shale	In process	112,000	tpy	Chute	Functional	80%	Uncontrolled	0.003	lb/ton	0.00510	0.2	0.05707	0.03360	0.05707
Kiln Feed	KF27	Kiln 2 feed (AccuRate feeder)	Drop Operation	Raw shale	In process	112,000	tpy	Dust cover	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00510	1	0.28533	0.16800	0.28533
Kiln Feed	KF28	Kiln 2 rear chamber system (rim seal)	General	Kiln rear chamber seal d	In process	112,000	tpy	Dust cover	Functional	99%	Uncontrolled	8.40E-01	lb/ton	No calculated value	0.01	No calculated value	0.47040	0.47040
Kiln Feed	KF29	Kiln 2 front seal	General	Raw shale	In process	112,000	tpy	Vacuum	Functional	99%	Uncontrolled	8.40E-01	lb/ton	No calculated value	0.01	No calculated value	0.47040	0.47040
Kiln Feed	KF30	Opening of kiln rim seals for cleaning	General	Kiln rear chamber seal d	In process	438	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	No calculated value	1	No calculated value	0.00066	0.00066
Kiln Feed	KF31	Removal of bag house plug (vacuum truck unloading)	General	Kiln rear chamber seal d	In process	338	tpy	Water suppression	Functional	0%	Uncontrolled	3.00E-03	lb/ton	No calculated value	1	No calculated value	0.00051	0.00051
Kiln Feed	(KF31)							Baghouse	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln	KL1	Drop point, kiln 1 to kiln 1 clinker cooler	General	Clinker	In process	121,000	tpy	Enclosed	Functional	99%	Uncontrolled	0.003	lb/ton	No calculated value	0.01	No calculated value	0.00182	0.00182
Kiln	KL2	Kiln 1 clinker cooler	General	Clinker	In process	121,000	tpy	Enclosed	Functional	90%	Uncontrolled	3.00E-01	lb/ton	No calculated value	0.1	No calculated value	1.81500	1.81500
Kiln	KL3	Drop point, kiln 1 clinker cooler to kiln 1 clinker belt	General	Clinker	In process	121,000	tpy	Partially enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	No calculated value	0.2	No calculated value	0.03630	0.03630
Kiln	KL4	Kiln 1 clinker belt	Conveyor	Clinker	In process	121,000	tpy	Partially underground	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.02122	0.02122
Kiln	(KL4)							Dust cover	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln	(KL4)							Water suppression, as needed	Functional	0%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln	KL5	Drop point, kiln 1 clinker belt to kiln 1 clinker pile	Drop Operation	Clinker	In process	121,000	tpy	Water suppression	Not functional	50%	Uncontrolled	0.003	lb/ton	0.01345	0.5	0.40675	0.09075	0.40675
Kiln	KL6	Kiln 1 clinker pile	Storage Pile	Clinker	In process	121,000	tpy	Water suppression	Partially functional	50%				2.77823	0.5	0.01549	#N/A	0.01549
Kiln	KL7	Drop point, kiln 2 to kiln 2 clinker cooler	General	Clinker	In process	112,000	tpy	Enclosed	Functional	99%	Uncontrolled	0.003	lb/ton	No calculated value	0.01	No calculated value	0.00168	0.00168
Kiln	KL8	Kiln 2 clinker cooler	General	Clinker	In process	112,000	tpy	Enclosed	Functional	90%	Uncontrolled	3.00E-01	lb/ton	No calculated value	0.1	No calculated value	1.68000	1.68000
Kiln	KL9	Drop point, kiln 2 clinker cooler to kiln 2 clinker belt	General	Clinker	In process	112,000	tpy	Partially enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	No calculated value	0.2	No calculated value	0.03360	0.03360
Kiln	KL10	Kiln 2 clinker belt	Conveyor	Clinker	In process	112,000	tpy	Partially underground	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01895	0.01895
Kiln	(KL10)							Dust cover	Functional	0%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln	(KL10)							Water suppression, as needed	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Kiln	KL11	Drop point, kiln 2 clinker belt to kiln 2 clinker pile	Drop Operation	Clinker	In process	112,000	tpy	Water suppression, mist	Not functional	50%	Uncontrolled	0.003	lb/ton	0.01345	0.5	0.37650	0.08400	0.37650
Kiln	KL12	Kiln 2 clinker pile	Storage Pile	Clinker	In process	112,000	tpy	Water suppression, mist	Partially functional	50%				2.77823	0.5	0.01549	#N/A	0.01549
Kiln	KL13	Transfer kiln 2 clinker pile to kiln 1 clinker pile	Drop Operation	Clinker	In process	112,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.01345	1	0.75300	0.16800	0.75300
Kiln	KL14	Muck pile	Storage Pile	Kiln baghouse dust	Post process	8,160	tpy	Moisture; Pile shaping; Compaction	Functional; Functional; Functional	50%				84.18870	0.5	1.05615	#N/A	1.05615
Kiln	KL15	Loading onto muck pile	Drop Operation	Kiln baghouse dust	Post process	8,160	tpy	None	None	0%				0.00011	1	0.00047	#N/A	0.00047
Kiln	KL16	Unloading muck pile	Drop Operation	Kiln baghouse dust	Post process	8,160	tpy	None	None	0%				0.00011	1	0.00047	#N/A	0.00047
Finish Plant	FP1	Drop point, kiln 1 clinker pile to transfer to #1 conveyor	General	Clinker	In process	233,000	tpy	Underground	Functional	90%	Uncontrolled	3.00E-03	lb/ton	No calculated value	0.1	No calculated value	0.03495	0.03495
Finish Plant	FP2	#1 conveyor	Conveyor	Clinker	In process	233,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01599	0.01599
Finish Plant	(FP2)							Partially underground	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP3	Drop point, #1 conveyor to grizzly	Drop Operation	Clinker	In process	233,000	tpy	None	None	80%	Uncontrolled	0.003	lb/ton	0.01345	0.2	0.31330	0.06990	0.31330
Finish Plant	FP4	Grizzly on lightweight aggregate feed platform	Drop Operation	Clinker	In process	233,000	tpy	Partially enclosed	Functional	70%	Uncontrolled	3.00E-03	lb/ton	0.01345	0.3	0.46995	0.10485	0.46995
Finish Plant	FP5	Drop point, grizzly to grizzly pile	Drop Operation	Clinker	In process	233,000	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.01345	1	1.56651	0.34950	1.56651
Finish Plant	FP6	Grizzly reject pile	Storage Pile	Clinker	In process	1,167	tpy	None	None	0%				2.77823	1	0.00510	#N/A	0.00510
Finish Plant	FP7	Drop point, grizzly to #2 conveyor	Drop Operation	Clinker	In process	233,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.01345	0.1	0.15665	0.03495	0.15665
Finish Plant	FP8	#2 conveyor	Conveyor	Clinker	In process	233,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.03155	0.03155
Finish Plant	FP9	Drop point, #2 conveyor to triple deck finish mill screen	Drop Operation	Clinker	In process	233,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.01345	0.1	0.15665	0.03495	0.15665
Finish Plant	FP10	Triple deck finish mill screen	General	Clinker	In process	233,000	tpy	Baghouse	Not functional	0%	Uncontrolled	2.20E-03	lb/ton	No calculated value	1	No calculated value	0.25630	0.25630
Finish Plant	FP11	Drop point, triple deck finish mill screen to 3/4" discharge conveyor	Drop Operation	3/4"	In process	69,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00373	0.1	0.01286	0.01035	0.01286
Finish Plant	FP12	3/4" discharge conveyor	Conveyor	3/4"	In process	69,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00647	0.00647
Finish Plant	(FP12)							Baghouse	Not functional	0%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP13	Drop point, 3/4" discharge conveyor to 3/4" to stockpile conveyor	Drop Operation	3/4"	In process	69,000	tpy	Enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	0.00373	0.2	0.02572	0.02070	0.02572
Finish Plant	FP14	3/4" to stockpile conveyor	Conveyor	3/4"	In process	69,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01273	0.01273
Finish Plant	FP15	Drop point, 3/4" to stockpile conveyor to 3/4" short term storage pile	Drop Operation	3/4"	In process	69,000	tpy	Tube	Functional	90%	Uncontrolled	0.003	lb/ton	0.00373	0.05	0.00643	0.00518	0.00643
Finish Plant	(FP15)							Water suppression	Functional	50%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP16	3/4" short term storage pile	Storage Pile	3/4"	In process	98,185	tpy	Water suppression	Functional	50%				1.13655	0.5	0.00449	#N/A	0.00449
Finish Plant	FP17	Drop point, triple deck finish mill screen to 3/8" discharge conveyor	Drop Operation	3/8"	In process	46,000	tpy	Enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	0.00373	0.2	0.01715	0.01380	0.01715
Finish Plant	FP18	3/8" discharge conveyor	Conveyor	3/8"	In process	46,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00289	0.00289
Finish Plant	(FP18)							Baghouse	Not functional	0%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP19	Drop point, 3/8" discharge conveyor to 3/8" to stockpile conveyor	Drop Operation	3/8"	In process	46,000	tpy	Enclosed	Functional	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.08575	0.06900	0.08575
Finish Plant	FP20	3/8" to stockpile conveyor	Conveyor	3/8"	In process	46,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00660	0.00660
Finish Plant	FP21	Drop point, 3/8" stockpile conveyor to 3/8" short term storage pile	Drop Operation	3/8"	In process	46,000	tpy	Water suppression, spray head	Functional	50%	Uncontrolled	0.003	lb/ton	0.00373	0.5	0.04287	0.03450	0.04287
Finish Plant	FP22	3/8" short term storage pile	Storage Pile	3/8"	In process	25,550	tpy	Water suppression, spray head	Functional	70%				1.24178	0.3	0.05191	#N/A	0.05191
Finish Plant	FP23	Drop point, triple deck finish mill screen to oversize discharge conveyor	Drop Operation	Clinker	In process	133,975	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.01345	0.1	0.09007	0.02010	0.09007
Finish Plant	FP24	Oversize discharge conveyor	Conveyor	Clinker	In process	133,975	tpy	Partially covered	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01122	0.01122

Norlite Fugitive Dust Sources and Calculations

Area	Source ID	Source Name	Source Type	Product	In/Post Proces	P - Production Rate	Units	Control	Condition	ER - emissions reduction efficiency, %	Emission Factor Type	Emission Factor (EF)	EF Units	EF - Calculated Emission Factor	(1-ER/100)	E - Emissions, ton/yr via calculations	E - Emissions, ton/yr via AP-42 fa	Combined Emissions
Finish Plant	(FP24)							Baghouse	Not functional	0%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP25	Drop point, oversize discharge conveyor to oversize hopper	Drop Operation	Clinker	In process	133,975	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.01345	1	0.90074	0.20096	0.90074
Finish Plant	FP26	Oversize hopper	General	Clinker	In process	133,975	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	No calculated value	1	No calculated value	0.20096	0.20096
Finish Plant	FP27	Drop point, oversize hopper to El Jay crusher speed conveyor	Drop Operation	Clinker	In process	133,975	tpy	Partially enclosed	Functional	70%	Uncontrolled	0.003	lb/ton	0.01345	0.3	0.27022	0.06029	0.27022
Finish Plant	FP28	El Jay crusher speed conveyor	Conveyor	Clinker	In process	133,975	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01151	0.01151
Finish Plant	FP29	Drop point, El Jay crusher speed conveyor to El Jay crusher	Drop Operation	Clinker	In process	133,975	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.01345	0.1	0.09007	0.02010	0.09007
Finish Plant	FP30	El Jay crusher	General	Clinker	In process	133,975	tpy	Baghouse	Not functional	90%	Uncontrolled	2.50E-02	lb/ton	No calculated value	0.1	No calculated value	0.16747	0.16747
Finish Plant	FP31	Drop point, El Jay crusher to El Jay discharge conveyor	Drop Operation	Clinker	In process	133,975	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.01345	0.1	0.09007	0.02010	0.09007
Finish Plant	FP32	El Jay discharge conveyor	Conveyor	Clinker	In process	133,975	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.00804	0.00804
Finish Plant	FP33	Drop point, El Jay discharge conveyor to #2 return conveyor	Drop Operation	Clinker	In process	133,975	tpy	Enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	0.01345	0.2	0.18015	0.04019	0.18015
Finish Plant	FP34	#2 return conveyor	Conveyor	Clinker	In process	133,975	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.01398	0.01398
Finish Plant	FP35	Drop point, #2 return conveyor to #2 conveyor	Drop Operation	Clinker	In process	133,975	tpy	Enclosed	Functional	80%	Uncontrolled	0.003	lb/ton	0.01345	0.2	0.18015	0.04019	0.18015
Finish Plant	FP36	Drop point, triple deck finish mill screen to fines to silo conveyor	Drop Operation	Block mix	In process	28,000	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00373	0.1	0.00522	0.00420	0.00522
Finish Plant	FP37	Fines to silo conveyor	Conveyor	Block mix	In process	28,000	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00840	0.00840
Finish Plant	(FP37)							Baghouse	Not functional	0%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP38	Drop point, fines to silo conveyor to enclosed fines storage pile	Drop Operation	4x0	In process	85,000	tpy	Chute	Functional	94%	Uncontrolled	0.003	lb/ton	0.00373	0.06	0.00951	0.00765	0.00951
Finish Plant	FP39	Enclosed fines storage pile	Storage Pile	4x0	In process	85,000	tpy	Roof	Functional	20%				5.85111	0.2	0.03001	#N/A	0.03001
Finish Plant	(FP39)							Concrete enclosure at bottom	Functional	75%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	(FP39)							Tarps	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP40	Open fines storage pile	Storage Pile	4x0	In process	85,000	tpy	Enclosed	Functional	20%				5.85111	0.2	0.00981	#N/A	0.00981
Finish Plant	(FP40)							Concrete wall to south	Functional	50%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	(FP40)							Wind screen	Functional	50%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP41	Baghouse dust silo 1	Storage Pile	Block mix	In process	85,000	tpy	Enclosed	Functional	97%	Controlled, fabric filter	9.90E-03	lb/ton	7.82955	0.03	0.00153	0.01262	0.00153
Finish Plant	FP42	Drop point, baghouse dust silo 1 to shipping belt	Drop Operation	Block mix	In process	85,000	tpy	Enclosed	Functional	99%		0.003	lb/ton	0.00373	0.01	0.00158	0.00128	0.00158
Finish Plant	FP43	Baghouse dust silo 2	Storage Pile	Block mix	In process	85,000	tpy	Enclosed	Functional	97%	Controlled, fabric filter	9.90E-03	lb/ton	7.82955	0.03	0.00153	0.01262	0.00153
Finish Plant	FP44	Drop point, baghouse dust silo 2 to shipping belt	Drop Operation	Block mix	In process	85,000	tpy	Enclosed	Functional	99%		0.003	lb/ton	0.00373	0.01	0.00158	0.00128	0.00158
Finish Plant	FP45	Shipping belt	Conveyor	Block mix	In process	27,094	tpy	Partially underground	Functional	90%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.1	No calculated value	0.00102	0.00102
Finish Plant	(FP45)							Dust cover	Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP46	Drop point, shipping belt to stationary belt	Drop Operation	Block mix	In process	27,094	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00373	0.1	0.00505	0.00406	0.00505
Finish Plant	FP47	Stationary belt	Conveyor	Block mix	In process	27,094	tpy	Dust cover	Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00369	0.00369
Finish Plant	(FP47)							Baghouse; Improved maintenance	Functional; Functional					(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP48	Drop point, stationary belt to radial stacker	Drop Operation	Block mix	In process	27,094	tpy	Enclosed	Functional	90%	Uncontrolled	0.003	lb/ton	0.00373	0.1	0.00505	0.00406	0.00505
Finish Plant	FP49	Radial stacker	Conveyor	Block mix	In process	27,094	tpy	Dust cover; Spray head adjustment	Functional; Partially Functional	70%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	0.3	No calculated value	0.00301	0.00301
Finish Plant	FP50	Drop point, radial stacker to block mix short term storage pile 1	Drop Operation	Block mix	In process	27,094	tpy	Baghouse	Functional	90%	Uncontrolled	0.003	lb/ton	0.00373	0.0125	0.00063	0.00051	0.00063
Finish Plant	(FP50)							Water suppression	Functional	50%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	(FP50)							Adjustable discharge height	Functional	75%				(Additional control)	(Additional control)	(Additional control)	#N/A	(Additional control)
Finish Plant	FP51	Block mix short term storage pile 1	Storage Pile	Block mix	In process	15,133	tpy	Low pile height/bldg	Functional	20%				7.82955	0.8	0.07249	#N/A	0.07249
Finish Plant	FP52	Block mix short term storage pile 2	Storage Pile	Block mix	In process	14,764	tpy	Low pile height/bldg	Functional	20%				7.82955	0.8	0.07249	#N/A	0.07249
Finish Plant	FP53	Block mix short term storage pile 3	Storage Pile	Block mix	In process	2,147	tpy	Low pile height/small pile/bldg	Functional	50%				7.82955	0.5	0.03096	#N/A	0.03096
Finish Plant	FP54	Block mix short term storage pile 4	Storage Pile	Block mix	In process	13,421	tpy	Low pile height/bldg	Functional	20%				7.82955	0.8	0.11829	#N/A	0.11829
Finish Plant	FP55	Block mix short term storage pile 5	Storage Pile	Block mix	In process	33,788	tpy	Low pile height	Functional	20%				7.82955	0.8	0.27841	#N/A	0.27841
Finish Plant	FP56	Block mix short term storage pile 6	Storage Pile	Block mix	In process	2,550	tpy	Low pile height/small pile	Functional	50%				7.82955	0.5	0.05963	#N/A	0.05963
Finish Plant	FP57	3/4" long term storage pile 5	Storage Pile	3/4"	Post process	37,531	tpy	Low pile height	Functional	20%				1.13655	0.8	0.01717	#N/A	0.01717
Finish Plant	FP58	Loading 3/4" onto trucks	Drop Operation	3/4"	Post process	69,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.02763	0.10350	0.02763
Finish Plant	FP59	Loading 3/8" onto trucks	Drop Operation	3/8"	Post process	46,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.01842	0.06900	0.01842
Finish Plant	FP60	Loading clinker onto trucks	Drop Operation	Clinker	Post process	233,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00141	1	0.16458	0.34950	0.16458
Finish Plant	FP61	Loading block mix onto piles	Drop Operation	Block mix	Post process	92,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.03684	0.13800	0.03684
Finish Plant	FP62	Loading block mix onto trucks	Drop Operation	Block mix	Post process	92,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.03684	0.13800	0.03684
Fines Processing	FN1	8 X 0 long term storage pile	Storage Pile	Block mix	Post process	27,094	tpy	Enclosed	Functional	85%				7.82955	0.15	0.02218	#N/A	0.02218
Fines Processing	FN2	4 X 0 fines feed pile	Storage Pile	4x0	In process	66,839	tpy	Low pile height	Functional	20%				5.85111	0.8	0.01975	#N/A	0.01975
Fines Processing	FN3	Loading of block mix into Cedarapids feed hopper (surge bin)	Drop Operation	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00373	1	0.12459	0.10026	0.12459
Fines Processing	FN4	Cedarapids feed hopper (surge bin)	General	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	No calculated value	1	No calculated value	0.10026	0.10026
Fines Processing	FN5	Drop point, Cedarapids feed hopper to feeder belt	Drop Operation	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.12459	0.10026	0.12459
Fines Processing	FN6	Feeder belt	Conveyor	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.01702	0.01702
Fines Processing	FN7	Drop point, feeder belt to screen feed belt	Drop Operation	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.12459	0.10026	0.12459
Fines Processing	FN8	Screen feed belt	Conveyor	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.01154	0.01154
Fines Processing	FN9	Drop point, screen feed belt to Astec 2618 fines screen	Drop Operation	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.12459	0.10026	0.12459
Fines Processing	FN10	Astec 2618 fines screen	General	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.002	lb/ton	No calculated value	1	No calculated value	0.06684	0.06684
Fines Processing	FN11	Drop point, fines screen to #4s belt	Drop Operation	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.12459	0.10026	0.12459
Fines Processing	FN12	#4s belt	Conveyor	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.01421	0.01421
Fines Processing	FN13	Drop point, #4s belt to 4 mesh reject pile	Drop Operation	4x0	In process	66,839	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.12459	0.10026	0.12459
Fines Processing	FN14	4 mesh reject pile	Storage Pile	4x0	In process	27,094	tpy	Low pile height	Functional	20%				5.85111	0.8	0.01975	#N/A	0.01975
Fines Processing	FN15	Drop point, fines screen to fines #8s belt	Drop Operation	8x0	In process	27,094	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.05050	0.04064	0.05050
Fines Processing	FN16	#8s belt	Conveyor	8x0	In process	27,094	tpy	None	None	0%	Uncontrolled	0.003	lb/ton per 300 ft	No calculated value	1	No calculated value	0.00580	0.00580
Fines Processing	FN17	Drop point, #8s belt to fines 8 X 0 pile	Drop Operation	8x0	In process	27,094	tpy	None	None	0%	Uncontrolled	0.003	lb/ton	0.00373	1	0.05050	0.04064	0.05050
Fines Processing	FN18	8 X 0 pile	Storage Pile	8x0	In process	27,094	tpy	Low pile height	Functional	20%				7.53489	0.8	0.02543	#N/A	0.02543
Fines Processing	FN19	3/4" long term storage pile 6	Storage Pile	3/4"	Post process	9,847	tpy	Low pile height	Functional	20%				1.13655	0.8	0.00384	#N/A	0.00384
Fines Processing	FN20	Loading screened fines onto trucks (8 X 0, 4 X 0, 4 mesh reject)	Drop Operation	Block mix	Post process	27,094	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.01085	0.04064	0.01085
Block Mix	BM1	Block mix long term storage pile 1	Storage Pile	Block mix	Post process	8,376	tpy	None	None	0%				7.82955	1	0.25272	#N/A	0.25272
Block Mix	BM2	Block mix long term storage pile 2	Storage Pile	Block mix	Post process	8,376	tpy	Low pile height	Functional	20%				7.82955	0.8	0.01598	#N/A	0.01598
Block Mix	BM3	Block mix long term storage pile 3	Storage Pile	Block mix	Post process	8,376	tpy	Low pile height	Functional	20%				7.82955	0.8	0.01862	#N/A	0.01862
Block Mix	BM4	Block mix long term storage pile 4	Storage Pile	Block mix	Post process	11,341	tpy	Low pile height	Functional	20%				7.82955	0.8	0.20980	#N/A	0.20980
Block Mix	BM5	Loading block mix into portable screen	Drop Operation	Block mix	Post process	89,118	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.03568	0.13368	0.03568
Block Mix	BM6	Astec 710T	General	Block mix	Post process	44,559	tpy	None	None	0%	Uncontrolled	0.002	lb/ton	No calculated value	1	No calculated value	0.04456	0.04456
Block Mix	BM7	Reade screen	General	Block mix	Post process	44,559	tpy	None	None	0%	Uncontrolled	0.002	lb/ton	No calculated value	1	No calculated value	0.04456	0.04456
Block Mix	BM8	Loading onto temporary block mix pile	Drop Operation	Block mix	Post process	89,118	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.03568	0.13368	0.03568
Block Mix	BM9	Temporary block mix pile for customer pickup	Storage Pile	Block mix	Post process	89,118	tpy	Low pile height	Functional	20%				7.82955	0.8	0.04084	#N/A	0.04084
Block Mix	BM10	Loading block mix onto trucks	Drop Operation	Block mix	Post process	89,118	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.03568	0.13368	0.03568
Block Mix	BM11	Loading onto block mix pile	Drop Operation	Block mix	Post process	89,118	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.03568	0.13368	0.03568
Island	IS1	3/4" long term storage pile 1	Storage Pile	3/4"	Post process	2,840	tpy	Low pile height	Functional	20%				1.13655	0.8	0.00719	#N/A	0.00719
Island	IS2	3/4" long term storage pile 2	Storage Pile	3/4"	Post process	70,138	tpy	Low pile height	Functional	20%				1.13655	0.8	0.01052	#N/A	0.01052
Island	IS3	3/4" long term storage pile 3	Storage Pile	3/4"	Post process	4,014	tpy	Low pile height	Functional	20%				1.13655	0.8	0.02381	#N/A	0.02381
Island	IS4	3/4" long term storage pile 4	Storage Pile	3/4"	Post process	10,528	tpy	Low pile height	Functional	20%				1.13655	0.8	0.04041	#N/A	0.04041
Island	IS5	3/8" long term storage pile	Storage Pile	3/8"	Post process	45,642	tpy	Low pile height	Functional	20%				1.24178	0.8	0.01876	#N/A	0.01876
Island	IS6	Block mix long term storage pile 5	Storage Pile	Block mix	Post process	2,147	tpy	Low pile height	Functional	20%				7.82955	0.8	0.02643	#N/A	0.02643
Island	IS7	Loading onto 3/4" pile	Drop Operation	Block mix	Post process	69,000	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.02763	0.10350	0.02763
Island	IS8	Loading 3/4" onto trucks	Drop Operation	Block mix	Post process	69,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.02763	0.10350	0.02763
Island	IS9	Loading onto 3/8" pile	Drop Operation	Block mix	Post process	46,000	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.01842	0.06900	0.01842
Island	IS10	Loading 3/8" onto trucks	Drop Operation	Block mix	Post process	46,000	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00080	1	0.01842	0.06900	0.01842
Boneyard	BY1	Boneyard shale pile 1	Storage Pile	Shale fines	Post process	9,446	tpy	None	None	0%				0.16838	1	0.00410	#N/A	0.00410
Boneyard	BY2	Boneyard shale pile 2	Storage Pile	Shale fines	Post process	9,446	tpy	None	None	0%				0.16838	1	0.00410	#N/A	0.00410
Boneyard	BY3	Loading shale fines onto boneyard shale piles	Drop Operation	Shale fines	Post process	9,446	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	0.00073	1	0.00346	0.01417	0.00346
Boneyard	BY4	Loading boneyard shale piles onto trucks	Drop Operation	Shale fines	Post process	9,446	tpy	Loader Operator Protocol	Functional	0%	Uncontrolled	3.00E-03	lb/ton	0.00073	1	0.00346	0.01417	0.00346
Overburden Storage	OS1	Bulldozing	Bulldozing	Overburden	Post process	206,265	tpy	None	None	0%	Uncontrolled	3.00E-03	lb/ton	6.55695	1	2.88506	0.30940	2.88506
Overburden Storage	OS2	Receiving overburden from quarry	Drop Operation	Overburden	Post process	206,265	tpy	None	None	0%	Uncontrolled	2.00E-03	lb/ton	0.00008	1	0.00793	0.20627	0.00793
Overburden Storage	OS3	Wind erosion in overburden storage area	Overburden Erosion	Overburden	Post process	--	--	None	None	0%	Uncontrolled	3.80E-01	ton/acre-year	No calculated value	1	No calculated value	1.90000	1.90000
Road	RD1	Transport of stone from quarry to primary	Unpaved Road	Shale fines	In process	15,504	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.56834	0.5	2.20290	48062.78750	2.20290
Road	RD2	Transfer of overburden from quarry to overburden storage area	Unpaved Road	Shale fines	In process	15,875	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.56834	0.5	2.25566	49214.02652	2.25566
Road	RD3	Transport of shales fines to boneyard	Unpaved Road	Shale fines	In process	1,043	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.56834	0.5	0.14819	3233.12856	0.14819
Road	RD4	Transport of product off-site by truck	Unpaved Road	Shale fines	Post process	7,992	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.55304	0.5	1.10499	24775.34091	1.10499
Road	RD5	Travel of LGF delivery trucks	Unpaved Road	Shale fines	#N/A	550	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.55304	0.5	0.07598	1703.67898	0.07598
Road	RD6	Maintenance traffic	Unpaved Road	Shale fines	#N/A	2,914	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.29637	0.5	0.21589	9032.71307	0.21589
Road	RD7	Passenger vehicle traffic	Paved Road	Shale fines	#N/A	5,952	mi	Water	Functional	50%				0.96935	0.5	1.44230	#N/A	1.44230
Road	RD8	Transport of shale fines to overburden storage area	Unpaved Road	Shale fines	#N/A	1,427	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.56834	0.5	0.20276	4423.84091	0.20276
Road	RD9	Water truck movement	Unpaved Road	Shale fines	#N/A	3,686	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.35795	0.5	0.32983	11425.92129	0.32983
Road	RD10	On-site product movement via front end loader	Unpaved Road	Shale fines	#N/A	4,493	mi	Water	Functional	50%	Uncontrolled	6.2	lb/mi	0.32171	0.5	0.36139	13929.45076	0.36139

APPENDIX D
SITE-SPECIFIC VARIABLES

Site-wide Variables & Assumptions

Variable	Value	Units	Comments
a_unpaved	0.7	-	Unpaved roads[a]
b_unpaved	0.45	-	Unpaved roads[a]
f	11.6%	-	Percentage of year with unobstruted wind speeds >12 mph at mean pile height[b]
k_drop	1	-	Drop operations[a]
k_unpaved	4.9	lb/VMT	Unpaved roads[a]
k_paved	0.011	lb/VMT	Paved roads[a]
k_conveyor	1	-	Conveyor[a]
N	365	days	Averaging period
ob_density	1.28	ton/yd^3	Average overburden density
p	139.4	days	Days with at least 0.01 in of precipitation[b]
PE	136	-	Thornthwaite's evaporation-precipitation index
STER	1	g/s	Short term emission rate
U	7.15	mph	Average wind speed[b]

[a] Values obtained from AP-42.

