INTERIM MEASURE WORK PLAN
IN-SITU GROUNDWATER TREATMENT

Former Rod and Wire Mill Area
Tradepoint Atlantic
Sparrows Point, Maryland

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June 28, 2016
Revised August 22, 2016
Project No.: 2016-3421
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1.0 INTRODUCTION

Advanced GeoServices Corp. (Advanced GeoServices) has prepared this Interim Measure Work Plan (R&W Mill IM Workplan) to support the approval and implementation of an upgraded interim measure designed to remediate elevated dissolved cadmium and zinc metals within groundwater at the A3 parcel of property owned by Tradepoint Atlantic. Tradepoint Atlantic is currently redeveloping the 3100 acre property at Sparrows Point Maryland formerly occupied by an integrated steel mill complex that was operated chiefly by Bethlehem Steel Corporation since 1916. The A-3 parcel was the site of a rod and wire mill complex located as shown on Figure 1 and is more commonly known as the Rod and Wire Mill Area. Groundwater from a portion of the Rod and Wire Mill Area has been undergoing pump and treat interim measure actions for a significant period of time.

Environmental cleanup and associated interim measures are being conducted at the Tradepoint Atlantic property in compliance with requirements pursuant to the following:

- Administrative Consent Order (ACO) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the Maryland Department of the Environment (effective September 12, 2014); and

- Settlement Agreement and Covenant Not to Sue (SA) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the United States Environmental Protection Agency (effective November 25, 2014).

Parcel A3 is also part of the acreage that remains subject to the requirements of the Multimedia Consent Decree between Bethlehem Steel Corporation, the United States Environmental Protection Agency (EPA), and the Maryland Department of the Environment (MDE) (effective October 8, 1997) as documented in correspondence received from EPA on September 12, 2014.
A development plan for Parcel A-3 is underway that consists of a proposed structure spanning approximately 301,500 SF. The northern limit of the proposed building is proximal to an existing groundwater pumping well. A 5 acre parking area is proposed for the remainder of the parcel to the north of the proposed building. The developer (Tradepoint Atlantic) has expressed a desire to begin site work and grading as soon as possible.

The planned interim measure for the A-3 Parcel will consist of the treatment of groundwater by in-situ neutralization and attenuation of dissolved metals by mineral precipitation. Selection of this remedy was supported by several pre-design investigation programs more fully described in following sections. This document provides background information used to select and design the interim measure including the site description, summary and highlights of recent investigation findings and the conceptual site model, details for the proposed remedial approach and associated implementation and schedule and reporting elements.

1.1 SITE DESCRIPTION

Sparrows Point housed large scale iron and steel production operations from the 1800’s until 2012 based on the historical information presented in “Phase II and Pre-Design Investigation Workplan, Parcel A-3, Former Rod and Wire Mill Area” (EAG, Sept 17, 2015). This included raw material handling, coke production, sinter production, iron production, steel production, and semi-finished and finished product separation. In 1970, Sparrows Point was the largest steel facility in the United States. Steelmaking operations at the Facility ceased in fall 2012.

The Rod and Wire Mill Area encompasses about 67 acres on the northwestern portion of the property (Site, see Figure 1). The mills that were formerly located in this area produced rods and wire products from the 1940’s into the early 1980’s. The area is bounded to the west by Riverside Drive and Bear Creek, to the north by Bethlehem Boulevard and Interstate 695, and to the east by the former Pipe Mill Area. After the operations activities ceased in the early 1980’s, the demolition of the remnant structures occurred between 1994 and 2000.
Manufacturing operations at the Wire Mill included leaching of zinc ore along with additional treatment processes to remove cadmium impurities. These activities resulted in elevated levels of zinc and cadmium in the soil and groundwater. The leaching process was implemented in large tanks located inside the north end of the former Rod and Wire Mill building. In 1959 filters were installed to dewater the residues. Filtrate from the dewatering process was typically recycled to the wire plating process. The dewatered sludge was temporarily stored on the ground north of the mill buildings in the Former Sludge Bin Storage Area (see Figure 2). Excess filtrate is assumed to have been discharged to an adjacent pond (East Pond) until 1971; after which it was sent to the onsite waste water treatment plant. The Rod and Wire Mill operation terminated in the early 1980s.

During a period in the mid-1980s to early 1990s, eight (8) Solid Waste Management Units (SWMUs) were identified in the vicinity of the Rod and Wire Mill during a series of investigations and interim measures to address conditions were performed by the then owner, Bethlehem Steel. Three (3) of these SWMUs are the focus of this R&W Mill IM Workplan and associated remedial action and include:

- SWMU 27: Sludge Bin Storage Area;
- SWMU 28: Northwest Pond; and
- SWMU 29: East Pond.

1.2 CURRENT INTERIM MEASURES

The historical operations at the Rod and Wire Mill Area resulted in releases of acidic liquids, cadmium and zinc to the soil and groundwater. In 1986 a soil and groundwater remediation program was initiated to address elevated levels of cadmium and zinc in the groundwater and residual soil contamination in the Sludge Bin Storage Area. Remediation included a soil-flushing program and associated pumping and treatment of groundwater from shallow and intermediate wells. Groundwater pumping was discontinued in 1999 as part of the Rod and Wire Mill demolition.
Following a reassessment, pumping and treatment of groundwater resumed in September 2001 and has continued to the present date. A plume of dissolved cadmium and zinc is observed in the sandy subsurface from approximately 20 to 30 feet below ground surface (bgs). The average depth of water has been observed at shallow as approximately 3 to 5 feet bgs. Sandy and clayey subsoils exist down to approximately 50-60 feet bgs. There is currently no indication that there is a significant plume of dissolved cadmium and zinc at depths greater than 30-ft bgs.

The current Interim Measure Remedy operations are summarized as follows:

- Institutional controls for soils to limit worker exposure provide a “Restricted Work Area” at the Former Sludge Bin Storage Area.
- A groundwater monitoring network that includes 31 wells to collect water level and groundwater quality data.
- A groundwater pump and treat system that utilizes two intermediate depth zone recovery wells (RW10-PZM020 and RW15-PZM020) that typically operate at a combined pumping rate of 5.0-12.0 gallons per minute (gpm). A total of 4,487,659 gallons of water were extracted from the Former Rod and Wire Mill Area pumping wells and treated during 2015. The average pumping rate for the pump and treat system was 12,295 gpd, or 8.5 gpm. A total of 210 pounds (lbs) of cadmium and 10,630 pounds (lbs) of zinc were removed and treated during 2015.

1.3 RECENT INVESTIGATIONS/FINDINGS

In late April 2016 field work associated with the “Interim Remedial Measures Workplan, Pre-Design Investigation Supplement, Parcel A-3” (Advanced GeoServices, April 1, 2016) was performed. Subsequently, data was received and evaluated in early May 2016. Concurrently the “Pre-Design Investigation, Rod and Wire Mill Area, Characterization Report,” ARM Group; April 1, 2016 (ARM PDI Report) was received. The key findings from these investigations are presented in this section.
1.3.1 ARM Group PDI Report

The ARM PDI Report characterized the soils and groundwater beneath the former Rod and Wire Mill area. Key information and understandings presented in the report included the 3D contours of cadmium and zinc in soil and intermediate groundwater isocontours for cadmium and zinc (See Appendix A, figures 6, 7, 9 and 10). These figures indicate

- The primary source of zinc is the western portion of the northwest pond (just west of the existing transformer pad)\(^1\).
- A secondary zinc source is located further west near the former sludge bin location.
- The former sludge bin location also appears to be the primary cadmium source.

These areas will be the target of the R&W Mill IM Workplan.

An extensive groundwater model of Site conditions was also completed by ARM Group. The following information was developed as part of this model.

- The groundwater modeling completed and presented on Figure 11 of the ARM PDI Report, along with the subsurface characterizations confirms the presence of a higher permeability sand zone within which the relatively higher concentrations of dissolved cadmium and zinc concentrations in groundwater have been identified.

- Figure 12 of the ARM PDI Report depicts the groundwater elevations in this area with the existing pumping system in operation at RW10-PZM020 and RW15-PZM020 (RW-10 and RW-15).

- A seepage velocity of 10 feet per year, or less is anticipated when the pumping system is turned off based on the information presented in the ARM PDI report on Figure 11 (permeability), Figure 17, (hydraulic gradient), and Table 6 (porosity).

\(^1\) Note that a significant portion of the former East Pond is inaccessible due to the new electrical transformer station.
When the pumping system is turned on the combination of a larger hydraulic gradient and the presence of a zone of elevated hydraulic conductivity outside of the source zone (green zone on ARM PDI report Figure 11) will result in higher seepage velocities for groundwater entering the source zone during pumping.

1.3.2 Advanced GeoServices Field Investigation

Advanced GeoServices developed the “Interim Remedial Measures Work Plan, Pre-Design Investigation Supplement, Parcel A-3” (Advanced GeoServices, April 1, 2016) and performed the associated field work. The field work consisted of several test pit excavations, soil sample analysis, groundwater sample analysis, soil-reagent treatability study, and a groundwater pH adjustment titration study. The observations and results of the treatability study in conjunction with updated findings from the ARM PDI Report were used to modify the conceptual site model (CSM) and support the selection of an appropriate Interim Measure to address the identified dissolved zinc and cadmium in the intermediate zone groundwater at the Site.

The goal of the Advanced GeoServices field investigation was to answer the following specific questions:

- What are the background groundwater conditions (up-gradient of source areas)?
- What are the most efficient reagent(s) for neutralizing groundwater?
- What is the acidic potential of the source area(s) that is available to continue to contribute acidity (flux) to the groundwater?
- What are the most efficient reagent(s) for neutralizing soils and/or stabilizing zinc and cadmium within the soils?
- What other metals/constituents are potentially mobilized as a result of pH neutralization?
- What are the physical soil properties that need to be addressed as part of a remedy that involves reagent addition to subsurface soils?
1.3.2.1 **Up-Gradient Groundwater Findings**

The field work to assess the groundwater conditions consisted of the installation of two (2) up-gradient wells to assess the background aquifer conditions. The shallow well is identified as CW-MW-1(S). The intermediate depth well is identified as CW-MW-2(I).

Both wells have acidic pH values of 4.09 (CW-MW-1, shallow) and 4.23 (CW-MW-2, intermediate). The shallow well had a dissolved iron concentration of 49.9 mg/L. The intermediate well had a dissolved iron concentration of 126 mg/L. Cadmium total and dissolved concentrations were non-detect and zinc total and dissolved concentrations less than 100 µg/L. The analytical groundwater data for these wells is presented on Table 1 (as well as “in plume wells” RW-2 and RW-10 and titration study). The acidity is also much less than the wells in the plume. These wells suggest the source of acidity may be up-gradient groundwater. This was further supported by the test pit study performed (see Section 1.4.2.4). Local shallow and intermediate pH conditions are presented on Figures 3 and 4.

1.3.2.2 **In-Plume Well Findings**

Groundwater samples were collected from the intermediate zone well at the RW-2 location (RW-2I) and pumping well RW-10 to represent the down-gradient aquifer conditions. The analytical data gathered from these wells generally corroborates existing data for the aquifer in this area. Notable observations include:

- RW-10 has elevated dissolved cadmium, nickel, and zinc, whereas RW-2I has only elevated zinc. The level of dissolved zinc in RW-10 (447 mg/L) is less than that in RW-2I (653 mg/L); and

- Both RW-10 and RW-2I have high levels of dissolved iron and manganese with the levels in RW-2I (Iron: 690 mg/L; Manganese: 24.9 mg/L) higher than those in RW-10 (Iron: 217 mg/L; Manganese: 18.7 mg/L).
1.3.2.3 **Groundwater Reagent/Titration Study**

Select groundwater samples from RW-2I, RW-10, CW-MW-1(S) and CW-MW-2(S) were delivered to ALS Analytical Laboratory in Middletown, Pennsylvania in unpreserved containers. Three aliquots from each well were then separated and sodium hydroxide was used to raise the pH to 7.5, 9, and 10.5. At each pH point dissolved metals analysis was performed. The data is presented on Table 1. The pH-adjusted samples are indicated as such. For example the aliquot from RW-10 that was adjusted to pH 10.5 is identified as “RW-10 pH 10.5”.

As expected as pH increased the dissolved concentrations of iron, cadmium, and zinc decreased. The decrease was moderate at pH 7.5 and became more effective and pronounced at pH 9 and 10.5.

Jar testing was also performed with up-gradient groundwater mixed with a variety of alkaline reagents. The following observations were made:

- Agricultural Lime remained relatively insoluble and was slow to react. A tablespoon (approximately) of agricultural lime added to a cup of up-gradient groundwater produced an initial pH increase to 5.9. After a few days, the lime addition increased the pH to 7. Over a period of three weeks the pH increased as high as 8.7. No additional increase was observed after several days.

- Enviroblend, a proprietary Magnesium Oxide reagent, was also relatively insoluble, but was quick to react. A teaspoon of Enviroblend added to a cup of up-gradient groundwater produced an initial pH increase to 10.7. Within 24 hours the pH had increased to 11.17.

- Terrabond\textsuperscript{MG}, a proprietary Magnesium Carbonate product, was more soluble and quick to react and raised the pH to between 9.5 and 10 within a few minutes.
The removal of dissolved cadmium and zinc from solution may be by precipitation of hydroxide minerals, carbonate minerals, or adsorption onto iron and manganese hydroxides or a combination of processes. The dissolved iron concentrations are reduced as pH increases in a manner similar to dissolved cadmium and zinc. In-situ reactions may be greater than those observed in bench scale tests due to the longer residence time and adsorption reactions with the soil. The available data indicated no additional contaminants appear to be mobilized at the evaluated pH values in the testing completed.

1.3.2.4 **Source Area Soil Study**

The investigation plan proposed that five (5) test pits would be excavated in and around the three source areas. However, the test pit excavation went much better than expected. A total of 5 test pits were excavated in the accessible portion of the Former East Pond; 2 test pits were excavated near the former Sludge Bin Area, and 2 test pits were excavated near the former Northwest Pond Area (see Figure 2).