[b] Values obtained from historical daily weather data for Albany International Airport for the years 2004 through 2013.

Overburden Characteristics

Sample Number	Sample	Silt Content, %
12580	SAND, fine/medium; some Silt/Clay; some fine Gravel	32.80%
12212	SILT/CLAY; little fine/medium Sand; little Fine Gravel	74.90%
12205	SILT/CLAY; and fine Sand; little fine Gravel	48.30%
12175	SAND, fine/medium; some Silt/Clay; some fine Gravel	31.80%
11707	SILT/CLAY; trace fine Sand; trace fine Gravel	95.10%
11706	SILT/CLAY; and fine/medium Sand; little fine Gravel	46.50%
11705	SILT/CLAY; trace fine Sand	98.50%
	Average	61.13%

All values taken from Gifford Engineering's Interim Stablity Report on the Overburden Spoil Storage Berms dated October 30, 2012.

Production Rates & Hours (select examples)

Area	2012 (ton/year)	2013 (ton/year)	Average (ton/year)	2012 Operating Hours (hours/year)	2013 Operating Hours (hours/year)	Average Operating Hours (hours/year)	Fraction of Year Operational
Quarry:	288,759	272,707	280,733	2,365	3,081	2,723	0.311
Kiln 1:	127,993	107,146	117,570	8,069	7,583	7,826	0.893
Kiln 2:	109,115	103,801	106,458	7,925	7,649	7,787	0.889

Product Characteristics

Product	Silt content, %[a]	Moisture content (in process) , %[b]	Moisture content (post process), %[c]	Density, ton/yd3
Raw shale	0.25%	2.00%	2.00%	
Shale fines	0.20%	8.00%	8.00%	
Clinker	3.30%	1.00%	5.00%	
3/4"	1.35%	2.50%	7.50%	
3/8"	1.48%	2.50%	7.50%	
Block mix	9.30%	2.50%	7.50%	
3/16"	1.35%	2.50%	7.50%	
4x0	6.95%	2.50%	7.50%	
8x0	8.95%	2.50%	7.50%	
Overburden	61.13%	40.00%	40.00%	
Kiln baghouse dust	100.00%	0.00%	30.00%	0.42
Kiln rear chamber seal dust	14.65%	0.00%	30.00%	1.20
Kiln clinker cooler multiclone dust	32.90%	0.00%	30.00%	0.93
Block mix baghouse dust	100.00%	2.50%	2.50%	
Muck pile baghouse dust	100.00%	30.00%	30.00%	
Finish plant baghouse dust	100.00%	2.50%	2.50%	

[a]Although material passing through a 200 sieve can contain both silt and clay, we assumed that all material passing through a 200 sieve is silt as a conservative estimate of emissions.

[b]The "in process" moisture content for the end products (3/4", 3/8", block mix, 3/16", 4x0, and 8x0) is 2.5%. The average moisture content for these materials is between 0% and 5%, so an average value of 2.5% has been used in calculations.

[c]The "post process" moisture content for the end products (3/4", 3/8", block mix, 3/16", 4x0, and 8x0) is 7.5%. The average moisture content for these materials is between 5% and 10%, so an average value of 7.5% has been used in calculations.

Mean Vehicle Weights[a]

Vehicle Type	Mean Weight, tons
Quarry haul truck	42.5
Customer delivery truck	40
LGF delivery truck	40
Maintenance truck	10
Passenger vehicle	2
Front end loader	12
Water truck[b]	15.2

[a]All vehicle weights listed here are mean weights (mean of empty and full vehicles, if applicable).

[b]Assume the water trucks can hold an average of 2,500 gal of water.

Southern Overburden Storage Area Clay Yardage

Year	Overburden Stripped, yd^3	Overburden Stripped, tons
2008	187,903.0	240,731.9
2009	339,389.0	434,808.2
2010	108,705.0	139,267.4
2011	150,580.0	192,915.6
2012	146,638.0	187,865.3
2013	61,940.0	79,354.4
Average*	165,859.2	212,490.5

* Excludes 2014 data

APPENDIX E
PHOTOGRAPH LOG

FUGITIVE DUST EMISSION POINTS PHOTOGRAPH LOG

NORLITE, LLC

A DIVISION OF TRADEBE ENVIRONMENTAL SERVICES, LLC

COHOES, NEW YORK

QUARRY AREA (QA) EMISSION POINTS PHOTOGRAPHS

Quarry Photograph 1, facing west:
Drilling (QA1, not pictured) and blasting (QA2, not pictured) operations occur in the quarry to extract stone from the earth. Facing west, below is a quarried stone pile (QA3) in the quarry, as a result of those efforts.

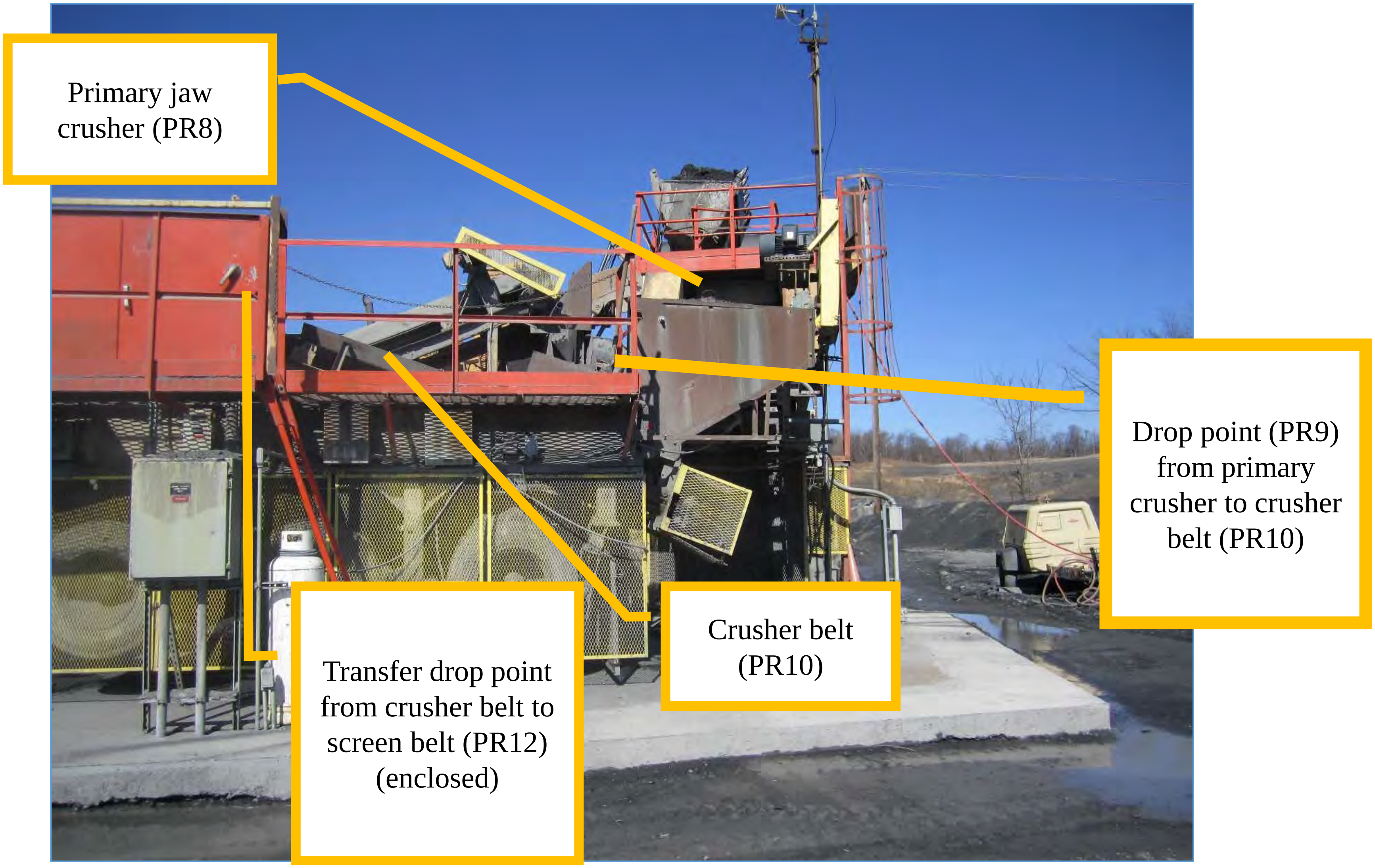
Quarry Photograph 2, facing west:
Stone is loaded (QA4) into a truck in the quarry. Stripped overburden (QA5, not pictured) is also loaded (QA6, not pictured), into trucks in the quarry.

PRIMARY AREA (PR) EMISSION POINTS PHOTOGRAPHS

Primary Photograph 1, facing southwest:

Primary operations begin with loading (PR1, not pictured) and unloading (PR3, not pictured) material onto and from the shot rock pile (PR2, not pictured). Shale from the quarry is also loaded (PR4, not pictured) onto the shale stockpile (PR5, not pictured) by front end loaders. A view of stone from the shale stockpile (PR5) being unloaded (PR6) into the primary jaw crusher (PR7), primary jaw crusher (PR8), and related drop points (PR9 and PR10).

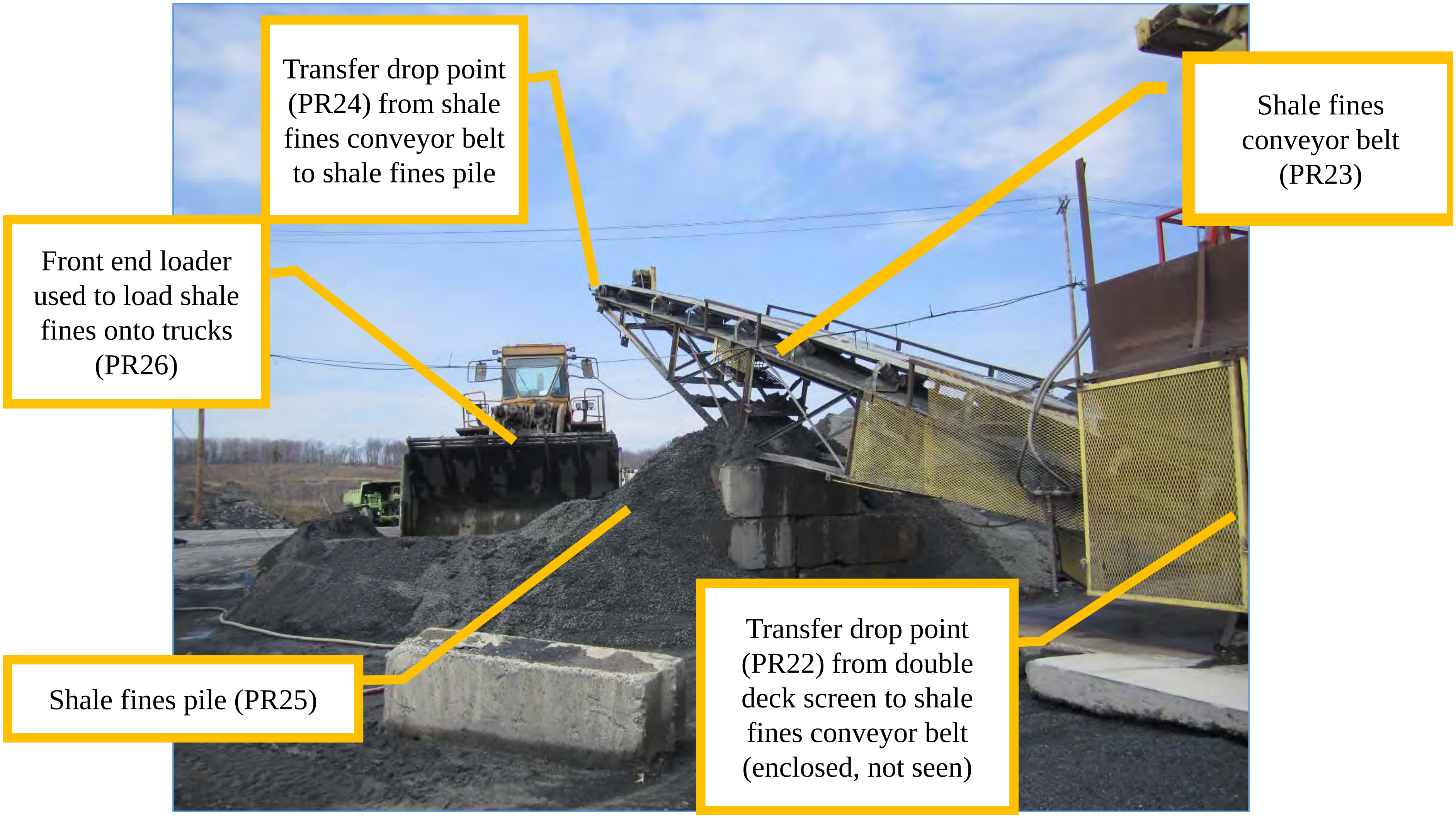
Primary Photograph 2, looking west:
A view of the primary jaw crusher (PR8) and where material drops (PR9) onto the crusher belt (PR10) and drops (PR11) from the crusher belt to the screen belt (PR12, enclosed).



Primary Photograph 3, looking southwest:
A view of the partially enclosed screen belt (PR12) and where material drops (PR13) into the double deck screen (PR14). The screen separates material onto two separate conveyor belts (one to the kiln feed pile (PR21) and the other to the shale fines storage pile (PR25)). Within the screen, some material is dropped (PR15, unseen) into the primary cone crusher (PR16, unseen), to further crush material. This material drops (PR17, unseen) from the primary cone crusher back to the primary crush screen for sorting. Some material, destined for the kiln feed pile, drops (PR18) from the screen to the shale conveyor belt (PR19).

Primary Photograph 4, looking south:
A view of the shale conveyor belt (PR19) and the transfer of material dropping (PR20) onto the shale kiln feed pile (PR21).

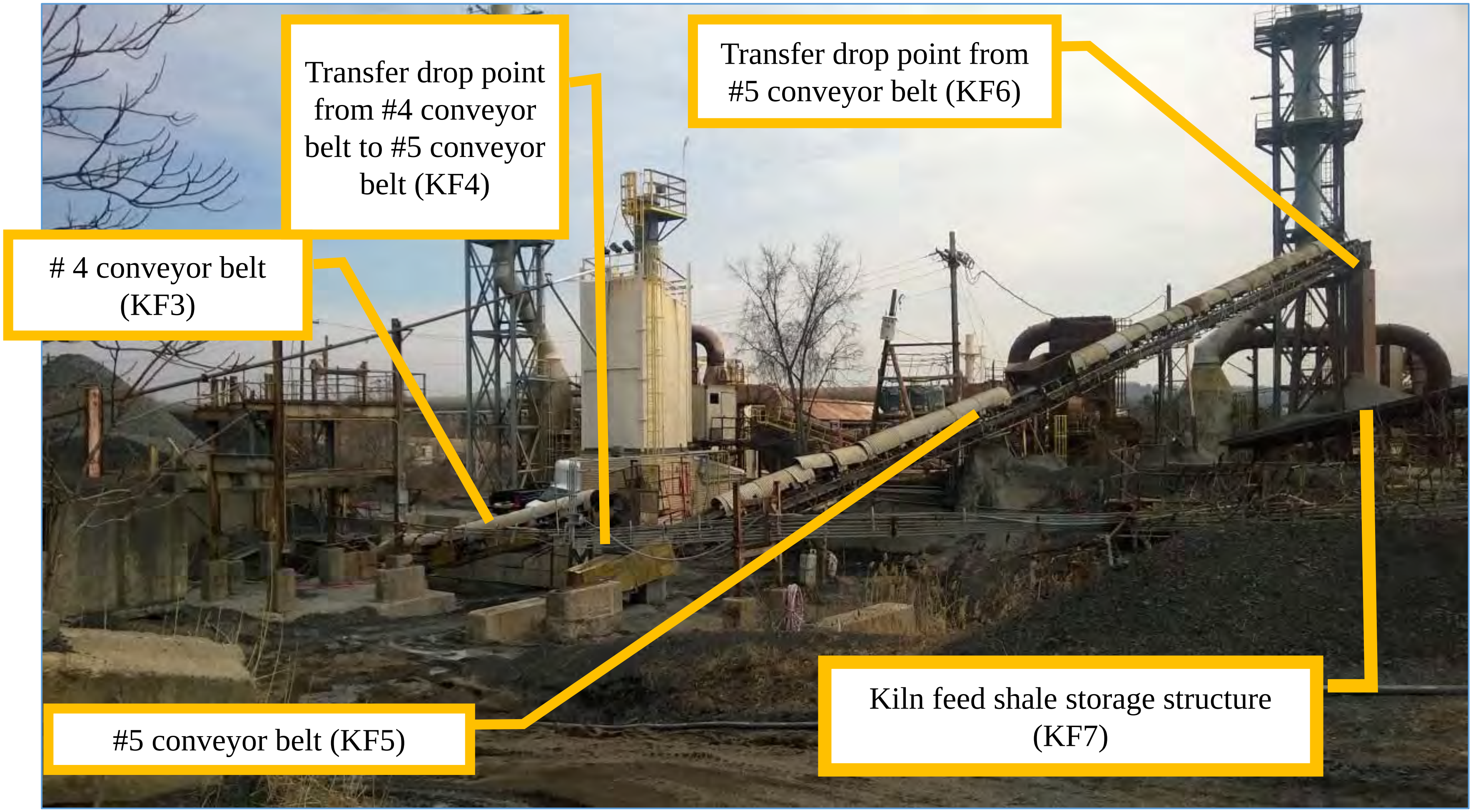
Primary Photograph 5, looking northwest:
A view of the second conveyor belt, the shale fines conveyor (PR23), transporting material (PR24) from the double deck screen (PR15) to the shale fines pile (PR25). There is also a loader that is used to load the shale fines to trucks (PR26).



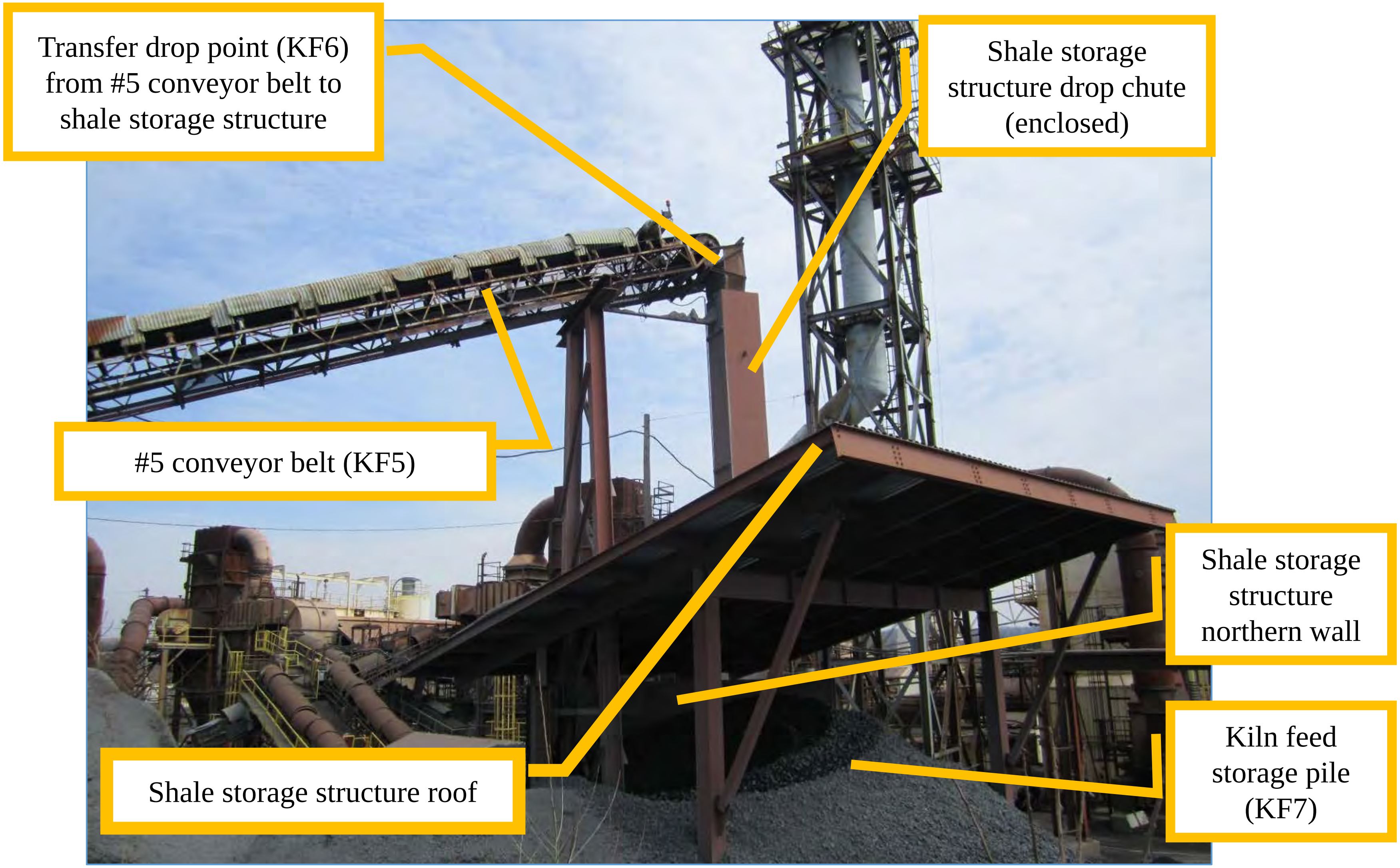
KILN FEED AREA (KF) EMISSION POINTS PHOTOGRAPHS

Kiln Feed Area Photograph 1, looking southwest:
Underground and below the shale kiln feed pile (PR21), material drops (KF1, not pictured) onto the #4 conveyor belt (KF3), which starts underground and extends aboveground to transfer (KF4) material to the #5 conveyor belt (KF6). The #5 conveyor belt transports material to a drop point that deposits the material into the kiln feed storage structure. A loader (not pictured) also transfers (KF2) material to the #4 conveyor belt.

Kiln Feed Area Photograph 2, looking northeast:
A full view the transfer (KF4) from #4 conveyor belt (KF3) to the #5 conveyor belt (KF5), which transfers (KF6) to the shale kiln feed storage structure (KF7) through an enclosed chute. The shale storage structure is partially enclosed with a roof and a back wall.

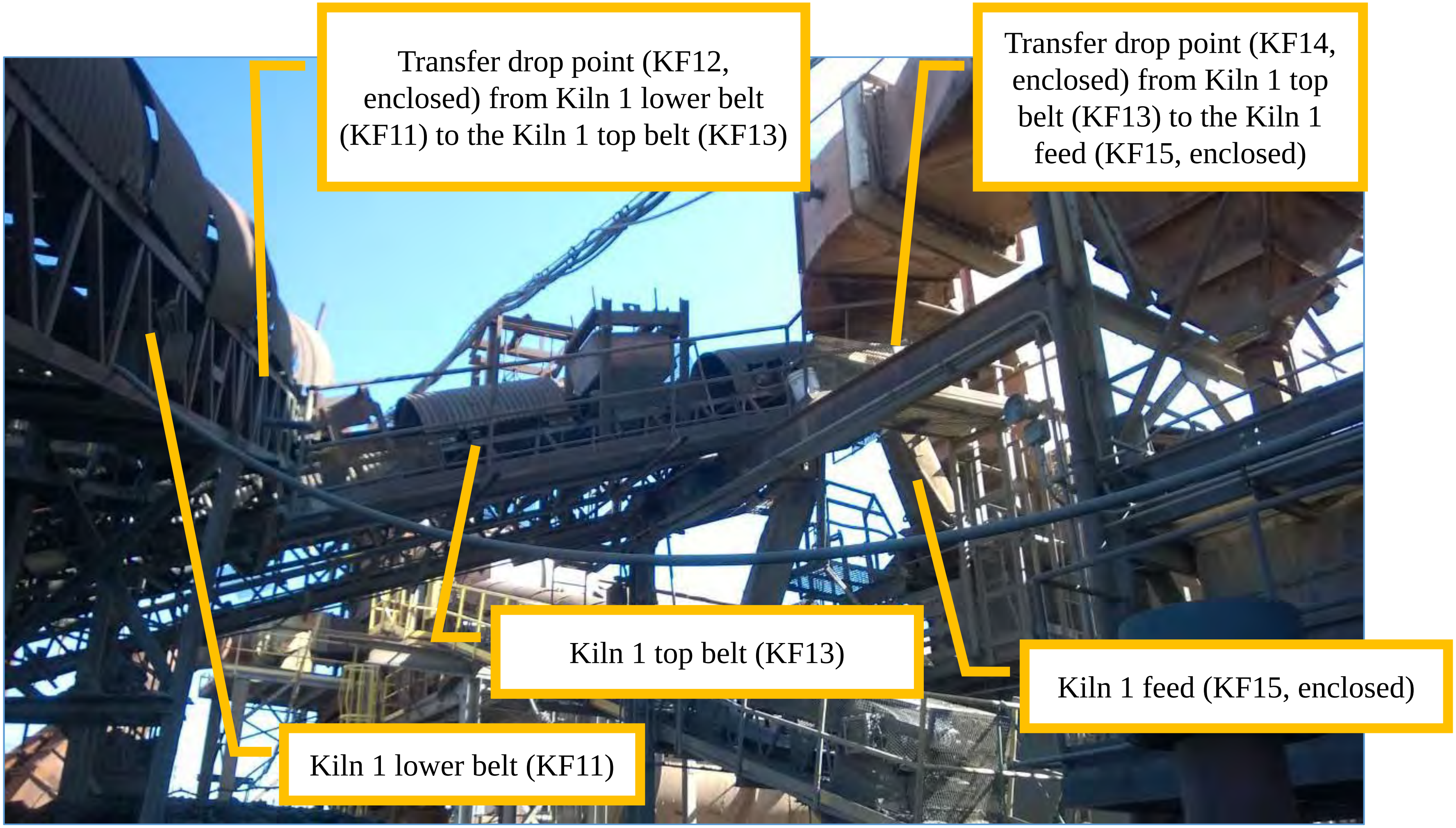


Kiln Feed Area Photograph 3, looking east:
A close-up view of #5 conveyor belt (KF5) dropping (KF6) material through an enclosed chute onto the shale kiln feed storage pile (KF7). The shale storage structure is partially enclosed with a roof and a back wall.

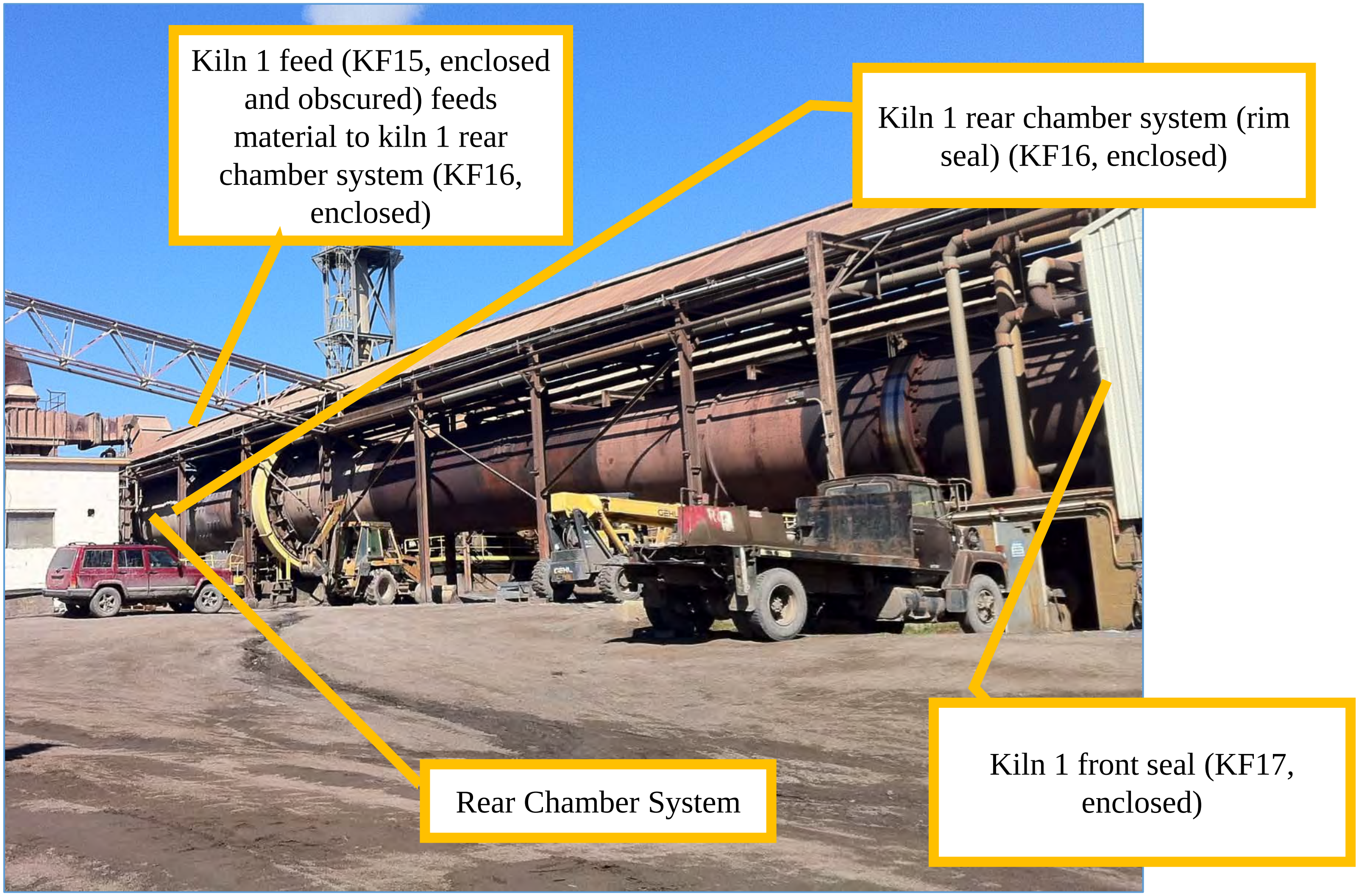


Kiln Feed Area Photograph 4, underground and looking northwest:
The shale kiln feed storage pile (KF7) drops (KF8) material onto the kiln 1 feeder belt (KF9), which then drops (KF10) onto the kiln1 lower belt (KF11). The kiln 1 lower belt extends outside from underground and transfers material to the kiln 1 top belt (out of frame).