In addition to the test pits, four (4) Geoprobe soil borings were performed and soil samples were collected during the up-gradient well installation. The approximate locations of the soil borings are shown on Figure 2 as well.

The general observations of the soils study are:

- Subsurface is a mixture of clay lenses and sand layers (as indicated on ARM PDI Report cross sections Figures 8 and 9).

- Test pit excavation sidewalls were very stable to depths of 20-22 feet bgs.

- Water infiltration was not significant and primarily occurred within the upper 10 feet bgs (perched water zone).
The clay encountered was relatively stiff. Excavated soils when mixed were not highly plastic based on the Atterberg test results.

Depending on location high concentrations of total iron, cadmium, zinc, magnesium, and manganese were observed (as expected).

Zinc and cadmium leaching was observed in SPLP samples collected at intermediate depth in boring locations B2 (20-30 feet bgs) and B3 (15-25 feet bgs).

Arsenic was not detected in any SPLP sample.

Acidity from soils was not as high as expected with measured pH values of 6 to 7.

1.4 UPDATED CONCEPTUAL SITE MODEL

As a result of the findings from the field investigation performed by Advanced GeoServices, the CSM has been updated to reflect the following unexpected positions:

The up-gradient wells had a very low pH (both less than 4.23) and very high iron (greater than 50 mg/L) concentrations.

pH in the shallow groundwater is approximately 4 - 4.2 in the up-gradient well locations and remains approximately 5.52 at RW-006 and 5.1 at SWM-2; both immediately south of the substation. As previously described, the pH of the shallow groundwater increases in wells within the source area and west towards the shoreline (approximately pH 11.5). Figure 3 depicts the pH in and around the IRM treatment area.

pH in the intermediate groundwater is approximately 4 - 4.2 in the up-gradient well locations and remains approximately 4 – 5 in the area immediately west of the substation (RW-063, RW-067, RW-02). It increases to slightly over 6 in the current
pumping well (RW10) and ranges from 5 to 7 approaching the shoreline (TS04, RW20 and RW19 respectively). Figure 4 depicts the pH in and around the IRM treatment area.

- The source of the acidity in the up-gradient groundwater does not appear to be related to previous acid washing or other known operations on the A3 parcel. The up-gradient wells are approximately 1,400 feet east of the past acid washing operations. The specific cause of the low pH is unknown at this time. Due to the low groundwater flow rate and seepage velocity, in conjunction with the distances from up-gradient locations to the IRM work areas, the source of the up-gradient conditions does not have a significant bearing on the proposed remedy within the A3 parcel.

- The test pit soils collected from the source areas and in particular from the east pond are not nearly as acidic as expected.

- Based on the testing completed, the zinc and cadmium in those soils do not appear to be a significant source of the dissolved cadmium, zinc, or the low pH found in the groundwater.

- The clay encountered in the test pits was stiff enough to allow the pits to maintain remain open for several hours until they were backfilled.
2.0 PROPOSED INTERIM MEASURES REMEDIAL APPROACH

2.1 OVERVIEW

2.1.1 Interim Measures Remedial Process

The strategy for addressing the elevated dissolved cadmium and zinc in the intermediate groundwater zone is to precipitate the dissolved metals in-situ by raising the groundwater pH from approximately 4 to approximately 9.5 to 10. This will be accomplished by adding alkaline reagents into the intermediate groundwater zone at select high concentration areas. Excavated soils will be replaced with alkaline charges that will react with acidic groundwater to create slightly alkaline conditions within the aquifer and remove the dissolved cadmium and zinc from solution. The alkaline charges will utilize a combination of fast acting Terrabond\textsuperscript{MG} (40% by weight) in conjunction with limestone aggregate (60% by weight). The reagents will be in trenches in a staggered/offset alignment that is perpendicular to the current groundwater flow under pumping conditions and also under non-pumping conditions. The remainder of this work plan describes the implementation of this interim remedy.

2.1.2 Locations

The staggered/offset treatment trenches will be constructed down-gradient of the 24 mg/l cadmium isopleth and 465 mg/L zinc isopleth as depicted in the ARM PDI Report and as shown in Figures 6A an 6B. The trench constructed down-gradient of the cadmium source will measure approximately 530 feet in length. The trench constructed down-gradient of the zinc source will be approximately 500 feet in length. In addition, since the pending redevelopment of the site will significantly limit future access to certain areas of the site, two additional short trenches will also be installed near the highest concentrations of dissolved cadmium and zinc (trench lengths approximately 175 feet and 240 feet, respectively). The general locations of the two primary trenches and two smaller trenches are shown on Figures 6A and 6B. The final locations of the trenches will be field located and may be altered slightly to accommodate redevelopment considerations.
2.1.3 Additives

The reagent mix will include fast acting and long acting alkaline materials. The fast acting reagent, Terrabond\textsuperscript{MG}, reacts quickly within the aquifer to create alkaline conditions (as well as chemical bonds) which reduce the mobility of the metals in groundwater. The fast acting reagent is being used to help facilitate the near term ability to shutdown the current groundwater extraction system. The long acting reagent, limestone aggregate (#57 stone gradation), reacts much more slowly within the aquifer and is being used to address the long term need due to the up-gradient groundwater’s low pH. The limestone aggregate will provide a structurally stable frame for the Terrabond reagent. The Terrabond\textsuperscript{MG} will account for 40% (by weight) of the reagent mix. The limestone aggregate will make up the remaining 60% of the reagent mix. The allowable tolerance on the reagent blend will be ±10%.

Groundwater modeling within the ARM PDI Report shows that once the groundwater extraction system is shutdown the groundwater seepage velocity in the impacted areas will be significantly reduced and thus greatly increase the residence time of any impacted groundwater.

2.1.4 Phased Pump and Treat Modification/Shutdown

The primary purpose of implementing this new interim remedial measure is to reduce dissolved concentrations of metals in the groundwater and eliminate the potential for future unacceptable discharges to surface water. In addition, this IM will allow for the shutdown and replacement of the ineffective existing groundwater extraction system. However, it is believed that in the immediate time period after the treatment trenches installation, the groundwater extraction system will help to spread the reagents down-gradient due to the higher seepage velocity created by the pumping.

The current schedule for redevelopment will require the re-location of RW-10 since it is within the planned footprint of the new building. The new location of RW-10, renamed RW-10A, is shown on Figure 11A/B. The plan is to operate RW-10A on an interim basis until the post-installation groundwater data shows the results of the alkaline reagents. The operation of RW-
10A is expected to facilitate the spread of the Terrabond\textsuperscript{MG} due to the increased hydraulic gradient caused by the pumping. The expected operational period is 4 to 6 months after the source interim action is installed. RW-15 may also need to be re-located; however, a final decision has not been made. RW-15 will continue to operate after the shutdown of RW-10A until sufficient data has been collected on the performance of the treatment walls.

2.2 TREATMENT DESIGN AND INSTALLATION

2.2.1 Reagent Mix Optimization Testing

Initially, jar testing was performed using alkaline reagents and materials to evaluate the effects when mixed with Site soils and groundwater. The results of the soil jar testing are summarized on Table 2. The soil jar testing confirmed that Lime products can have an impact on pH, but have a slow reaction time; and that Enviroblend and Terrabond have a more pronounced and rapid effect on raising the pH. Table 3 presents a summary of the jar testing performed on Site groundwater which had similar results to the soil jar testing.

In order to better evaluate the long term effectiveness of alkaline reagents, a modified multiple extraction SPLP test (SW846 Method 1312) was performed using four(4) different mix ratios:

- Batch A - 5\% Terrabond\textsuperscript{MG}/98\% Agricultural Lime,
- Batch B - 30\% Terrabond\textsuperscript{MG}/70\% Agricultural Lime,
- Batch C - 10\% Enviroblend\textsuperscript{CS}/90\% sand, and
- Batch D - 20\% Enviroblend\textsuperscript{CS}/80\% sand.

Site in-plume groundwater from RW-10 was used instead of synthetic rain water as the leaching water. The testing objective was to evaluate the long term capacity of the reagent mixes to neutralize the low pH groundwater, precipitate the dissolved cadmium and zinc, and assess whether any increases in other metals occurs due to the change in pH. The leachate from each SPLP test is being analyzed for pH, Alkalinity, Acidity, and dissolved TAL metals. The
groundwater that was used as the extraction fluid had initial dissolved concentrations of 11 mg/L for cadmium and 710 mg/L for zinc.

The testing demonstrated that the reagent mixtures based on 5% Terrabond\textsuperscript{MG} and 10% Enviroblend\textsuperscript{CS} did not produce satisfactory treatment results. Zinc reduction for these blends was less than 65% on the initial extraction. Subsequent extractions resulted in decreased effectiveness, as expected.

Testing demonstrated that the reagent mixtures based on 30% Terrabond and 20% Enviroblend were able to produce satisfactory results. Both reagent blends produced greater than 99% reduction for dissolved cadmium (0.014 mg/L and 0.024 mg/L respectively) and zinc (1 mg/L and 0.72 mg/L respectively) during the first extraction cycle. The 30% Terrabond produced a reduction in both dissolved cadmium and zinc of approximately 96% on the second extraction cycle; 20% Enviroblend produced a reduction in both dissolved cadmium and zinc of approximately 99% on the second extraction cycle. On the third extraction cycle, the 30% Terrabond achieved a reduction for dissolved cadmium of 85% and a reduction for dissolved zinc of 60%; a reagent mixture with 20% Enviroblend reduced the dissolved concentrations of cadmium by 31% and dissolved zinc by 92%. A summary of the reagent treatability study is provided on Table 4.

Terrabond was able to cost effectively meet the project criteria and has been selected for the reagent blend on the following basis:

- Similar performance at reducing concentrations of dissolved cadmium and zinc through the first two extraction cycles.
- Better performance at reducing dissolved cadmium concentration on the third extraction cycle.

2.2.2 Treatment Installation

The location of the primary treatment trenches were selected based on the ARM Group PDI Report which showed the highest zinc intermediate groundwater concentrations at RW-067-PZ and RW-
57-PZ and highest total cadmium intermediate groundwater concentration at RW-057-PZ. These locations also correlate to the highest soil concentrations and the location of the Former East Pond and Former Sludge Bin Storage areas.

Four additional shorter (approximately 80 - 160 feet long) treatment trenches will be installed. Two of the walls will be up-gradient of the primary zinc wall and within the 635 mg/L isopleth. The second set of two short treatment trenches will be between the primary zinc and primary cadmium treatment trenches and within the zinc 550 mg/L isopleth. Locations of the trenches are shown on Figures 6A and 6B. The final locations of the trenches will be field located and may be altered slightly to accommodate redevelopment considerations.

The treatment trenches are initially intended to be approximately 35 feet deep and 3 feet wide. Actual dimensions may be modified as field conditions and field equipment dictate to facilitate installation of the reagent materials. An excavator will be used to install the treatment trenches. The primary zinc trench will be 500 feet long, the primary cadmium trench will be 530 feet long and the four shorter trenches will each be 80 - 160 feet long. The side walls of the test pits stayed open up to 22 feet for a short period of time before the influx of perched groundwater started to occur. The proposed approach takes advantage of these understandings to minimize the need for benching.

The trench installations will not produce a continuous “wall”. The trench installations will be performed in lengths of 50-100 feet. The lengths of excavation that make up a trench will be offset in two staggered rows approximately 10 - 15 feet apart (edge to edge). Each section will be excavated and the lower 20 feet (15 to 35 foot depth interval) will be backfilled with the final reagent mix. The remaining trench will be backfilled up to the last 2 feet with soil spoils from the trench (pending TCLP results, see Section 2.2.3) before the next section is started. Two feet of clean fill will be placed at the end of the day in the remaining portion of the trench to help avoid subsurface materials getting mixed into the clean fill. In locations that will not be paved a geotextile marker will be placed between the trench spoils backfill and the 2 foot thick clean soils layer.
The non-reagent backfill will be placed in controlled area and managed based on the available analytical results. See Figure 7 and 8 for a cross-section of the treatment trench. The locations and alignment of the treatment trenches will be accurately surveyed. The depth of the treatment trenches will be measured using field methods (markings on excavator boom, etc.) to determine the approximate depth of excavation since personnel will be prohibited from entering the excavation or approaching the excavation sidewall.

In the event subsurface obstructions are encountered that cannot be easily removed, the trench will be offset laterally to avoid the obstruction. The remaining wall will continue along this new alignment and parallel to the initial trench layout.

In the event the treatment trenches will not stay open at the target depths, the reagent mix will be mixed into the native soils using the excavator bucket to the extent possible. In these instances the Terrabond reagent will be added to the native soils at a ratio of approximately 1:1 (50% by weight). The limestone aggregate will not be used for mixing with collapsed soils. The trench will subsequently be backfilled according to the original design (see Figure 7).

2.2.3 Materials Management

A materials management area will be setup north of the primary cadmium treatment trench. This area will be used to stockpile and mix the reagents. Prior to the start of excavation a soil characterization study will be performed along the proposed trench alignment. Geoprobe borings will be performed at approximately 100 foot intervals along the alignment of the treatment trenches. Each boring will be performed for the zero to 15 foot depth interval. The entire interval will be used to create a composite sample to represent that portion of the treatment trench. The composite sample will be analyzed for TCLP metals to determine if the soils in the zero to 15 foot depth interval may be used as backfill within the treatment trench excavations.
Soils from locations that have hazardous TCLP results will not be used as backfill and will be managed as a hazardous material. Sampling based on a 15 foot depth and 100 foot spacing along the treatment trench will result in one sample per 166 CY of material to be excavated. Each sample will represent the soil from that sample location to a distance half-way to the next sample location. Soils from the zero to 15 foot depth interval that are not hazardous will be used as backfill above the reagent blend in the 2 foot to 15 foot depth interval. Soils excavated from deeper than 15 feet will be managed as waste and tested for appropriate parameters to allow disposal at the Gray’s landfill onsite.