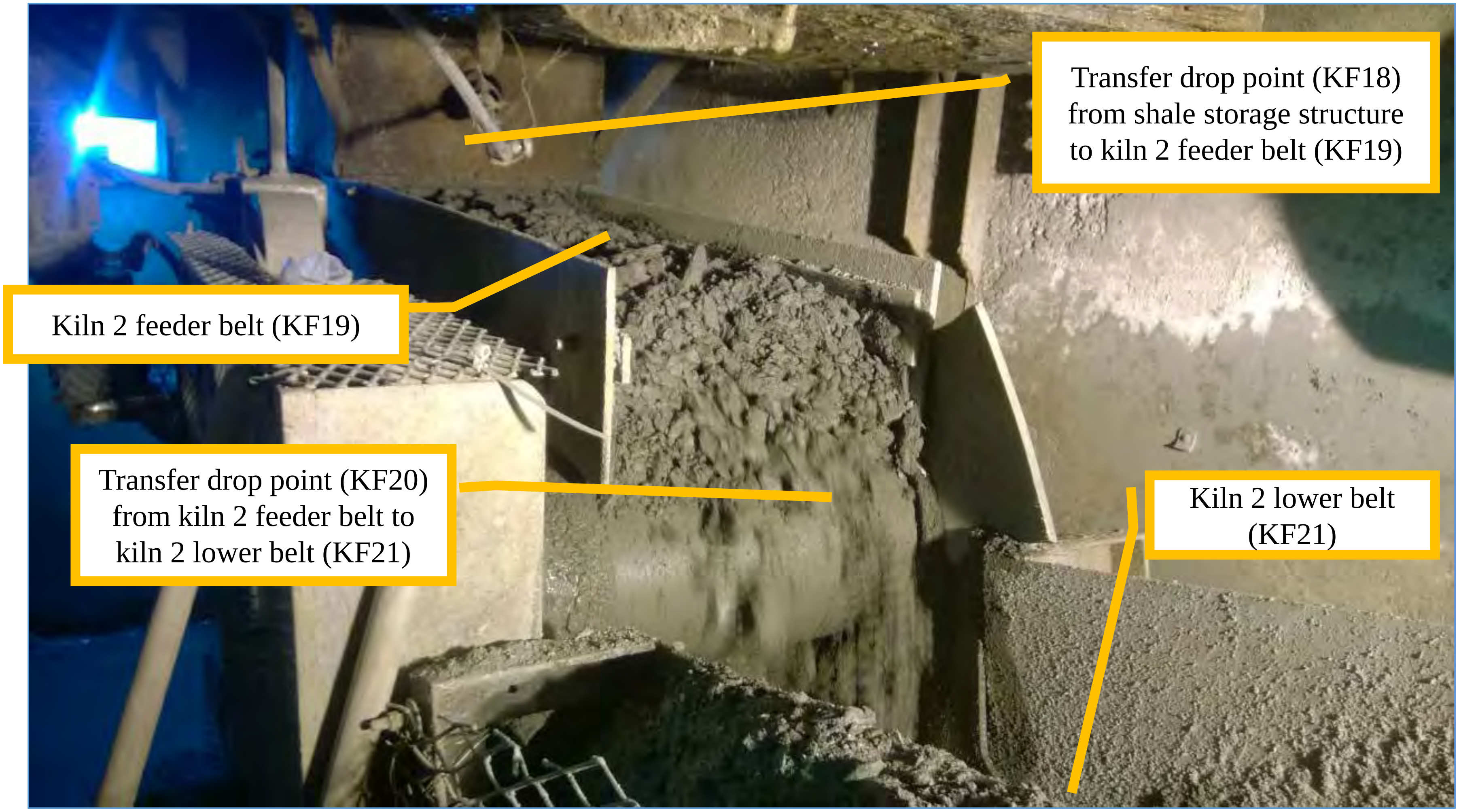
Kiln Feed Area Photograph 5, looking north:
The kiln 1 lower belt (KF11) drops (KF12) material onto the kiln 1 top belt (KF13).
The kiln 1 top belt drops (KF14) material into the kiln 1 feed (KF15).



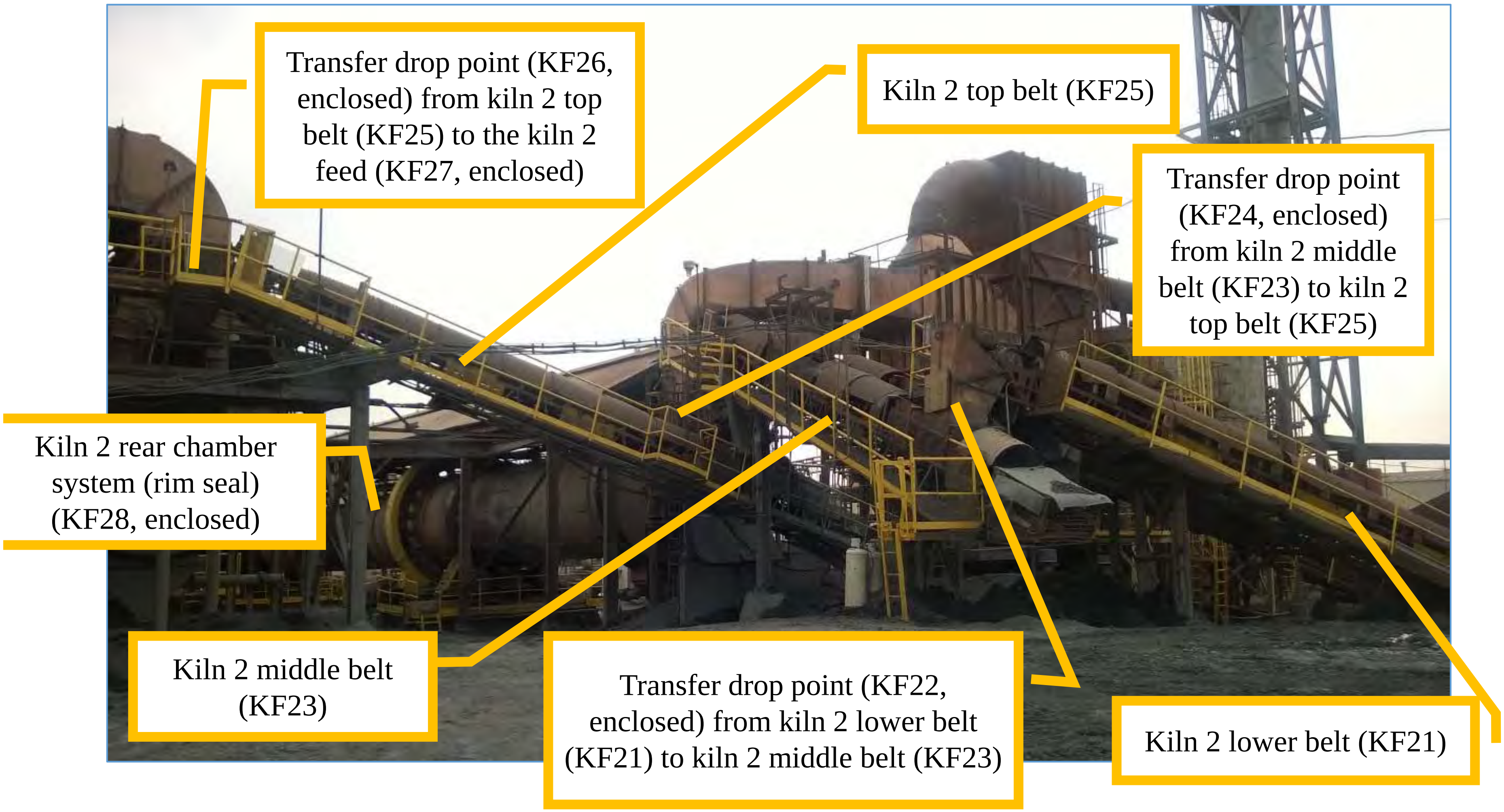
Kiln Feed Area Photograph 6 looking northwest:
The kiln 1 feed (KF15, enclosed), feeds material through the kiln 1 rear chamber system (KF16, enclosed) and the kiln 1 front seal (KF17, enclosed).



Kiln Feed Area Photograph 7: Underground and looking northwest, the shale kiln feed storage pile (KF7) drops (KF18) material onto the Kiln 2 feeder belt (KF19), which then drops (KF20) onto the Kiln 2 lower belt (KF21). The Kiln 2 lower belt extends from underground to the outside.



Kiln Feed Area Photograph 8, looking southeast:
The Kiln 2 lower belt (KF21) drops (KF22) material onto the kiln 2 middle belt (KF23), which drops (KF24) material onto the kiln 2 top belt (KF25). The top belt drops (KF26) material into kiln 2 feed (KF27, enclosed), which goes directly into kiln 2 rear chamber system (rim seal) (KF28). Material goes through, internally, to the kiln 2 front seal (KF29, enclosed and not pictured).

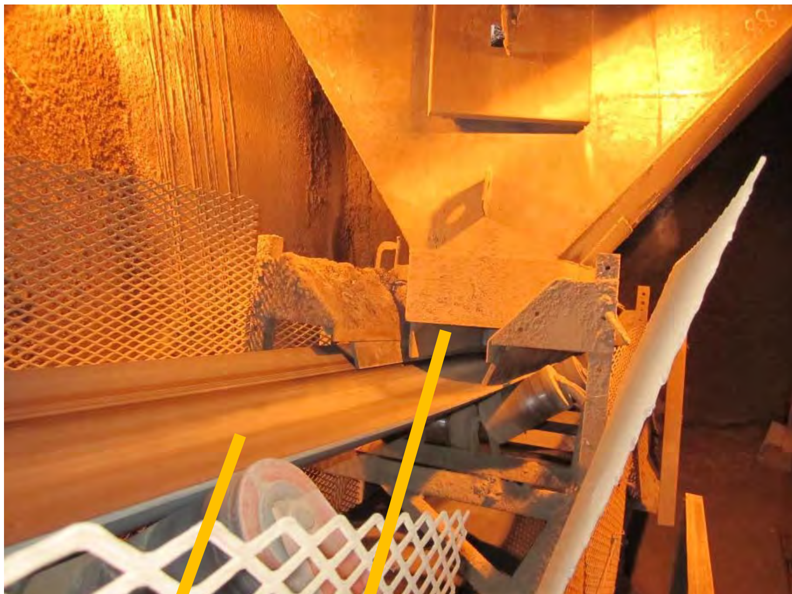


Kiln Feed Area Photograph 9, looking northwest:
The kiln rim seal, which has a chute that can be opened for cleaning (KF30).

Kiln Feed Area Photograph 10, looking west: The kiln rim seal chute is opened (KF31) for cleaning.

KILN AREA (KL) EMISSION POINTS PHOTOGRAPHS

Kiln Area Photographs 1 and 2:
Underground and looking west, material from Kiln 1 drops (KL1, out of frame) to the Kiln 1 clinker cooler (KL2, unseen – in building). Looking north, material then drops (KL3) below to the Kiln 1 clinker belt (KL4), which advances outside from underground.



Kiln Area Photograph 3:
Looking west, material from kiln 1 clinker belt (KL4) drops (KL5) to the kiln 1 clinker pile (KL6). Material from the kiln 2 clinker pile (KL12, not pictured) is also transferred (KL13) to the kiln 1 clinker pile.

Kiln Area Photographs 4 and 5:
Looking west, material from kiln 2 drops (KL7, unseen – in building) to the kiln 2 clinker cooler (KL8, unseen – in building). Material then drops (KL9) below to the Kiln 2 clinker belt (KL10), which advances outside from underground.

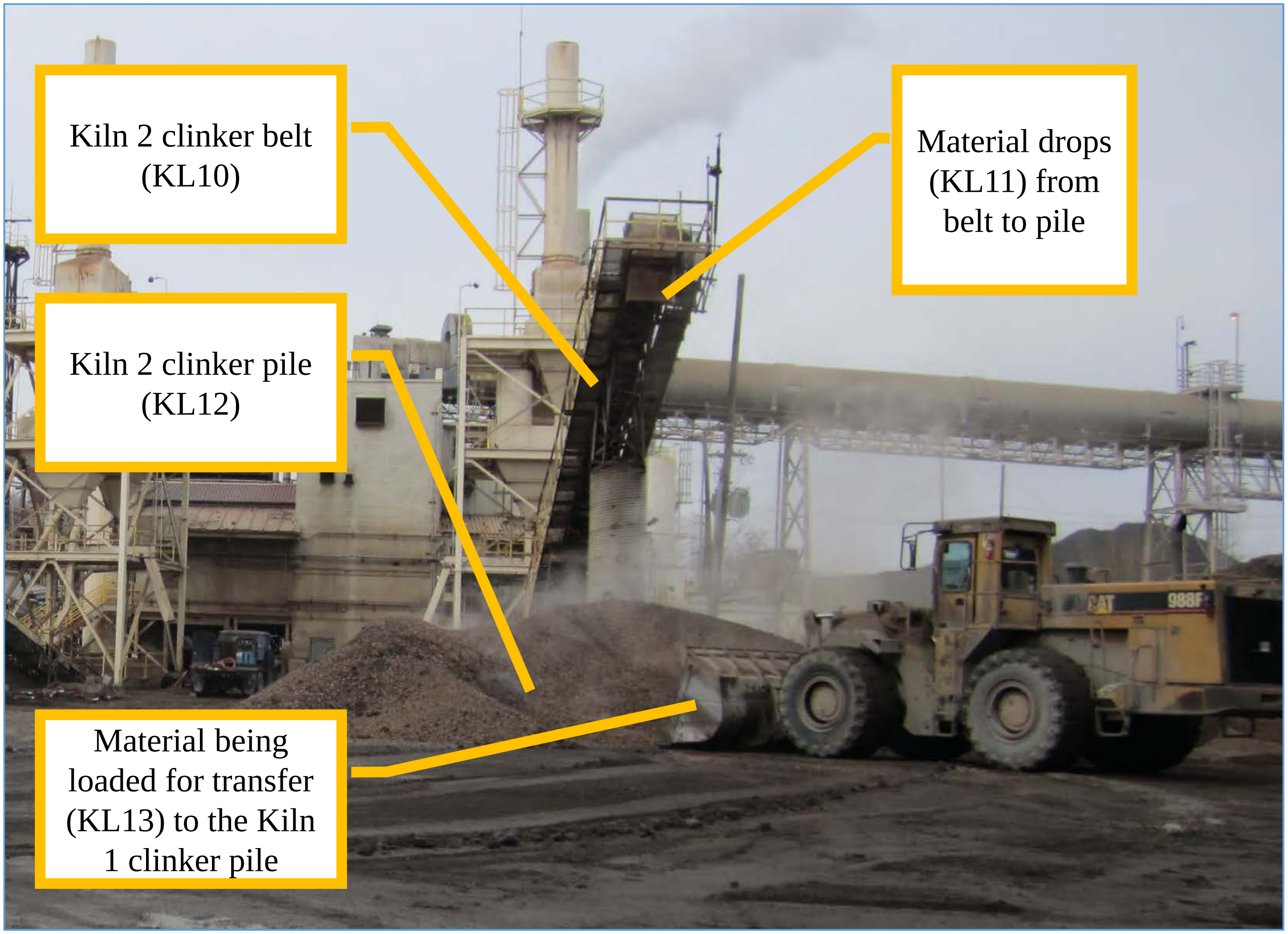
Material drops (KL9) from kiln 2 clinker cooler

The kiln 2 clinker belt (KL10), partially underground

Fugitive dust source IDs KL7 (kiln 2 material drop) and KL8 (kiln 2 clinker cooler) originate inside of this building.

The kiln 2 clinker belt (KL10) emerges from underground and extends outside

Kiln Area Photograph 6:
Looking west, material from kiln 2 clinker belt (KL10) drops (KL11) to the kiln 2 clinker pile (KL12). Material in the kiln 2 clinker pile is transferred (KL13) to combine with the kiln 1 clinker pile (KL6). Material from the kiln 2 clinker pile (KL12) is also transferred (KL13) to the kiln 1 clinker pile.



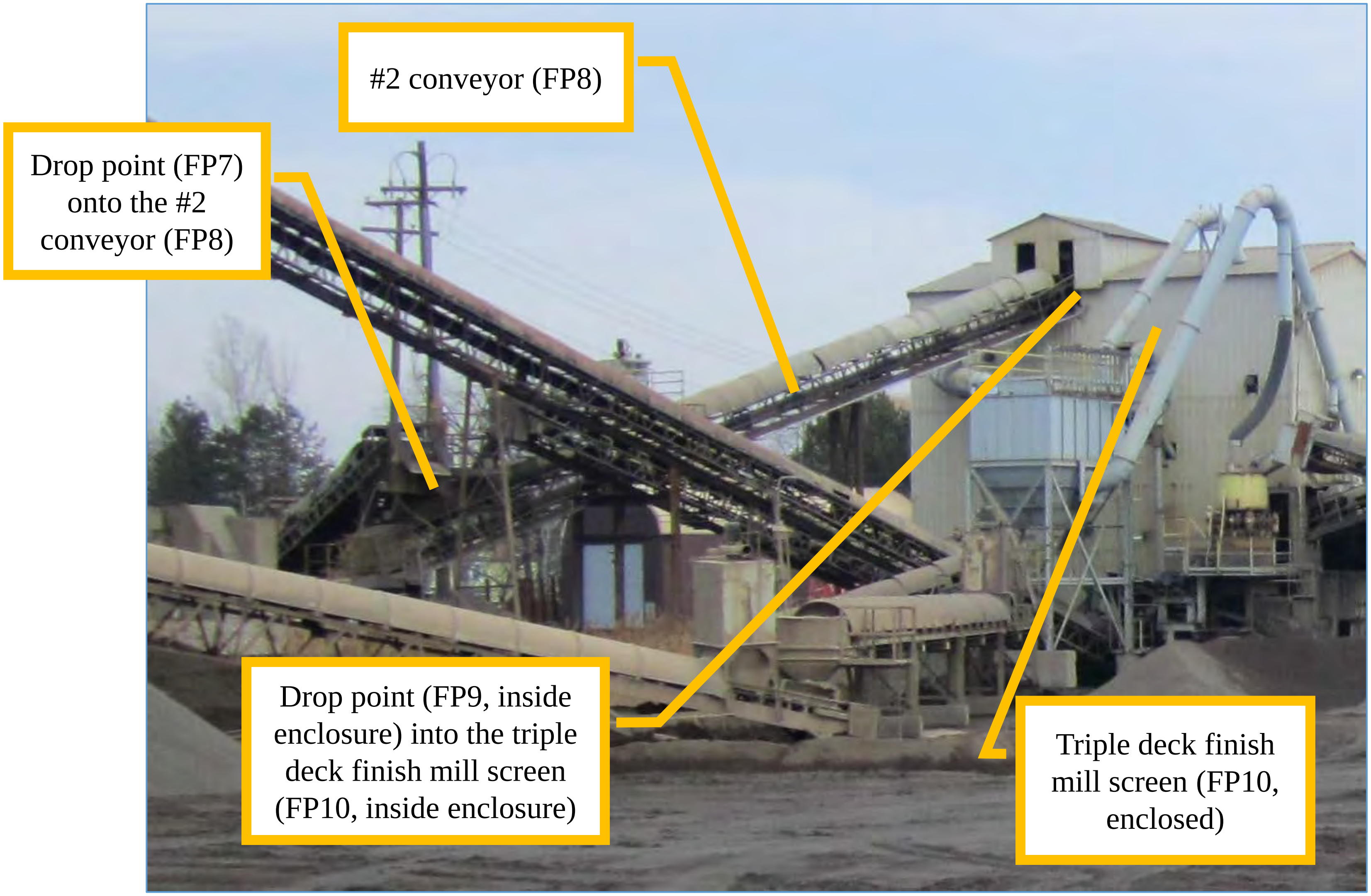
Kiln Area Photograph 7, looking north: This is the muck pile (KL14), from where material is loaded (KL15, not pictured) and unloaded (KL16, not pictured).

FINISHING PLANT AREA (FP) EMISSION POINTS PHOTOGRAPHS

Finishing Plant Area Photograph 1, looking west: The material in the kiln 1 clinker pile (KL6) is dropped (FP1, underground and not pictured) onto the #1 conveyor (FP2), which begins underground and extends above ground.

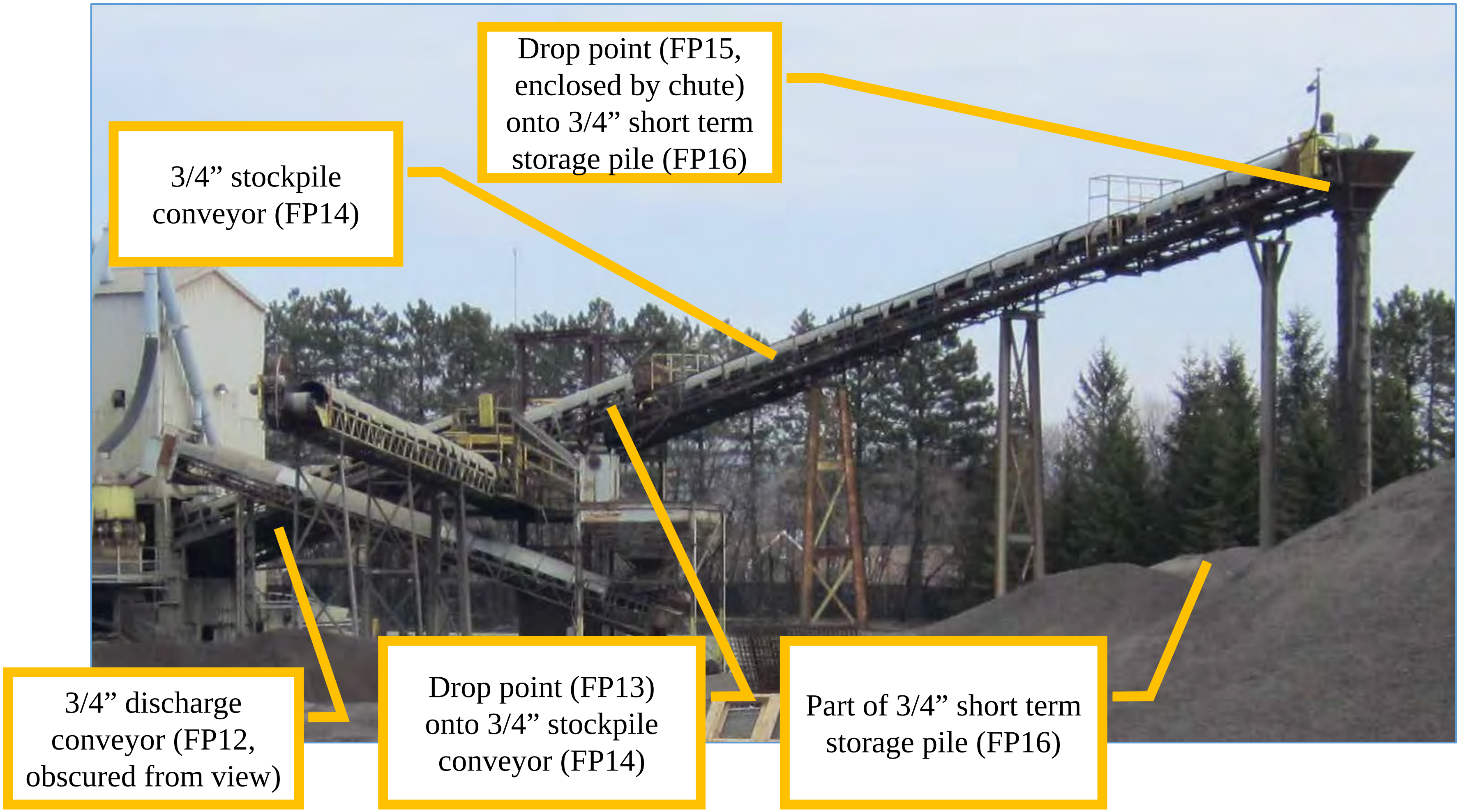
Finishing Plant Area Photograph 2, looking northwest:
The material on the #1 conveyor (FP2) drops (FP3) into the grizzly (FP4), which is a small screen that sits on the lightweight aggregate feed platform. Material drops (FP5) from the grizzly onto the grizzly reject pile (FP6).

Finishing Plant Area Photograph 3, looking north:
The accepted material from the grizzly drops (FP7) onto the #2 conveyor (FP8), which then drops (FP9) the material to the triple deck finish mill screen (FP10).



Finishing Plant Area Photograph 4, looking northwest:
The material in the triple deck finish mill screen (FP10) drops (FP11) material onto the 3/4" discharge conveyor (FP12). Material from the 3/4" discharge conveyor (FP12) then drops (FP13, out of frame) onto the 3/4" to stockpile conveyor (FP14, out of frame).

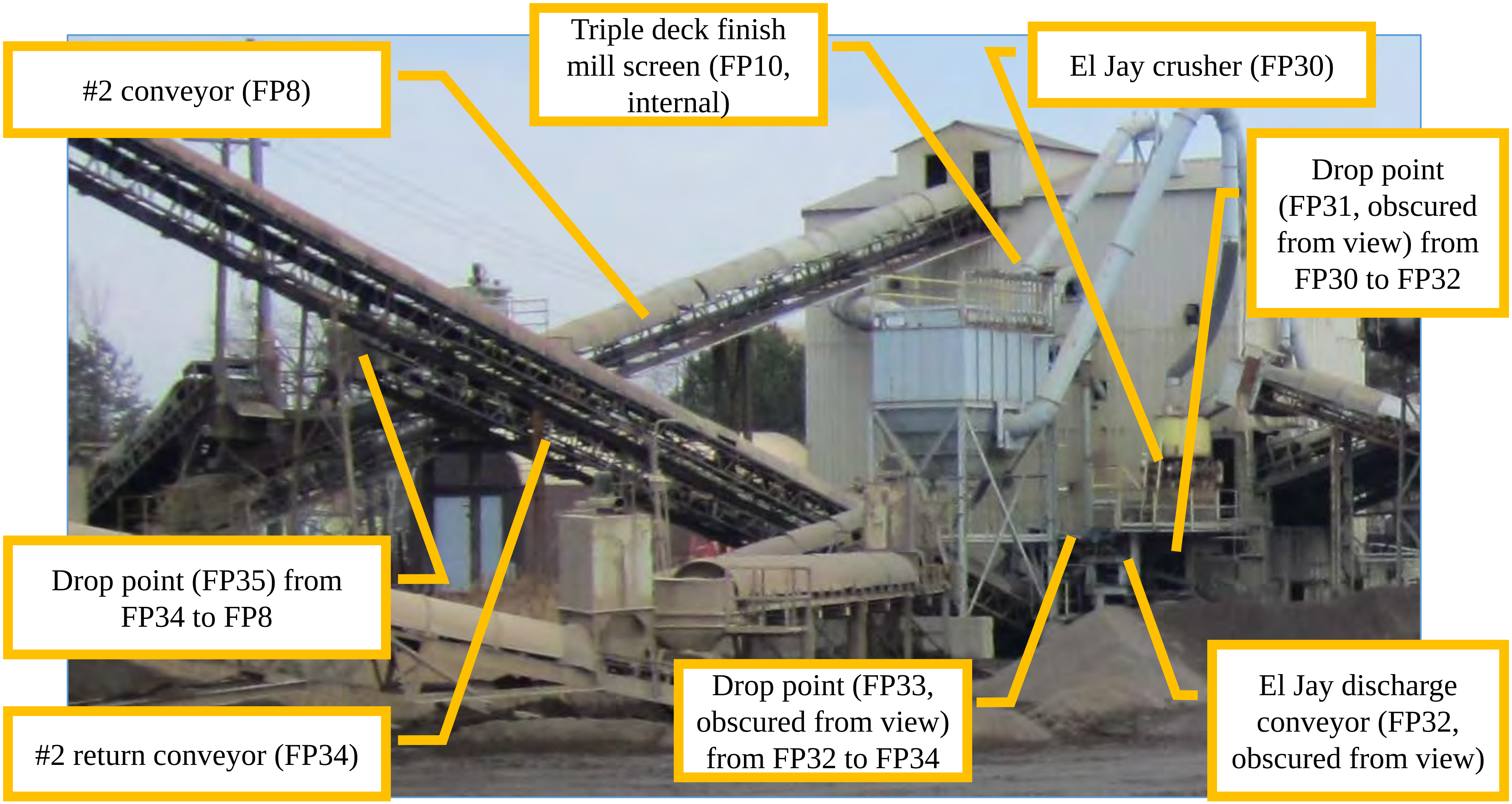
Finishing Plant Area Photograph 5, looking east:
Material from the 3/4” discharge conveyor (FP12) drops (FP13) onto the 3/4” to stockpile conveyor (FP14). Material on the 3/4” to stockpile conveyor then drops (FP15) onto the 3/4” short term storage pile (FP16).