Soils/spoils that are determined to be hazardous based on the pre-excavation sampling (or post-excavation sampling) will be segregated for disposal at an appropriately permitted disposal facility. Onsite stabilization of hazardous soils/materials to render them non-hazardous will not occur without the approval of MDE. If onsite stabilization is proposed details on the treatment process will be provided to MDE for review and approval.

Soils that are removed from beneath the water table may be saturated. These soils will be allowed to dewater naturally by being placed in stockpiles that allow the water to drain out of the stockpiles. If substantial quantities of pore water are encountered, this water will be collected and transported to the on-site wastewater treatment plant for treatment. If solidification is required to satisfy transportation and disposal requirements it will be performed in accordance with a plan that is approved by MDE. Figures 9 and 10 show the preliminary layout of the Materials Management Area and general construction layout, respectfully. The final layout may be modified by the Contractor.

2.2.4 Dust Control

The individual stockpiles within the Materials Management area will remain covered whenever they are not being used to minimize dust and prevent them from becoming wet. A weighted cover system shall be used to keep the covers in place. Given the silty gradation of the Terrabond MG, only the working face of the stockpile will be uncovered to access the material. Each stockpile will be covered at the end of each day.
2.2.5 Water Management

A 20,000 Frac tank and associated pumps and hoses will be setup next to the Materials Management Area on-site prior to the start of the treatment trench installation as a contingency measure.

2.2.6 Erosion and Sediment Control

Erosion and sediment controls will be established in accordance with the overall redevelopment plan for Parcel A3 by the Owner.

2.3 HEALTH AND SAFETY

The existing Health and Safety Plan (HASP) for the Sparrows Point site will be followed by the prime remediation contractor. Appendix B includes copies of the Material Safety Data Sheets (MSDS) for the two planned reagents. If other reagents/suppliers are used the SDS sheets will be updated. The remediation contractor will develop, as necessary, addendums to the existing site HASP.

2.4 GROUNDWATER MONITORING

As a result of the proposed development and future usage of the property, as well as the locations of the alkaline charges, the existing groundwater monitoring well network must be modified. Figure 11A depicts the proposed modifications to the shallow groundwater monitoring well network. Seven (7) shallow wells must be abandoned because they are inside of or extremely close to the proposed building footprint. An additional three (3) shallow wells will be abandoned due to their location relative to a proposed stormwater basin located along Riverside Drive. Six (6) new shallow wells will be installed north of the proposed building footprint and four (4) new shallow wells will be installed west of the proposed stormwater basin along Riverside Drive.
Figure 11B depicts the proposed modifications to the intermediate groundwater monitoring well network. Five (5) intermediate wells must be abandoned because they are inside of the proposed building footprint. An additional five (5) intermediate wells will be abandoned due to their location relative to a proposed stormwater basin located along Riverside Drive. Six (6) new intermediate wells will be installed north of the proposed building footprint and four (4) new intermediate wells will be installed west of the proposed stormwater basin along Riverside Drive. In addition, RW-10 will be relocated (replacement well ID RW-10A). Table 5 presents a summary of the proposed modifications to the groundwater monitoring network.

The groundwater monitoring program to evaluate the performance of the treatment trenches and subsequent shutdown of the extraction wells will utilize intermediate zone wells summarized in Table 6. The locations of the existing and new wells relative to the treatment trenches are shown on Figures 11A and 11B. The final locations of the new wells will be field located and may be altered slightly to accommodate redevelopment considerations. The new wells will be 2-inch diameter PVC wells with 2 inch Schedule 40 slotted screens with a sand pack and 2.8 inch diameter, 5 foot long stainless steel mesh screen on the outside of the sand (i.e., GeoProbe Slim Prepack). The wells will be installed using a GeoProbe drill rig to minimize the generation of soil cuttings.

2.4.1 Interim Treatment Goals

The interim groundwater treatment goals are to increase the pH above 7 to affect a > 90% reduction in dissolved concentrations of cadmium and zinc within the source areas as compared to existing conditions. The existing conditions will be established based on Interim Measure monitoring results and Pre-Design Investigation data collected in the 2 quarters prior to the implementation of the treatment trenches.

If monitoring demonstrates a decrease in cadmium and zinc concentrations over two consecutive quarters, EAG will request permission to shut off the RW-10A pumping well.
2.4.2 Long Term Treatment Goals

Ultimately the treatment goal will be to demonstrate that the concentration of groundwater discharges of the primary contaminants (cadmium and zinc) at the shoreline/property boundary are acceptable when compared to the *Maryland Department of the Environment Ambient Water Quality Criteria, Toxic Substances Criteria for Ambient Surface Waters – Inorganic Substances, Aquatic Life Saltwater Chronic Exposure Limits (COMAR 26.08.02.03-2).*

- Cadmium: 8.8 ug/L
- Zinc: 81 ug/L

It is also anticipated that as part of a final corrective measures process a surface water mixing zone will be established with more specific treatment goals that will be defined at that time and that those goals will be evaluated in the longer term as part of a Monitoring Natural Attenuation remedy.
3.0 REPORTING

A Construction Completion Report (CCR) will be submitted to the US EPA and Maryland Department of the Environment approximately 45 days after the completion of the installation work. The CCR will provide the following information:

- Summary of overall work performed;
- As-built vertical and horizontal alignments of the treatment walls;
- Summary of reagents volumes/tonnage used;
- Locations of new wells and associated well construction logs;
- Summary of soil spoils managed and final disposal;
- Summary of water managed and final disposal; and
- Description of Significant Problems Encountered and Resolutions.

A groundwater monitoring report will be provided approximately 6 months after the installation of the treatment trenches and new wells. The groundwater monitoring report will provide the following:

- Performance monitoring data and evaluation; and
- Conclusions and Recommendations.

Subsequent semi-annual reports will be submitted as appropriate to document the performance of the interim measure.
4.0 SCHEDULE

Below is a tentative schedule for the implementation of this work plan:

- Reagent Mix Optimization Testing: Complete
- Work Plan, Permitting, Submittals, MDE Approval: August 19, 2016
- Pre-Excavation Soil TCLP Characterization: August 22 – 23, 2016
- Mobilization and Site Preparation: Week of September 5, 2016
- Treatment Trench Install: September 12 – October 14
- New MW and RW-10A Installation including abandonment of existing wells: Complete by October 21
  - Short-Term Groundwater Monitoring – November 2016 through February 2017 (See Table 6)
- Groundwater Monitoring Report: March 2017
- RW-10A Tentative Shutdown: April 2017 (pending 2 consecutive months of observed Cd/Zn decreases)
- RW-15 Continued Operation: TBD
5.0 CONTINGENCY

Provisions are in place to support implementation of additional groundwater treatment at the Rod and Wire Mill Area if necessary to support the final closure process required for the ACO, SE and associated Multimedia Consent Decree. Following the completion of in-situ R&W Mill IM Work, groundwater conditions will continue to be evaluated to determine if an additional down-gradient treatment is needed to achieve cleanup objectives. In anticipation of this contingency, and in coordination with the property redevelopment, an area parallel to Riverside Road (see Figure 12) has been designated. This designated area will not be impacted by the development of the site.

The injection of alkaline reagents such as sodium hydroxide at locations up-gradient from the alignment of the alkaline charges is also a contingency that will be evaluated following installation of the alkaline charges. This contingency could be implemented to relieve some of the solids loading on the alkaline charge media as dissolved metals precipitate out of the groundwater. The location of these injection points is not identified at this time.
TABLES
# TABLE 1
PDI SUPPLEMENT GROUNDWATER DATA AND TITRATION STUDY  
Former Rod and Wire Mill Pilot Scale Work Plan  
Sparrows Point, Maryland

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| **Dissolved Metals** |       |       |     |     |       |     |     |       |     |     |             |     |     |
| Aluminum, Dissolved | mg/L  | U     | 5   | U   | 10   | U   | 10  | U     | 0.1 |
| Antimony, Dissolved | mg/L  | U     | 1   | U   | 2    | U   | 2   | U     | 0.02|
| Arsenic, Dissolved  | mg/L  | U     | 0.4 | U   | 0.8  | U   | 0.8 | U     | 0.008|
| Barium, Dissolved   | mg/L  | U     | 0.5 | U   | 1    | U   | 1   | 0.037 | 0.01|
| Beryllium, Dissolved| mg/L  | U     | 0.2 | U   | 0.4  | U   | 0.4 | U     | 0.004|
| Cadmium, Dissolved  | mg/L  | 10    | 0.1 | U   | 0.2  | U   | 0.2 | U     | 0.002|
| Calcium, Dissolved  | mg/L  | 201   | 5   | 255 | 10   | 260 | 10  | 10.5  | 0.1 |
| Chromium, Dissolved | mg/L  | U     | 0.25| U   | 0.5  | U   | 0.5 | U     | 0.005|
| Cobalt, Dissolved   | mg/L  | U     | 0.25| U   | 0.5  | U   | 0.5 | U     | 0.005|
| Copper, Dissolved   | mg/L  | U     | 0.5 | U   | 1    | U   | 1   | U     | 0.01|
| Iron, Dissolved     | mg/L  | 217   | 3   | 690 | 6    | 716 | 6   | 49.9  | 0.06|
| Lead, Dissolved     | mg/L  | U     | 0.3 | U   | 0.6  | U   | 0.6 | U     | 0.006|
| Magnesium, Dissolved| mg/L  | 103   | 5   | 162 | 10   | 168 | 10  | 3.7   | 0.1 |
| Manganese, Dissolved| mg/L  | 18.7  | 0.25| 24.9| 0.5  | 25.8| 0.5 | 0.4   | 0.005|
| Mercury, Dissolved  | mg/L  | U     | 0.0005| U   | 0.0005| U   | 0.0005| U     | 0.0005|
| Nickel, Dissolved   | mg/L  | 1.2   | 1    | U   | 2    | U   | 2   | U     | 0.02|
| Potassium, Dissolved| mg/L  | U     | 25   | U   | 50   | U   | 50  | 0.99  | 0.5 |
| Selenium, Dissolved | mg/L  | U     | 1   | U   | 2    | U   | 2   | U     | 0.02|
| Silver, Dissolved   | mg/L  | U     | 0.2 | U   | 0.4  | U   | 0.4 | U     | 0.004|
| Sodium, Dissolved   | mg/L  | 249   | 25   | 79.1| 50   | 79.8| 50  | 12.3  | 0.5 |
| Thallium, Dissolved | mg/L  | U     | 1    | U   | 2    | U   | 2   | U     | 0.02|
| Vanadium, Dissolved | mg/L  | U     | 0.25| U   | 0.5  | U   | 0.5 | U     | 0.005|
| Zinc, Dissolved     | mg/L  | 447   | 1   | 653 | 2    | 679 | 2   | 0.069 | 0.02|

<p>| <strong>Conventional</strong>    |       |       |     |     |       |     |     |       |     |     |
| Acidity, Total      | mg/L  | 1170  | 25  | 2900| 125  | NA  | 130 | 25    |     |
| Alkalinity, Total   | mg/L  | 5     | 5   | U   | 5    | NA  | 86  | 5     |     |
| Chloride            | mg/L  | 413   | 5   | 32.4| 5    | 33.3| 5   | 22.5  | 5    |
| Nitrate/Nitrite-N   | mg/L  | U     | 0.5 | U   | 0.5  | U   | 0.5 | U     | 0.5 |
| Phosphorus, Total   | mg/L  | 0.11  | 0.1 | 0.27| 0.1  | 0.19| 0.1 | 1.1   | 0.1 |
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### TABLE 1
PDI SUPPLEMENT GROUNDWATER DATA AND TITRATION STUDY
Former Rod and Wire Mill Pilot Scale Work Plan
Sparrows Point, Maryland

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<td>U 0.005</td>
<td>U 0.05</td>
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<td>U 0.2</td>
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# TABLE 2
PDI SUPPLEMENT SOIL REAGENT JAR TESTING
Former Rod and Wire Mill, Pilot Scale Work Plan
Sparrows Point, Maryland

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<td>5.09</td>
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<td></td>
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<td>13-May</td>
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<td></td>
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<td>16-May</td>
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<td>6-Jun</td>
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### TABLE 3
PDI SUPPLEMENT GROUNDWATER REAGENT JAR TEST
Former Rod and Wire Mill Pilot Scale Work Plan
Sparrows Point, Maryland

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<td>7.8</td>
<td>13-May</td>
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<td>6-Jun</td>
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<td>11.17</td>
<td>13-May</td>
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<td></td>
<td>9.2 *</td>
<td>6-Jun</td>
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* Possible calibration error on pH probe.
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<th>Reduction</th>
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<th>Reduction</th>
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<td>90.00%</td>
<td>4</td>
<td>63.64%</td>
<td>5.9</td>
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<td>398</td>
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<td>ND</td>
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<td>NA</td>
<td>ND</td>
<td>NA</td>
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<td>ND</td>
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<th>Reduction</th>
<th>Terra 20% (Rot 3)</th>
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<td>ND</td>
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<td>32.92%</td>
<td>22.7</td>
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<th>Reduction</th>
<th>EB 10% (Rot 2)</th>
<th>Reduction</th>
<th>EB 10% (Rot 3)</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>s.u.</td>
<td>Groundwater</td>
<td>7.04</td>
<td>6.97</td>
<td>NA</td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Cadmium, dis</td>
<td>mg/L</td>
<td>11</td>
<td>6.7</td>
<td>39.09%</td>
<td>10.1</td>
<td>8.18%</td>
<td>12</td>
<td>-9.09%</td>
</tr>
<tr>
<td>Zinc, dis</td>
<td>mg/L</td>
<td>710</td>
<td>261</td>
<td>63.24%</td>
<td>533</td>
<td>NA</td>
<td>720</td>
<td>-1.41%</td>
</tr>
<tr>
<td>Arsenic, dis</td>
<td>mg/L</td>
<td>ND</td>
<td>ND</td>
<td>NA</td>
<td>ND</td>
<td>NA</td>
<td>0.023</td>
<td>NA</td>
</tr>
<tr>
<td>Iron, dis</td>
<td>mg/L</td>
<td>140</td>
<td>100.00%</td>
<td>ND</td>
<td>100.00%</td>
<td>ND</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>Magnesium, dis</td>
<td>mg/L</td>
<td>96</td>
<td>184</td>
<td>-91.67%</td>
<td>158</td>
<td>-64.58%</td>
<td>155</td>
<td>-61.46%</td>
</tr>
<tr>
<td>Manganese, dis</td>
<td>mg/L</td>
<td>24</td>
<td>13.4</td>
<td>44.17%</td>
<td>19.1</td>
<td>20%</td>
<td>20.1</td>
<td>16.25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th>Units</th>
<th>Groundwater</th>
<th>EB 20% (Rot 1)</th>
<th>Reduction</th>
<th>EB 20% (Rot 2)</th>
<th>Reduction</th>
<th>EB 20% (Rot 3)</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>s.u.</td>
<td>Groundwater</td>
<td>9.23</td>
<td>9.1</td>
<td>NA</td>
<td></td>
<td>7.44</td>
<td></td>
</tr>
<tr>
<td>Cadmium, dis</td>
<td>mg/L</td>
<td>11</td>
<td>0.024</td>
<td>99.78%</td>
<td>0.051</td>
<td>99.54%</td>
<td>7.6</td>
<td>30.91%</td>
</tr>
<tr>
<td>Zinc, dis</td>
<td>mg/L</td>
<td>710</td>
<td>0.72</td>
<td>99.90%</td>
<td>0.29</td>
<td>99.96%</td>
<td>56.5</td>
<td>92.04%</td>
</tr>
<tr>
<td>Arsenic, dis</td>
<td>mg/L</td>
<td>ND</td>
<td>ND</td>
<td>NA</td>
<td>ND</td>
<td>NA</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>Iron, dis</td>
<td>mg/L</td>
<td>140</td>
<td>100.00%</td>
<td>ND</td>
<td>100.00%</td>
<td>ND</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>Magnesium, dis</td>
<td>mg/L</td>
<td>96</td>
<td>255</td>
<td>-165.63%</td>
<td>373</td>
<td>-288.54%</td>
<td>302</td>
<td>-214.58%</td>
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<tr>
<td>Manganese, dis</td>
<td>mg/L</td>
<td>24</td>
<td>0.044</td>
<td>99.82%</td>
<td>0.84</td>
<td>97%</td>
<td>24.7</td>
<td>-2.92%</td>
</tr>
</tbody>
</table>
## TABLE 5
MONITORING WELL NETWORK MODIFICATIONS
Former Rod and Wire Mill Area
Sparrows Point Terminal, Sparrows Point, Maryland
2016-3421

<table>
<thead>
<tr>
<th></th>
<th>Existing Monitoring Well to Remain</th>
<th>Existing Monitoring Well to be Abandoned and Replaced</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shallow Zone</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RW02-PZM000</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW03-PZM003</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW04-PZM003</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW05-PZP001</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW06-PZM001</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW07-PZM004</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW08-PZM003</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW09-PZM004</td>
<td>X</td>
<td></td>
</tr>
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<td>RW10-PZM004</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW11-PZM004</td>
<td>X</td>
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</tr>
<tr>
<td>RW12-PZM004</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW19-PZP000</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW20-PZP000</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW22</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW23</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW24</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TS04-PDM004</td>
<td>X</td>
<td></td>
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<tr>
<td>TS04-PPM007</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Intermediate Zone</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RW01-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW02-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW07-PZM017</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW10-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW13-PZM020</td>
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<tr>
<td>RW14-PZM020</td>
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<td>RW15-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW16-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW17-PZM019</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW19-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW20-PZM020</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW21-PZM023</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW22</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW23</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>RW24</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TS04-PZM023</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
# TABLE 6
ENHANCED GROUNDWATER MONITORING PROGRAM
Former Rod and Wire Mill Area
Sparrows Point Terminal, Sparrows Point, Maryland
2016-3421

<table>
<thead>
<tr>
<th>GROUNDWATER WELL</th>
<th>FREQUENCY</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Wells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RW-O2-PZM020</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>RW-01-PZM020</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>RW-07-PZ017</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>RW-14-PZ020</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>RW-15-PZM020</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>RW-19-PZM020</td>
<td>Quarterly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>TS04-PZM023</td>
<td>Quarterly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>Re-Located Wells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RW-10A</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
<tr>
<td>New Wells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A thru P</td>
<td>Monthly</td>
<td>pH, Zn, Cd</td>
</tr>
</tbody>
</table>

Notes:
1. Sampling frequency to be integrated into current site-wide monitoring program.
2. All new/replacement wells to be sampled at least once prior to a shutdown of the pump and treat system (unless otherwise approved by MDE and/or USEPA).
3. Sampling frequency to be re-evaluated after one year.
FIGURES
Proposed Investigation Plan

PII Supplemental Data Collection
Parcel A-3, Former Rod and Wire Mill Area
Figure 5

PDI Supplemental Data Collection Sampling Locations

1 inch = 200 feet

Legend
- Upgradient Monitoring Well
- Approximate Soil Boring Location
- Approximate Test Pit Location
- Former East Pond
- Former Sludge Bin Storage Area
- Former Northwest Pond

Source: EnviroAnalytics, Inc.

Parcel A-3
Former Rod and Wire Mill Area

Former Sludge Bin Storage Area

Former Northwest Pond

Former East Pond

SWMU 27 (REC 6A)
Former Sludge Bin Storage Area

SWMU 28 (REC 6B)
Former Northwest Pond

SWMU 29 (REC 6C)
Former East Pond

0 200 400 Feet
Parcel A-3
Former Rod and Wire Mill Area

Treatment Trench Layout - Zinc

Zn Concentration Intermediate GW Concentration (µg/L)

- 0 - 155,000
- 155,000 - 265,000
- 265,000 - 370,000
- 370,000 - 465,000
- 465,000 - 550,000
- 550,000 - 635,000
- 635,000 - 785,000

Source: ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
SITE
Long Term Lease from Norfolk Southern Railroad
Former Rod and Wire Mill Area
Sparrows Point Terminal
Sparrows Point, Maryland

Treatment Trench Cross-Section

Legend
- On-Site Clean Fill
- Backfill Spoils
- Alkaline Charge

FIGURE 7
Project No.: 2016-3421
Figure 8
Treatment Trench Verse Stratigraphy

Cross Section A-A'

EnviroAnalytics Group
ARM Project 150298M
March 2016

Legend
- Gravel/Slag
- Sand
- Clay

Note: amsl = above mean sea level
Cross-section is vertically exaggerated approximately 14:1
Former Rod and Wire Mill Area
Sparrows Point Terminal
Sparrows Point, Maryland

Materials Management Area Preliminary Layout

FIGURE 9

Agricultural Lime Storage
Reagent Mixing Area
TerraBond Storage
Spoils Staging
Spoils Staging
Spoils Staging

100’
50’
50’
50’
50’
50’
Figure 10

Parcel A-3
Former Rod and Wire Mill Area
Construction Area Layout

Legend
- Former East Pond
- Former Northwest Pond
- Former Sludge Bin Storage Area
- Proposed Treatment Trench Location
- Proposed Treatment Trench Contingency Location
- Proposed Building Footprint
- Construction Support Areas
- Proposed Paved Area

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Parcel A-3
Former Rod and Wire Mill Area
Enhanced GW Monitoring Network
Proposed MW Shallow Zone

Legend
- Proposed New Monitoring Well Shallow Zone
- Proposed Abandoned Monitoring Well Shallow Zone
- Monitoring Well Shallow Zone
- Proposed Treatment Trench Contingency Location

Former East Pond
Former Northwest Pond
Former Sludge Bin Storage Area
Proposed Treatment Trench Location
Proposed Building Footprint
Proposed Paved Area
Proposed MW locations may change slightly based on final site development layout

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Figure 11B

Parcel A-3
Former Rod and Wire Mill Area
Enhanced GW Monitoring Network
Proposed MW Intermediate Zone

Proposed MW locations may change slightly based on final site development layout.
Parcel A-3
Former Rod and Wire Mill Area
Contingency Treatment Trench Location

Legend:
- Former East Pond
- Former Northwest Pond
- Former Sludge Bin Storage Area
- Proposed Treatment Trench Contingency Location
- Proposed Building Footprint
- Proposed Paved Area

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
APPENDICES
APPENDIX A
Concentration Table (mg/kg)

0 - 370 (GW Protection)
>370 - 8,000
>8,000 - 11,800
>11,800 - 20,400
>20,400 - 34,000
>34,000 - 48,000
>48,000 - 63,000
>63,000 - 80,000
>80,000 - 118,000

Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours (mg/kg)
Pre-Design Investigation (All Depths)
March 15, 2016

Tradepoint Atlantic
Baltimore County, MD

EnviroAnalytics Group
ARM Project 150298M

Phase II - Soil Boring
Remedial Design Boring
Parcel A3 (Rod & Wire Mill)
Cross Section Map View
April 4, 2016

Figure 8

EnviroAnalytics Group
Sparrows Point Terminal
ARM Project 150298M
Baltimore County, MD
Parcel A3 (Rod & Wire Mill) - Cadmium Concentration in Intermediate Groundwater

April 5, 2016

EnviroAnalytics Group
Baltimore County, MD

tradepoint atlantic

Cadmium Concentration (ug/L)

- ND - 7,000
- >7,000 - 12,000
- >12,000 - 18,000
- >18,000 - 24,000
- >24,000 - 30,000
- >30,000 - 37,000
- >37,000 - 45,000

Figure 9

Piezometer
Existing Site-wide Well
Parcel A3 (RWM) boundary
Parcel A3 (Rod & Wire Mill) - Zinc Concentration in Intermediate Groundwater

April 5, 2016

Figure 10

EnviroAnalytics Group
Tradepoint Atlantic

ARM Project 150298M
Baltimore County, MD

Parcel A3

Zinc Concentration (ug/L)

- 0 - 155,000
- >155,000 - 265,000
- >265,000 - 370,000
- >370,000 - 465,000
- >465,000 - 550,000
- >550,000 - 635,000
- >635,000 - 785,000
Numerical Groundwater Model
RW10 and RW15 ON
Calibrated Results
Groundwater Elevation Contours
Posted Measured and Calibrated Water Elevations

Map Legend
- Modeled groundwater elevation
- Measured groundwater elevation

Monitoring Well
with posted modeled and measured
groundwater elevations*

Groundwater Flow Vector
Flow direction indicated by arrow orientation
Flow magnitude indicated by arrow length

*All modeled groundwater elevations were
within 0.25 feet of the measured values.

Modeled Groundwater Elevation Contours
RW10 and RW15 Pumps ON
(units = feet above sea level)
Numerical Groundwater Model
RW10 and RW15 OFF
Modeled Groundwater Elevation Contours

Map Legend

- Monitoring Well Location
- Groundwater Flow Vector
  Flow direction indicated by arrow orientation
  Flow magnitude indicated by arrow length

Patapsco River

Contour interval = 0.010 feet

Modeled Groundwater Elevation Contours
RW10 and RW15 Pumps OFF
(units = feet above sea level)
Parcel A3 (Rod & Wire Mill)
Cross Section
Tradepoint Atlantic
Baltimore County, MD

Cross Section A-A'

EnviroAnalytics Group
ARM Project 150298M
March 2016

LEGEND
- Gravel/Slag
- Sand
- Clay

Note: amsl = above mean sea level
Cross-section is vertically exaggerated approximately 14:1
Parcel A3 (Rod & Wire Mill)
Cross Section
Tradepoint Atlantic
Baltimore County, MD

Cross Section B-B'

EnviroAnalytics Group
ARM Project 150298M
March 2016

LEGEND
Gravel/Slag
Sand
Clay

Note: amsl = above mean sea level
Cross-section is vertically exaggerated approximately 11:1
Cross Section C-C'

EnviroAnalytics Group
ARM Project 150298M
March 2016

Legend

Gravel/Slag
Sand
Clay

North
South

Horizontal Distance (ft)

Elevation (ft amsl)

Parcel A3 (Rod & Wire Mill)
Cross Section
Tradepoint Atlantic
Baltimore County, MD

amsl = above mean sea level
Cross-section is vertically exaggerated
SAFETY DATASHEET
Texas

1. Identification
Product identifier
Limestone

Other means of identification
Aggregate, Crushed Stone, Manufactured Sand, Agricultural Lime

Synonyms

Recommended use
Limestone is used in the manufacture of bricks, mortar, cement, concrete, plasters, paving materials, other construction materials, steel, consumer products, and other goods. Limestone aggregate may be distributed in bags, totes, and bulk shipments.

Recommended restrictions
None known.

Manufacturer/Importer/Supplier/Distributor information
Company
Bluegrass Materials Company, LLC
Address
200 W Forsyth Street, Jacksonville, FL 32202
Telephone
Corporate office: 904 (701) 6500
Website
http://bluegrassmaterials.com/
Contact person / E-mail /
Maryland: Gustaf Buttar, MSP, gbuttar@bluegrassmaterials.com, (443) 802 2769
Georgia: Brian McNamara, CMSP, bmnamara@bluegrassmaterials.com, (678) 618-2733
Kentucky: Eric Loggins, CMSP, eloggins@bluegrassmaterials.com, (270) 535-9762

2. Hazard(s) identification
Physical hazards
Not classified.

Health Hazards
Carcinogenicity
Category 1A
Specific Target Organ Toxicity,
Category 2
Repeated Exposure

OSHA defined hazards
Not classified.

Label elements

Signal word
Danger

Hazard statement
May cause cancer. May cause damage to organs (lung) through prolonged or repeated exposure.

Precautionary statement
Prevention
Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection.

Response
If exposed or concerned: Get medical advice/attention.

Storage
Restrict or control access to stockpile areas. Engulfment hazard: To prevent burial or suffocation, do not enter a confined space, such as a silo, bulk truck or other storage container or vessel that stores or contains aggregates without an effective procedure for assuring safety.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC)
None known.