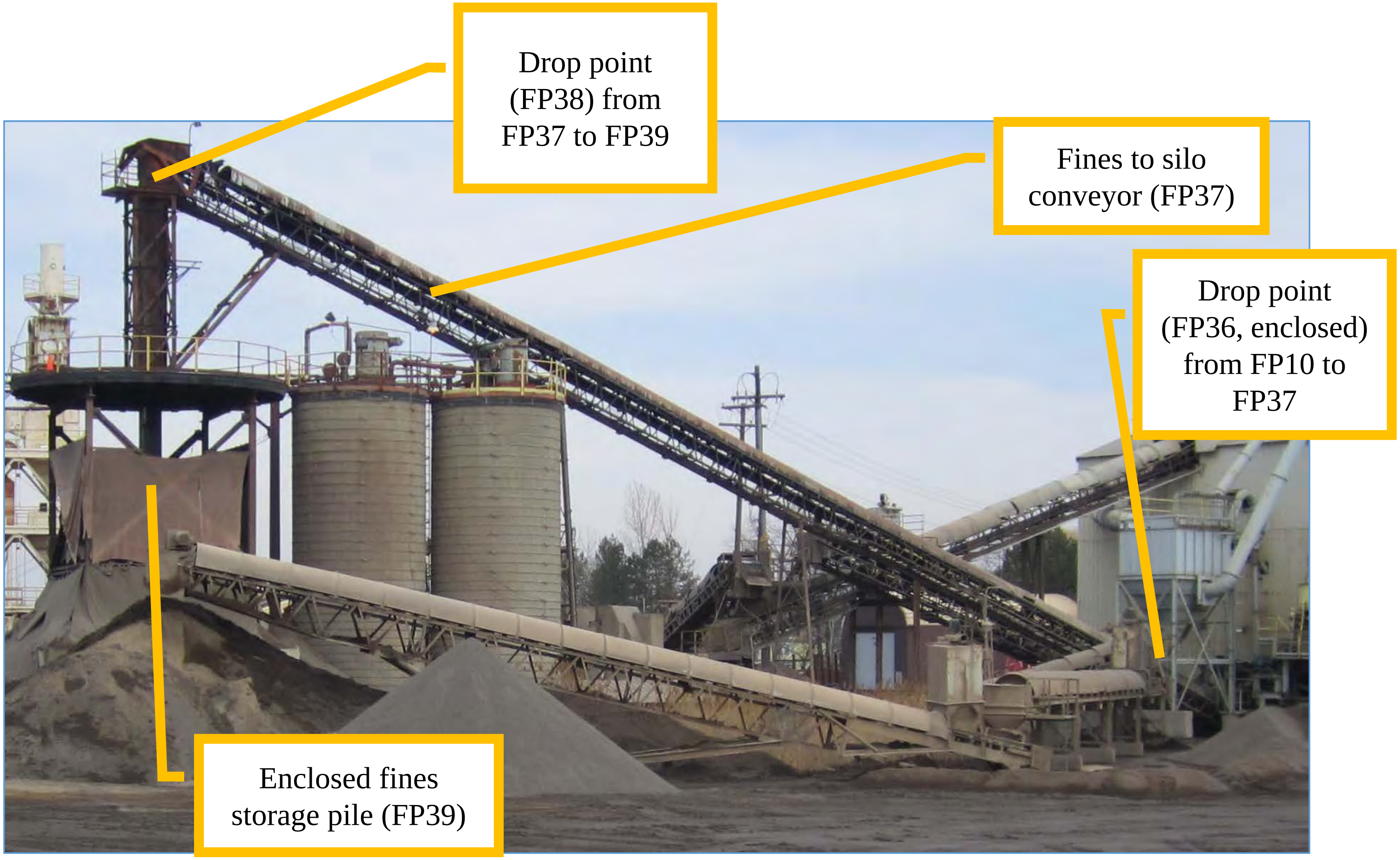
Finishing Plant Area Photograph 6, looking east: The material in the triple deck finish mill screen (FP10) drops (FP17, internal and not pictured) material onto the 3/8" discharge conveyor (FP18). Material from the 3/8" discharge conveyor drops (FP19) onto the 3/8" to stockpile conveyor (FP20). Material on the 3/8" to stockpile conveyor drops (FP21) onto the 3/8" short term storage pile (FP22).

Finishing Plant Area Photograph 7, looking east:
The material in the triple deck finish mill screen (FP10) drops (FP23, enclosed and not pictured) material onto the oversize discharge conveyor (FP24). Material from the oversize discharge conveyor drops (FP25) into the oversize hopper (FP26). The material in the oversize discharge hopper (FP26) drops (FP27) onto the El Jay crusher speed conveyor (FP28). From here, material drops (FP29) into the El Jay crusher (FP30) where the oversized material is crushed down into smaller sizes.

Finishing Plant Area Photograph 8, looking northeast:
After material is re-crushed in the El Jay crusher (FP30), it is dropped (FP31) onto the El Jay discharge conveyor (FP32), which transfers (FP33) material to the #2 return conveyor (FP34). The #2 return conveyor returns (FP35) material to the #2 conveyor (FP8), which brings the material back (FP9) to the triple deck finish mill screen (FP10) for re-sorting.

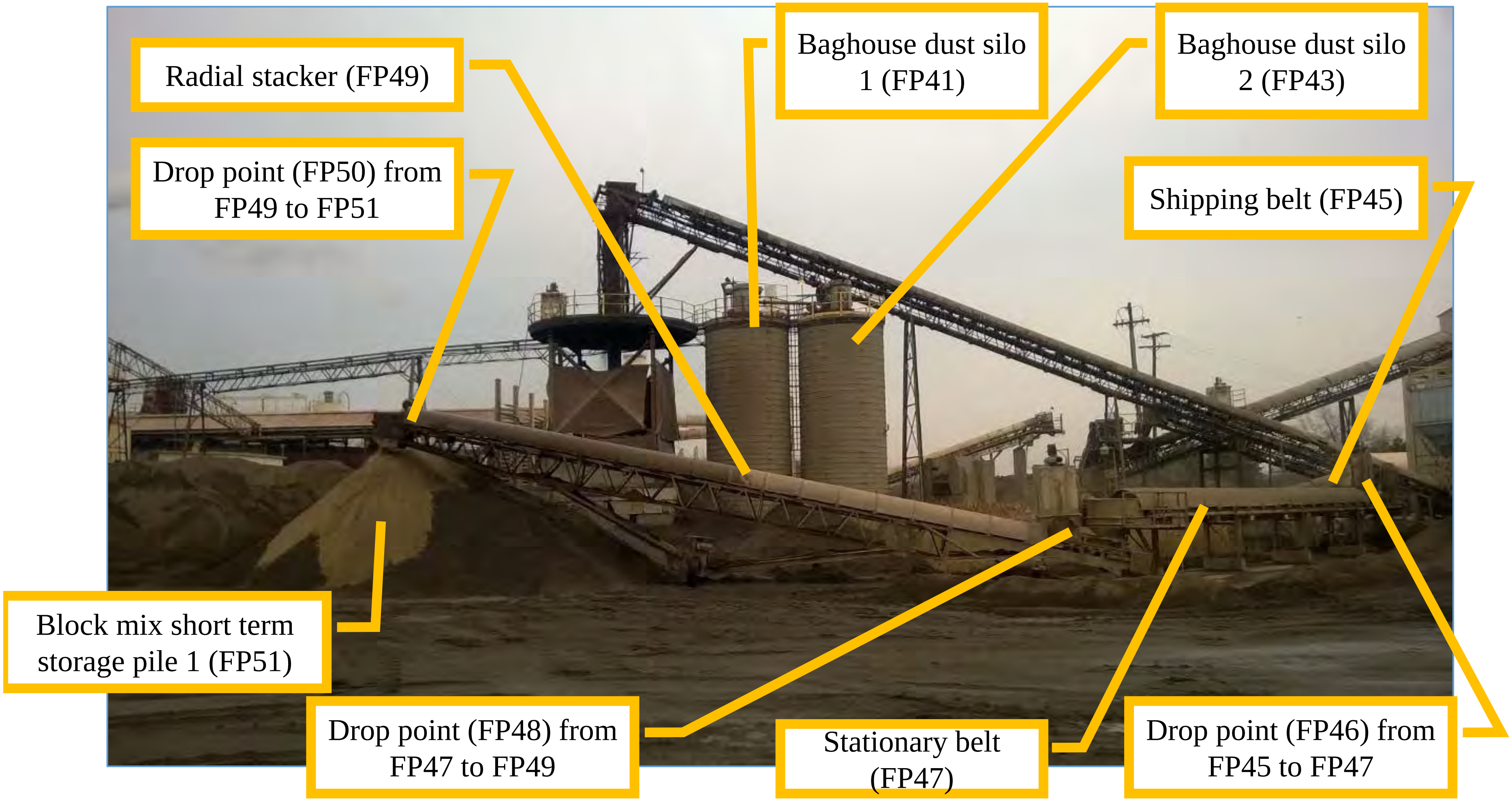


Finishing Plant Area Photograph 9, looking north:
The material in the triple deck finish mill screen (FP10) drops (FP36, enclosed and not pictured) material onto the fines to silo conveyor (FP37). Material from the fines to silo conveyor drops (FP38) down an enclosed chute into the enclosed fines storage pile (FP39).

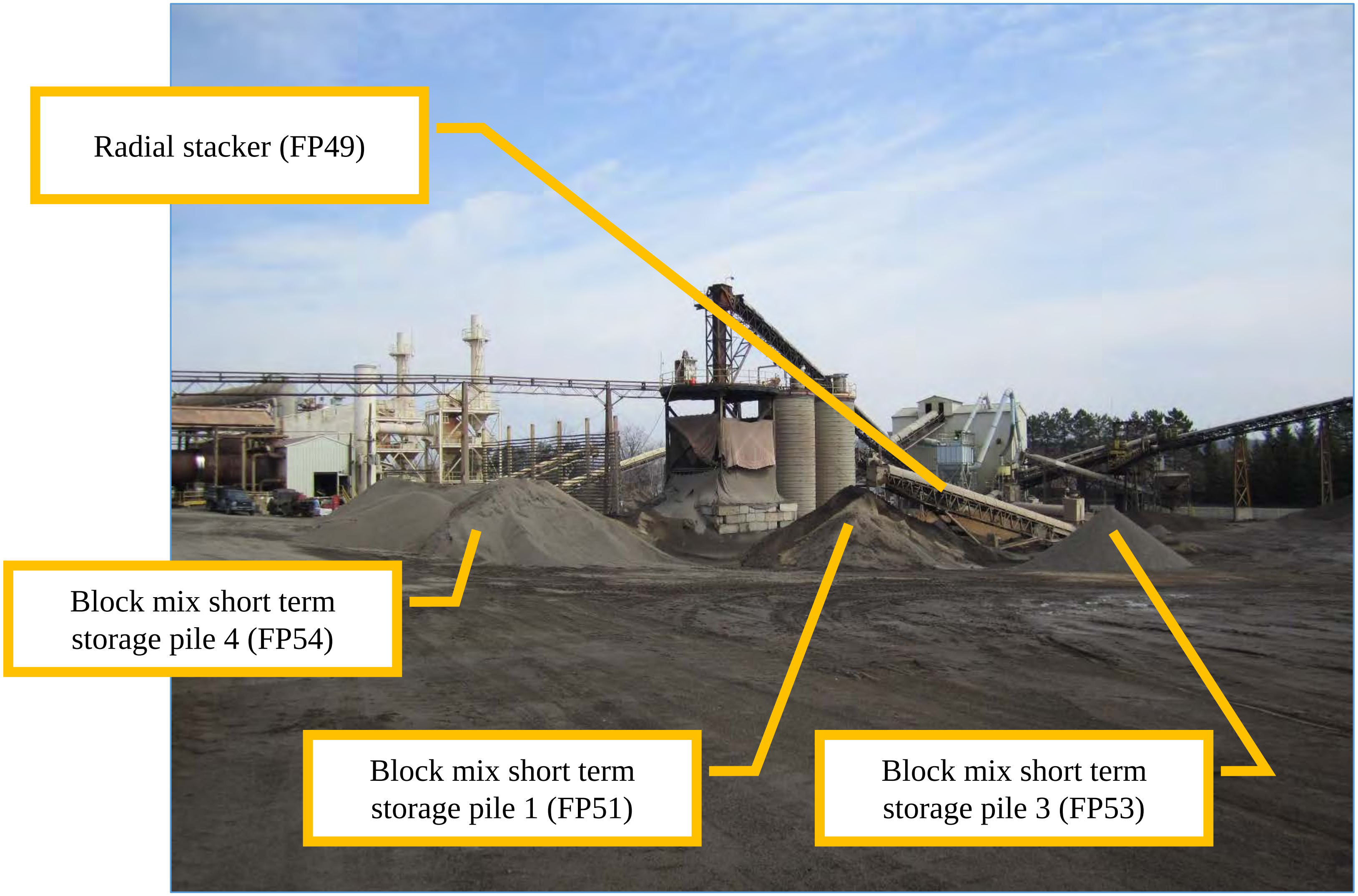


Finishing Plant Area Photograph 10, looking north:
A view of the open fines storage pile (FP40), which is to the immediate north of the enclosed fines storage pile (FP39). Included in this photo is a view of the baghouse dust silo 1 (FP41) and baghouse dust silo 2 (FP43).

Finishing Plant Area Photograph 11, looking north: Material drops (FP42, underground, not viewed) material from Baghouse dust silo 1 (FP41) onto the shipping belt (FP45, mostly obscured from view). Material is also dropped (FP44) from Baghouse dust silo 2 (FP43) onto the shipping belt. Material is then transferred (FP46) onto the stationary belt (FP47), which transfers (FP48) the material to the radial stacker (FP49). The radial stacker drops (FP50) material onto the Block mix short term storage pile 1 (FP51).



Finishing Plant Area Photograph 12, looking north: The radial stacker (FP49) transfers (FP50) material to block mix short term storage piles 1 through 6 (FP51 through FP56). Below is an example of what these short term storage piles may look like at any given time.

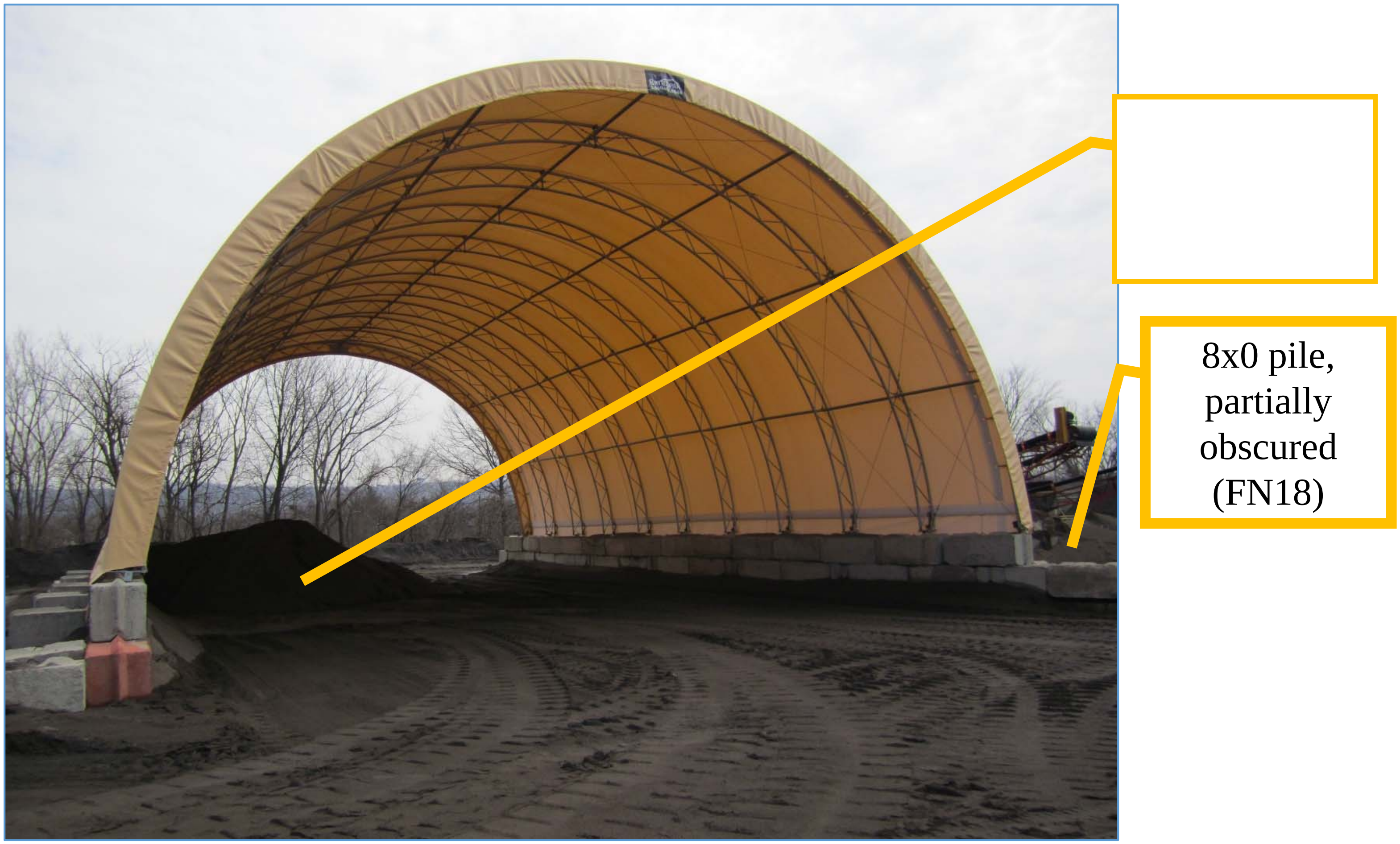


Finishing Plant Area Photograph 13: Looking west, 3/4” long term storage pile 5 (FP57).

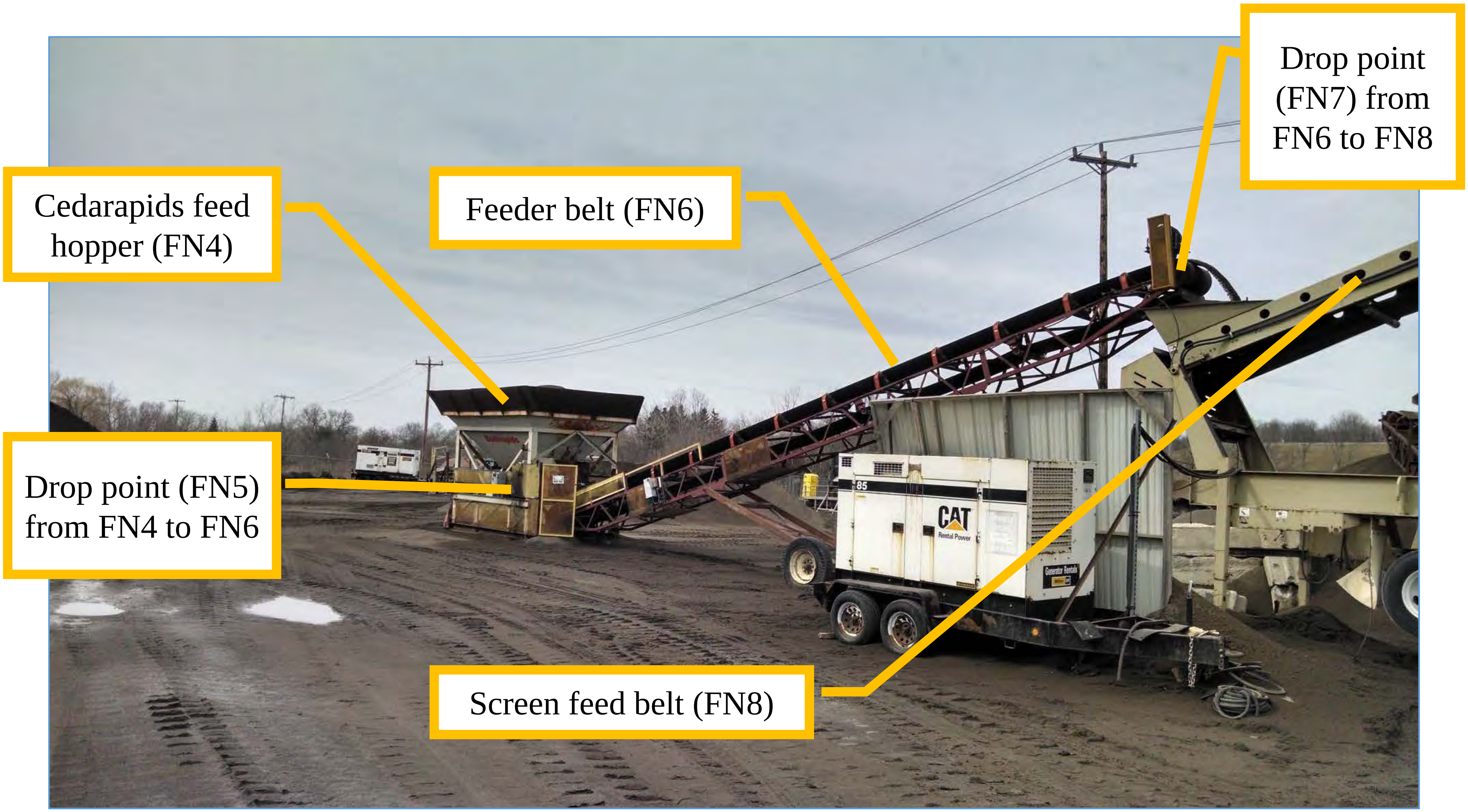
Finishing Plant Area Photograph 14: Looking northwest, a front-end loader is loading (FP61) block mix on block mix short term storage pile 2 (FP52). A front-end loader would similarly be used to load (FP58) 3/4” onto truck, load (FP59) 3/8” onto trucks, load (FP60) clinker onto trucks, and load (FP62) block mix onto trucks.

FINES PROCESSING AREA (FN) EMISSION POINTS PHOTOGRAPHS

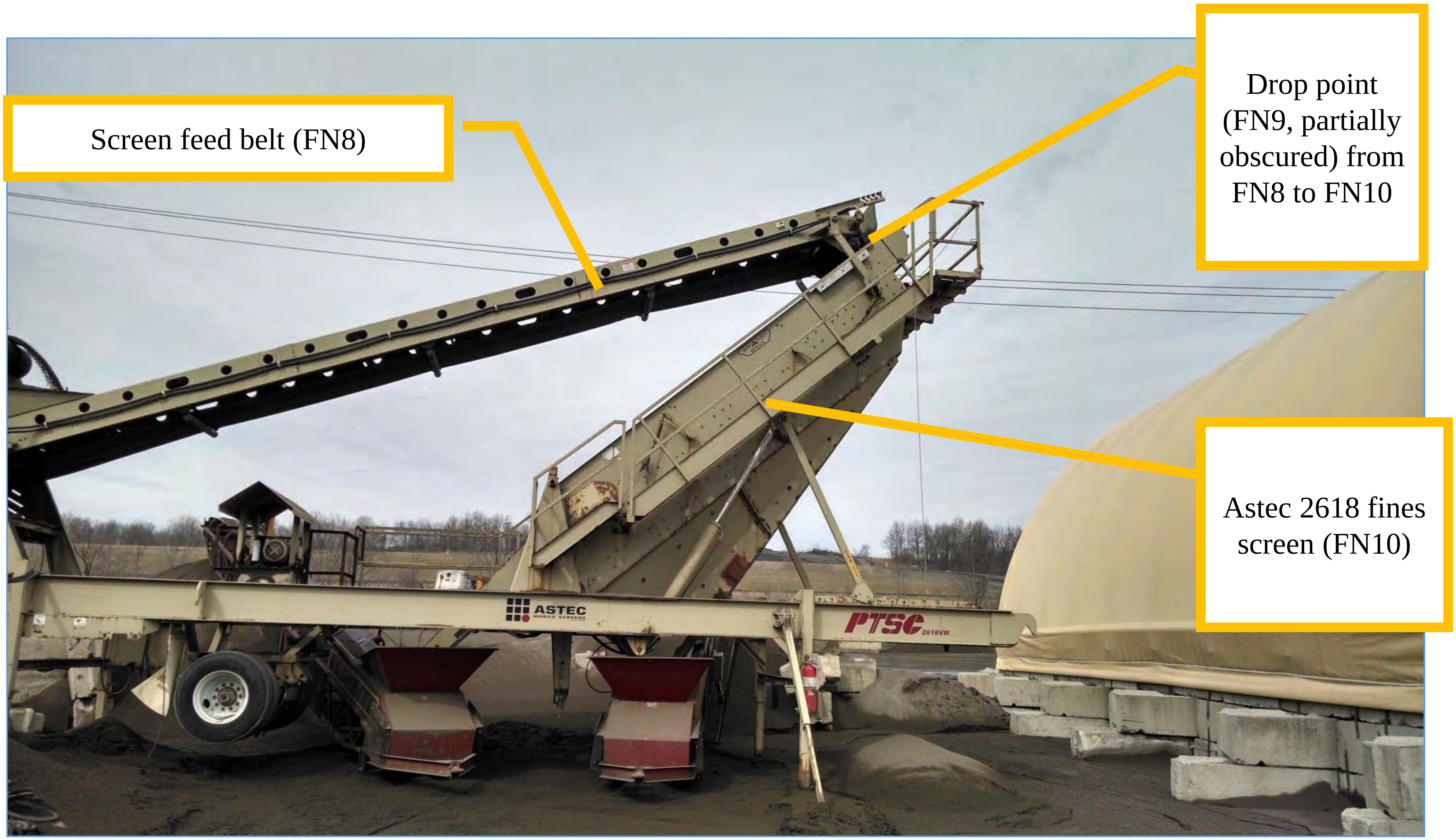
Fines Processing Area Photograph 1: Looking east, the 8x0 long term storage pile (FN1), which is partially enclosed. The 8x0 pile (FN18, partially obscured) sits outside and to the direct south of the 8x0 long term enclosure. The 4x0 fines feed pile (FN2, not pictured) and the 4 mesh reject pile (FN14, not pictured) are also stockpiles in the same row of stockpiles to the south of this enclosure in the fines processing area. The 3/4” long term storage pile 6 (FN19, not pictured) sits to the north of the pictured enclosure.