Supplemental information
Respirable Crystalline Silica (RCS) may cause cancer. Limestone is a naturally occurring mineral complex that contains varying quantities of quartz (crystalline silica). In its natural bulk state, limestone is not a known health hazard. Limestone may be subjected to various natural or mechanical forces that produce small particles (dust) which may contain respirable crystalline silica (particles less than 10 micrometers in aerodynamic diameter). Repeated inhalation of respirable crystalline silica (quartz) may cause lung cancer according to IARC and NTP: ACGIH states that it is a suspected cause of cancer. Other forms of RCS (e.g., tridymite and cristobalite) may also be present or formed under certain industrial processes.

3. Composition/information on ingredients
Mixtures

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium Carbonate</td>
<td>1317-65-3</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>Crystalline Silica (Quartz)</td>
<td>14808-60-7</td>
<td>&gt; 0.1</td>
</tr>
</tbody>
</table>
4. First-aid measures

**Inhalation**
Limestone dust: Move to fresh air. Call a physician if symptoms develop or persist.

**Skin contact**
Limestone dust: Wash off with soap and water. Get medical attention if irritation develops and persists.

**Eye contact**
Limestone dust: Immediately flush with plenty of water for at least 15 minutes. Hold eyelids apart. Occasionally lift the eyelid(s) to ensure thorough rinsing. Beyond flushing, do not attempt to remove material from the eye(s). Get medical attention if irritation develops or persists.

**Ingestion**
Limestone dust: Rinse mouth and drink plenty of water. Never give anything by mouth to an unconscious person. Get medical attention.

**Most important symptoms/effects, acute and delayed**
Inhaling dust may cause discomfort in the chest, shortness of breath, and coughing. Prolonged inhalation may cause chronic health effects. This product contains crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica liberated from this product can cause silicosis, and may cause cancer.

**Indication of immediate medical attention and special treatment needed**
Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

**General information**
Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Pre-existing medical conditions that may be aggravated by exposure include disorders of the eye, skin and lung (including asthma and other breathing disorders). If addicted to tobacco, smoking will impair the ability of the lungs to clear themselves of dust.

5. Fire-fighting measures

**Suitable extinguishing media**
Limestone is not flammable. Use fire-extinguishing media appropriate for surrounding materials.

**Unsuitable extinguishing media**
None known.

**Specific hazards arising from the chemical**
No unusual fire or explosion hazards noted. Not a combustible dust.

**Special protective equipment and precautions for firefighters**
Use protective equipment appropriate for surrounding materials.

**Specific methods**
Contact with powerful oxidizing agents may cause fire and/or explosions (see section 10 of SDS).

**General fire hazards**
No unusual fire or explosion hazards noted.

6. Accidental release measures

**Personal precautions, and emergency procedures**
Spilled material, where dust is generated, may overexpose cleanup personnel to respirable crystalline silica-containing dust. Do not dry sweep or use compressed air for clean-up. Wetting of spilled material and/or use of respiratory protective equipment may be necessary.

**Methods and materials for containment and cleaning up**
Avoid discharge of fine particulate matter into drains or water courses.

**Environmental precautions**

7. Handling and storage

**Precautions for safe handling**
Do not handle until all safety precautions have been read and understood. Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at places where dust is formed. Do not breathe dust. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.

**Conditions for safe storage, Including any incompatibilities**
Avoid dust formation or accumulation.
8. Exposure controls/personal protection

Occupational exposure limits
2 – Value also applies to MSHA Metal / Non-Metal (1973 TLVs at 30 CFR 56/57.5001).
3 – OSHA enforces 0.250 mg/m³ in construction and shipyards (CPL-03-00-007).
4 – Value also applies to OSHA construction (29 CFR 1926.55 Appendix A) and shipyards (29 CFR 1915.1000, Table Z).
5 – MSHA limit = 10 mg/m³.

U.S. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulates not otherwise classified (CAS SEQ250).</td>
<td>PEL</td>
<td>5 mg/m³</td>
<td>Respirable fraction</td>
</tr>
<tr>
<td>Calcium Carbonate (CAS 1317-65-3)</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>Respirable fraction (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 mg/m³</td>
<td>Total dust (4)</td>
</tr>
</tbody>
</table>

U.S. OSHA Table Z-3 (29 CFR 1910.1000)

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Silica (Quartz) (CAS 14808-60-7)</td>
<td>TWA</td>
<td>0.3 mg/m³</td>
<td>Total dust (1,2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 mg/m³</td>
<td>Respirable (1,2,3)</td>
</tr>
<tr>
<td>Tridymite and Cristobalite (other forms of crystalline silica) (CAS Mixture)</td>
<td>TWA</td>
<td>0.15 mg/m³</td>
<td>Total dust (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.05 mg/m³</td>
<td>Respirable (1,2)</td>
</tr>
<tr>
<td>Particulates not otherwise classified (CAS SEQ250)</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>Respirable fraction (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 mg/m³</td>
<td>Total dust (1,4,5)</td>
</tr>
</tbody>
</table>

US. ACGIH Threshold Limit Values®

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Silica (all forms; CAS mixture)</td>
<td>TWA</td>
<td>0.025 mg/m³</td>
<td>Respirable fraction</td>
</tr>
<tr>
<td>Particulates not otherwise classified silica (CAS Mixture)</td>
<td>TWA</td>
<td>3 mg/m³</td>
<td>Respirable particles (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/m³</td>
<td>Inhalable particles (2)</td>
</tr>
</tbody>
</table>

US. NIOSH: Pocket Guide to Chemical Hazards

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Silica (all forms; CAS mixture)</td>
<td>TWA</td>
<td>0.05 mg/m³</td>
<td>Respirable dust</td>
</tr>
<tr>
<td>Calcium Carbonate (CAS 1317-65-3)</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>Respirable fraction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/m³</td>
<td>Total dust</td>
</tr>
</tbody>
</table>

Biological limit values
No biological exposure limits noted for the ingredient(s).

Exposure guidelines
OSHA PELs, MSHA PELs, and ACGIH TLVs are 8-hr TWA values. NIOSH RELs are for TWA exposures up to 10-hr/day and 40-hr/wk. Occupational exposure to nuisance dust (total and respirable) and respirable crystalline silica should be monitored and controlled. Terms including “Particulates Not Otherwise Classified,” “Particulates Not Otherwise Regulated,” “Particulates Not Otherwise Specified,” and “Inert or Nuisance Dust” are often used interchangeably; however, the user should review each agency’s terminology for differences in meanings.

Appropriate engineering controls
Good general ventilation (typically 10 air changes per hour indoors) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection
Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection
Use personal protective equipment as required.

Other
Use personal protective equipment as required.

Respiratory protection
When handling or performing work with limestone that produces dust or respirable crystalline silica in excess of applicable exposure limits, wear a NIOSH-approved respirator.
Thermal hazards
Not anticipated. Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations
Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Solid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Solid, particles.</td>
</tr>
<tr>
<td>Color</td>
<td>To be completed by company.</td>
</tr>
<tr>
<td>Odor</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Initial boiling point and boiling range</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

Flash point
Non-combustible

Evaporation rate
Not applicable.

Flammability (solid, gas)
Not applicable.

Upper/lower flammability or explosive limits

| Flammability limit – lower (%) | Not applicable. |
| Flammability limit – upper (%) | Not applicable. |

Vapor pressure
Not applicable.

Vapor density
Not applicable.

Relative density
To be completed by company.

Solubility(ies)

<table>
<thead>
<tr>
<th>Solubility (water)</th>
<th>Insoluble</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

Other information

Explosive properties
Not applicable.

10. Stability and reactivity

Reactivity
The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability
Material is stable under normal conditions.

Possibility of hazardous reactions
No dangerous reaction known under conditions of normal use.

11. Toxicological information

Information on likely routes of exposure

Inhalation
Repeated inhalation of respirable crystalline silica (quartz) may cause silicosis, a fibrosis (scarring) of the lungs. Silicosis is irreversible and may be fatal. Silicosis increases the risk of contracting pulmonary tuberculosis. Some studies suggest that repeated inhalation of respirable crystalline silica may cause other adverse health effects including lung and kidney cancer.

Skin contact
Limestone dust: May cause irritation through mechanical abrasion.

Eye contact
Limestone dust: May cause irritation through mechanical abrasion.

Ingestion
Not likely, due to the form of the product. However, accidental ingestion of the content may cause discomfort.

Symptoms related to the
Limestone dust: Discomfort in the chest. Shortness of breath. Coughing.
physical, chemical and toxicological characteristics

Information on toxicological effects

Acute toxicity
Not expected to be acutely toxic.

Skin corrosion/irritation
This product is not expected to be a skin hazard.

Serious eye damage/eye irritation
Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization
No respiratory sensitizing effects known.

Skin sensitization
Not known to be a dermal irritant or sensitizer.

Germ cell mutagenicity
No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity
Respirable crystalline silica has been classified by IARC and NTP as a known human carcinogen, and classified by ACGIH as a suspected human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity
Crystalline Silica (Quartz) (CAS 14808-60-7) 1 Carcinogenic to humans.
Respirable Tridymite and Cristobalite 1 Carcinogenic to humans.
(Other forms of Crystalline) (CAS Mixture)

NTP Report on Carcinogens
Crystalline Silica (Quartz) (CAS 14808-60-7) Known To Be Human Carcinogen.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
Not listed.

Reproductive toxicity
Not expected to be a reproductive hazard.

Specific target organ toxicity
Not classified.

- single exposure

Specific target organ toxicity – repeated exposure
Respirable crystalline silica: May cause damage to organs (lung) through prolonged or repeated exposure.

Aspiration hazard
Due to the physical form of the product it is not an aspiration hazard.

Chronic effects
Prolonged inhalation of respirable crystalline silica may be harmful. May cause damage to organs (lungs) through prolonged or repeated exposure. There are reports in the literature suggesting that excessive crystalline silica exposure may be associated with autoimmune disorders and other adverse health effects involving the kidney. In particular, the incidence of scleroderma (thickening of the skin caused by swelling and thickening of fibrous tissue) appears to be higher in silicotic individuals. To date, the evidence does not conclusively determine a causal relationship between silica exposure and these adverse health effects.

12. Ecological information

Ecotoxicity
Not expected to be harmful to aquatic organisms. Discharging limestone dust and fines into waters may increase total suspended particulate (TSP) levels that can be harmful to certain aquatic organisms.

Persistence and degradability
Not applicable.

Bioaccumulative potential
Not applicable.

Mobility in soil
Not applicable.

Other adverse effects
No other adverse environmental effects (e.g., ozone depletion, photochemical ozone creation potential, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions
Do not allow fine particulate matter to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with fine particulates. Dispose of contents in accordance with local/regional/national/international regulations.

Hazardous waste code
Not regulated.

Waste from residues / unused products
Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging
Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty packaging materials should be recycled or disposed of in accordance with applicable regulations and practices.

14. Transport information

DOT
Not regulated as dangerous goods.
IATA
Not regulated as dangerous goods.

IMDG
Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable.

15. Regulatory information

US federal regulations
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)
Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)
Hazard categories
Immediate Hazard - No
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance
Not listed.

SARA 311/312 Hazardous chemical
Yes

SARA 313 (TRI reporting)
Not regulated.

Other federal regulations
Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List
Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)
Not regulated.

Safe Drinking Water Act (SDWA)

US state regulations
Not regulated.
US. Massachusetts RTK - Substance List
Crystalline Silica (Quartz) (CAS 14808-60-7)
Respirable Tridymite and Cristobalite (other forms of crystalline silica) (CAS Mixture)

US. New Jersey Worker and Community Right-to-Know Act
Crystalline Silica (Quartz) (CAS 14808-60-7)
Respirable Tridymite and Cristobalite (other forms of crystalline silica) (CAS Mixture)

US. Pennsylvania Worker and Community Right-to-Know Law
Crystalline Silica (Quartz) (CAS 14808-60-7)
Respirable Tridymite and Cristobalite (other forms of crystalline silica) (CAS Mixture)

US. Rhode Island RTK
Not regulated.

US. California Proposition 65
WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance
Crystalline Silica (Quartz) (CAS 14808-60-7)

International Inventories

<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date: July 22, 2015
Revision Date: July 22, 2015
Revision Date: V001.2015

Disclaimer

Notice: Bluegrass Materials Company, LLC believes the information contained herein is accurate; however, Bluegrass Materials Company, LLC makes no guarantees with respect to such accuracy and assumes no liability in connection with the use of the information contained herein by any party. The provision of the information contained herein is not intended to be and should not be construed as legal advice or as ensuring compliance with any federal, state or local laws and regulations. Any party using this product should review all such laws, rules or regulations prior to use. NO WARRANTY IS MADE, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE.
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name AQUAMAG® NW

Other means of identification
Product Code AQUAMAG® NW
Synonyms Magnesium Hydroxide, Mag Hydroxide, Hydrated Magnesia, Mg(OH)₂

Recommended use of the chemical and restrictions on use
Recommended Use Waste water treatment.
Uses advised against No information available

Details of the supplier of the safety data sheet
Manufacturer Address
Premier Magnesia, LLC, 300 Barr Harbor Drive, Suite 250, West Conshohocken, PA 19428

Emergency telephone number
Company Phone Number 610-828-6929
24 Hour Emergency Phone Number Chemtrec 1-800-424-9300
Emergency Telephone Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
Not hazardous in normal industrial use. Dust from dried product slurry is classified as a "nuisance particulate, not otherwise regulated" as specified by ACGIH and OSHA.

Label elements

Emergency Overview

White to off-white aqueous slurry. Not a fire or spill hazard. Low toxicity. Dust is classified as a "nuisance particulate not otherwise regulated". Do not store in drums or tanks constructed of aluminum! See section 7.

Appearance Slurry
Physical state Liquid
Odor Odorless

Particulate may cause eye irritation
Low toxicity by skin contact
An unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Hazards not otherwise classified (HNOC)
Other Information
3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Common name</th>
<th>Magnesium Hydroxide CAS# 1309-42-8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synonyms</td>
<td>Magnesium Hydroxide, Mag Hydroxide, Hydrated Magnesia, Mg(OH)₂</td>
</tr>
</tbody>
</table>

Formula #1

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
<th>Trade Secret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>39-47</td>
<td></td>
</tr>
<tr>
<td>Magnesium Hydroxide</td>
<td>1309-42-8</td>
<td>53-61</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

First aid measures

Eye contact
Rinse thoroughly with plenty of water, also under the eyelids. If eye irritation persists: Get medical advice/attention.

Skin Contact
Wash skin with soap and water.

Inhalation
Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Ingestion
Ingestion is an unlikely route of exposure. If ingested in sufficient quantity and victim is conscious, give 1-2 glasses of water or milk. Never give anything by mouth to an unconscious person. Leave decision to induce vomiting to qualified medical personnel, since particles may be aspirated into the lungs. Seek immediate medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms
No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

Unsuitable extinguishing media
Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical
No information available.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
6. ACCIDENTAL RELEASE MEASURES

**Personal precautions, protective equipment and emergency procedures**

**Personal precautions**
Ensure adequate ventilation, especially in confined areas.

**Environmental precautions**

**Environmental precautions**
See Section 12 for additional ecological information.

**Methods and material for containment and cleaning up**

**Methods for containment**
Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**
Carefully clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation.

7. HANDLING AND STORAGE

**Precautions for safe handling**

**Advice on safe handling**
Handle in accordance with good industrial hygiene and safety practice.

**Conditions for safe storage, including any incompatibilities**

**Storage Conditions**
Do not allow product to freeze. Do not store in drums or tanks constructed of aluminum.

**Incompatible materials**
Maleic anhydride; Aluminum metal in contact with product may produce hydrogen.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Control parameters**

**Exposure Guidelines**
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

**Appropriate engineering controls**

**Engineering Controls**
Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits.

**Individual protection measures, such as personal protective equipment**

**Eye/face protection**
The use of eye protection is recommended.

**Skin and body protection**
The use of eye protection, gloves and long sleeve clothing is recommended.

**Respiratory protection**
Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred.

**General Hygiene Considerations**
Avoid contact with eyes, skin and clothing. After handling this product, wash hands before eating or drinking.
### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Slurry</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
<td>Odor threshold</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
<td>No information available</td>
</tr>
<tr>
<td>Property</td>
<td>Values</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>10-11</td>
<td></td>
</tr>
<tr>
<td>Melting point</td>
<td>350 °C</td>
<td></td>
</tr>
<tr>
<td>Freezing point</td>
<td>No Information available</td>
<td></td>
</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>loses free water at 100 °C</td>
<td>Chemically combined water at 350°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Same as water</td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper flammability limit</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Lower flammability limit</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Vapor density</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>Water solubility</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Auto ignition temperature</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Kinematic viscosity</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Dynamic viscosity</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Other Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Softening point</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
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<td></td>
</tr>
<tr>
<td>VOC Content (%)</td>
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<td></td>
</tr>
<tr>
<td>Density</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Bulk density</td>
<td>12.71-13.19 lb/gal</td>
<td></td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

#### Reactivity

No data available

#### Chemical stability

Stable under recommended storage conditions.

#### Possibility of Hazardous Reactions

None under normal processing.

##### Hazardous polymerization

Hazardous polymerization does not occur.

#### Conditions to avoid

Extremes of temperature and direct sunlight.

#### Incompatible materials

Maleic anhydride; Aluminum metal in contact with product may produce hydrogen.
Hazardous Decomposition Products
Heat and steam.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information
Product does not present an acute toxicity hazard based on known or supplied information

Inhalation
No data available.

Eye contact
No data available.

Skin Contact
No data available.

Ingestion
No data available.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>&gt; 90 mL/kg (Rat)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7732-18-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium Hydroxide</td>
<td>= 8500 mg/kg (Rat)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1309-42-8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information on toxicological effects

Symptoms
No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation
May cause eye irritation.

Sensitization
No information available.

Germ cell mutagenicity
No information available.

Carcinogenicity
No information available.

Reproductive toxicity
No information available.

STOT - single exposure
No information available.

STOT - repeated exposure
No information available.

Aspiration hazard
No information available.

Numerical measures of toxicity - Product Information

12. ECOLOGICAL INFORMATION

Eco toxicity
No data available on any adverse effects of this material on the environment

Persistence and degradability
No information available.

Bioaccumulation
No information available.

Other adverse effects
No information available
13. DISPOSAL CONSIDERATIONS

Waste treatment methods
Disposal of wastes
This produce does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal once the free water component is evaporated or absorbed by a suitable absorbent (earth). Follow all applicable federal, state and local regulations for safe disposal.

Contaminated packaging
Do not reuse container.

14. TRANSPORT INFORMATION

Note: WARNING! Premier Magnesia, LLC prohibits this product from transportation or storage in tanks constructed of aluminum! See section 10.

DOT
Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

15. REGULATORY INFORMATION

International Inventories
TSCA All substances are listed in TSCA
DSL/NDSL Complies
EINECS/ELINCS Complies
ENCS Does not comply
IECSC Complies
KECL Complies
PICCS Does not comply
AICS Complies

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories
Acute health hazard No
Chronic Health Hazard No
Fire hazard No
Sudden release of pressure hazard No
Reactive Hazard No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)
CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals This product does not contain chemicals known to the state of California to cause birth defects or other reproductive harm.

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water 7732-18-5</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. EPA Label Information
EPA Pesticide Registration Number Not Applicable

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
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</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Physical hazards</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>

Revision Date 26-June-2015
Revision Note No information available
Disclaimer
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End of Safety Data Sheet
SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name AQUAMAG®

Other means of identification
Product Code AQUAMAG®
Synonyms Magnesium Hydroxide, Mag Hydroxide, Hydrated Magnesia, Mg(OH)₂

Recommended use of the chemical and restrictions on use
Recommended Use Waste water treatment.
Uses advised against No information available

Details of the supplier of the safety data sheet
Manufacturer Address Premier Magnesia, LLC, 300 Barr Harbor Drive, Suite 250, West Conshohocken, PA 19428

Emergency telephone number
Company Phone Number 610-828-6929
24 Hour Emergency Phone Number Chemtrec 1-800-424-9300
Emergency Telephone Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification
OSHA Regulatory Status Not hazardous in normal industrial use. Dust from dried product slurry is classified as a "nuisance particulate, not otherwise regulated" as specified by ACGIH and OSHA.

Label elements

Emergency Overview

White to off-white aqueous slurry. Not a fire or spill hazard. Low toxicity. Dust is classified as a "nuisance particulate not otherwise regulated". Do not store in drums or tanks constructed of aluminum! See section 7.

Appearance Slurry Physical state Liquid Odor Odorless

Particulate may cause eye irritation
Low toxicity by skin contact
An unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Hazards not otherwise classified (HNOC)
Other Information
3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Common name</th>
<th>Magnesium Hydroxide CAS# 1309-42-8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synonyms</td>
<td>Magnesium Hydroxide, Mag Hydroxide, Hydrated Magnesia, Mg(OH)$_2$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Formula #1</th>
<th>Mg(OH)$_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
</tr>
<tr>
<td>Magnesium Hydroxide</td>
<td>1309-42-8</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

**First aid measures**

**Eye contact**
Rinse thoroughly with plenty of water, also under the eyelids. If eye irritation persists: Get medical advice/attention.

**Skin Contact**
Wash skin with soap and water.

**Inhalation**
Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

**Ingestion**
Ingestion is an unlikely route of exposure. If ingested in sufficient quantity and victim is conscious, give 1-2 glasses of water or milk. Never give anything by mouth to an unconscious person. Leave decision to induce vomiting to qualified medical personnel, since particles may be aspirated into the lungs. Seek immediate medical attention.

**Most important symptoms and effects, both acute and delayed**

**Symptoms**
No information available.

**Indication of any immediate medical attention and special treatment needed**

**Note to physicians**
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media**
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

**Unsuitable extinguishing media**
Caution: Use of water spray when fighting fire may be inefficient.

**Specific hazards arising from the chemical**
No information available.

**Explosion data**
- Sensitivity to Mechanical Impact: None.
- Sensitivity to Static Discharge: None.

**Protective equipment and precautions for firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

<table>
<thead>
<tr>
<th>Personal precautions</th>
<th>Ensure adequate ventilation, especially in confined areas.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental precautions</td>
<td>See Section 12 for additional ecological information.</td>
</tr>
</tbody>
</table>

Methods and material for containment and cleaning up

| Methods for containment | Prevent further leakage or spillage if safe to do so. |
| Methods for cleaning up | Carefully clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation. |

7. HANDLING AND STORAGE

Precautions for safe handling

| Advice on safe handling | Handle in accordance with good industrial hygiene and safety practice. |
| Conditions for safe storage, including any incompatibilities | Maleic anhydride; Aluminum metal in contact with product may produce hydrogen. |

| Storage Conditions | Do not allow product to freeze. Do not store in drums or tanks constructed of aluminum! |
| Incompatible materials | Maleic anhydride; Aluminum metal in contact with product may produce hydrogen. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

| Exposure Guidelines | This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies. |
| Appropriate engineering controls | Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits. |

| Individual protection measures, such as personal protective equipment | Avoid contact with eyes, skin and clothing. After handling this product, wash hands before eating or drinking. |
| Eye/face protection | The use of eye protection is recommended. |
| Skin and body protection | The use of eye protection, gloves and long sleeve clothing is recommended. |
| Respiratory protection | Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred. |
9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Slurry</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
<td>Odor</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>10-11</td>
<td></td>
</tr>
<tr>
<td>Melting point</td>
<td>350 °C</td>
<td>No information available</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No Information available</td>
<td></td>
</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>Loses free water at 100 °C</td>
<td>;Chemically combined water at 350°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Same as water</td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper flammability limit:</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Lower flammability limit:</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Vapor density</td>
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<td></td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>Water solubility</td>
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<td>Aqueous Slurry</td>
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<tr>
<td>Solubility in other solvents</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Partition coefficient</td>
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<td></td>
</tr>
<tr>
<td>Autoignition temperature</td>
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<td></td>
</tr>
<tr>
<td>Decomposition temperature</td>
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<tr>
<td>Kinematic viscosity</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Dynamic viscosity</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Explosive properties</td>
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<td></td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Softening point</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>VOC Content (%)</td>
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<td></td>
</tr>
<tr>
<td>Density</td>
<td>No information available</td>
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</tr>
<tr>
<td>Bulk density</td>
<td>12.71-13.00 lb/gal</td>
<td></td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Reactivity
No data available

Chemical stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
Extremes of temperature and direct sunlight.

Incompatible materials
Maleic anhydride; Aluminum metal in contact with product may produce hydrogen.
Hazardous Decomposition Products
Heat and steam.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information
Product does not present an acute toxicity hazard based on known or supplied information

<table>
<thead>
<tr>
<th>Route</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>No data available.</td>
</tr>
<tr>
<td>Eye contact</td>
<td>No data available.</td>
</tr>
<tr>
<td>Skin Contact</td>
<td>No data available.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>No data available.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water 7732-18-5</td>
<td>&gt; 90 mL/kg (Rat)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium Hydroxide 1309-42-8</td>
<td>= 8500 mg/kg (Rat)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information on toxicological effects

Symptoms
No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

<table>
<thead>
<tr>
<th>Effect</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irritation</td>
<td>May cause eye irritation.</td>
</tr>
<tr>
<td>Sensitization</td>
<td>No information available.</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>No information available.</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>No information available.</td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>No information available.</td>
</tr>
<tr>
<td>STOT - single exposure</td>
<td>No information available.</td>
</tr>
<tr>
<td>STOT - repeated exposure</td>
<td>No information available.</td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>No information available.</td>
</tr>
</tbody>
</table>

Numerical measures of toxicity

12. ECOLOGICAL INFORMATION

Ecotoxicity
No data available on any adverse effects of this material on the environment

Persistence and degradability
No information available.

Bioaccumulation
No information available.

Other adverse effects
No information available.
13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes

This produce does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal once the free water component is evaporated or absorbed by a suitable absorbent (earth). Follow all applicable federal, state and local regulations for safe disposal.

Contaminated packaging

Do not reuse container.

14. TRANSPORT INFORMATION

Note:

WARNING! Premier Magnesia, LLC prohibits this product from transportation or storage in tanks constructed of aluminum! See section 10.

DOT

Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

15. REGULATORY INFORMATION

International Inventories

TSCA

All substances are listed in TSCA

DSL/NDSL

Complies

EINECS/ELINCS

Complies

ENCS

Does not comply

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Complies

KECL

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Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
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US Federal Regulations

SARA 313

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SARA 311/312 Hazard Categories

Acute health hazard

No

Chronic Health Hazard

No

Fire hazard

No

Sudden release of pressure hazard

No

Reactive Hazard

No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)
CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals. This product does not contain chemicals known to the state of California to cause birth defects or other reproductive harm.

U.S. State Right-to-Know Regulations

U.S. EPA Label Information
EPA Pesticide Registration Number: Not Applicable

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Physical hazards</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>

Revision Date: 26-June-2015
Revision Note: No information available

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End of Safety Data Sheet
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name  
BRUCIMAG®

Other means of identification
Product Code  
BRUCIMAG®
Synonyms  
Brucite, Magnesium Hydroxide Mg(OH)₂

Recommended use of the chemical and restrictions on use
Recommended Use  
Waste water treatment. Flame retardant.
Uses advised against  
No information available

Details of the supplier of the safety data sheet
Manufacturer Address  
Premier Magnesia, LLC, 300 Barr Harbor Drive, Suite 250, West Conshohocken, PA 19428

Emergency telephone number
Company Phone Number  
610-828-6929
24 Hour Emergency Phone Number  
Chemtrec 1-800-424-9300
Emergency Telephone  
Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
Product dust is classified as a "nuisance particulate, not otherwise regulated" as specified by ACGIH and OSHA. The excessive, long-term inhalation of mineral dusts may contribute to the development of industrial bronchitis, reduced breathing capacity, and may lead to the increased susceptibility to lung disease.