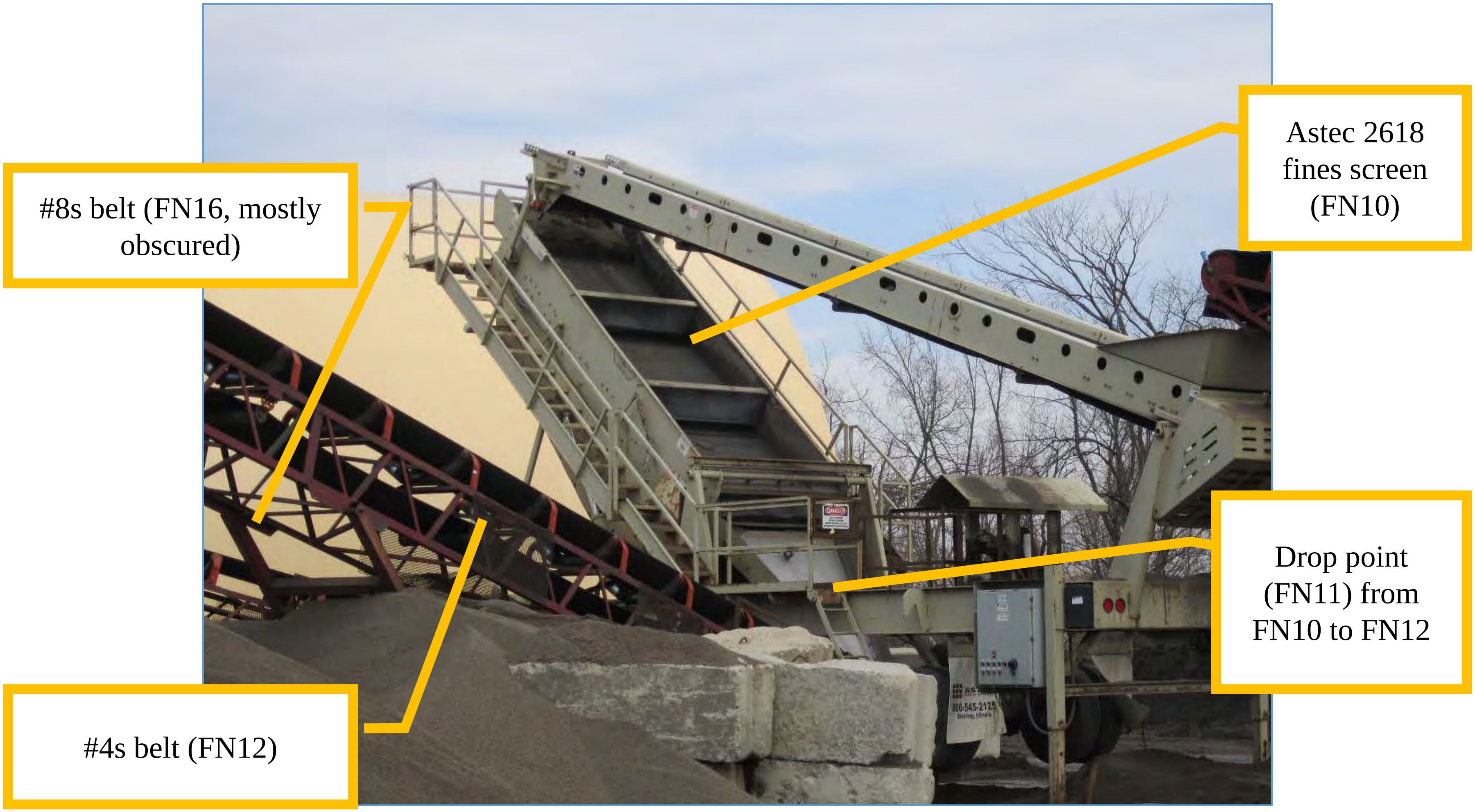
Fines Processing Area Photograph 2, looking southwest: Block mix is loaded (FN3, not pictured) into the Cedarapids feed hopper (FN4), which then drops (FN5) material onto the feeder belt (FN6). The feeder belt transfers (FN7) the material onto the screen feed belt (FN8).



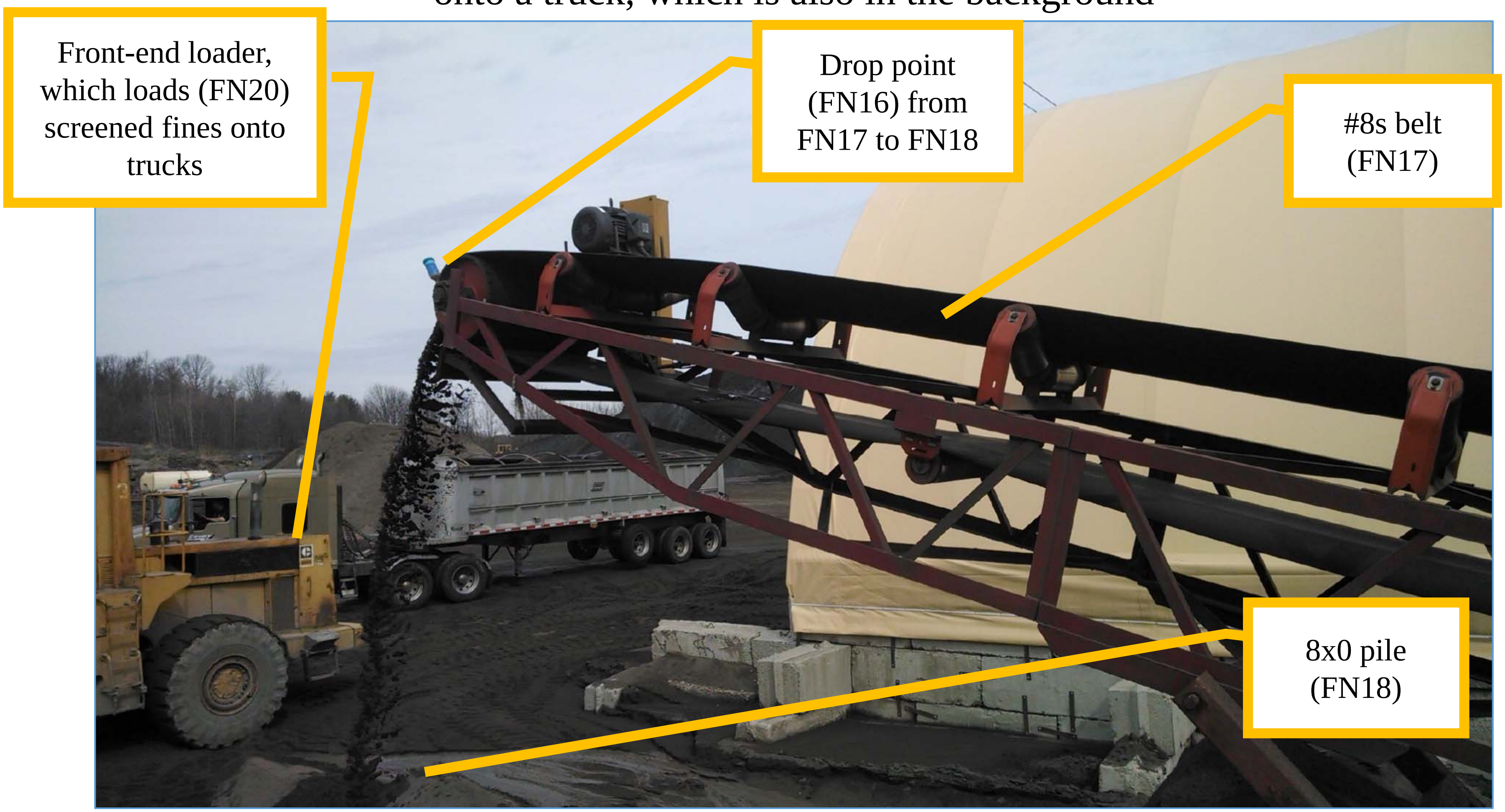
Fines Processing Area Photograph 3: Looking west, material is carried on the screen feed belt (FN8) and dropped (FN9) from the screen feed belt to the Astec 2618 fines screen (FN10).



Fines Processing Area Photograph 4, looking northeast: Material is separated though the Astec fines screen (FN10) and is dropped (FN9) from the screen feed belt to the Astec 2618 fines screen (FN10). Material that has not passed through the No. 4 sieve screen is transferred (FN11) to the #4s belt (FN12). Material that does not pass through the No. 8 sieve screen is transferred (FN15, not pictured) to the #8s belt (FN16, mostly obscured).



Fines Processing Area Photograph 5, looking northwest: A portable conveyor, the #8s belt (FN17), is used to drop (FN18) material onto the 8x0 pile (FN18), which sits to the south of the 8x0 long term storage pile (FN1). Similarly, the #4s belt drops (FN12, not pictured) material onto the 4 mesh reject pile (FN14, not pictured), which sits to the south of the 8x0 pile. Partially obscured in the background, there is a front-end loader, which is used to load (FN20) screened fines onto a truck, which is also in the background



BLOCK MIX AREA (BM) EMISSION POINTS PHOTOGRAPHS

Block Mix Area Photograph 1, looking southeast: Material is dropped (BM11) onto the block mix long term storage piles 1 through 4 (BM1 through BM4) by way of multiple, movable conveyor belts, which sit in the block mix area.

Block Mix Area Photograph 2, looking west: The block mix is loaded (BM5, not pictured) into a portable screen, such as the Astec 710T (BM6) or the Reade screen (BM7).

Block Mix Area Photographs 3 & 4: Looking southeast, the block mix is loaded (BM8, not in picture) onto the temporary block mix pile (BM9) for customer pickup. the block mix is loaded (BM10) onto trucks and loaded (BM11) onto a block mix pile.

ISLAND AREA (IS) EMISSIONS POINT PHOTOGRAPHS

Island Area Photograph 1, looking northeast: An example of the 3/4” long term storage piles 1 through 4 (IS1 through IS4), which vary in size depending on customer demand. A 3/8” long term storage pile (IS5, not pictured) and the block mix long term storage pile 5 (IS6, not pictured) are also located in the island area of the facility. Material is loaded (IS7) onto the 3/4” pile (IS1 through IS4) or loaded (IS9) onto the 3/8” pile (IS5). The loading (IS8) of 3/4” material onto trucks and the loading (IS10) of 3/8” material onto trucks also occurs in the island area, but is not pictured.

BONEYARD AREA (BY) EMISSION POINTS PHOTOGRAPHS

Boneyard Area Photograph 1, looking southwest: A view of the boneyard shale piles (BY1 and BY2), which vary in size.

APPENDIX F
DECEMBER 2013 STOCKPILE INVENTORY

SPECTRA
ENVIRONMENTAL GROUP, INC.
ENGINEERING, ARCHITECTURE AND SURVEYING, PC

January 7, 2014

Mr. Mark Coombs, Plant Manager
Norlite, LLC
628 South Saratoga Street
Cohoes, New York 12047

Subject: Norlite, LLC – Cohoes Facility
December 2013 Light Weight Aggregate Stockpile Inventory
Spectra File # 09129

Dear Mr. Coombs:

The following is a summary of stockpile inventory calculations for the Norlite, LLC Cohoes facility recorded as of Monday, December 30, 2013. Spectra Environmental Group, Inc. completed a survey lead by a New York State licensed land surveyor who employed sub-centimeter GPS surveying equipment to conduct the work. The collected points were modeled in AutoCAD 2008, an industry-accepted software program, to generate a contour map of each stockpile. To insure accuracy, four (4) different methodologies were used to obtain the volume of each stockpile within the created contour maps, as follows: Grid Volume, Composite Volume, Section Volume: Average End Area, and Section Volume: Prismoidal shape. An average of the four (4) calculated volumes was then generated to obtain the volume estimates provided in the table below.

Stockpile designations correspond to the enclosed Stockpile Location Map, included as Figure 1.

STOCKPILE NUMBER*	PRODUCT	VOLUME (CUBIC YARDS)
1	3/4" Aggregate	365
2	3/4" Aggregate	991
3	3/4" Aggregate	278
5c	3/4" Aggregate	75
18	3/4" Aggregate	260
19	3/4" Aggregate	142
20	3/4" Aggregate	106
Total 3/4" Product:		**2,217**
4a	3/8" Aggregate	3,713
4b	3/8" Aggregate	95
Total 3/8" Product:		**3,808**
5a (1)	Screened Fines	17
5a (2)	Screened Fines	43
5a (3)	Screened Fines	153
5d	Screened Fines	180
Total Fines at Astec Plant:		**393**
6	Block Mix	6,880
7	Block Mix	1,035
8	Block Mix	440
9	Block Mix	451
9a	Block Mix	64
13	# 4's	218

14	Block Mix	400
15	Block Mix	1,007
16	Block Mix	76
Total BM Product:		**10,571**
10a	Clinker	2,553
10b	Clinker	3,662
12	Clinker	11,065
Total Clinker Product:		**17,280**
*Figure 1 (enclosed) shows stockpile locations by number		

Please feel free to call us if you have any questions regarding the inventory results, or if you require the data in an alternate format.

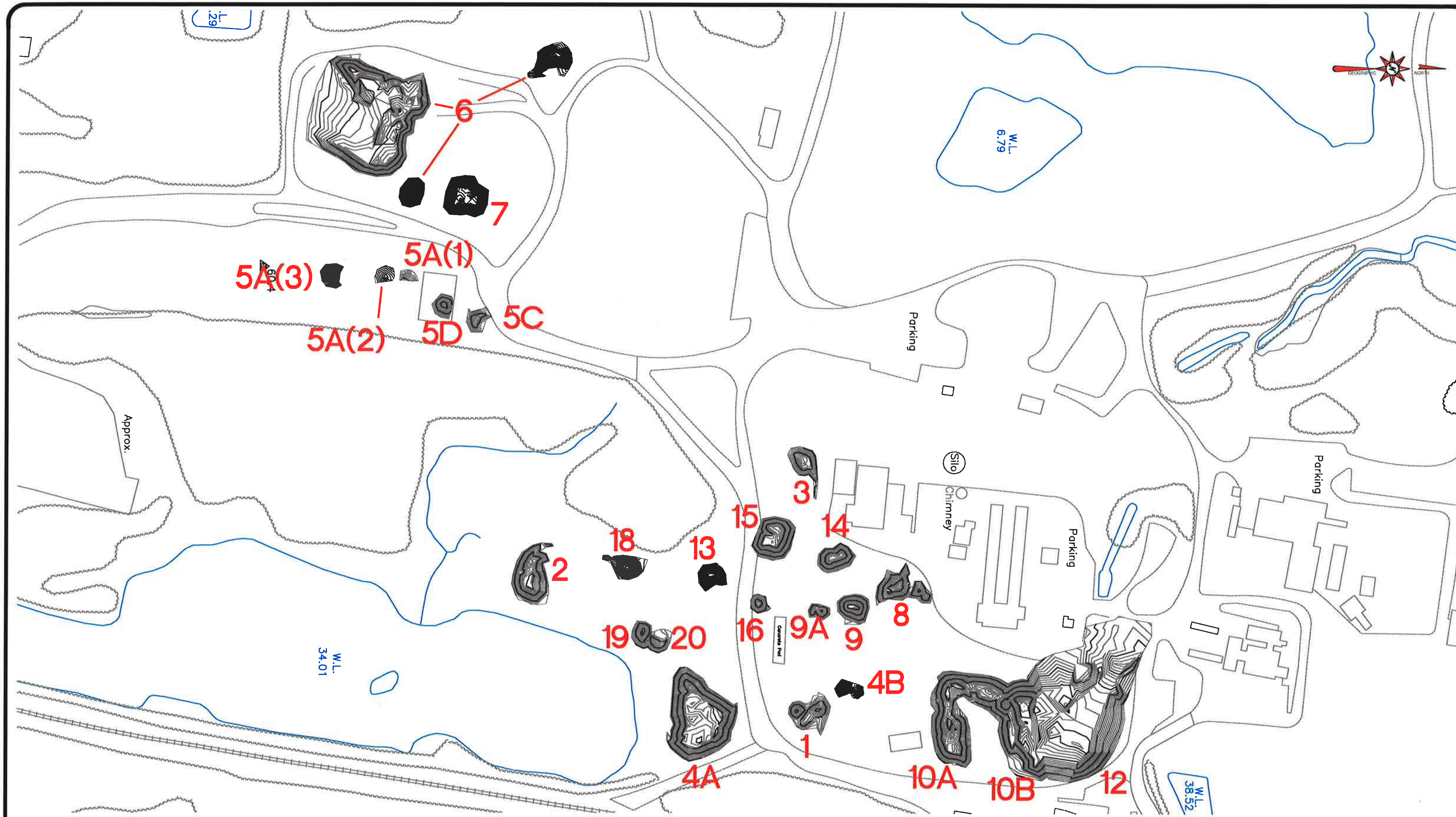
Sincerely,

SPECTRA ENVIRONMENTAL GROUP, INC.

Edward G. Davidson
Project Environmental Scientist

Enclosure

EGD
G:\2009\09129\Correspondence\1-7-2014 StockpileInv Ltr Final.doc



NOTES:

STOCKPILE SURVEY CONDUCTED BY SPECTRA ENVIRONMENTAL GROUP, INC., DECEMBER 30, 2013.

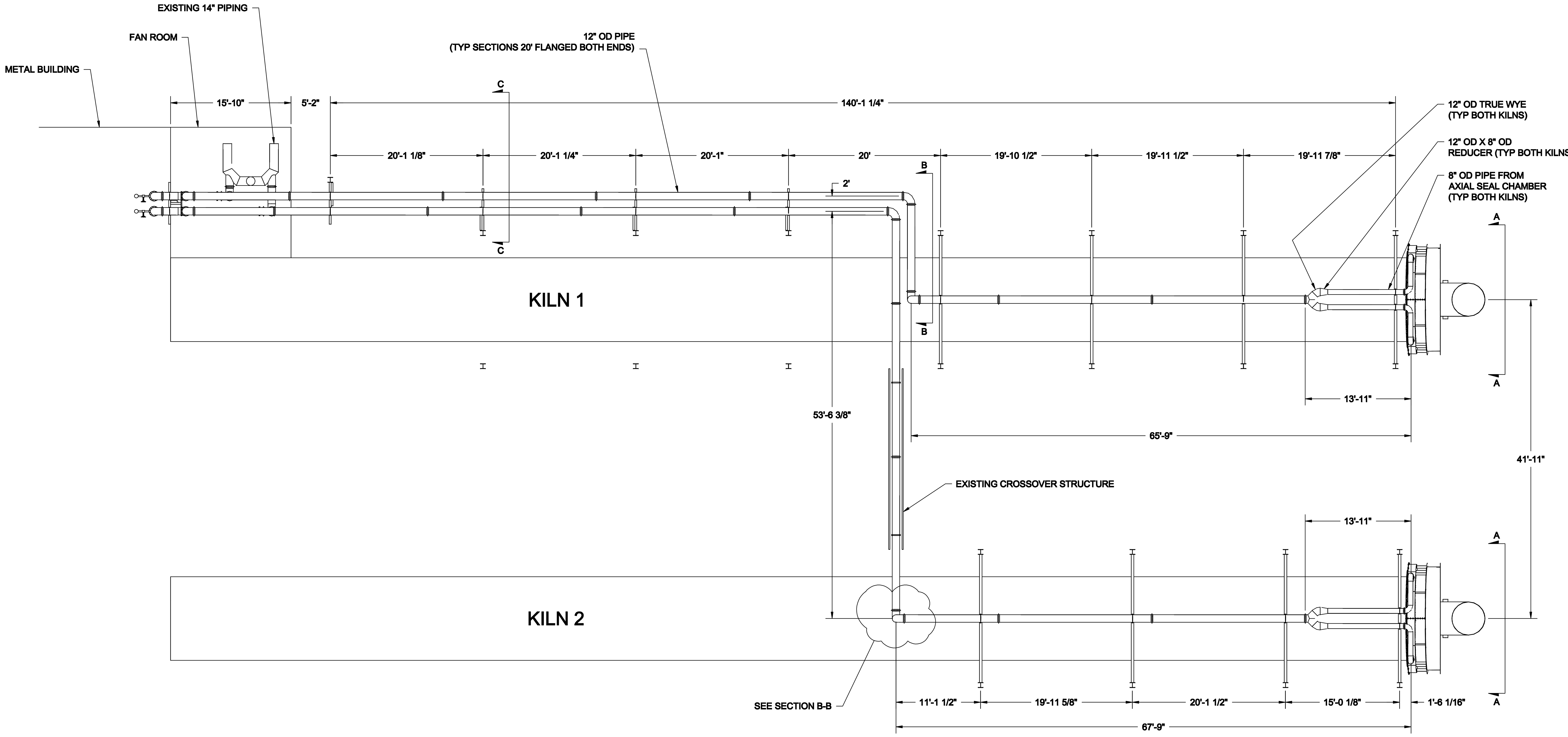
1 STOCKPILE IDENTIFICATION NUMBER (SEE ATTACHED LETTER)

SPECTRA ENVIRONMENTAL GROUP, INC.
19 British American Blvd.
Latham, N.Y. 12110

LIGHT WEIGHT AGGREGATE STOCKPILE LOCATION MAP
NORLITE, LLC
COHOES MINE SITE
TOWN OF COLONIE/CITY OF COHOES ALBANY CO., NY

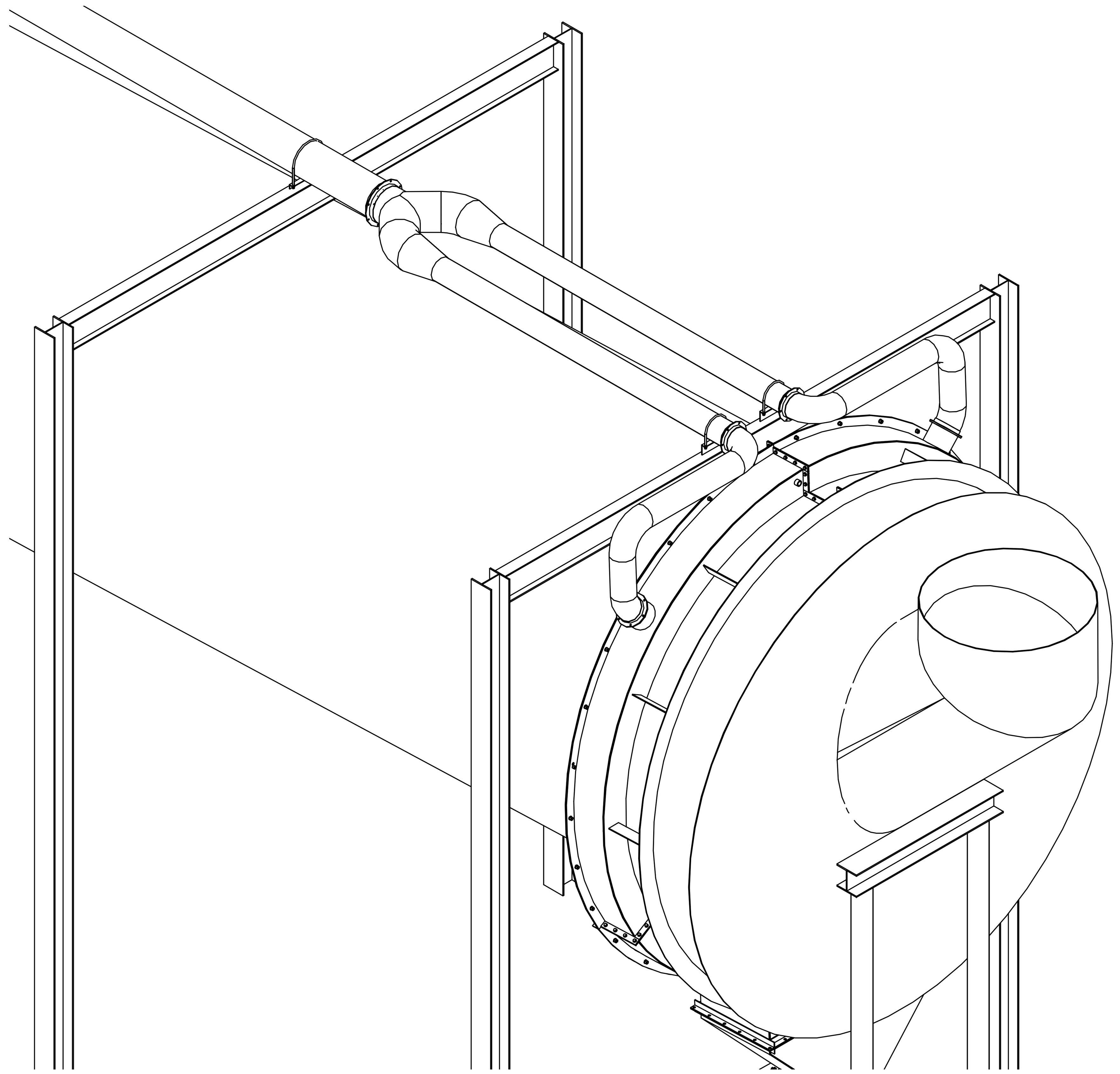
PROJ. NO.: 09129	DATE: 12/30/13	SCALE: 1"=150'	DWG. NO.: STOCKPILES	FIGURE 1

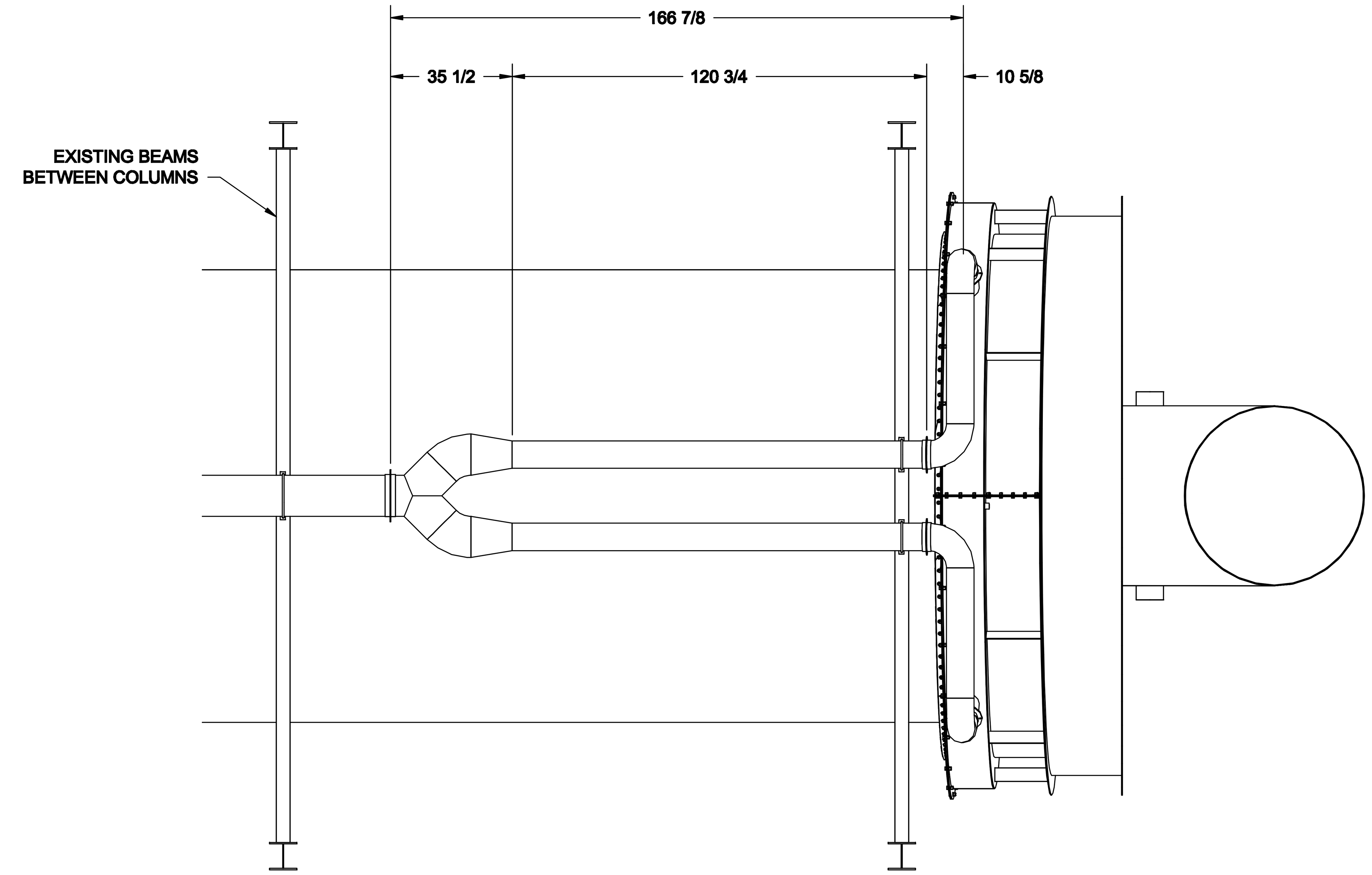
APPENDIX G
ENGINEERING DRAWINGS OF KILN REAR CHAMBER SYSTEM AND RIM SEAL CHUTES

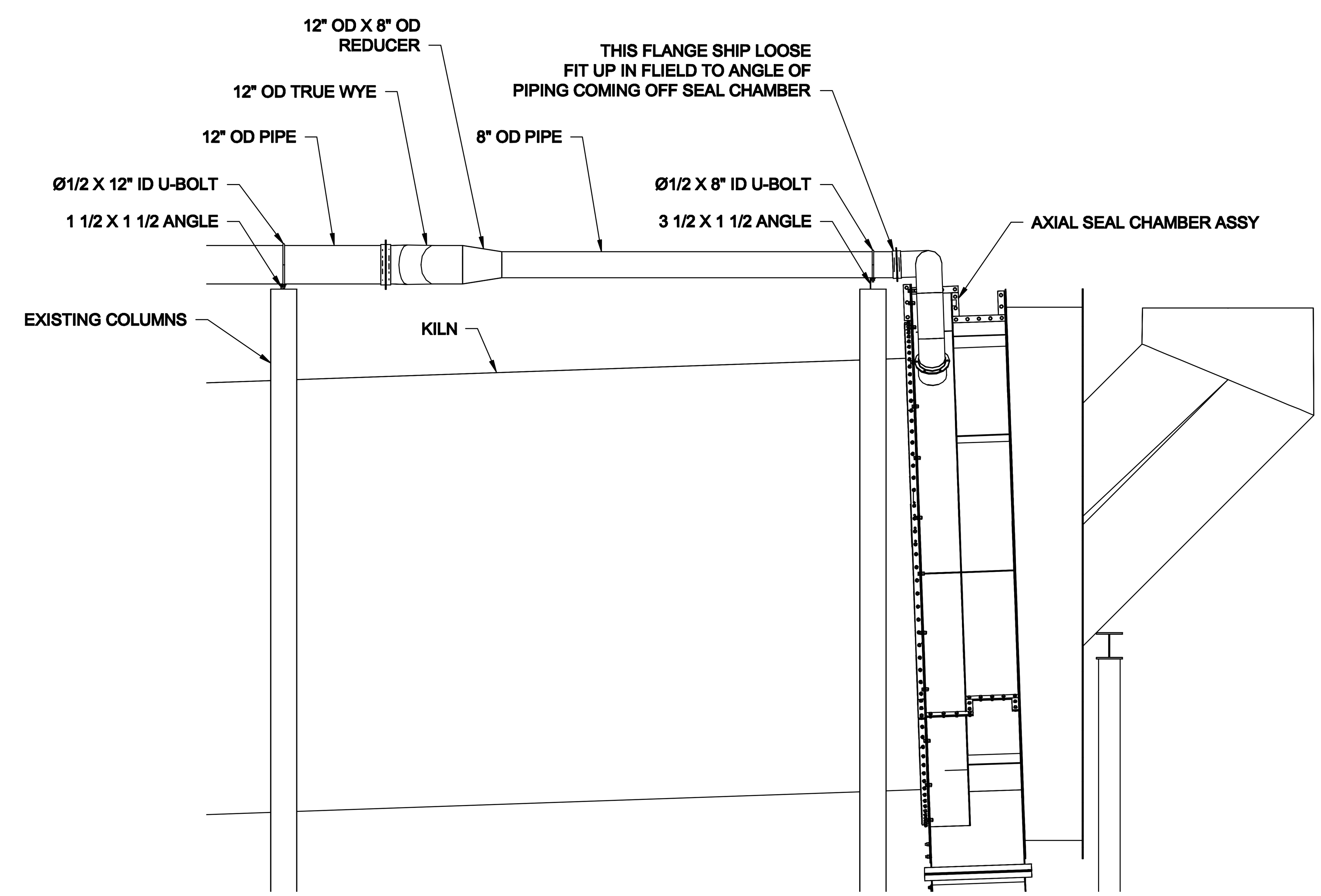


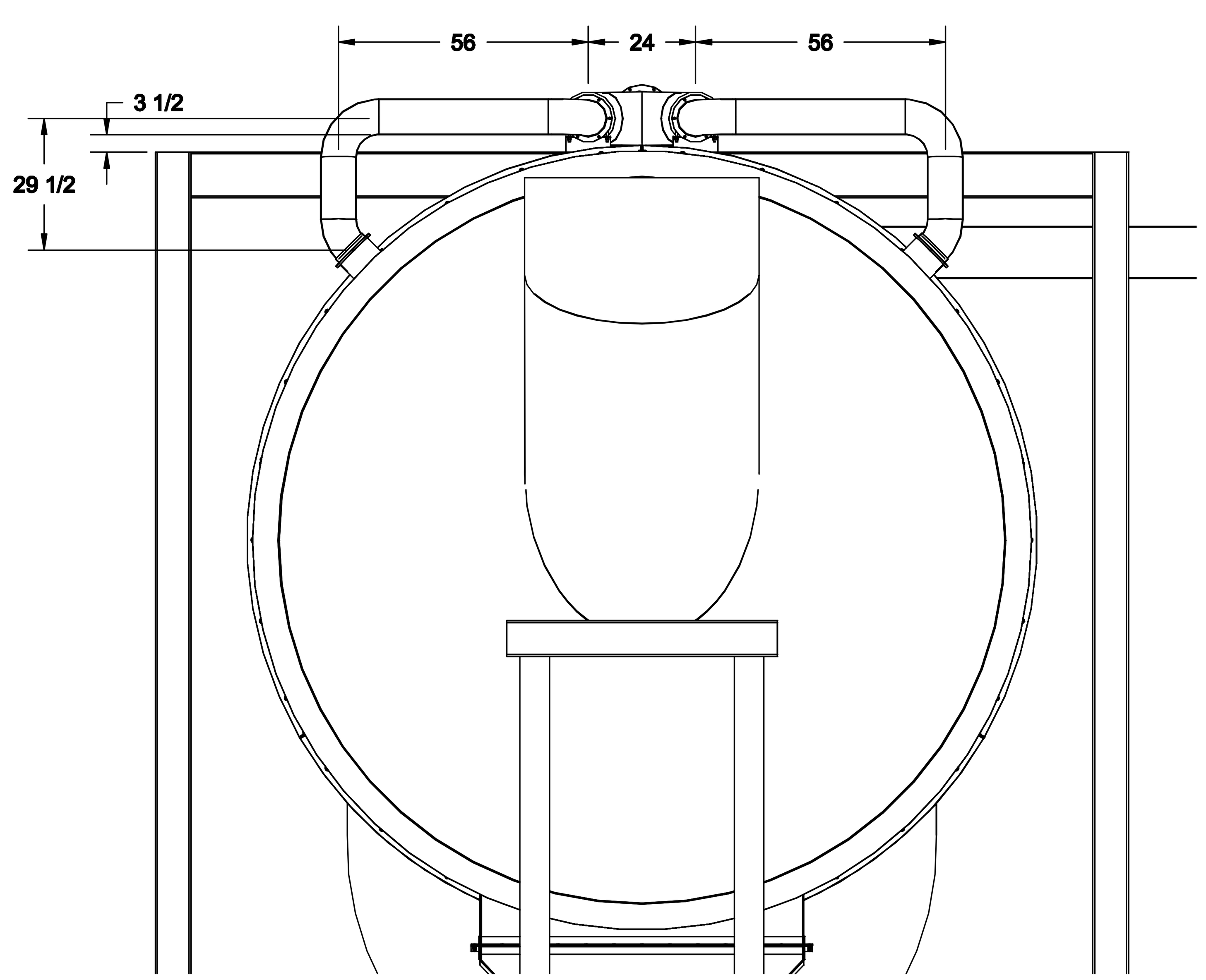
PLAN VIEW

WELDING WORKS MADISON CONNECTICUT	DRAWN BY JAR / APPROVED BY	DRAWING TITLE: PIPING FOR AXIAL SEAL CHAMBER
	DATE 6/21/10 / SCALE NONE	CUSTOMER: NORLITE COHOES, NY
TOLERANCES: FRACTIONS ± 1/16, ANGLES ± 0°-15', DECIMALS .XX ± .01, .XXX ± .005	WORK ORDER QUOTE	SIZE D / DWG 17640 / SH 1 OF 4 / REV. -




166 7/8
35 1/2
120 3/4
10 5/8
EXISTING BEAMS
BETWEEN COLUMNS


12" OD X 8" OD
REDUCER
THIS FLANGE SHIP LOOSE
FIT UP IN FLIELD TO ANGLE OF
PIPING COMING OFF SEAL CHAMBER
12" OD TRUE WYE
12" OD PIPE
8" OD PIPE
Ø1/2 X 12" ID U-BOLT
Ø1/2 X 8" ID U-BOLT
1 1/2 X 1 1/2 ANGLE
3 1/2 X 1 1/2 ANGLE
AXIAL SEAL CHAMBER ASSY
EXISTING COLUMNS
KILN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24
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3 1/2
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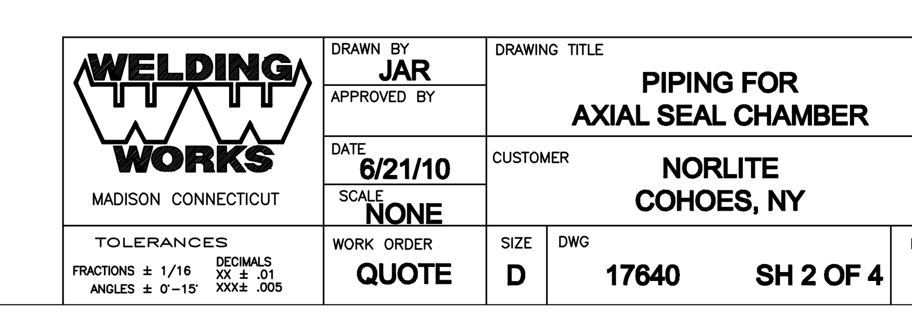
SECTION A-A


WELDING WORKS
MADISON CONNECTICUT
TOLERANCES
FRACTIONS ± 1/16
ANGLES ± 0°-15'
DECIMALS
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XXX ± .005
DRAWN BY
JAR
APPROVED BY
DATE
6/21/10
SCALE
NONE
WORK ORDER
QUOTE
DRAWING TITLE
PIPING FOR
AXIAL SEAL CHAMBER
CUSTOMER
NORLITE
COHOES, NY
SIZE
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17640
SH 2 OF 4
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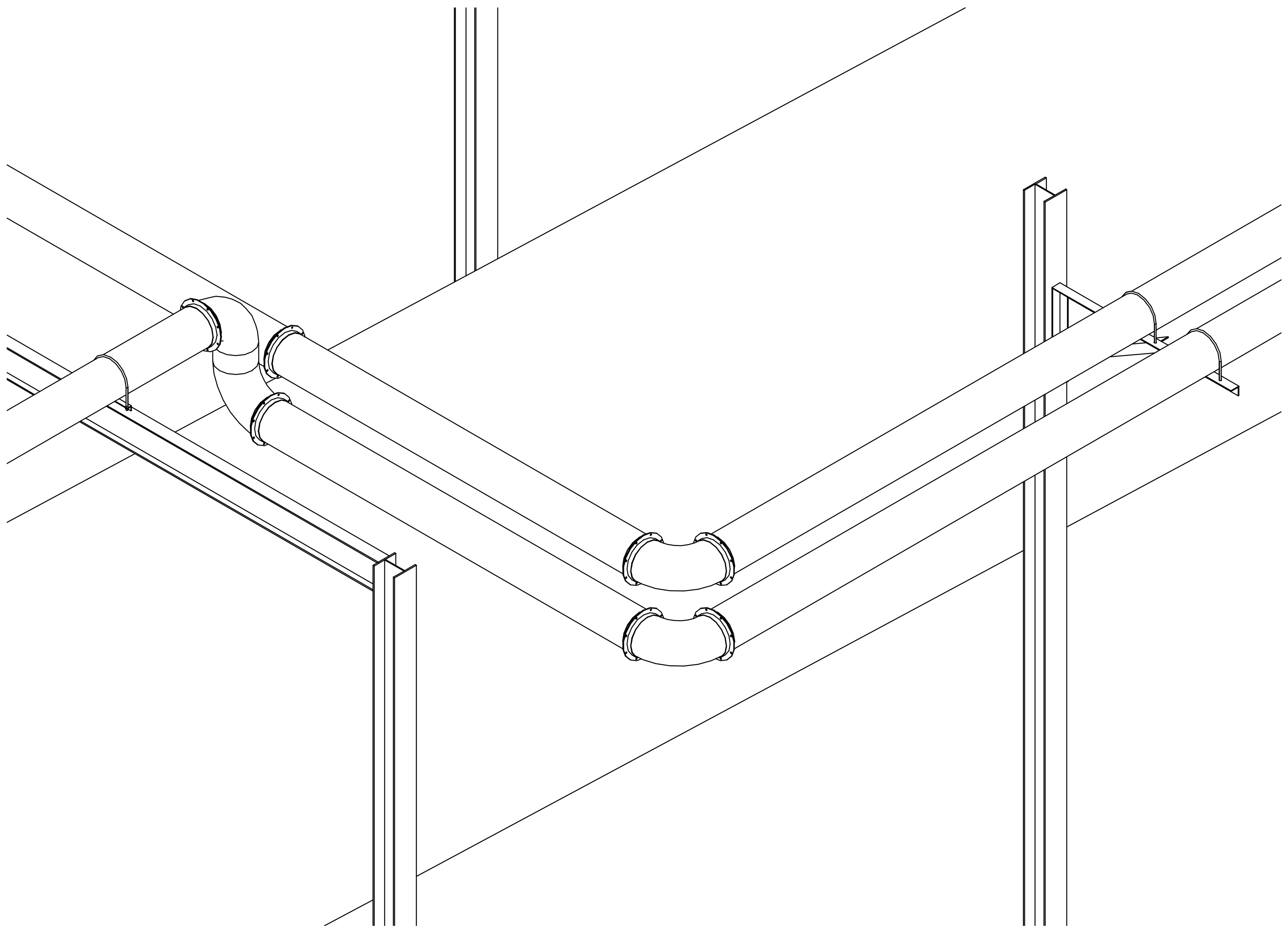
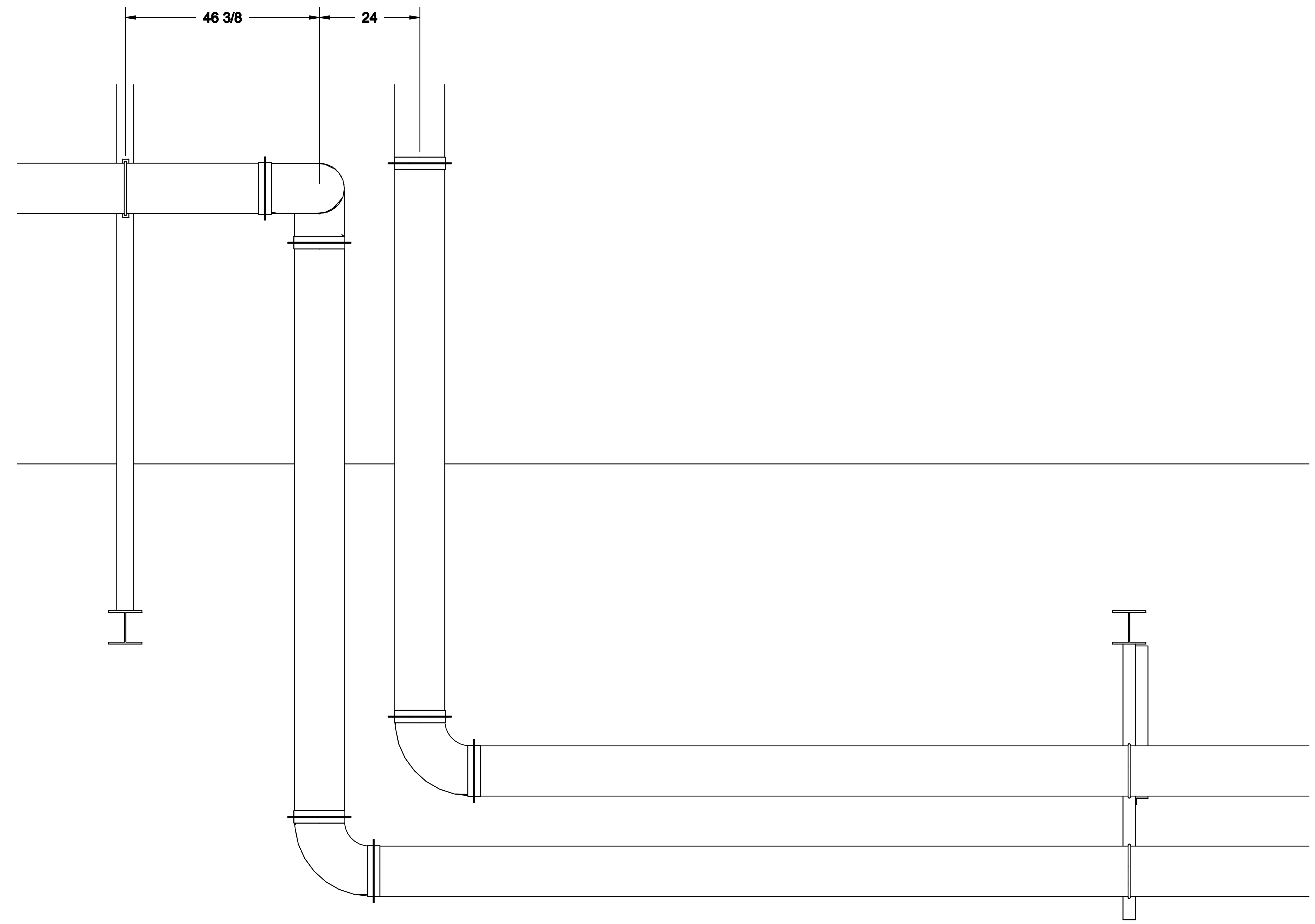
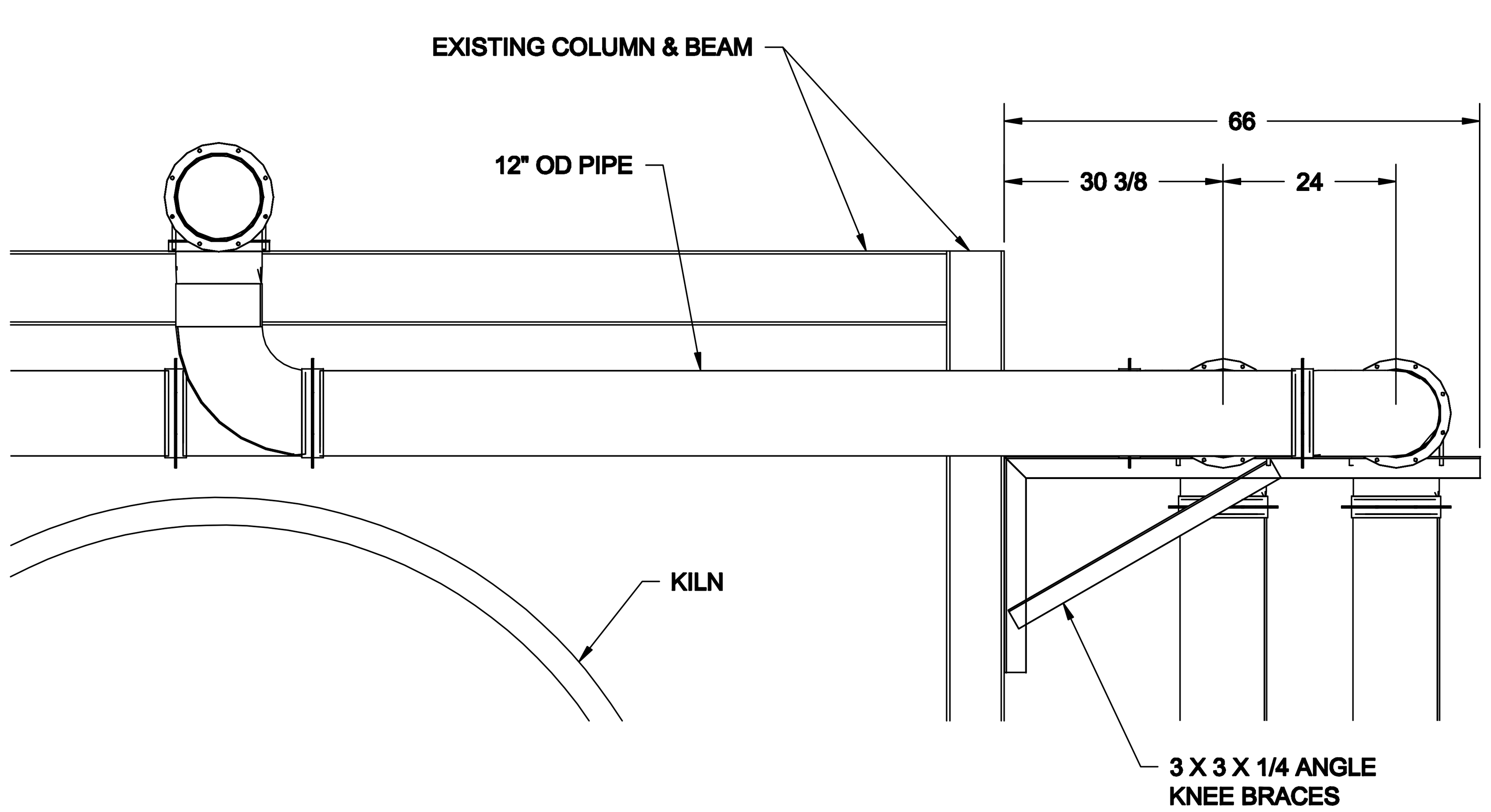
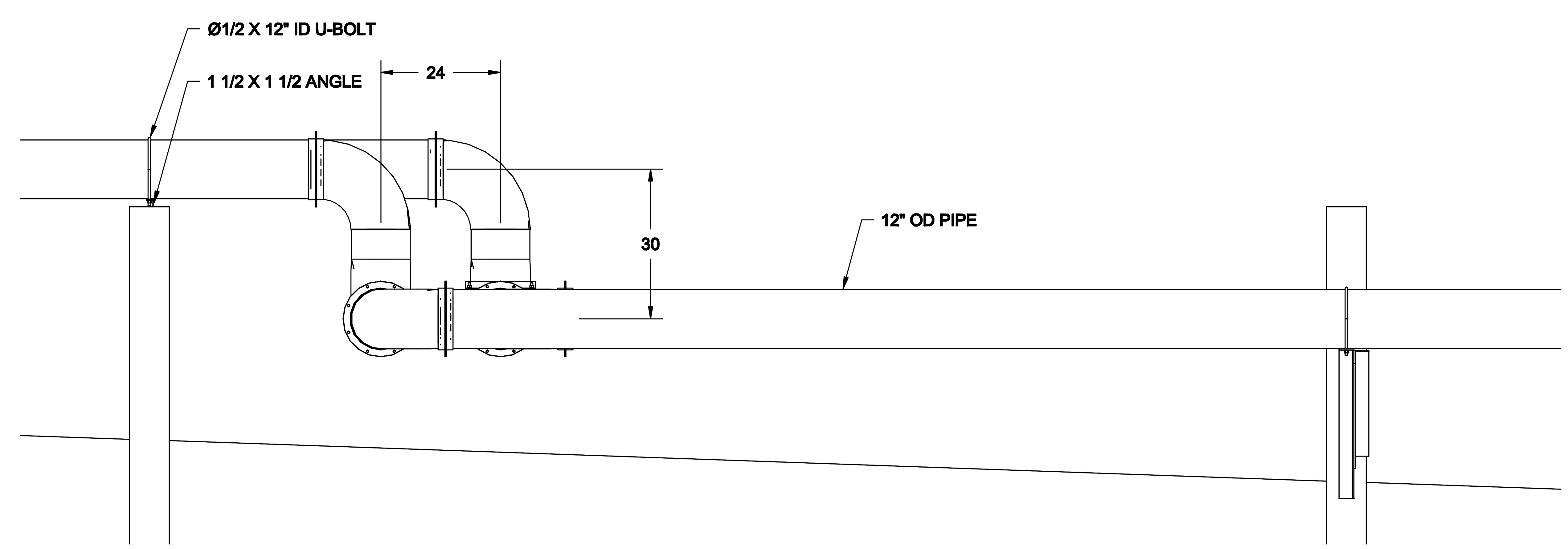


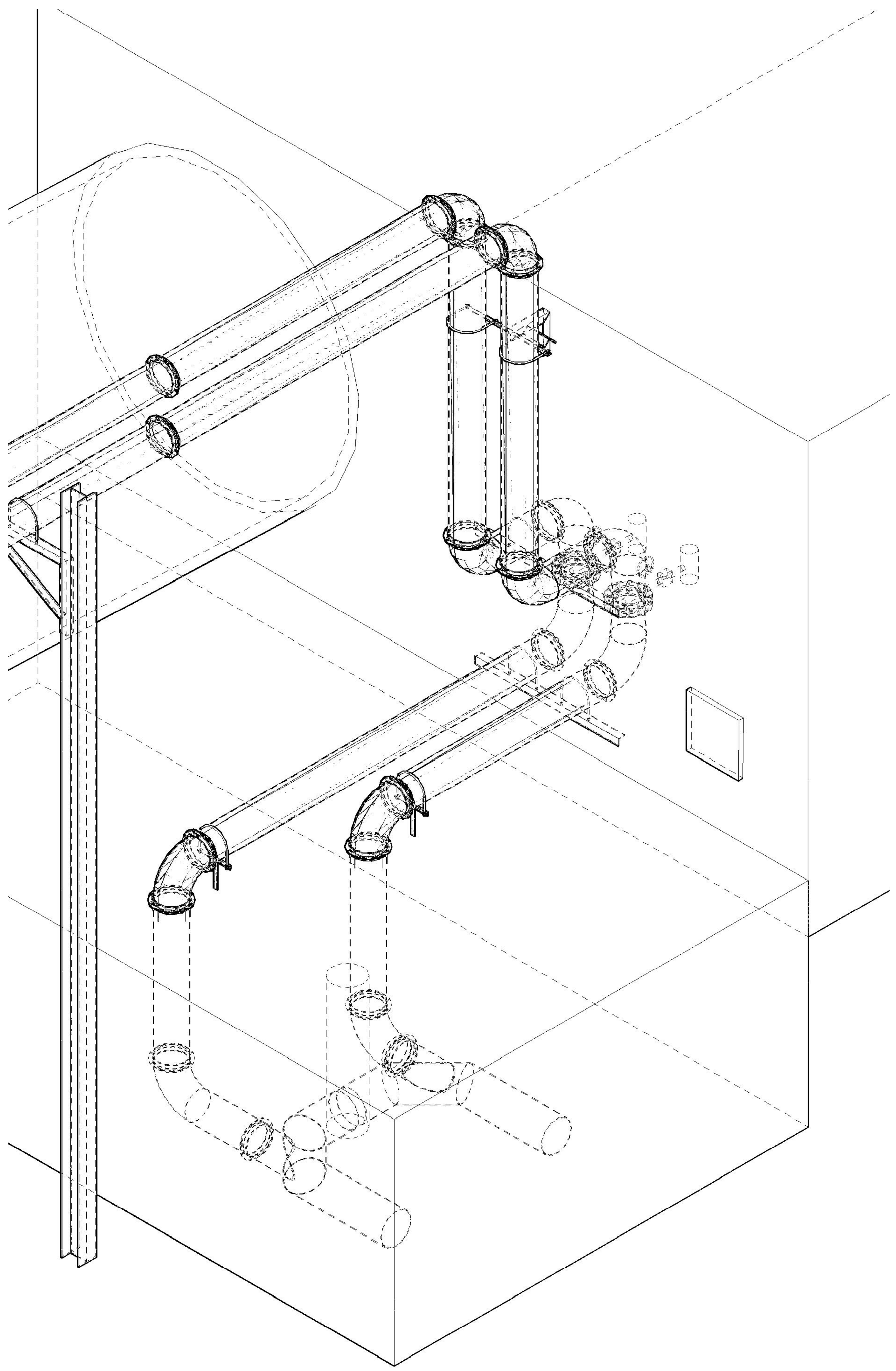


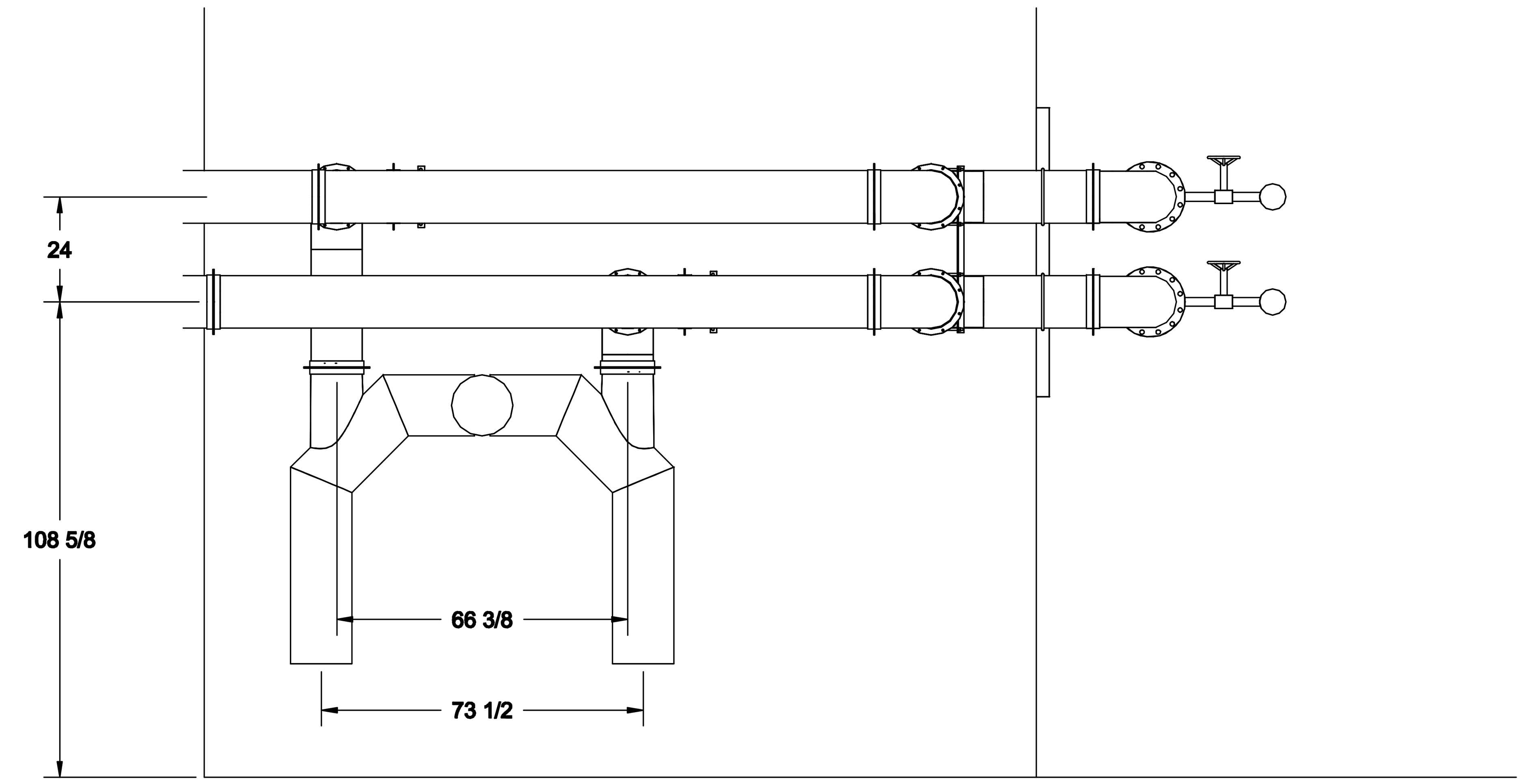


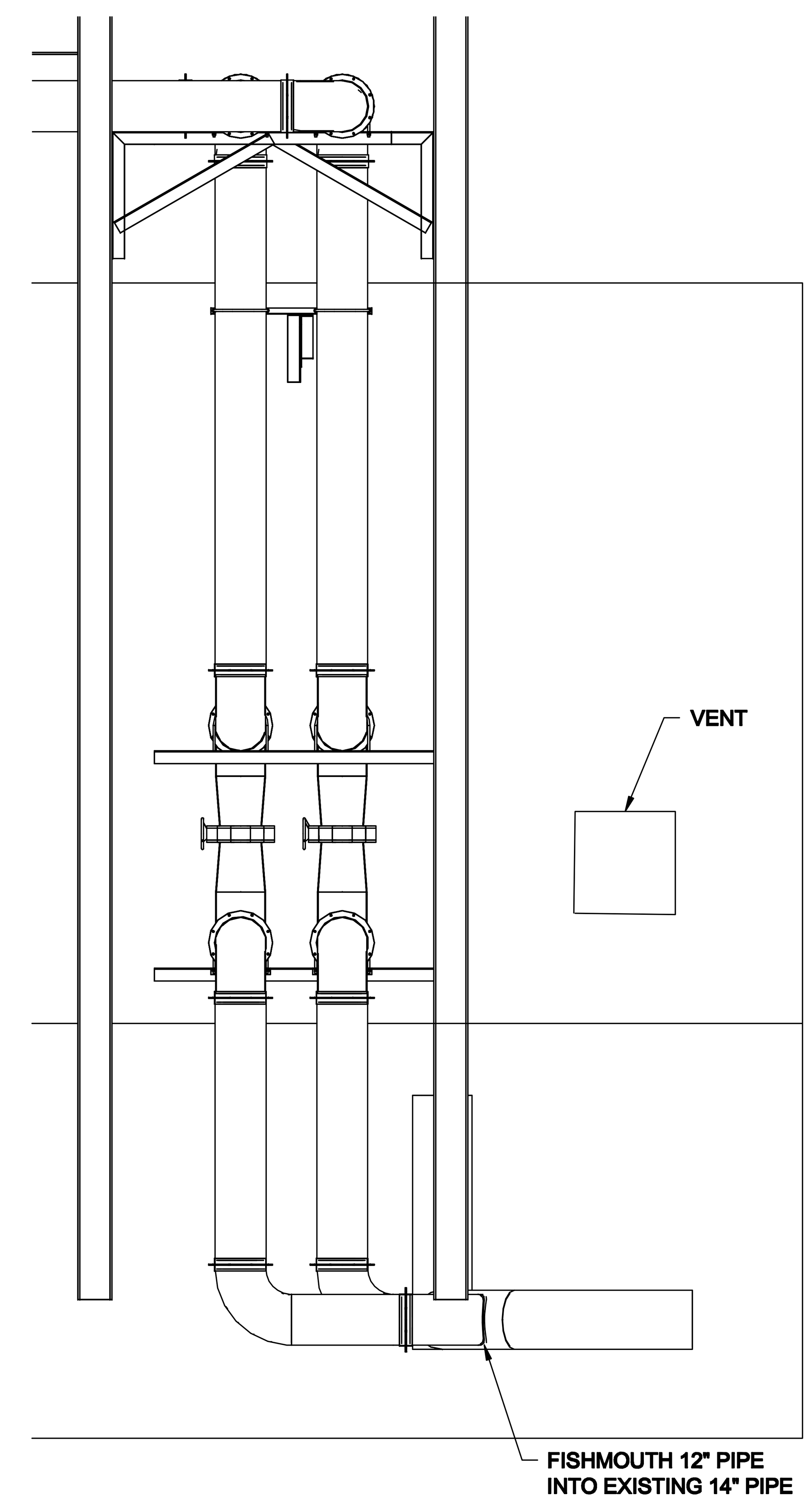
SECTION B-B



WELDING WORKS MADISON CONNECTICUT	DRAWN BY JAR APPROVED BY	DRAWING TITLE PIPING FOR AXIAL SEAL CHAMBER
	DATE 6/21/10 SCALE NONE	CUSTOMER NORLITE COHOES, NY
TOLERANCES FRACTIONS ± 1/16 DECIMALS XX ± .01 ANGLES ± 0°-15' XXX± .005	WORK ORDER QUOTE	SIZE D · DWG 17640 SH 3 OF 4 · REV. -







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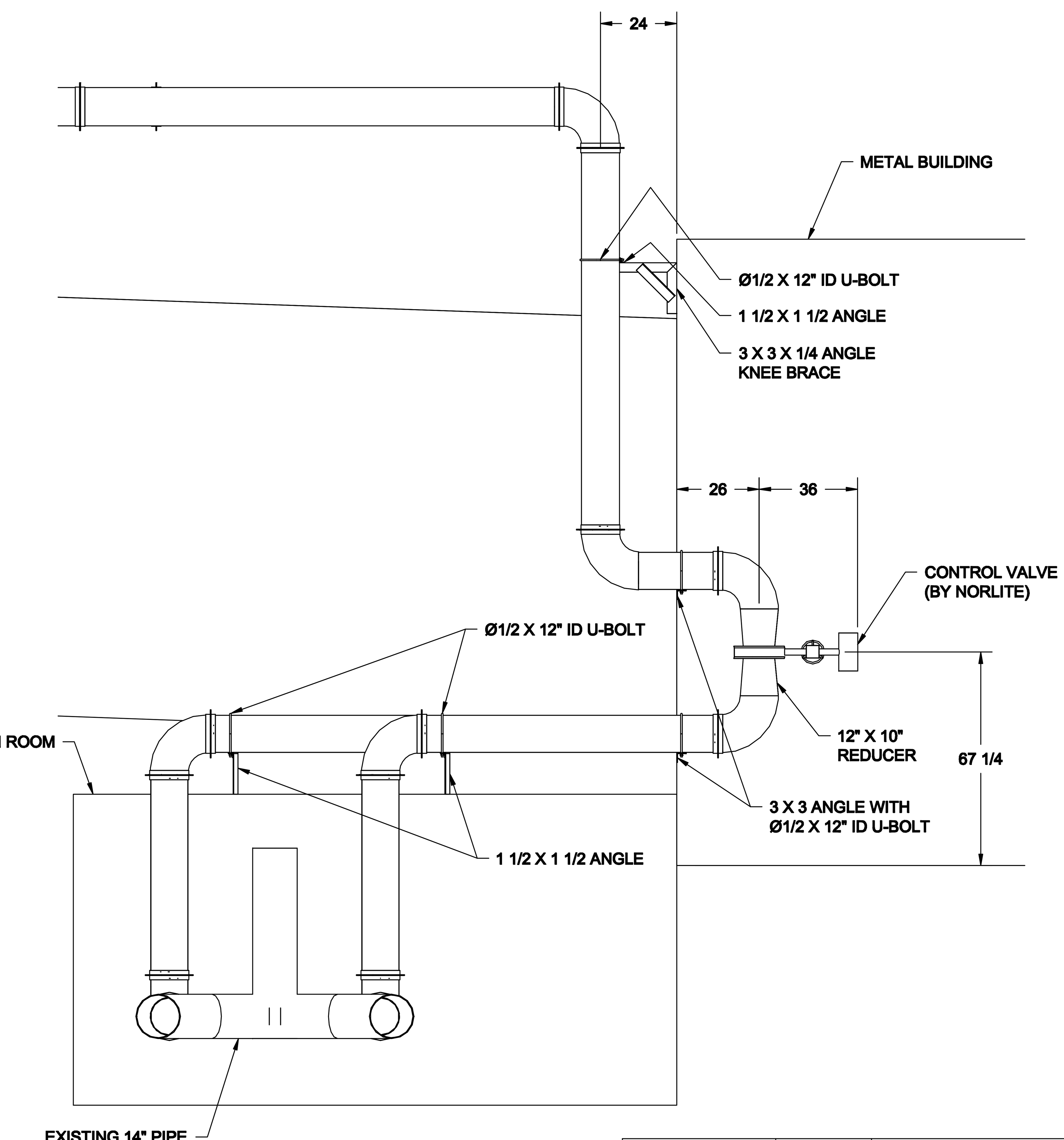
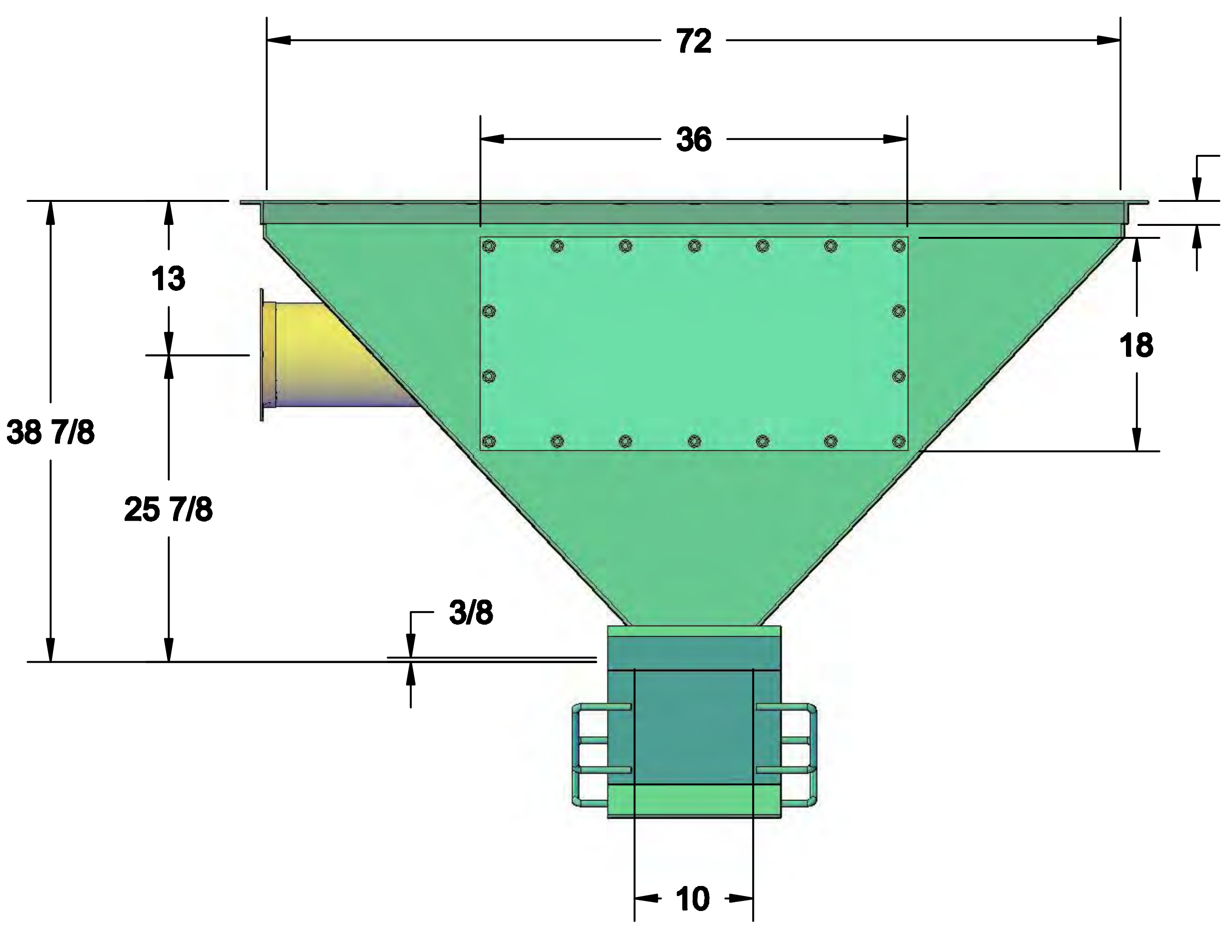


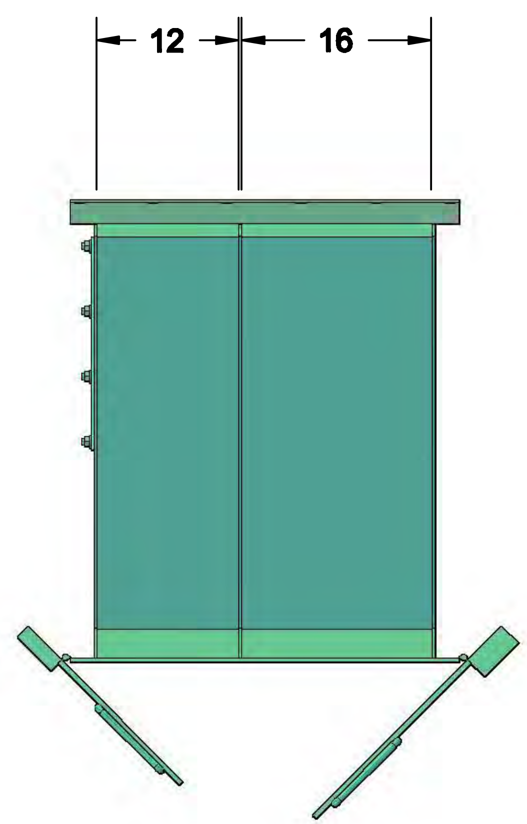
WELDING WORKS MADISON CONNECTICUT	DRAWN BY JAR APPROVED BY	DRAWING TITLE PIPING FOR AXIAL SEAL CHAMBER	
	DATE 6/21/10 SCALE NONE	CUSTOMER NORLITE COHOES, NY	
TOLERANCES FRACTIONS ± 1/16 ANGLES ± 0°-15' DECIMALS XX ± .01 XXX ± .005	WORK ORDER QUOTE	SIZE D | DWG 17640 SH 4 OF 4	REV. -

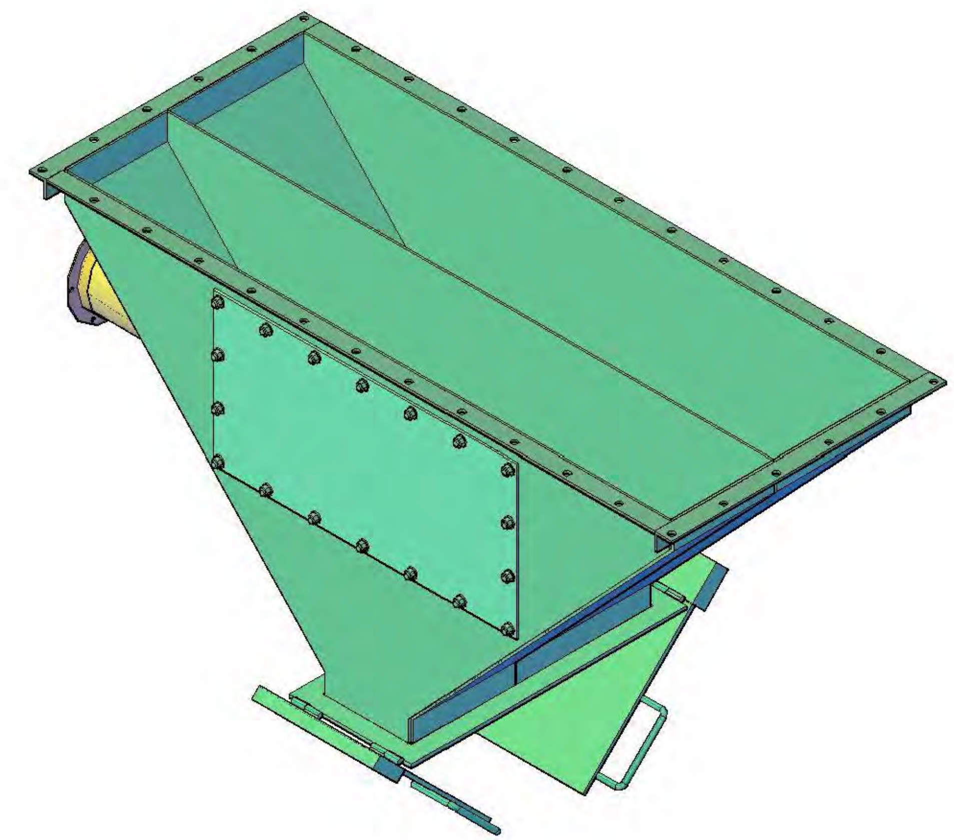
SIDE VIEW

END VIEW

				WELDING WORKS MADISON CONNECTICUT	DRAWN BY JAR APPROVED BY	DRAWING TITLE GENERAL LAYOUT FOR KILN 1, & KILN 2	
					DATE 9/14/09 SCALE NONE	CUSTOMER NORLITE COHOES, NY	
REV. A	BY JAR	DATE 5/4/10	DESCRIPTION HOPPER/PIPING	TOLERANCES FRACTIONS ± 1/16 ANGLES ± 0'-15' DECIMALS XX ± .01 XXX± .005	WORK ORDER 17261	SIZE D | DWG 17261-A SH 1 OF 1	REV. A







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APPROX WEIGHT =
900#

WELDING WORKS MADISON CONNECTICUT	DRAWN BY JAR	DRAWING TITLE CLEAN OUT HOPPER			
	APPROVED BY				
	DATE 11\16\09	CUSTOMER NORLITE			
	SCALE NONE				
TOLERANCES FRACTIONS ± 1/16 DECIMALS XX ± .01 ANGLES ± 0°-15' XXX± .005	WORK ORDER 17261	SIZE B	DWG SK-17261-06	SH 1 OF 1	REV. -

APPENDIX H
FINES AND KILN SILO STUDY

FUGITIVE DUST EMISSIONS CALCULATIONS

FOR LIGHTWEIGHT AGGREGATE FINES STOCKPILES AND KILN FEED STOCKPILE

Prepared for:

Norlite, LLC

A Division of Tradebe Environmental Services, LLC

May 8, 2014

Prepared by:

SPEC Engineering, PLLC
349 Northern Boulevard, Suite 2
Albany, NY 12204
(518) 487-4800
SPEC Job No. 13-094

INTRODUCTION

The Tradebe Environmental Services, LLC (Tradebe) Norlite facility, located in the City of Cohoes, Albany County, New York, was inspected by the New York State Department of Environmental Conservation (NYSDEC) in early 2012 and received a Notice of Violation (NOV) letter on May 9, 2013. As part of this NOV letter, NYSDEC is requesting upgrades to the facility's Fugitive Dust Plan (Plan) because they have expressed concern regarding the Plan. Specifically, NYSDEC is concerned that two existing material silos were removed for what Norlite identified as safety considerations and is requesting information regarding the need for replacement of the former lightweight fines and kiln feed silos. The current aggregate stockpiles in question, which are the subject of this study and report, are: a substantially-enclosed fines stockpile in the former fines silo footprint (enclosed fines), an open fines stockpile (open fines) that is located just to the north of the enclosed fines, and a substantially-enclosed shale feed stockpile (kiln feed). The following report details SPEC's efforts to evaluate the existing material storage areas and estimates potential fugitive dust emissions from each source.

BACKGROUND INFORMATION

Tradebe approached SPEC to seek third-party evaluation of potential fugitive dust emissions at Norlite. To do this, SPEC reviewed the adequacy and accuracy of the existing Plan. The existing Plan includes data for fugitive dust sources and control methods for the Norlite facility from 1990 and 1995 and estimates for proposed updates and changes to control methods and fugitive dust sources in 1990 and 1995. SPEC conducted an in-depth review of the former lightweight fines and shale feed silos to provide a third-party estimate of whether or not replacement silos are needed. Specific information regarding the former kiln feed and lightweight fines silos, as outlined in the existing Plan, is outlined below.

Former fines and kiln feed silos

The original lightweight fine aggregate material silo was referenced in the existing Plan multiple times on the following pages: 3-6, 3-10, 3-14, 4-4, 5-2, 5-4, 5-10, 8-1, and 8-23 (Appendix A). This silo was also mentioned in Table 8-1 of the existing Plan and in two letters from SCI-TECH, INC. to Timothy Lachell of Norlite, dated December 14, 2001, and December 31, 2002. All of these references to the original silo are merely mentions of there being a silo present, that it is a potential fugitive dust source, and suggested improvements to the silo. Most of the references to the silo are about the screens for the silo and not the silo itself. The silo is identified as housing fine aggregates.

Upon review of these references in terms of dust control, SPEC asserts that the silo was never taken into account in the 1990 calculations as a control device used to mitigate dust emissions as it was never explicitly mentioned. Further, the existing Plan Source ID 40 ("Fines Silo Screens") has the following description: "TSP emissions are generated from the screening of fines transferred to the fines silos. Two Screens serve the three silos. The emissions are controlled by an enclosure." When fugitive dust calculations were completed in 1990 for the Source ID pages, a screen house existed on top of the silo, serving as a control method for fugitive dust emissions from the conveyor belt/screen atop the silos. It is this enclosure that the Source ID description mentions at the time of the 1990 calculation and not the silo itself. The screen house was removed sometime between 1990 and 1993 due to changes in the material handling process. There is confusion over the word "enclosure" referring to the fines silo itself, when what is specifically referenced is the screen enclosure atop the silos. The silos themselves were never calculated to be emission control devices.

There is little mention of a kiln feed silo in the existing Plan. The few references in the existing plan are in Tables 3-1, 3-2, 4-1, and 5-2, referring to “Silo Conveyor to Kiln Feed Silo” as a fugitive dust source, but there is no description and no other substantial information about the kiln feed silo itself in the existing Plan. Along these lines, no credit is ever applied to the kiln feed silo as an emissions control device.

CURRENT CONDITIONS OF KILN FEED AND FINES CONTAINMENT

An aerial photograph showing the three (3) pile areas important to this report is included below as Photo 1.

Photo 1. Overhead map of the Norlite facility, showing the spatial locations of the three (3) areas in question in relation to each other and in relation to the facility as a whole.

With the removal of the lightweight fines silos, the enclosed fines product is currently contained in a structure made of square concrete blocks roughly eight (8) feet high and approximately thirty feet (30) long on all sides. There are two (2) tiers of metal bracing above the concrete base covered by heavy tarps. The roof of the original silo is still in place and helps to enclose the lightweight fines. A guarded material chute drops in from above, through the roof and down into the fines enclosure. The enclosed chute sits just above the stockpile within the structure, creating a short material transfer point. Below are a photo of the fines stockpile structure and a diagram of the chute (Photo 2 and Figure 1).

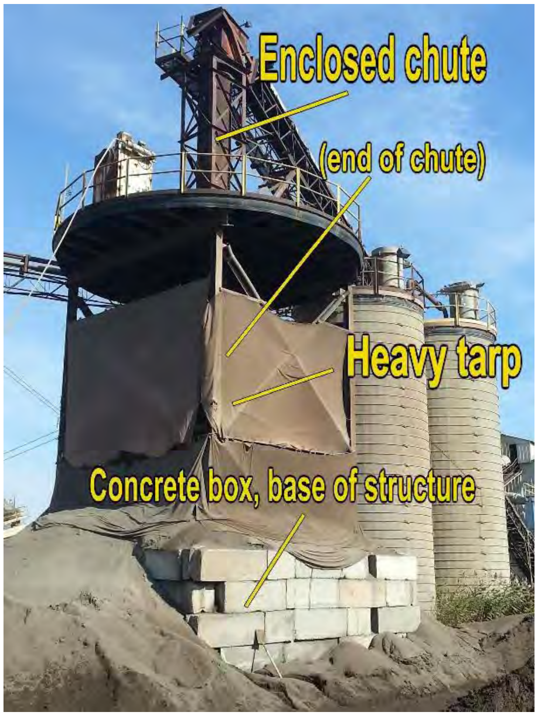

Photo 2. The enclosed fines structure, including chute coming in from above structure, tarp surrounding structure, and other structure details.

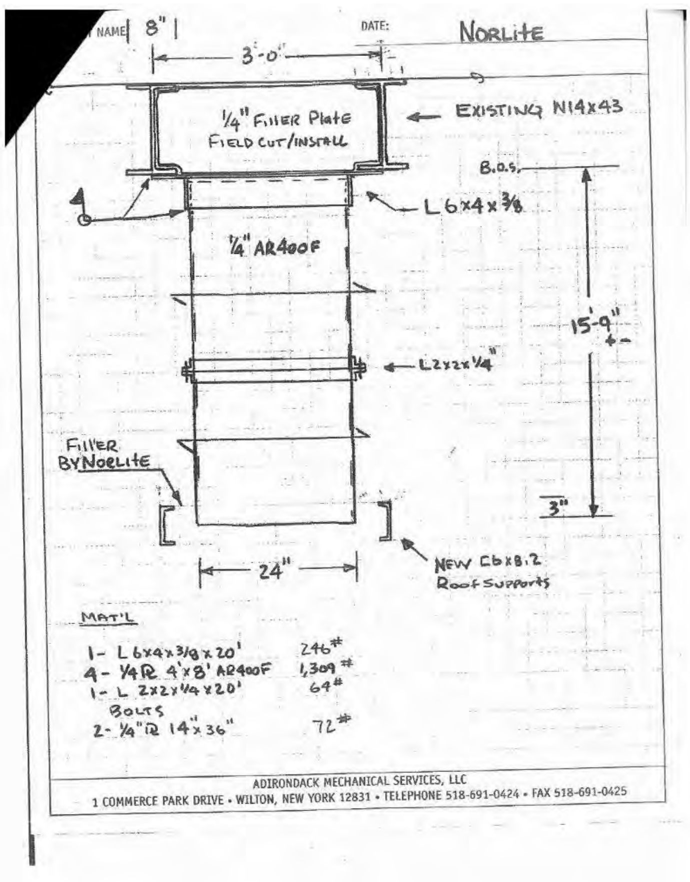

Figure 1. Diagram showing the specs of the chute for the enclosed fines material structure (provided in Norlite's existing Plan).

The second material storage area is the open fines pile located on the northern side of the enclosed fines structure. The open fines stockpile sits in a low profile and is situated in a topographic depression adjacent to the enclosed fines structure. The open fines are substantially blocked by a three (3) to four (4) foot high concrete retaining wall that is adjacent to the structure and is also blocked from wind erosion by the enclosed fines structure itself. There is also a banded wind screen on the west side of the open fines stockpile. Below are photos of the open fines storage area (Photos 3, 4, and 5).

Photo 3. View of open fines area from western side, showing the wind screen.

Photo 4. Open fines area, showing concrete wall on eastern side of pile which acts as a barrier against wind erosion.

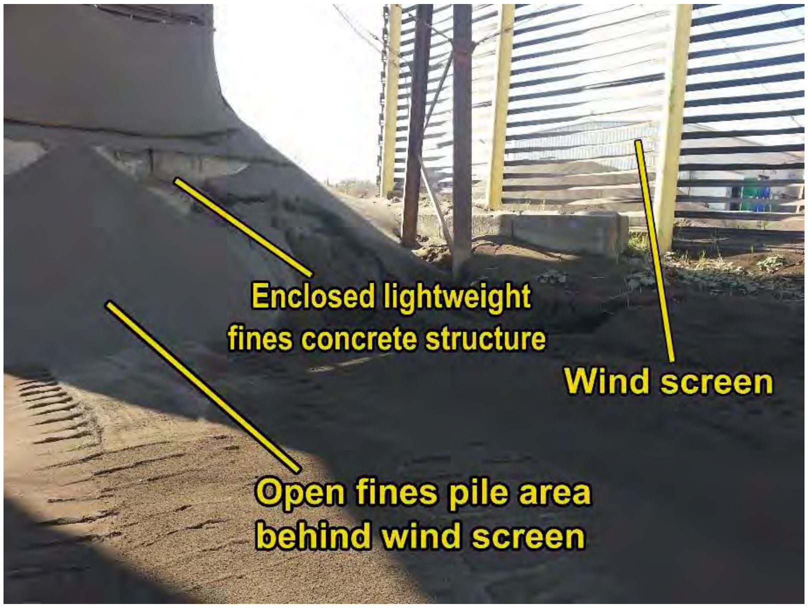

Photo 5. Open fines area, showing wind screen on western side of area.

With the removal of the former kiln feed silo, the kiln feed pile has a concrete wind wall on the north end of the pile and is covered overhead by a newly constructed metal overhang. There is an enclosed material chute that drops down from the conveyor above, through the roof, and ends just above the kiln feed stockpile. Material is transferred from the bottom of the pile (surge pile) directly into a conveyor system that delivers material into the kiln, giving the pile a concave shape. The kiln feed pile has a pile height sensor that hangs down from the metal overhang of the enclosure and limits pile height. When the material in the pile touches the sensor, an alarm sounds to alert personnel to stop feeding the kiln feed pile. Below are photos of the kiln feed pile (Photos 6 and 7).

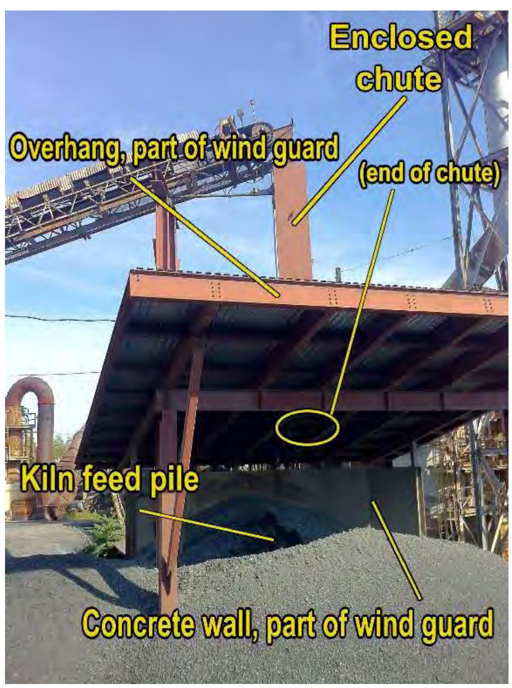

Photo 6. Kiln feed pile, showing concrete wind wall in back, metal overhang, and chute above pile.

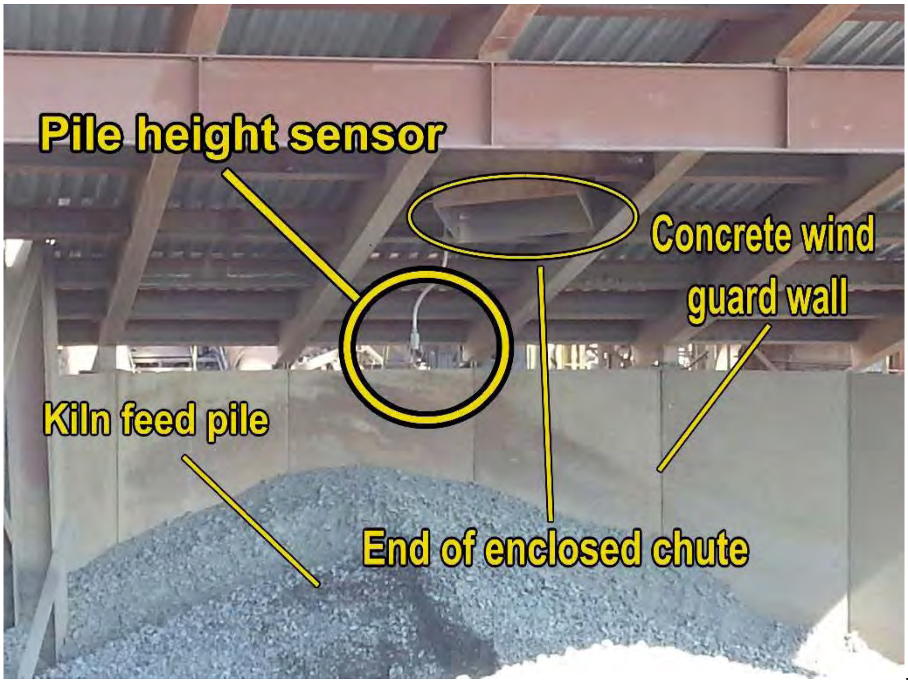

Photo 7. Close-up on back wall, chute, and height sensor that hangs above kiln feed pile. Note the limited accumulation of dust on the wall and roof structure.

FUGITIVE DUST CALCULATIONS METHODOLOGY: KILN FEED, ENCLOSED FINES STORAGE, AND OPEN FILES PILES

To calculate potential fugitive dust emissions, SPEC used equations from AP-42 Compilation of Air Pollutant Emission Factors[1] (Fourth and Fifth Editions, called referred to as AP-42 for the remainder of this report) which specifically calculate emission factors from wind erosion and material drop operations. These equations are the industry standard for calculating emissions in the aggregate industry. The calculated emission factors were then used in AP-42's general emissions equation in order to calculate the total fugitive dust emissions from each source. Storage pile wind erosion calculations will be discussed first, followed by drop point calculations.

The following is EPA AP-42's general emission rate equation and takes into account activity rate, an emission factor, and emission reductions from control methods.

$$E = (A)(EF)\left(1-\frac{ER_1}{100}\right)\left(1-\frac{ER_2}{100}\right)\ldots \qquad \text{(Equation 1)}$$

E = emissions (lb/yr)

A = activity rate (units depend on the units of the emissions factor)

EF = emission factor (varies)

ER = emission reduction efficiency (%)

[1] AP-42 Compilation of Air Pollutant Emission Factors, Fourth and Fifth Editions, United States Environmental Protection Agency

Note: Emissions reduction efficiencies can be compounded for multiple emissions reduction methods (ER1, ER2, etc.), serving as a multiplying variable in the series.

The units on the activity rate depend on the units on the emission factor. As can be seen below, the units of the emission factor for wind erosion are lb/day/acre. Therefore, the activity rate has units of day-acre/year. The emission factor units for the drop point are lb/ton, so the activity rate units are ton/year.

Although AP-42 provides emission factors for numerous products and processes, they are generalized factors based on studies that the EPA has conducted and may not be suitable for all processes. AP-42 provides many equations that can be used to calculate these emission factors, which typically provide more accuracy than the factors that are provided by AP-42 because they use site- or process-specific values to calculate the emission factors.

The following equation, taken from the fourth edition of AP-42, can be used to calculate the emission factor for wind erosion on product stockpiles. This equation takes into account material silt content as well as information regarding the site's climate.

$$EF = 1.7\left(\frac{s}{1.5}\right)\left(\frac{365-p}{235}\right)\left(\frac{f}{15}\right) \qquad \text{(Equation 2)}$$

EF = total suspended particulate emission factor (lb/day/acre)

s = silt content of aggregate (%)

p = number of days with 0.01 in of precipitation per year

f = percentage of time that the unobstructed wind speed exceeds 12 mph at the mean pile height

This equation takes into account material silt content and climate factors in order to obtain more accurate results.

The emission factor for the drop operations onto the storage piles can be calculated using the AP-42 equation for drop operations. This equation is applicable to both batch drop operations, such as product addition onto the open storage pile, and continuous drop operations, such as product addition onto the kiln feed pile and the enclosed fine pile.

$$EF = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \qquad \text{(Equation 3)}$$

EF = emission factor (lb/ton)

k = particle size multiplier (dimensionless)

U = mean wind speed (mph)

M = material moisture content (%)

This equation for drop operations takes into account mean wind speed for the site as well as the product material moisture content. The particle size multiplier k is a dimensionless factor that is applied in order to calculate emissions of different particulate matter.

The emission factor values obtained in Equations 2 and 3 were then applied to Equation 1 in order to calculate the annual emissions from each of the three (3) emission sources.

FUGITIVE DUST ESTIMATES: METHODOLOGY AND INPUTS

During SPEC's site visit on October 21, 2013, SPEC personnel observed the controls currently in place and used these observations to determine which emission reduction efficiency values should be used for each pile's calculations. EPA-450/3-77-010Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions[2] (EPA-450/3-77-010) and EPA-450/2-92-004 Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures[3] (EPA-450/2-92-004) were used as guidelines for assigning emission reduction efficiency values. Field observations were conducted during dry, moderately high wind conditions.

All three (3) piles are subject to wind erosion and have material dropped onto them. The enclosed fines storage pile and the kiln feed pile have emissions from the material drop operations onto them. The Open fines storage pile does not have a drop point emission value to it due to the nature of the pile formation: the pile forms as a result of the enclosed fines storage pile overflowing onto it rather than a conveyor or front end loader manually adding material to it.

The enclosed fines storage pile was assigned emission reduction efficiencies of 20% for the roof and 75% for the concrete enclosure for wind erosion calculations. For drop point calculations, the enclosed fines storage pile is assigned emission reduction efficiencies of 75% for its enclosure and 75% for the elongated drop chute, both observed in Photo 2 above.

The open fines pile does not have a defined enclosure and has limited built-in containment based on its location. For wind erosion calculations, SPEC assigned emission reduction efficiencies of 50% for the enclosed fines storage pile's concrete wall that blocks wind to the open fines pile, 50% for wind reduction due to the wind screen to the west of the pile, and 20% for the stockpile's low height, which decreases the potential for erosion. These control features for wind-borne erosion can be observed in Photos 3, 4, and 5 above. For drop point calculations, the concrete wall and wind screen were both given emission reduction efficiency values of 50% each.

Based on field observations, SPEC assigned the kiln feed pile emission reduction efficiencies of 50% for the roof, 75% for the concrete wind wall, and 20% for low pile height. Similar to the enclosed fines storage pile, the kiln feed pile has an enclosed chute that drops material onto the pile. The storage pile's height is controlled by a height sensor that alerts personnel of high pile levels. Because the kiln feed pile is located at the lower end of a steep incline, there is also built-in topographical shielding from wind. For drop point calculations, SPEC assigned the following emission reduction efficiencies: 75% for the concrete wall on the north side, 50% for the metal overhang above the storage pile, and 75% for the

[2] EPA-450/3-77-010 Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions, US EPA March 1977
[3] EPA-450/2-92-004 Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, US EPA September 1992

enclosed chute. All of these control features can be observed in Photos 6 and 7 above. These assigned control efficiencies are consistent with EPA AP-42 and EPA-450/3-77-010. Relevant efficiency values from these two documents are compiled in the following table.

Table 2. Control Efficiency Values

Emission points	Control methods	Control efficiencies
Wind erosion	Enclosure	95%-99%
	Watering	50%
Loading onto a pile	Enclosure	70%-99%
	Wind guard	50%
	Adjustable/telescopic chutes	75%
	Watering	50%

Material silt content and material moisture content was determined from sieve analysis data provided by Norlite to SPEC. Although silt is typically defined as material that passes through the No. 200 sieve, SPEC used a higher value in order to establish a conservative estimate of fugitive dust emissions. The medians of the percentages of material passing through the No. 100 sieve and No. 200 sieve were used for calculations.

SPEC obtained the values for p and f for Equation 2 through analysis of daily local weather data for Albany International Airport in Albany, NY. This weather data collection site is 5.2 miles from the Norlite site. Typical airport anemometer heights are between 20 feet to 50 feet high[4]. This gives us an overestimation of the average wind speeds at the height of the storage piles, leading to conservative fugitive dust emission numbers. The equation from the fourth edition of AP-42 was used instead of the equation found in the fifth edition due to the availability of applicable accurate site-specific data. Storage piles were assumed to be present 365 days per year for wind erosion calculations.

Rather than using one of the listed aerodynamic particle size multipliers from AP-42 (Table 3 below), SPEC has used $k=1$ in order to account for larger total suspended particles (TSP) in the equation for drop point emissions (Equation 3).

Table 3. AP-42 Drop Point Emissions Aerodynamic Particle Size Multiplier

< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053

RESULTS AND ANALYSIS

Calculations

The following table summarizes the results of the wind erosion calculations using Equations 1 and 2. For all three (3) storage piles, the following numbers were used: $p = 139.4$ *days* for number of days annually with at least 0.01 in of precipitation, $f = 11.6\%$ for percentage of time with winds above 12 mph, and 365 days for the number of days annually that each pile is present.

[4] Wind Resource Assessment Handbook: Fundamentals for Conducting a Successful Monitoring Program, AWS Scientific, Inc., prepared for National Renewable Energy Laboratory, April 1997

These calculations are updates to the calculations performed by SCI-TECH, INC. in the 1990s due to the availability of newer fugitive dust emission factor estimation equations. Thus, although the SCI-TECH, INC. report calculation numbers were accurate at the time, they are no longer an accurate representation of the fugitive dust emissions at the Norlite site.

Table 4. Wind Erosion Emissions Calculations

Pile	s (silt content)	Emission factor (lb/day/acre)	Area (acre)	ER_1	ER_2	ER_3	Emissions (lb/yr)	Emissions (ton/yr)
Enclosed fines	6.95%	5.85	0.141	20%	75%	-	60.21	0.0301
Open fines	6.95%	5.85	0.046	50%	50%	20%	19.64	0.0098
Kiln feed	0.25%	0.21	0.087	50%	75%	20%	0.67	0.0003

The following table summarizes the results of the drop point calculations using Equations 1 and 3. For all three (3) storage piles, the following numbers were used: $k = 1$ for particle size multiplier and $U = 7.15$ *mph* for average wind speed.

Table 5. Drop Point Emissions Calculations

Pile	Activity Rate (ton/yr)	M (material moisture content)	Emission factor (lb/ton)	ER_1	ER_2	ER_3	Emissions (lb/yr)	Emissions (ton/yr)
Enclosed fines	85,000	2.05%	0.0049	75%	75%	-	26.17	0.0131
Kiln feed	244,028	2.00%	0.0051	75%	50%	75%	38.85	0.0194

By adding the values from the wind erosion calculations and the drop point calculations, SPEC has estimated the annual emissions from each of these emission sources. These results are summarized in Table 5.

Table 6. Total Emissions from Each Storage Pile

Pile	Emissions from wind erosion (ton/yr)	Emissions from material drop point (ton/yr)	Total emissions (ton/yr)
Enclosed fines	0.0301	0.0131	0.0432
Open fines	0.0098	-	0.0098
Kiln feed	0.0003	0.0194	0.0198
Totals	**0.0402**	**0.0325**	**0.0728**

CONCLUSION

Analysis of current piles

SPEC asserts that the current sum of 0.0728 tons of annual emissions potential is typical. Based on this analysis, SPEC does not see the need for the reconstruction of the lightweight aggregate fines or kiln feed silos.

Table 7. Current Relative Fugitive Dust Percentages

Pile	Material production (tpy)	Fines content (tpy)	Calculated fugitive dust (tpy)	Fugitive dust, percentage of potential fugitive dust
Enclosed fines	85,000	5,908	0.0432	0.0007%
Open fines	52,000	3,614	0.0098	0.0003%
Kiln feed	244,028	610	0.0198	0.0032%
Total production	**244,028**	**10,132**	**0.0728**	

Suggestions to further reduce fugitive dust emissions

Based on the emissions rates detailed in this report, SPEC does not recommend the installation of a new silo. SPEC has no recommendations for improvements to the kiln feed enclosure. The kiln feed area is well contained by its roof, its concrete wall, its surge pile, and its pile height restriction. Similar to the kiln feed area, SPEC has no recommendations for improvements to the open lightweight fines pile that is north of the enclosed fines structure aside from continued good housekeeping practices. The open fines area is adequately contained by the banded wind screen, the concrete retaining wall that blocks wind, maintenance of a low height profile, and its position in a topographic depression. The area also benefits from the enclosed fines enclosure to the south, as the open fines area is effectively screened on three sides from wind erosion.

Although the potential fugitive dust emissions are low, SPEC has several recommendations for the enclosed fines structure. Though a new silo is not recommended, SPEC proposes the following alternative cost-effective solutions for improving fugitive dust emissions from the enclosed fines enclosure.

- *Improvements to the lightweight fines enclosure*: Currently, the enclosure consists of concrete blocks with tarps for two tiers and is open from the upper tarp to the roof. SPEC suggests that the bottom tier of tarp be removed and sheet metal be installed in its place. If sheet metal is not an option, SPEC recommends wind screen bands, similar to the banded wind screen, to be installed in place of the lower tarp. This will reduce dust from both wind erosion and from product accumulating on the tarp itself. The fabric of the lower tarp tends to accumulate and concentrate fine material that then becomes fugitive dust. It is believed that sheet metal siding will not accumulate the fine fraction and will adequately provide for wind screening above the concrete blocks.

- *Addition of misters*: SPEC suggests the addition of water misters. Spraying the air around the material will reduce the amount of fugitive dust that leaves the area surrounding the storage pile. It is SPEC's understanding that the material cannot be directly wetted because of customers' moisture constraints. Misters will only add minimal moisture content to the fines and should not exceed maximum moisture content limits.

- *Addition of a height sensor above enclosed fines piles within the silo*: The kiln feed storage pile has a sensor hanging above the pile, highlighted in Photo 7 above. This sensor's purpose is to detect when the aggregate pile has reached the maximum height for operational efficiency. When the aggregate reaches the sensor, it triggers a signal to stop the feed onto the pile. Installation of a similar device in the fines enclosure will prevent material from overstepping the concrete block walls.

- *Housekeeping*: Fugitive dust may also be reduced by additional pile housekeeping and improved housekeeping methods. Housekeeping improvements include:
  - More frequent clearing of fines that overstep the concrete block walls
  - Repair or replace any damaged parts of the elongated chute

- *Adding wind speed alarms to enclosed fines pile* : Much like the height sensor suggested above, a wind alarm would also provide an additional method of monitoring the potential for fugitive dust emissions. An anemometer would serve as a sensor to wind conditions around the facility, potentially hanging above a pile like the height alarm sensors do. According to page 6 of a letter to Timothy Lachell from SCI-TECH dated December 14, 2001, this instrument has already been installed near the eastern property boundary tree line. If relocated to the fines structure, this alarm would notify Norlite personnel to observe the area or areas at risk and use judgment to determine if the pile needs additional misting, needs additional cover, if material loading activities should be suspended, etc.

Calculations estimating reduction of fugitive dust emissions from the enclosed fines pile

SPEC calculated an estimated reduction of fugitive dust emissions if a few suggested improvements were implemented. If the enclosed fines structure were improved by adding the sheet metal as part of the containment in place of the lower tarp, the emissions reduction efficiency would increase. SPEC assumes this could increase the emission reduction of the enclosure from 75% to 90%. This improvement would impact the emissions from both wind erosion and the drop point. If misters were employed around the enclosed fines pile, water suppression could be added as an additional control method for the drop point with an efficiency of 50%. The results of these improvements are summarized in the following two tables.

Table 8. Wind Erosion Potential Emissions with Improved Controls

Pile	s (silt content)	Emission factor (lb/day/acre)	Area (acre)	ER_1	ER_2	ER_3	Emissions (lb/yr)	Emissions (ton/yr)
Enclosed fines	6.95%	5.85	0.141	20%	90%	-	24.16	0.0120

Table 9. Drop Point Potential Emissions with Improved Controls

Pile	Activity Rate (ton/yr)	M (material moisture content)	Emission factor (lb/ton)	ER_1	ER_2	ER_3	Emissions (lb/yr)	Emissions (ton/yr)
Enclosed fines	85,000	2.05%	0.0049	90%	75%	50%	5.23	0.0026

The total emissions from these three storage piles after improvements have been made to the enclosed fines storage pile are summarized in Table 9.

Table 10. Total emissions from each storage pile

Pile	Emissions from wind erosion (ton/yr)	Emissions from material drop point (ton/yr)	Total emissions (ton/yr)
Enclosed fines	0.0120	0.0026	0.0146
Open fines	0.0098	-	0.0098
Kiln feed	0.0003	0.0194	0.0198
Totals	**0.0221**	**0.0220**	**0.0442**

REFERENCES

1. AP-42 Compilation of Air Pollutant Emission Factors, Fourth and Fifth Editions, United States Environmental Protection Agency
2. EPA-450/3-77-010 Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions, US EPA March 1977
3. EPA-450/2-92-004 Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, US EPA September 1992
4. New Source Review (NSR) Emission calculations, Texas Commission on Environmental Quality, Air Permits Division, May 2008.
5. Wind Resource Assessment Handbook: Fundamentals for Conducting a Successful Monitoring Program, AWS Scientific, Inc., prepared for National Renewable Energy Laboratory, April 1997

APPENDIX I

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, AIR PERMITS DIVISION, *NEW SOURCE REVIEW (NSR) EMISSION CALCULATIONS* (2008)

Texas Commission on Environmental Quality
Air Permits Division

New Source Review (NSR) Emission Calculations

This information is maintained by the Chemical NSR Section and is subject to change. Last update was made **May 2008**. These emission calculations represent current NSR guidelines and are provided for informational purposes only. The emission calculations are subject to change based on TCEQ case by case evaluation. Please contact the appropriate Chemical NSR Section management if there are questions related to the emission calculations.

Sample Petroleum Coke Storage and Transfer Calculations

The emissions resulting from the storage and transfer of petroleum coke can be calculated by using the AP-42 emission factors and equations for aggregate handling and storage piles.

Aggregate Handling and Storage Piles
Total dust emissions from aggregate storage piles result from several distinct source activities within the storage cycle:

1. Loading of aggregate onto storage piles (batch or continuous drop operations).
2. Equipment traffic in storage area.
3. Wind erosion of pile surfaces and ground areas around piles.
4. Load out of aggregate for shipment or for return to the process stream (batch or continuous drop operations).

Drop Operations
Either adding aggregate material to a storage pile or removing it usually involves dropping the material onto a receiving surface. Truck dumping on the pile or loading out from the pile to a truck with a front-end loader are examples of batch drop operations. Adding material to the pile by a conveyor stacker is an example of a continuous drop operation.

The quantity of particulate emissions generated by either type of drop operation, in pounds per ton of material transferred, may be estimated using the following empirical expression:

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where:	E	=	emissions factor (lb/ton)
	k	=	particle size multiplier (dimensionless)
	U	=	mean wind speed (miles/hr)
	M	=	material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k)				
< 30 μm	< 15 μm	< 10 μm	< 5 μm	< 2.5 μm
0.74	0.48	0.35	0.2	0.053

Drop Operation Example

Company A is capable of loading a maximum of 200 tons per hour and a total of 300,000 tons per year of petroleum coke. The mean wind speed at the facility is 10 miles per hour while the moisture content in the coke is 8 percent. PM_{10} emissions resulting from the drop operations would be:

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

$$E = 0.35(0.0032)\frac{\left(\frac{10}{5}\right)^{1.3}}{\left(\frac{8}{2}\right)^{1.4}}$$

$$E = 0.0004\ lb\ PM_{10}\ /\ ton\ coke$$

$$HourlyEmissions = \left(\frac{0.0004\ lb\ PM_{10}}{ton\ coke}\right)\left(\frac{200\ tons\ coke}{hr}\right)$$

$$HourlyEmissions = 0.08\ lb\ PM_{10}\ /\ hr$$

$$Annual\ Emissions = \left(\frac{0.0004\ lb\ PM_{10}}{ton\ coke}\right)\left(\frac{300{,}000\ tons\ coke}{yr}\right)\left(\frac{1\ ton}{2000\ lb}\right)$$

$$Annual\ Emissions = 0.06\ \text{TPY}\ PM_{10}$$

Conveyors

The transfer (drop) of material from one conveyor belt to a different conveyor belt should be treated as a drop point and potential emissions should be calculated using the methodology in the preceding example. However, drop of material from the conveyor belt directly onto the storage pile is not considered a drop point. Emissions from dropping material from the conveyor onto the pile are accounted for in calculation of emissions from wind erosion that follows.

Fugitive emissions can be expected from the conveying and transferring of material due to wind, belt vibration, scrapers or brushes, etc. For an estimation of fugitive emissions along conveyors, a conservative assumption of one drop per 1,000 feet of conveyor length is made.

Example

Company B uses a 2,000 foot conveyor to transport petroleum coke to its storage pile. The conveyor is capable of transporting 25 tons per hour to the pile and, moves 4,000 tons of coke annually. Mean wind speed at this facility is 12 miles per hour and the moisture content of the coke is 10 percent. The PM_{10} emissions resulting from this conveyor would be:

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\left(\frac{length\,of\;conveyor}{1{,}000\;ft}\right)$$

$$E = 0.35(0.0032)\frac{\left(\frac{12}{5}\right)^{1.3}}{\left(\frac{10}{2}\right)^{1.4}}\left(\frac{2{,}000\;ft}{1{,}000\;ft}\right)$$

$$E = 0.0007\;lb\,PM_{10}\,/\,ton\,coke$$

$$HourlyEmissions = \left(\frac{0.0007\,lb\,PM_{10}}{ton\,coke}\right)\left(\frac{25\,tons\,coke}{hr}\right)$$

$$HourlyEmissions = 0.02\,lb\,PM_{10}\,/\,hr$$

$$Annual\;Emissions = \left(\frac{0.0007\,lb\,PM_{10}}{ton\,coke}\right)\left(\frac{4{,}000\,tons\,coke}{yr}\right)\left(\frac{1\,ton}{2000\,lb}\right)$$

$$Annual\ Emissions = 0.0014 \text{ TPY PM}_{10}$$

Wind Erosion from Stockpiles

Emissions expected due to wind erosion of stockpiles may be estimated by:

$$E = \frac{13.2(Number\ of\ Active\ Days)(Acreage\ of\ the\ Pile)(Control\ Factor)}{2000}$$

Where:	E	=	Emissions from the pile (tons/yr)
	Number of Active Days	=	Days per year where there is at least 8 hours of activity occurring at the piles
	Control Factor	=	For wet material, the control factor is 0.5 For sprayed material, the control factor is 0.3 For dry material, the control factor is 1

Example

Company C has a petroleum coke stockpile that covers 4 acres. There is activity at the site 300 days per year and the coke pile is routinely sprayed with water. PM_{10} emissions due to wind erosion would be:

$$E = \frac{13.2(Number\ of\ Active\ Days)(Acreage\ of\ the\ Pile)(Control\ Factor)}{2000}$$

$$E = \frac{13.2(300)(4)(0.3)}{2000}$$

$$E = 2.38\ TPY\ PM_{10}$$

APPENDIX J
LOADER OPERATOR PROCEDURES

ATTACHMENT B
BUCKET LOADER OPERATOR PROCEDURES

Purpose:
Provide guidelines to bucket loader operators for moving aggregate type materials to minimize dust "boil-up" to prevent offsite migration of dust during material transfer activities consistent with the principals of the fugitive dust plan.

Weather Conditions and Product Moisture Content :
Bucket loader operators need to maintain awareness at all times of product moisture content, and current wind conditions via visible sightings such as, but not limited, to stack plumes, wind socks, and/or anemometer stations. Bucket loader operators need to alter operations accordingly as wind conditions and product moisture content change up to and including cessation of operations. If the bucket loader operator is creating dust "boil-up" conditions which migrate offsite, the following steps will be taken:

1. Discontinue moving product, or
2. Increase product moisture by adding enough water to product to eliminate offsite migration.

Work Area:
Bucket loader operators need to maintain awareness at all times of visible moisture content of the travel areas in their work area. Bucket loader operators need to alter operations accordingly, to the extent practical, as moisture conditions change.

Material Movement:
As a general work practice, bucket loader operators should follow the good operating procedures described below:

Pile to Pile:
Bucket loader operators should approach stockpiles at ground level with a level bucket. When the bucket has achieved maximum depth into the stockpile, the bucket loader operator will perform a full "roll-back" of the loaded bucket before extracting from the stockpile. While transporting materials, the loaded bucket will be held at the lowest practical point until reaching the receiving stockpile. At the receiving stockpile the bucket loader operator will work at a minimum height to the pile to allow material to "roll-out" of the bucket and onto the pile to minimize dust generation.

Pile to Container:
Containers include, but are not limited to, truck bodies, railcars, feeders, hoppers, etc. Bucket loader operators should approach stockpiles at ground level with a level bucket. When the bucket has achieved maximum depth into the stockpile, the bucket loader operator will perform a full "roll-back" of the loaded bucket before extracting from the stockpile. Bucket loader operators will approach a container with the loaded bucket at the lowest practical point during travel and lift in a fashion as to maintain an even operating plane with the container. Bucket loader operators will achieve a minimum height to allow the material to "roll-out" into the container to minimum dust generation.

The above-described practices are proposed operating procedures to minimize the generation of dust to prevent offsite migration during the movement of the bucket loader and the movement of aggregate type materials. These practices are to be implemented with common sense to minimize the generation of dust.