Label elements

Emergency Overview

Not toxic in normal industrial use. Dust is classified as a "nuisance particulate not otherwise regulated" as specified by ACGIH and OSHA. If in solution, do not store or transport in drums or containers constructed of aluminum!

Appearance  
Fine Powder
Physical state  
Solid
Odor  
Odorless

Particulate may cause eye irritation
Low toxicity by skin contact
Low toxicity by inhalation route.
Particulate may cause upper respiratory irritation.
Ingestion is an unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Hazards not otherwise classified (HNOC)

Other Information
3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Common name</th>
<th>Magnesium Hydroxide CAS# 1309-42-8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synonyms</td>
<td>Brucite, Magnesium Hydroxide Mg(OH)\textsubscript{2}</td>
</tr>
</tbody>
</table>

| Formula #1                   | Mg(OH)\textsubscript{2} |

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
<th>Trade Secret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Hydroxide</td>
<td>1309-42-8</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

First aid measures

Eye contact
Rinse thoroughly with plenty of water, also under the eyelids. If eye irritation persists: Get medical advice/attention.

Skin Contact
Wash skin with soap and water.

Inhalation
Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Ingestion
Ingestion is an unlikely route of exposure. If ingested in sufficient quantity and victim is conscious, give 1-2 glasses of water or milk. Never give anything by mouth to an unconscious person. Leave decision to induce vomiting to qualified medical personnel, since particles may be aspirated into the lungs. Seek immediate medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms
No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

Unsuitable extinguishing media
Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical
No information available.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions
Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions
See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Carefully clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions
Do not allow product to freeze. Minimize dust generation during material handling and transfer. If in solution, Do Not store in containers constructed of aluminum!

Incompatible materials
Maleic anhydride; Aluminum metal in contact with product may produce hydrogen. Soluble in aqueous acids generating heat and steam.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls
Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection
The use of eye protection is recommended.

Skin and body protection
The use of eye protection, gloves and long sleeve clothing is recommended.

Respiratory protection
Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred.

General Hygiene Considerations
Avoid contact with eyes, skin and clothing. After handling this product, wash hands before eating or drinking.
9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Fine Powder</td>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
<td>Odor threshold</td>
<td>No info</td>
</tr>
<tr>
<td>pH</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting point</td>
<td>350 °C</td>
<td>Decomposes</td>
<td></td>
</tr>
<tr>
<td>Freezing point</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>Loses water at 350 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper flammability limit</td>
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<td></td>
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<tr>
<td>Lower flammability limit</td>
<td>No information available</td>
<td></td>
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</tr>
<tr>
<td>Vapor pressure</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vapor density</td>
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</tr>
<tr>
<td>Specific Gravity</td>
<td>3.04</td>
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</tr>
<tr>
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<td>Insoluble in water</td>
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<td>Aqueous Slurry</td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>No information available</td>
<td></td>
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</tr>
<tr>
<td>Partition coefficient</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No information available</td>
<td></td>
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</tr>
<tr>
<td>Kinematic viscosity</td>
<td>No information available</td>
<td></td>
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</tr>
<tr>
<td>Dynamic viscosity</td>
<td>No information available</td>
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</tr>
<tr>
<td>Explosive properties</td>
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</tr>
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<td>Oxidizing properties</td>
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<td>Softening point</td>
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</tr>
<tr>
<td>Molecular weight</td>
<td>No information available</td>
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</tr>
<tr>
<td>VOC Content (%)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
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<td></td>
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</tr>
<tr>
<td>Bulk density</td>
<td>18-25 lb/ft³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Reactivity
No data available

Chemical stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
Extremes of temperature and direct sunlight.

Incompatible materials
Maleic anhydride; Aluminum metal in contact with product may produce hydrogen. Soluble in aqueous acids generating heat and steam.
Hazardous Decomposition Products
Heat and steam.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information
Product does not present an acute toxicity hazard based on known or supplied information.

- Inhalation
  No data available.

- Eye contact
  No data available.

- Skin Contact
  No data available.

- Ingestion
  No data available.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Hydroxide</td>
<td>8500 mg/kg</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1309-42-8</td>
<td>( Rat )</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Information on toxicological effects

- Symptoms
  No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

- Irritation
  May cause eye irritation.

- Sensitization
  No information available.

- Germ cell mutagenicity
  No information available.

- Carcinogenicity
  No information available.

- Reproductive toxicity
  No information available.

- STOT - single exposure
  No information available.

- STOT - repeated exposure
  No information available.

- Aspiration hazard
  No information available.

Numerical measures of toxicity - Product Information

12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available on any adverse effects of this material on the environment.

Persistence and degradability
No information available.

Bioaccumulation
No information available.

Other adverse effects
No information available.
13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes
This product does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal. Follow all applicable federal, state and local regulations for safe disposal.

Contaminated packaging
Do not reuse container.

14. TRANSPORT INFORMATION

Note:
If in solution, Do Not transport in containers constructed of aluminum!

DOT
Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

15. REGULATORY INFORMATION

International Inventories

TSCA Complies
DSL/NDSL Complies
EINECS/ELINCS Complies
ENCS Complies
IECSC Complies
KECL Complies
PICCS Complies
AICS Complies

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard No
Chronic Health Hazard No
Fire hazard No
Sudden release of pressure hazard No
Reactive Hazard No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material
US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals. This product does not contain chemicals known to the state of California to cause birth defects or other reproductive harm.

U.S. State Right-to-Know Regulations

U.S. EPA Label Information
EPA Pesticide Registration Number Not Applicable

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Physical hazards</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>

Revision Date 16-April-2015
Revision Note No information available

Disclaimer
The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name Magnesite 33 -200

Other means of identification
Product Code Magnesite 33 -200
Synonyms Ground Magnesite, Raw ground Magnesite, Magnesium Carbonate,

Recommended use of the chemical and restrictions on use
Recommended Use No information available.
Uses advised against No information available

Details of the supplier of the safety data sheet
Manufacturer Address Premier Magnesia, LLC, 300 Barr Harbor Drive, Suite 250, West Conshohocken, PA 19428

Emergency telephone number
Company Phone Number 610-828-6929
24 Hour Emergency Phone Number Chemtrec 1-800-424-9300
Emergency Telephone Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification
Product dust is classified as a "nuisance particulate, not otherwise regulated" as specified by ACGIH and OSHA. The excessive, long-term inhalation of mineral dusts may contribute to the development of industrial bronchitis, reduced breathing capacity, and may lead to the increased susceptibility to lung disease.

Label elements

Emergency Overview
Not a fire or spill hazard. Low toxicity. Dust is classified as a "nuisance particulate not otherwise regulated".

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Fine Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
</tbody>
</table>

Causes mild irritation to the eyes
Particulate may cause upper respiratory irritation.
Chronic overexposure may cause lung damage
An unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Hazards not otherwise classified (HNOC)

Other Information
3. COMPOSITION/INFORMATION ON INGREDIENTS

Common name: Magnesium Carbonate  CAS# 546-93-0.
Synonyms: Ground Magnesite, Raw ground Magnesite, Magnesium Carbonate,
Chemical Family: Metallic Carbonate.
Formula #1: MgCO₃

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
<th>Trade Secret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Carbonate</td>
<td>546-93-0</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

First aid measures

Eye contact: Rinse thoroughly with plenty of water, also under the eyelids. If eye irritation persists: Get medical advice/attention.

Skin Contact: Wash skin with soap and water.

Inhalation: Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Ingestion: Ingestion is an unlikely route of exposure. If ingested in sufficient quantity and victim is conscious, give 1-2 glasses of water or milk. Never give anything by mouth to an unconscious person. Leave decision to induce vomiting to qualified medical personnel, since particles may be aspirated into the lungs. Seek immediate medical attention.

Self-protection of the first aider: Use personal protective equipment as required.

Most important symptoms and effects, both acute and delayed

Symptoms: No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians: Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media: Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical
No information available.

Explosion data
Sensitivity to Mechanical Impact: None.
Sensitivity to Static Discharge: None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions
Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions
See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Carefully, clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions
Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid generation of dust. Do not allow contact with water.

Incompatible materials
Formaldehyde. Soluble in aqueous acids generating heat and steam.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls
Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection
Avoid contact with eyes. The use of eye protection is recommended.

Skin and body protection
The use of eye protection, gloves and long sleeve clothing is recommended.

Respiratory protection
Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred. Ensure adequate ventilation, especially in confined areas.

General Hygiene Considerations
Avoid contact with skin, eyes or clothing. Wash hands thoroughly after handling.
### 9. PHYSICAL AND CHEMICAL PROPERTIES

**Information on basic physical and chemical properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Fine Powder</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Gray to light brown</td>
<td>Odor</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Odorless</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>Insoluble</td>
<td>10% aqueous slurry</td>
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<tr>
<td>Melting point/freezing point</td>
<td>&gt;2100 °C, &gt;3800 °F</td>
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</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>Loses CO₂ at 900 °C</td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
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<td></td>
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<tr>
<td>Upper flammability limit:</td>
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<td></td>
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<tr>
<td>Lower flammability limit:</td>
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<td></td>
</tr>
<tr>
<td>Vapor pressure</td>
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<td>Vapor density</td>
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</tr>
<tr>
<td>Specific Gravity</td>
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<td>Solubility in other solvents</td>
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</tr>
<tr>
<td>Partition coefficient</td>
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<td></td>
</tr>
<tr>
<td>Autoignition temperature</td>
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<td></td>
</tr>
<tr>
<td>Decomposition temperature</td>
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<td></td>
</tr>
<tr>
<td>Kinematic viscosity</td>
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<td></td>
</tr>
<tr>
<td>Dynamic viscosity</td>
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<tr>
<td>Explosive properties</td>
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<td></td>
</tr>
<tr>
<td>Oxidizing properties</td>
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<td></td>
</tr>
<tr>
<td>Softening point</td>
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<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>VOC Content (%)</td>
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<td></td>
</tr>
<tr>
<td>Density</td>
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</tr>
<tr>
<td>Bulk density</td>
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</table>

**Other Information**

- Softening point: No information available
- Molecular weight: No information available
- VOC Content (%): No information available
- Density: No information available
- Bulk density: 65-85 lb/ft³

### 10. STABILITY AND REACTIVITY

**Reactivity**

No data available

**Chemical stability**

Stable under recommended storage conditions.

**Possibility of Hazardous Reactions**

None under normal processing.

- **Hazardous polymerization**: Hazardous polymerization does not occur.

**Conditions to avoid**

Extremes of temperature and direct sunlight.

**Incompatible materials**

Formaldehyde. Soluble in aqueous acids generating heat and steam.

**Hazardous Decomposition Products**

Heat and steam.
11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information  
Magnesium Carbonate  CAS# 546-93-0

- Inhalation  
  No data available.

- Eye contact  
  No data available.

- Skin Contact  
  No data available.

- Ingestion  
  No data available.

Information on toxicological effects

- Symptoms  
  No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

- Sensitization  
  No information available.

- Germ cell mutagenicity  
  No information available.

- Carcinogenicity  
  This product does not contain any carcinogens or potential carcinogens as listed by OSHA, IARC or NTP.

- Reproductive toxicity  
  No information available.

- STOT - single exposure  
  No information available.

- STOT - repeated exposure  
  No information available.

- Aspiration hazard  
  No information available.

Numerical measures of toxicity - Product Information

12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available on any adverse effects of this material on the environment

Persistence and degradability

No information available.

Bioaccumulation

No information available.

Other adverse effects  
No information available

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes  
This produce does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal once the free water component is evaporated or absorbed by a suitable absorbent (earth). Follow all applicable federal, state and local regulations for safe disposal. Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging

Do not reuse container.
14. TRANSPORT INFORMATION

DOT  
Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Inventory</th>
<th>Does not comply</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSCA</td>
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</tr>
<tr>
<td>DSL/NDSL</td>
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<tr>
<td>EINECS/ELINCS</td>
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<td>ENCS</td>
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<td>IECSC</td>
<td></td>
</tr>
<tr>
<td>KECL</td>
<td></td>
</tr>
<tr>
<td>PICCS</td>
<td></td>
</tr>
<tr>
<td>AICS</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Yes/No</th>
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</thead>
<tbody>
<tr>
<td>Acute health hazard</td>
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</tr>
<tr>
<td>Chronic Health Hazard</td>
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</tr>
<tr>
<td>Fire hazard</td>
<td>No</td>
</tr>
<tr>
<td>Sudden release of pressure hazard</td>
<td>No</td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
</tr>
</tbody>
</table>

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65
This product does not contain chemicals known to the state of California to cause birth defects or other reproductive harm

U.S. State Right-to-Know Regulations

U.S. EPA Label Information
EPA Pesticide Registration Number Not Applicable
## 16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
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<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Physical hazards</th>
<th>Personal protection</th>
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<td>X</td>
</tr>
</tbody>
</table>

**Revision Date**: 16-April-2015  
**Revision Note**: No information available  

**Disclaimer**

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*End of Safety Data Sheet*
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name MAGOX® AG GRADE

Other means of identification
Product Code MAGOX® AG GRADE
Synonyms Light Burned Magnesium Oxide, Caustic Calcined Magnesia, MgO, Magnesium Oxide

Recommended use of the chemical and restrictions on use
Recommended Use Soil amendments.
Uses advised against No information available

Details of the supplier of the safety data sheet
Manufacturer Address Premier Magnesia, LLC, 300 Barr Harbor Drive, Suite 250, West Conshohocken, PA 19428

Emergency telephone number
Company Phone Number 610-828-6929
24 Hour Emergency Phone Number Chemtrec 1-800-424-9300
Emergency Telephone Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification
OSHA Regulatory Status
Product dust is classified as a "nuisance particulate, not otherwise regulated" as specified by ACGHI and OSHA. The excessive, long-term inhalation of mineral dusts may contribute to the development of industrial bronchitis, reduced breathing capacity, and may lead to the increased susceptibility to lung disease. This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.122)

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Label elements

Emergency Overview

The product contains no substances which at their given concentration, are considered to be hazardous to health

Appearance Fine granular   Physical state Solid   Odor Odorless

Hazards not otherwise classified (HNOC)

Other Information
Unknown Acute Toxicity 100% of the mixture consists of ingredient(s) of unknown toxicity
3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
<th>Trade Secret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Oxide</td>
<td>1309-48-4</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

First aid measures

Eye contact
Rinse thoroughly with plenty of water, also under the eyelids. (Get medical attention immediately if irritation persists.).

Skin Contact
Wash skin with soap and water.

Inhalation
Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Ingestion
Not an expected route of exposure. Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Do not induce vomiting without medical advice. Immediate medical attention is required.

Most important symptoms and effects, both acute and delayed
Symptoms
No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
Water reacts with magnesium oxide producing magnesium hydroxide and heat. Do not allow water to get inside containers: reaction with water will cause product to swell, generate heat, and burst its container. If contact is unavoidable, use sufficient water to safely absorb the heat that may be generated. Wetted product is not a health or environmental hazard.

Specific hazards arising from the chemical
No information available.

Explosion data
Sensitivity to Mechanical Impact
None.
Sensitivity to Static Discharge
None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions
Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions
See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Carefully, clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Use personal protective equipment as required.

Conditions for safe storage, including any incompatibilities

Storage Conditions
Store in dry, protected storage. Product is stable under normal conditions of dry storage. Do not allow water to get inside containers: reaction with water will cause product to swell, generate heat, and burst its container.

Incompatible materials
Interhalogens, bromine pentafluoride, chlorine trifluoride. Contact with aluminum metal may release hydrogen gas. Incandescent reaction with phosphorus pentachloride. Water will react with magnesium oxide to form magnesium hydroxide and release heat and steam.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Oxide</td>
<td>TWA: 10 mg/m$^3$ inhalable fraction</td>
<td>TWA: 15 mg/m$^3$ fume, total particulate</td>
<td>IDLH: 750 mg/m$^3$ fume</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(vacated) TWA: 10 mg/m$^3$ fume and total particulate</td>
<td></td>
</tr>
</tbody>
</table>

NIOSH IDLH Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred.

Appropriate engineering controls

Engineering Controls
Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection
Avoid contact with eyes. The use of eye protection is recommended.

Skin and body protection
The use of eye protection, gloves and long sleeve clothing is recommended.
Respiratory protection
Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred.

General Hygiene Considerations
Wash hands thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
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</tr>
<tr>
<td>Appearance</td>
<td>Fine granular</td>
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</tr>
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<td>Color</td>
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<td>Odor</td>
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<td>Odor threshold</td>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks</th>
<th>Method</th>
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<tr>
<td>pH</td>
<td>10-11</td>
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<td>Melting point/freezing point</td>
<td>&gt;2100 °C &gt;3800 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiling point / boiling range</td>
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<td>Explosive properties</td>
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<td>Oxidizing properties</td>
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<td>Bulk density</td>
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</tbody>
</table>

10. STABILITY AND REACTIVITY

Reactivity
No data available

Chemical stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
Extremes of temperature and direct sunlight.
Incompatible materials
Interhalogens, bromine pentafluoride, chlorine trifluoride. Contact with aluminum metal may release hydrogen gas. Incandescent reaction with phosphorus pentachloride. Water will react with magnesium oxide to form magnesium hydroxide and release heat and steam.

Hazardous Decomposition Products
Heat and steam.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information
Magnesium Oxide  CAS# 1309-48-4

Inhalation
Inhalation of fume (not MgO dust particulate) produced upon decomposition of magnesium compounds can produce a febrile reaction and leukocytosis in humans.

Eye contact
No data available.

Skin Contact
No data available.

Ingestion
No data available.

Information on toxicological effects

Symptoms
No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Sensitization
No information available.

Germ cell mutagenicity
No information available.

Carcinogenicity
No information available.

Reproductive toxicity
No information available.

STOT - single exposure
No information available.

STOT - repeated exposure
No information available.

Aspiration hazard
No information available.

Numerical measures of toxicity - Product Information

Unknown Acute Toxicity
100% of the mixture consists of ingredient(s) of unknown toxicity

12. ECOLOGICAL INFORMATION

Ecotoxicity
No data available on any adverse effects of this material on the environment

100% of the mixture consists of components(s) of unknown hazards to the aquatic environment

Persistence and degradability
No information available.

Bioaccumulation
No information available.

Other adverse effects
No information available
13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes
This product does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal once the free water component is evaporated or absorbed by a suitable absorbent (earth). Follow all applicable federal, state and local regulations for safe disposal.

Contaminated packaging
Do not reuse container.

14. TRANSPORT INFORMATION

DOT
Not regulated Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Inventory</th>
<th>Complies</th>
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</thead>
<tbody>
<tr>
<td>TSCA</td>
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<tr>
<td>DSL/NDSL</td>
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</tr>
<tr>
<td>EINECS/ELINCS</td>
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<tr>
<td>ENCS</td>
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<tr>
<td>IECSC</td>
<td></td>
</tr>
<tr>
<td>KECL</td>
<td></td>
</tr>
<tr>
<td>PICCS</td>
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<tr>
<td>AICS</td>
<td></td>
</tr>
</tbody>
</table>

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
This product does not contain any substances reportable under Sections 302, 304 or 313. Sections 311 and 312 do apply. (Routine Reporting and Chemical Inventories)

SARA 311/312 Hazard Categories

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Acute health hazard</td>
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<tr>
<td>Chronic Health Hazard</td>
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</tr>
<tr>
<td>Fire hazard</td>
<td></td>
</tr>
<tr>
<td>Sudden release of pressure hazard</td>
<td></td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td></td>
</tr>
</tbody>
</table>

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material
US State Regulations

California Proposition 65
This product does not contain chemicals known to the State of California to cause cancer, birth defects or other reproductive toxins.

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Oxide</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. EPA Label Information

EPA Pesticide Registration Number  Not Applicable

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
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</thead>
<tbody>
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<td>Health hazards</td>
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<td>0</td>
<td>0</td>
<td>-</td>
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<tr>
<td>HMIS</td>
<td>Health hazards</td>
<td>Flammability</td>
<td>Physical hazards</td>
<td>Personal protection</td>
</tr>
<tr>
<td>Health hazards</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>

Revision Date 16-April-2015

No information available

Disclaimer
The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name OXYMAG®
Other means of identification
Product Code OXYMAG®
Synonyms None

Recommended use of the chemical and restrictions on use
Recommended Use A finely ground magnesium oxide powder which has been specially calcined for use in magnesium oxychloride and magnesium oxysulfate cement.
Uses advised against No information available

Details of the supplier of the safety data sheet
Manufacturer Address Premier Magnesia, LLC, 300 Barr Harbor Drive, Suite 250, West Conshohocken, PA 19428

Emergency telephone number
Company Phone Number 610-828-6929
24 Hour Emergency Phone Number Chemtrec 1-800-424-9300
Emergency Telephone Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
A brownish, free flowing powder. Not a fire or spill hazard. Low toxicity. Dust is classified as a "nuisance particulate not otherwise regulated".

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Acute toxicity - Inhalation (Dusts/Mists) Not toxic in normal industrial use.

Label elements

Emergency Overview

Not toxic in normal industrial use. Dust is classified as a "nuisance particulate not otherwise regulated" as specified by ACGIH and OSHA. The excessive, long-term inhalation of mineral dusts may contribute to the development of industrial bronchitis, reduced breathing capacity, and may lead to the increased susceptibility to lung disease.

Appearance Fine Powder Physical state Solid Odor Odorless

Particulate may cause eye irritation
Low toxicity by skin contact
Chronic overexposure by inhalation of airborne particulate may irritate upper respiratory system as well as the throat
Ingestion is an unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Hazard not otherwise classified (HNOC)

Other information
3. COMPOSITION/INFORMATION ON INGREDIENTS

Common name Calcined Magnesite, Magnesium Oxide.
Common name Magnesium Sulfate.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
<th>Trade Secret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Sulfate</td>
<td>7487-88-9</td>
<td>10-15</td>
<td></td>
</tr>
<tr>
<td>Magnesium Oxide</td>
<td>1309-48-4</td>
<td>85-90</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

First aid measures

Eye contact Rinse thoroughly with plenty of water, also under the eyelids. If eye irritation persists: Get medical advice/attention.

Skin Contact Wash skin with soap and water.

Inhalation Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Ingestion Ingestion is an unlikely route of exposure. If ingested in sufficient quantity and victim is conscious, give 1-2 glasses of water or milk. Never give anything by mouth to an unconscious person. Leave decision to induce vomiting to qualified medical personnel, since particles may be aspirated into the lungs. Seek immediate medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media Product on initial contact with water will generate some heat. Excess water will dissipate any heat.

Unsuitable extinguishing media Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical

Explosion data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters

Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions
Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions
See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Carefully clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions
Store in dry, protected storage. Product is stable under normal conditions of storage. Minimize dust generation during material handling and transfer.

Incompatible materials
Magnesium Oxide component is soluble in aqueous acids generating heat and steam; violent reaction or ignition with interhalogens (e.g., bromine pentafluoride; chlorine trifluoride). Incandescent reaction with phosphorus pentachloride. Water will react with magnesium oxide producing magnesium hydroxide and heat. The magnesium sulfate is potentially explosive when reacted with ethoxyethynyl alcohols (i.e., 1-ethoxy-3methyl-1butyn-3-ol).

8. EXPOSURE CONTROLS/PERSOAL PROTECTION

Control parameters

Exposure Guidelines
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

<table>
<thead>
<tr>
<th>Chemical Name</th>
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<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
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<tbody>
<tr>
<td>Magnesium Oxide</td>
<td>TWA: 10 mg/m³ inhalable fraction</td>
<td>TWA: 15 mg/m³ fume, total particulate (vacated) TWA: 10 mg/m³ fume and total particulate</td>
<td>IDLH: 750 mg/m³ fume</td>
</tr>
</tbody>
</table>

Appropriate engineering controls

Engineering Controls
Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection
The use of eye protection is recommended.

Skin and body protection
The use of eye protection, gloves and long sleeve clothing is recommended.
Respiratory protection  Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred.

General Hygiene Considerations  Avoid contact with skin, eyes or clothing. After handling this product, wash hands before eating or drinking.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
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<tr>
<td>Appearance</td>
<td>Fine Powder</td>
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<td>Color</td>
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<td>melting pt &gt;2100 °C melting pt &gt;3800 °F</td>
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<td>Boiling point / boiling range</td>
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<td>Flash point</td>
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</tr>
<tr>
<td>Evaporation rate</td>
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<td>Flammability (solid, gas)</td>
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<td>Vapor pressure</td>
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<td>Vapor density</td>
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<td>Specific Gravity</td>
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<tr>
<td>Oxidizing properties</td>
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<tr>
<td>Softening point</td>
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<td></td>
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</tr>
<tr>
<td>Molecular weight</td>
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<td>VOC Content (%)</td>
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<tr>
<td>Density</td>
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<tr>
<td>Bulk density</td>
<td>65-75 lb/ft³</td>
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</table>

### 10. STABILITY AND REACTIVITY

#### Reactivity
No data available

#### Chemical stability
Stable under recommended storage conditions.

#### Possibility of Hazardous Reactions
None under normal processing.

##### Hazardous polymerization
Hazardous polymerization does not occur.

#### Conditions to avoid
Extremes of temperature and direct sunlight.
Incompatible materials
Magnesium Oxide component is soluble in aqueous acids generating heat and steam; violent reaction or ignition with interhalogens (e.g., bromine pentfluoride; chlorine trifluoride). Incandescent reaction with phosphorus pentachloride. Water will react with magnesium oxide producing magnesium hydroxide and heat. The magnesium sulfate is potentially explosive when reacted with ethoxyethynyl alcohols (i.e., 1-ethoxy-3methyl-1buthn-3-ol).

Hazardous Decomposition Products
Heat and steam above 1100°C SOx.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information
Magnesium Oxide CAS# 1309-48-4 Product does not present an acute toxicity hazard based on known or supplied information. Magnesium Sulfate CAS #7487-88-9 Product does not present an acute toxicity hazard based on known or supplied information.

Inhalation
Inhalation of fume (not MgO dust particulate) produced upon decomposition of magnesium compounds can produce a febrile reaction and leukocytosis in humans.

Eye contact
Irritating to eyes.

Skin Contact
Low toxicity by skin contact.

Ingestion
Ingestion is an unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Information on toxicological effects

Symptoms
No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Serious eye damage/eye irritation
Irritating to eyes.

Irritation
Irritating to eyes and respiratory system.

Sensitization
No information available.

Germ cell mutagenicity
No information available.

Carcinogenicity
No information available.

Reproductive toxicity
No information available.

STOT - single exposure
No information available.

STOT - repeated exposure
No information available.

Aspiration hazard
No information available.

Numerical measures of toxicity

12. ECOLOGICAL INFORMATION

Ecotoxicity
No data available on any adverse effects of this material on the environment

Persistence and degradability
No information available.
Bioaccumulation
No information available.

Other adverse effects
No information available

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes
This product does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal. Follow all applicable federal, state and local regulations for safe disposal.

Contaminated packaging
Do not reuse container.

14. TRANSPORT INFORMATION

DOT
Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

15. REGULATORY INFORMATION

International Inventories

TSCA
Does not comply

DSL/NDSL
Does not comply

EINECS/ELINCS
Does not comply

ENCS
Does not comply

IECSC
Does not comply

KECL
Does not comply

PICCS
Does not comply

AICS
Does not comply

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard
No

Chronic Health Hazard
No

Fire hazard
No

Sudden release of pressure hazard
No

Reactive Hazard
No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)
CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
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U.S. EPA Label Information
EPA Pesticide Registration Number Not Applicable

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
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<tr>
<td>HMIS</td>
<td>Health hazards</td>
<td>Flammability</td>
<td>Physical hazards</td>
<td>Personal protection</td>
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Revision Date 25-Sept-2015
Revision Note No information available

Disclaimer
The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet