CORNERSTONE
Environmental Group, LLC

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January 16, 2012

Mukonde Chama
Pima County Department of Environmental Quality
33 North Stone Avenue
Suite 700
Tucson, AZ 85701-1317

Re: Marana Regional Landfill
Class I Permit Application Addendum – Air Dispersion Modeling Report
Permit Number 6133

Dear Mukonde:

On behalf of our client, DKL Holdings, Inc. (DKL), Cornerstone Environmental Group, LLC (Cornerstone) is submitting this *Air Dispersion Modeling Report* as an addendum to the Class I Operating Permit application for the Marana Regional Landfill (MRLF). Air dispersion modeling was conducted in response to the Department's incomplete application letter, dated October 17, 2011. The modeling performed demonstrates compliance with the Pima County SIP Rule 171 (C)(2)), Rule 504(B) and (C). Based upon communications with the Department, DKL understands that the completion of the air dispersion modeling and submittal of the attached report also satisfies Pima County SIP Rule 171 (C)(2)), Rule 504(E) cited as an additional requirement in the incompleteness letter.

It is anticipated that the Pima County SIP, which has required this submittal, will be revised to incorporate the current Pima County Code and corresponding federal regulations in the near future. Therefore, it is hoped that the PDEQ will take this into consideration as you develop the MRLF Class I permit terms and conditions. We would request that a pre-draft copy of the permit be provided to DKL for their review prior to issuance of the draft for public comment, so as to afford DKL an opportunity to work with the PDEQ to address any terms which may be of particular concern.

We appreciate the PDEQ's assistance in completing the air dispersion modeling for MRLF and welcome any questions you might have as you complete your review of the submitted report. Please feel free to contact either myself, at 630-633-5830, or Craig Young, at 630-633-5806.

Sincerely,

Cornerstone Environmental Group, LLC

Kay Gilmer
Client Manager

Craig Young, P.E.
Project Manager

Enclosure: MRLF Air Dispersion Modeling Report

cc: Larry Henk, DKL Holdings, Inc.

AIR DISPERSION MODELING REPORT
(ADDENDUM TO CLASS I PERMIT APPLICATION)

MARANA REGIONAL LANDFILL

MARANA, ARIZONA

Prepared for
DKL Holdings
Tucson, Arizona
January 2012

Prepared by

Cornerstone Environmental Group, LLC
17 West Wetmore Road, Suite 310
Tucson, Arizona 85705

Project No. 090250

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EXECUTIVE SUMMARY

This modeling report summarizes the results of an air dispersion modeling analysis for the proposed Marana Regional Landfill in Marana, Arizona. This document is prepared in accordance with the Arizona Department of Environmental Quality (ADEQ) "Air Dispersion Modeling Guidelines for Arizona Air Quality Permits" (December 2004) and includes the following information:

- Project background and list of applicable regulations for the project
- Map and description of the local topography and areas surrounding the facility
- Description of the regional climatology and meteorology
- Detailed facility layout that includes:
  - source locations
  - fenceline
  - locations of the nearest residences
  - schools and offsite workplaces.
- Calculated emissions for each source
- Description of the source characterizations (volume source dimensions)
- Modeling approach (modeling options, land classification, receptor location and elevation, meteorological data selection)
- Ambient background concentration
- Modeling results

Modeling was performed consistent with the *Marana Regional Landfill Air Dispersion Modeling Protocol* submitted to the Pima County Department of Environmental Quality (PDEQ) on Novemebr 28, 2011 and approved by the Department on December 22, 2011, except as noted below:

- The path for vehicles traveling along dirt roads within the active area of Module 1A and 1B was modified slightly from what was presented in Figure 1-2 of the modeling protocol to represent a more realistic gradual curve. Locations of the volume sources on the dirt road were adjusted accordingly.

- Elevations of the dirt road sources were modified to reflect the approximate slope of the dirt road to be built within each module.

- The receptor grid was changed from 100-meter spacing out to 10 kilometers to 500-meter spacing out to 2-kilometers. Cornerstone also developed a network of closely spaced receptors around the "coarse-grid location" representing the maximum modeled concentration.

- The control efficiency for emissions generated by all vehicles traveling on dirt roads and waste hauling vehicles on paved roads was changed from 50% to 75% to account for frequent watering and/or other applied dust control measures as necessary to comply with Pima County Code fugitive dust regulations.

- For Phase III, the hours of operation for construction vehicles use for Module 1B were reduced to 19 hours per day. Therefore, emission rates for the volume sources associated with construction of that module were reduced by a factor of 19/24.

- Calculation of the monitored background PM_{10} concentration was based on the time period described in the modeling protocol, with the exception of one anomalously high reading on October 28, 2009. That value was replaced with the next highest concentration monitored in the same month.

These changes reflect more accurately either the data used or actual design features. The receptor grid change was approved by the PDEQ prior to completing the modeling.

Modeling results demonstrate that each phase of the contruction and operation of the facility during the five year permit term will not exceed the PDEQ ambient air quality standard of 150 ug/m^3 for Total Suspended Particulate (TSP).

1 INTRODUCTION

1.1 Facility Description

The proposed Marana Regional Landfill will encompass a total area of approximately 591 acres, with a total final landfill footprint of approximately 415 acres. The landfill will accept municipal solid waste (MSW) consisting of non-hazardous residential, commercial, industrial, and inert waste. Primary stationary sources currently proposed to be operated at the site include the MSW landfill operation, facility roadways, material handling, and a water pump equipped with a diesel-fired stationary reciprocating internal combustion engine.

1.2 Proposed Project

The first phase of the landfill is identified on the facility layout as Module 1A, located in the southwest corner of the property (see Figure 1-1). This initial construction phase will have an estimated waste capacity of 2.9 million cubic yards. Construction of Module 1A will involve excavation of the soil and placement of a liner and leachate collection system and has been conservatively estimated to occur within the first year. When construction of Module 1A is completed, the facility will begin to accept municipal solid waste for placement in the landfill.

Waste will be delivered to the site by transfer trucks from transfer stations, commercial vehicles, and private vehicles and placed in Module 1A. During the landfill operations, waste will be evenly spread in layers and compacted. A layer of soil or approved alternate material (including but not limited to tarps, shredded/processed green wastes, bottom ash, shredded waste tires, petroleum contaminated soils (PCS), auto shredder fluff, and crushed glass) is then spread in a layer of at least 6 inches over the waste as daily cover. The refuse will be covered at the end of each operating day.

Additional cells/modules will be constructed after Module 1A. The Air Quality Permit Application submitted to the PDEQ was for the first five years of construction and operation of the Marana Regional Landfill.

1.3 Applicable Regulations for the Project

A Class I air quality permit application for the initial construction phase(s) of the landfill was submitted and received by the PDEQ on September 23, 2011. PDEQ assigned a permit number (Permit # 6133) to the project but has not yet issued the permit. The application was deemed incomplete in a letter sent by PDEQ on October 17, 2011

because the application did not include all requirements of the State Implementation Plan (SIP). Included in the incompleteness letter was the requirement for an air dispersion modeling analysis. Since the Marana Regional Landfill's potential emissions of TSP exceeds the SIP major source threshold of 100 tons per year (as defined in Pima County SIP Rule 171 (C)(2)), Rule 504(C) requires that an "estimate of the concentration of a pollutant in the ambient air near a proposed new major source" be made. This estimate is determined by conducting air dispersion modeling of the facility's emissions to demonstrate compliance with the 24-hour TSP ambient air quality standard of 150 micrograms per cubic meter ($\mu g/m^3$) found in Rule 342.

Other requirements applicable to the project are listed within the Class I Permit Application.

1.4 Modeled Sources

As in the air permit application, this modeling analysis includes construction and operation emissions during the first five years of construction and operation of the landfill. Construction of the Module 1A will involve excavating the soil from the landfill area, hauling the soil to a stockpile area on-site, and installation of a liner and leachate collection system. No waste will be placed in the landfill until construction of the landfill, liner, and leachate collection system for Module 1A is complete.

In the early stages of waste placement in Module 1A, there will be no additional construction activity. This will occur until such time when additional waste capacity is needed. At that time, construction will begin on future cells and modules, such as Module 1B. This future construction activity will require excavating smaller soil volumes than was required for Module 1A. Construction of Module 1B will take place concurrently with on-going waste disposal activities in Module 1A.

For modeling purposes, this project is therefore divided into three phases: Phase I – Construction of Module 1A, Phase II – Landfill Operation (of Module 1A), and Phase III – Landfill Operation and Future Cell Construction of Module 1B. A description of the emission sources associated with each phase is provided below.

1.4.1 Phase I – Construction of Module 1A

1) Construction/Excavated Soils Hauling Roads – Includes road dust from vehicles that carry the excavated soils from the Module 1A construction area to the main soils stockpile north of the haul road. Construction vehicles will travel approximately 0.3 miles on a dirt road in the landfill construction area and then approximately 1.1 miles along a road consisting of asphalt millings to the main soil stockpile, before returning via the same route to the landfill construction area (see Figure 1-2).

2) Construction/Excavated Soils Handling – Soil that is excavated during construction of the landfill is placed onto the main stockpile area in the northern part of the site.

1.4.2 Phase II – Landfill Operation

1) Waste Hauling Roads – Includes road dust from vehicles transporting waste into the facility and exiting the facility. Waste hauling vehicles will enter through the front gate, travel approximately 0.3 miles on a paved road, approximately 0.7 miles on a road consisting of asphalt millings to the active portion of the landfill, approximately 0.3 miles on a dirt road within the active landfill, and back again along the same route.

2) Material Handling of the Waste – Emissions associated with waste placement into the active area of the landfill. Emissions from this process are considerably less than road dust created by vehicle traffic. The waste drop point is located in the southern portion of Module 1A.

3) Daily Cover Soil Hauling Roads – Road dust from vehicles that carry the daily cover material (soil or alternate material) to the active area of the landfill. The location from which the daily cover will be acquired will be located a short distance from the active landfill. Travel distances (one-way) for vehicles carrying daily cover material is approximately 0.2 miles on the asphalt millings surface and approximately 0.4 miles on dirt roads.

4) Daily Cover Soil Handling Operations – Placing of the soil or alternate material used for daily cover. The location of this point is the same as that for waste handling.

5) Perimeter and Access Roads – Infrequently traveled roads for inspections and well monitoring. These roads will be used by pick-up trucks or passenger vehicles only and generally not by waste or soil handling trucks.

6) Diesel-fired Stationary Reciprocating Internal Combustion Engine (RICE) – Engine used to power a water pump near the southern property boundary.

1.4.3 Phase III – Landfill Operation and Future Construction

1) Includes the same sources that are listed in Phase II for landfill operations. The landfill operations will occur concurrently with construction of a new module – Module 1B. Module 1B is to be constructed adjacent to Module 1A.

2) Construction/Excavated Soils Hauling Roads – As in Phase I, includes road dust from vehicles that carry the excavated soils from the construction area to the main soils stockpile north of the haul road. The volume of soils excavated for construction of Module 1B is representative of future construction activities in other parts of the landfill. Also, the distance traveled by construction vehicles for Module 1B are the most conservative (furthest from the stockpile).

As shown in Figure 1-1, Module 1B will be constructed adjacent to Module 1A (immediately to the east). It is assumed for this analysis that part of the road covered with asphalt millings during construction and operation of Module 1A will be changed to a dirt road. The distance traveled by construction vehicles will be approximately 0.3 miles on the dirt road in the landfill construction area. The vehicles will then travel approximately 1.0 miles along a road consisting of asphalt millings to the main soil stockpile, before returning via the same route to the landfill construction area.

2 MODELING PARAMETERS

2.1 Modeling Strategy

Modeling was performed to determine whether predicted TSP concentrations concentrations associated with the landfill construction and operations would be below the TSP ambient air quality standard as identified within SIP Rule 342. To determine compliance, the highest second-high (HSH) 24-hour average predicted concentration is added to a "representative" background concentration and compared to the 24-hour ambient standard of 150 $\mu g/m^3$ (listed in the SIP).

2.2 Modeling Inputs

2.2.1 Model Selection

A windows-based software program called BEEST®, which incorporates the latest version of AERMOD (version 11103) and associated pre-and post-processing programs in a graphic interface, was used for this analysis.

2.2.2 Land Classification

As specified in the EPA's modeling guidance (40 CFR Part 51 Appendix W), the choice between rural or urban dispersion parameters is based on the predominant land use within a 3-kilometer radius of the site. Although there are some sparsely populated areas nearby, the area within 3 kilometers of the Marana Regional Landfill is primarily desert. Therefore, rural dispersion parameters were used. An aerial photo showing the surrounding area is shown in Figure 2-1.

2.2.3 Dry Deposition Option

AERMOD includes in its regulatory default option a particle deposition algorithm that allows the user to input particle size distribution data for sources of TSP. Dry deposition is used to account for the settling of heavier, large diameter particles close to the source and is applied where the particle size distribution is known. Since a majority of the TSP emissions from this project consist of particles greater than 10 microns in diameter, the dry particle deposition option was used. The particle size categories for this modeling study were $PM_{2.5}$, PM_{10}, and PM_{30}. The "PM_{30}" category includes all particulate with a diameter larger than PM_{10}.

2.2.4 Meteorological Data

Pre-processed AERMOD-ready meteorological data was obtained from the ADEQ. The five year data set (June 1, 2000 to May 31, 2005) includes surface observations from a

nearby Portland cement plant in Rillito, located about 8 miles east of the proposed Marana Regional Landfill site, and upper air data from the Tucson Airport.

PDEQ indicated that meteorological data was also available for two nearby PM_{10} monitoring stations, Tangerine and Coachline. However, these stations do not record key parameters such as cloud cover, Albedo, surface roughness and Bowen ratio that are needed when processing data for input to AERMOD. Also, the Tangerine and Coachline stations are more likely to be influenced by the nearby mountains than the Rillito site or the location of the Marana Regional Landfill. Therefore, the Rillito site was selected and approved by the PDEQ for this analysis to be most representative of the meteorological conditions at Marana Regional Landfill.

Modeling was done for 12 months of meteorological data per run. As discussed in Section 3, the 24-hour standard for TSP can be exceeded once per day (at each receptor) over a given 12-month period. Since the meteorological data starts on June 1, 2000, each model run was performed for the period of June 1 to May 31 of the following year.

2.2.5 Building Downwash

No building data will be included in this analysis, as the modeled sources are not affected by building downwash.

2.2.6 Receptor Grids

Receptors are placed every 25 meters along the property line. The modeling protocol proposed additional receptors at various distances out to a maximum distance of 10 kilometers. However, since preliminary modeling showed that the maximum impacts occur at the property line, the receptor grid ("coarse grid") was reduced to 2,000 meters beyond the property line. Spacing for the receptors beyond the fenceline is 500 meters (Figure 2-2). The nearest school, residence and workplace are within the limits of the coarse receptor grid, as shown in Figure 2-2. This change from the approved modeling protocol was accepted by the PDEQ, as documented in e-mail correspondence from the agency dated January 5, 2012.

To assure the location of the maximum concentration for each phase, Cornerstone first determined the location of the maximum-modeled concentration using the coarse grid. Using that location, Cornerstone then developed a network of receptors closely spaced around the "coarse-grid location" (Figures 2-3, 2-4, and 2-5). Elevations for these receptors are the same as the receptor identified in the "coarse-grid" run.

2.2.7 Terrain Elevations

The landfill will be located in the Avra Valley between Tucson and Phoenix, approximately 3.5 miles west of the Marana Regional Airport and 8 miles west of Interstate Highway 10. The Tucson Mountains are located to the southeast of the site.

Terrain elevations above mean sea level were estimated for receptors using the AERMAP processor and digital elevation data from the National Elevation Dataset (NED).

Source elevations were also determined for AERMAP with the exception of the sources within the active area of the landfill. Dirt road sources associated with construction of Module 1A and Module 1B were assigned an elevation of 585 meters, which is the base elevation of the bottom of the proposed landfill. For waste hauling and daily cover truck traffic on the dirt road within the active landfill, elevations will change over time as waste is placed in the landfill. A conservative estimate for this modeling assessment was for the elevation of the dirt road to start at 585 meters when trucks enter the landfill disposal cell, and assign an elevation rise by 8 feet for every 100 feet of horizontal distance.

2.2.8 Source Characterization

The roads and material handling drop points were modeled as volume sources, as described in the ADEQ Modeling Guidance. Dimensions of all volume sources were calculated according to the 8-step process outlined in the guidance, as described below.

2.2.8.1 Roads

Step 1 – Determine adjusted width.

For roads, this was calculated as the actual width of the road plus 6 meters.

Step 2 – Determine number of volume sources.

The length of the road was divided by the adjusted width to determine the maximum number of volume sources available.

Step 3 – Determine the volume height.

The volume height was equal to twice the height of the vehicles generating the emissions.

Step 4 – Determine initial horizontal sigma for each volume.

The initial lateral dimension was twice the adjusted width (road width plus 6 meters) divided by 2.15, where the road is represented by “alternating volume sources”.

Step 5 – Determine the initial vertical dimension.

The initial vertical sigma was the volume height divided by 2.15.

Step 6 – Determine the release height.

The release height was set to half of the volume height.

Step 7 – Determine the emission rate for each volume source.

Emissions for each segment of the road (each individual volume source) were based on the expected vehicle traffic along with the control efficiency from watering.

Step 8 – Determine the UTM coordinate for each source.

The volume source UTM coordinate was based on the center of the base of the volume.

2.2.8.2 Waste Material and Soil Handling

Waste material and soil handling drop points were also modeled as volume sources. For these sources, the adjusted width is the typical width of a dump truck. The waste handling (waste drop point) was conservatively placed near the southwest corner of the base of the footprint for Module 1A (closest to the fenceline). In reality, as the landfill is filled with waste, the location of the drop point will move to different points within Module 1A. For excavation soils, the drop point was conservatively modeled near the northeast corner of the main soil stockpile (closest to the fenceline).

2.2.8.3 Diesel-Fired Water Pump

The 110-horsepower diesel fired water pump was modeled as a point source, conservatively located at the irrigation well near the southern boundary of the facility. The water pump engine was modeled as operating year-round (8,760 hours per year), although actual operation of this engine is likely to be far less.

The location of the sources included in the model is shown in Figures 1-1 and 1-2.

2.2.9 Source Emission Rates

A summary of the TSP emission rates for each source are provided in Table 2-1. Detailed emission calculations are provided in Appendix A. Note that the emission calculations presented in this modeling protocol are broken down into more detail than those presented in the Class I air permit application for the project.

The modeling guidance specifies that emissions must be calculated assuming "worst-case" operating scenarios. It is important to note that the "worst-case" operating scenario for calculating modeled impacts is different than the "worst-case" scenario used in the permit application to calculate potential to emit. In the permit application, it was assumed that construction and operation of Module 1A occur simultaneously which results in a conservative over-prediction of annual emissions to represent potential to emit. Modeling such a scenario would over-predict air quality impacts, since the operation activities will not begin until after construction of Module 1A is complete. Therefore, construction and operation of Module 1A are modeled separately.

Other changes incorporated in the emission calculations for the modeling include the use of asphalt millings rather than gravel and a higher control efficiency for watering construction roads. These changes represent a more realistic "worst-case" scenario for ambient air quality impacts, as they reflect updated operational information from the facility.

Since this project is subject to the visibility limitation in Rule 343, road emissions will be controlled through watering and/or the application of chemical dust suppression. Therefore, "controlled" emission rates are used in the analysis.

Emission calculations used in the modeling represent a conservative estimate for determining air quality impacts from the project. Exact vehicle types, weights, and trips per day may differ slightly from what is provided below.

2.2.9.1 Phase I – Module 1A Construction:

- The amount of soil excavated during construction of Module 1A was modeled at 10,726 tons per day (equates to 268 articulated trucks (large dump trucks) per 24-hour period). This assumes an aggressive schedule with construction of the landfill completed within one calendar year.

- The construction contractor may build a new road for soil transport to the stockpile. However, since the exact location of that new road is not known at this time, it assumed that all construction vehicles will travel approximately along the path marked in Figure 1-2.

- Dust control measures (e.g. frequent watering or application of a chemical dust suppressant), as necessary to comply with Pima County Code fugitive dust regulations will be applied to the road where the construction vehicles will travel. Contractors will be required to employ these strict dust control measures to reduce offsite dust emissions.

- Control efficiency from watering is 75% for dirt roads, 90% for milled asphalt roads.

- Construction vehicles will generally remain on-site. Emissions from these vehicles will be associated with round trip travel from the landfill to the stockpile area and back to the landfill.

2.2.9.2 Phase II – Module 1A Operation

<u>Waste Hauling</u>

- The amount of waste received for disposal was modeled at 2,000 tons per day.

- Waste brought to the site will travel approximately 2.6 miles per round trip (to the southwest corner of the site). This conservatively assumes the maximum possible distance that waste hauling trucks will travel onsite.

- The drop point for the waste brought to the landfill will be near the southwest corner of the base of Module 1A.

- Dust control measures utilized similar to those noted for Phase I. Control efficiency from watering is 75% for the paved roads, 90% for milled asphalt, and 75% for dirt roads.

Daily Cover

- The amount of soil placement for daily cover was modeled at approximately 691 tons/day.

- The number of vehicle trips for daily cover was modeled at approximately 22 trips per day.

- The daily cover stockpile will contain sufficient soil and alternative cover material to supply the landfill with daily cover throughout the life of the landfill. No additional excavated soils should be needed from the main excavated soils stockpile.

- Heavy equipment will be used to transport daily cover material from the stockpile to the landfill.

- Dust control measures utilized similar to those noted for Phase I. The control efficiency from watering applied in the modeled emissions was 90% for milled asphalt and 75% for dirt roads.

Perimeter and Access Roads

- One pickup truck trip per day is conservatively assumed to travel along both the perimeter and access roads.

- The control efficiency from watering applied in the modeled emissions was 50% for paved roads and 90% for milled asphalt. The control efficiency for watering on unpaved perimeter and access roads used in the modeling was 50% due to their limited use.

2.2.9.3 Phase III – Operation of Module 1A and Module 1B Construction

- All of the inputs used in Phase II are the same for Phase III.

- The amount of soil excavated during construction of Module 1B was modeled at 4,487 tons per day (equates to 112 articulated trucks (large dump trucks) per 24-hour period). This assumes an aggressive schedule with construction of the landfill completed within one calendar year.

- For this phase only, construction is limited to no more than 19 hours per day.

2.2.10 Ambient Background Concentrations

Since local TSP concentrations have not been monitored since 1990, PDEQ recommended using PM_{10} concentrations from either the Tangerine or Coachline monitoring station. The Tangerine station monitors PM_{10} and Coachline monitors $PM_{2.5}$. For this analysis, the Tangerine PM_{10} data is used. PDEQ provided two years and 10 months of measured PM_{10} concentrations from the Tangerine monitor (January 2009 to October 2011).

The ADEQ modeling guidance requires that permit applicants select the average of the highest monitored values from the most recent three years of available data. For this analysis, the maximum 24-hour monitored concentration was determined for each month (see Table 2-2).

A review of the monitored data showed all monthly maximum values were between 12 and 66 micrograms per cubic meter (ug/m3), with the exception of October 2009. On October 28, 2009, the monitor recorded a 24-hour concentration of 101 ug/m^3. This appears to be in error as all 24-hour monitored concentrations at that location from April 2009 to October 2009 showed readings between 9 and 31 ug/m^3. Removing the anomalously high concentration results in an average for the monthly maximum values of 28.1 ug/m^3. This value was used as a background for this analysis.

3 MODEL RESULTS

For all phases, "total impacts" (i.e., maximum-modeled concentration + background concentration) are below the threshold of 150 $\mu g/m^3$. For Phases I and II, maximum-modeled concentrations are located on the property line (i.e., the "dense grid runs" show no difference in the location). For Phase III however, the dense-grid run shows a slightly higher maximum than the coarse-grid run[1]. Therefore, we are confident that maximum-modeled concentrations for all phases are identified appropriately.

Modeling results presented in Table 3-1 demonstrate that each phase of the contruction and operation of the facility during the five year permit term will not exceed the PDEQ ambient air quality standard of 150 ug/m^3.

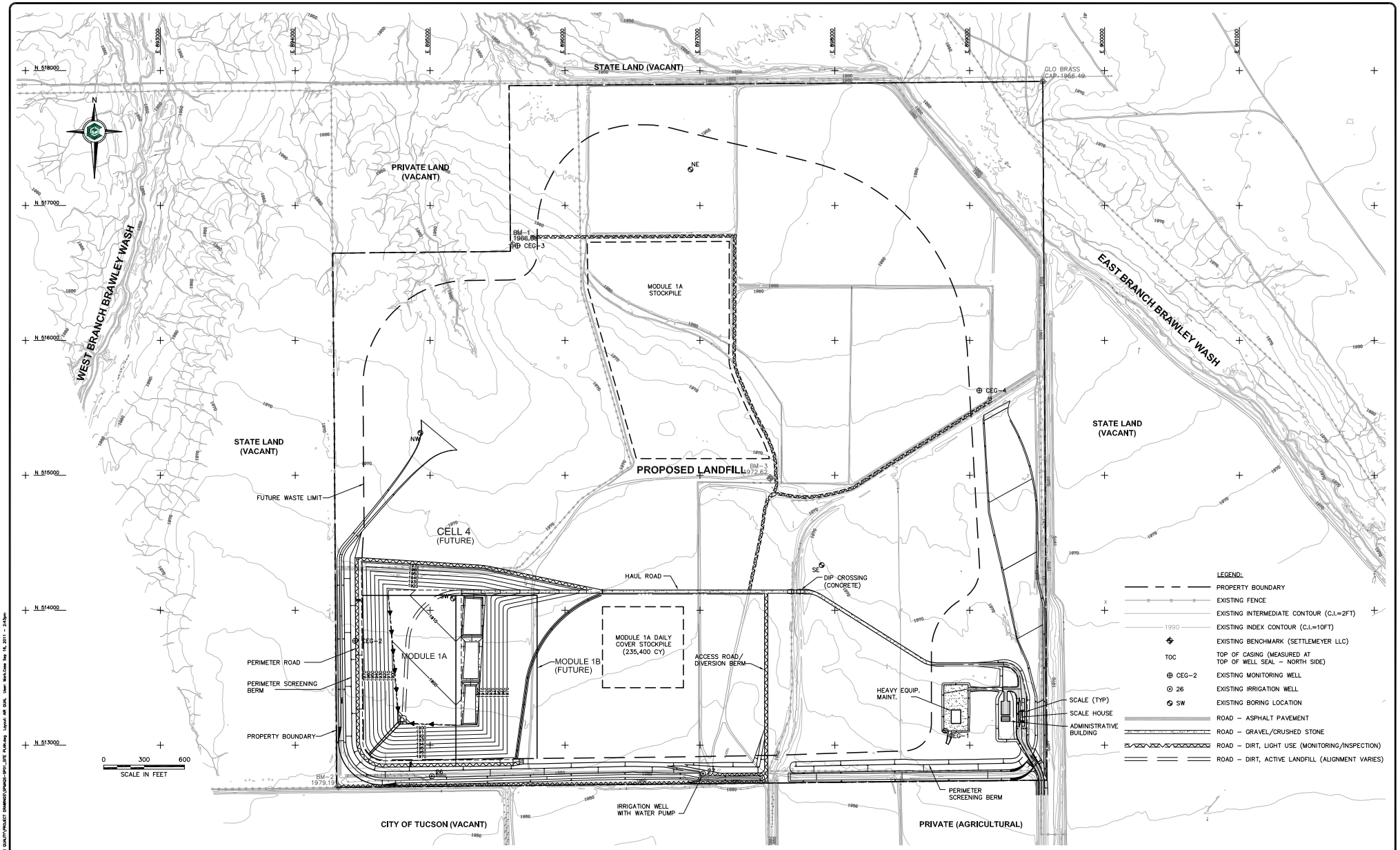
[1] Phase III construction is assumed to be 19 hr/day which reduces emissions of applicable sources approximately 20.83%. For Phases I and II, no hours of operations limits are assumed.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client and the Pima Department of Environmental Quality (PDEQ) as the permitting agency, unless otherwise noted. Any reliance on this report by any other third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, review agency, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

FIGURES



TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010.

GROUND CONTROL BY SETTLEMEYER LLC.

NOT FOR CONSTRUCTION

PRELIMINARY

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

DATE OF ISSUE SEPT. 2011 — DRAWN BY MDC — DESIGNED BY MDC — CHECKED BY CEB — APPROVED BY GRB

CORNERSTONE Environmental Group, LLC

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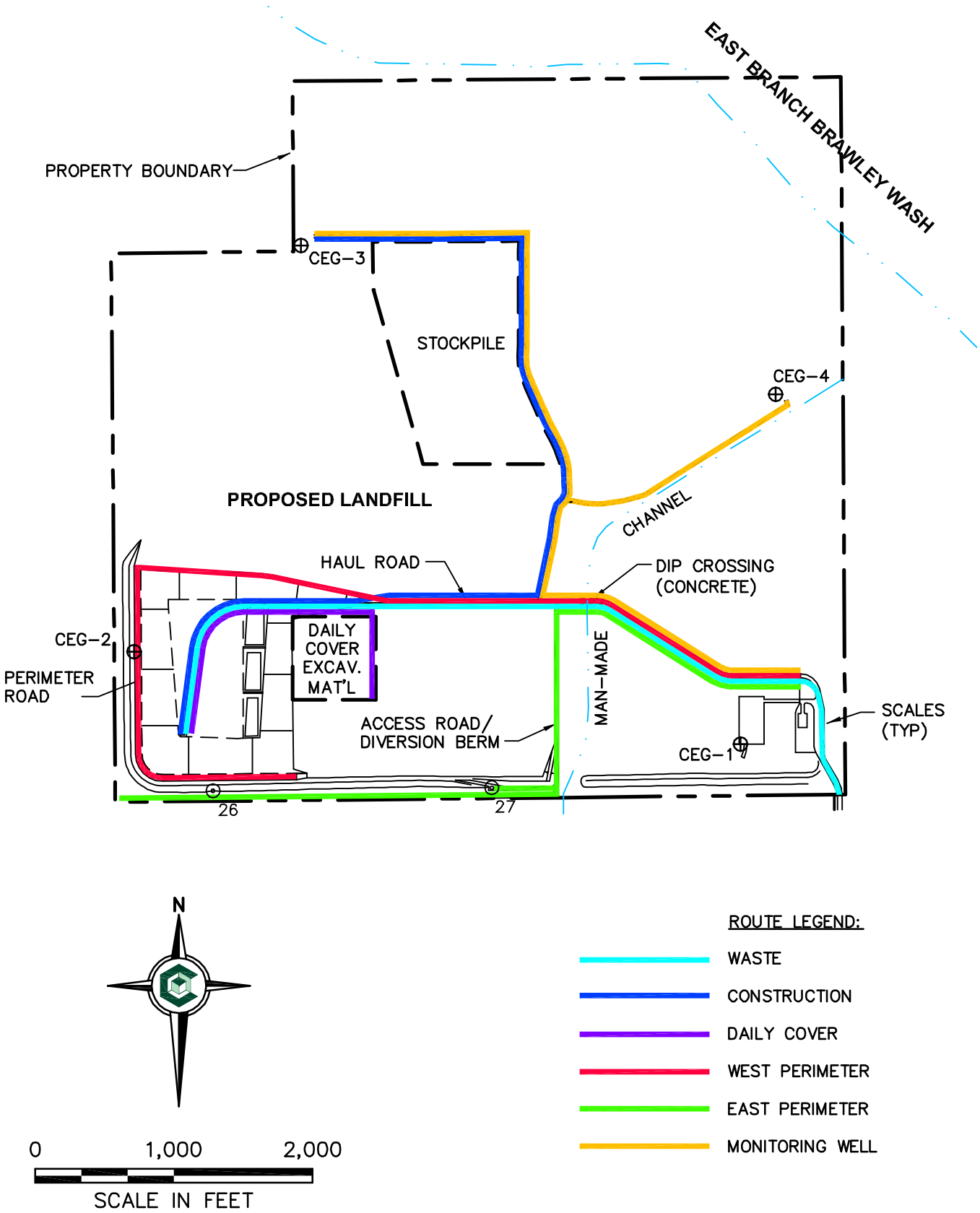
DKL HOLDINGS
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
TITLE V PERMIT APPLICATION

SITE PLAN

SHEET NO. 1

PROJECT NO. 090250.4

Figure 1-1



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DKL HOLDINGS
MARANA REGIONAL LANDFILL

ROADWAY ROUTING

FIGURE NO.
1-2

PROJECT NO.
090250.4

File: X:\PROJECTS\MARANA\090250 - AIR QUALITY\PROJECT DRAWINGS\SPMAQS-FIG 01_PH1 ROAD MAP.dwg Layout: AIR QUAL LT User: Mark.Case Jan 13, 2012 - 8:29am

Figure 2-1 Aerial Photo of Site Location

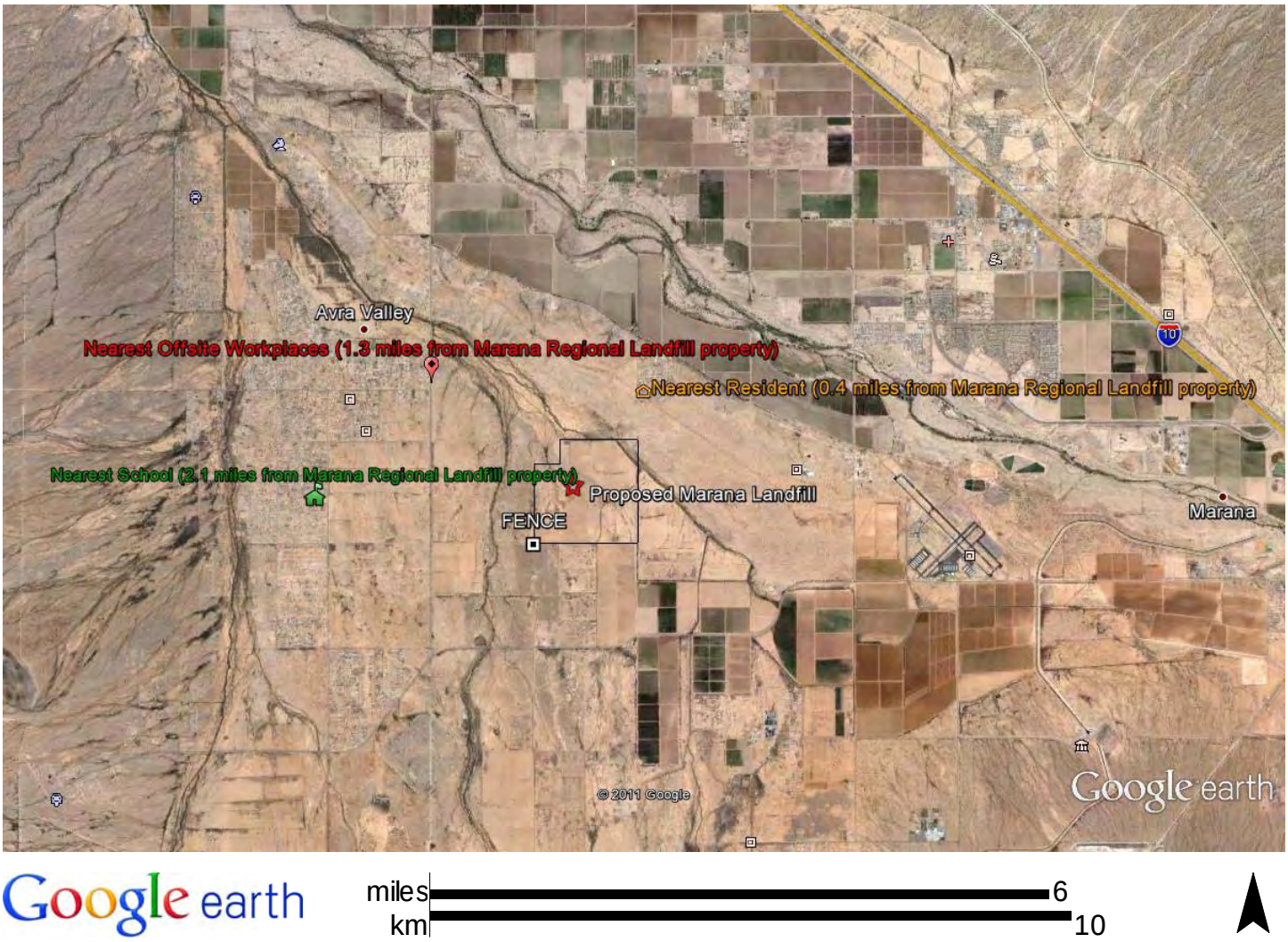
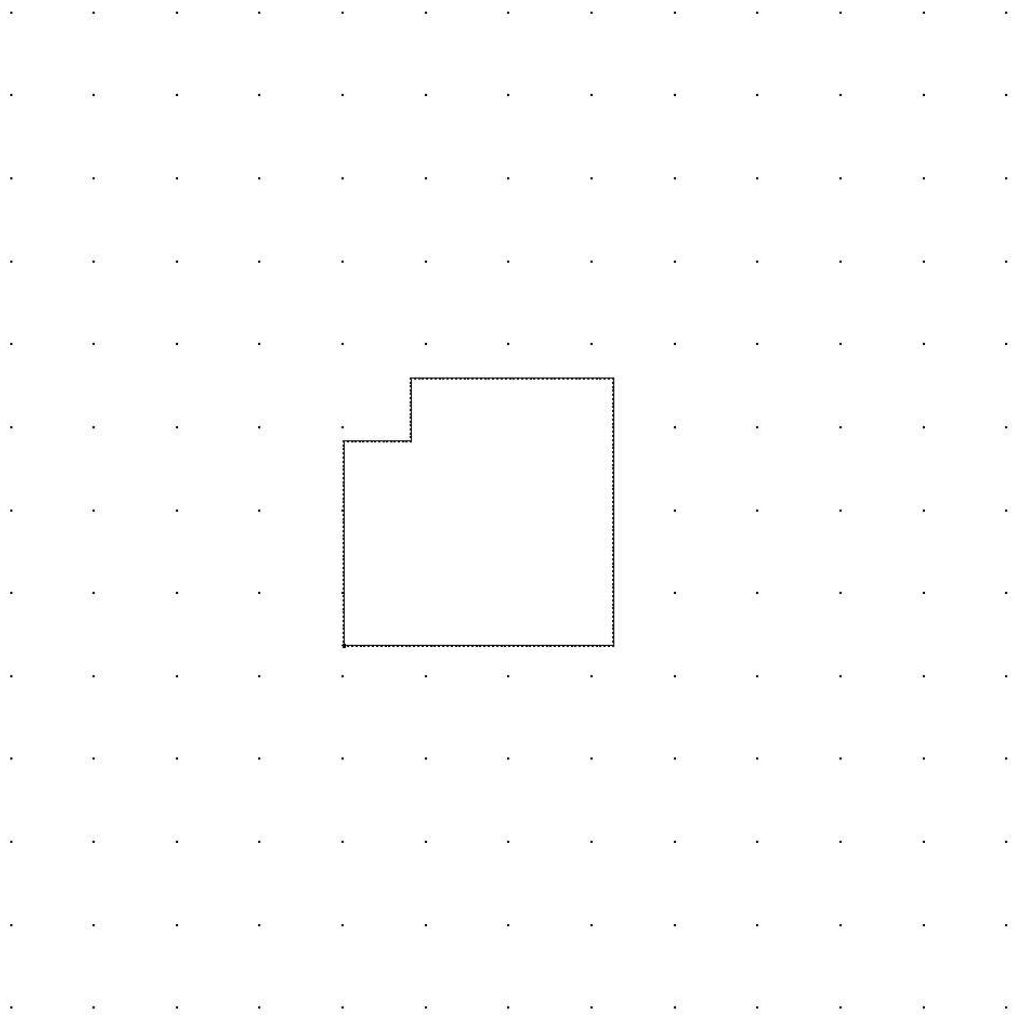


Figure 2-2
Nearest Residence, School and Offsite Workplace

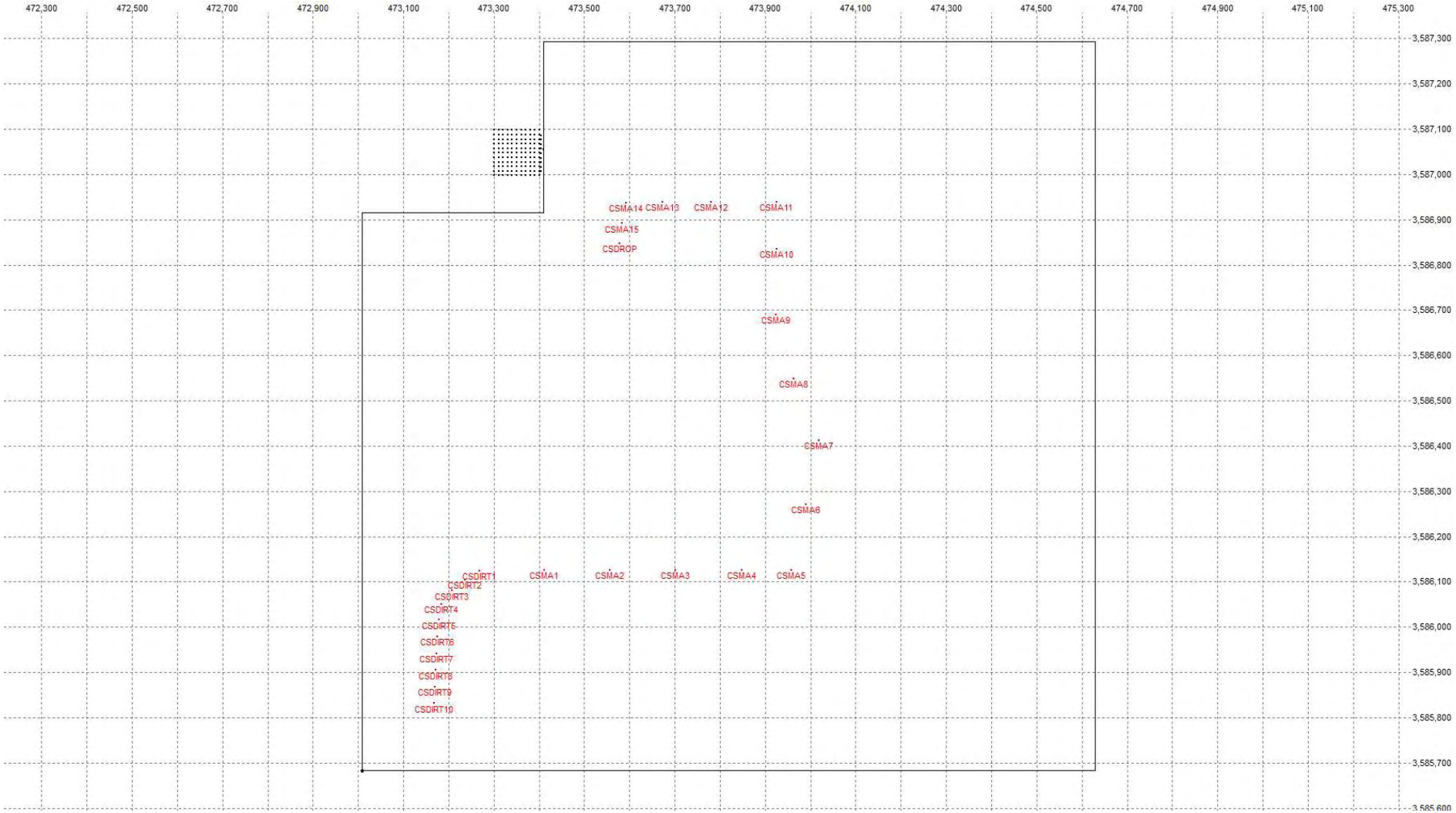


CORNERSTONE
Environmental Group, LLC

Date: 01/12/2012
DWN: SDM
APP:
REV: 0

Project Number
090250

FIGURE 2-3
MARANA REGIONAL LANDFILL
MARANA, AZ
PHASES I-III RECEPTORS
COARSE GRID

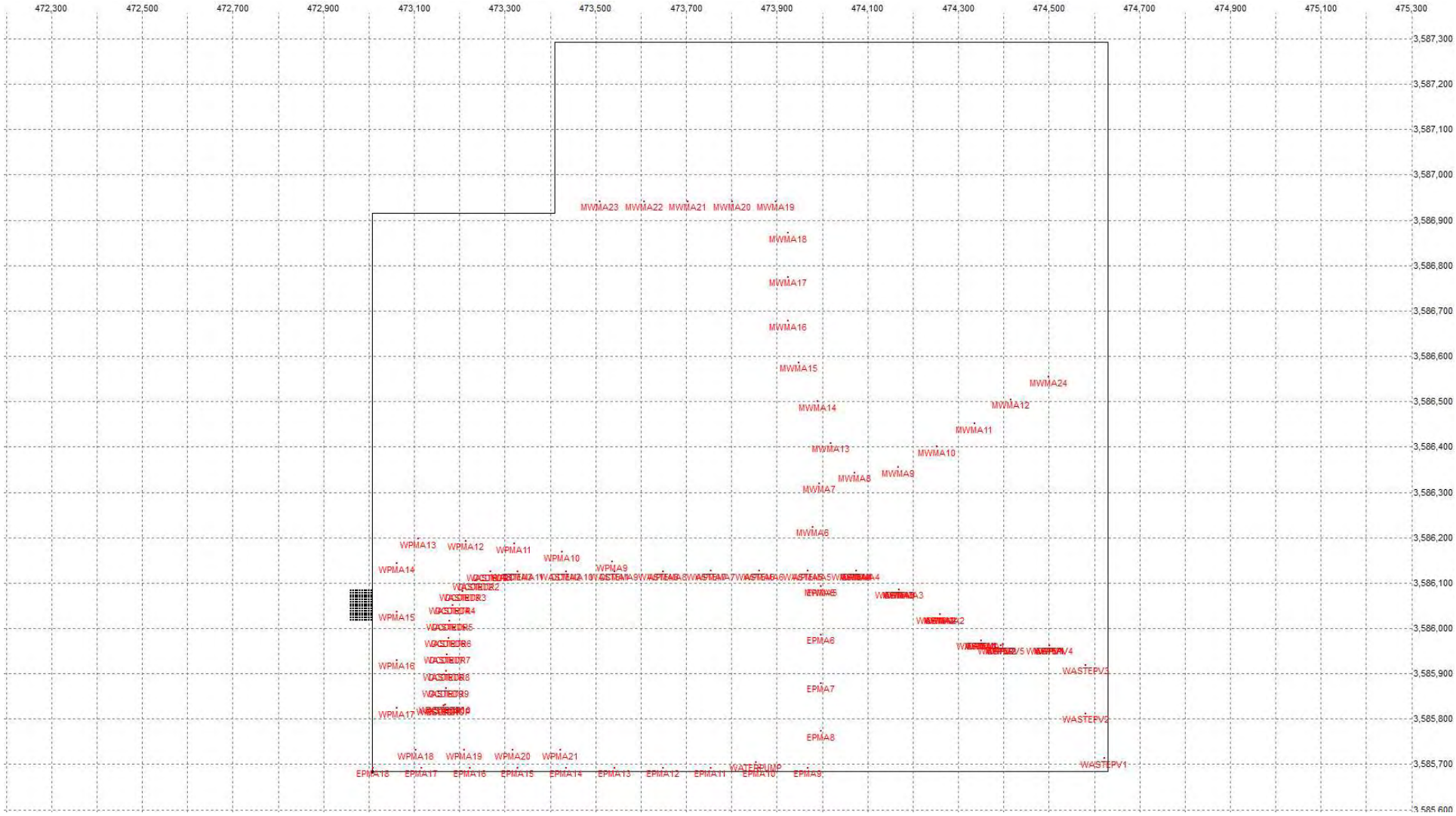


CORNERSTONE
Environmental Group, LLC

Date: 01/12/2012
DWN: SDM
APP:
REV: 0

Project Number
090250

FIGURE 2-4
MARANA REGIONAL LANDFILL
MARANA, AZ
PHASE I RECEPTORS
DENSE GRID

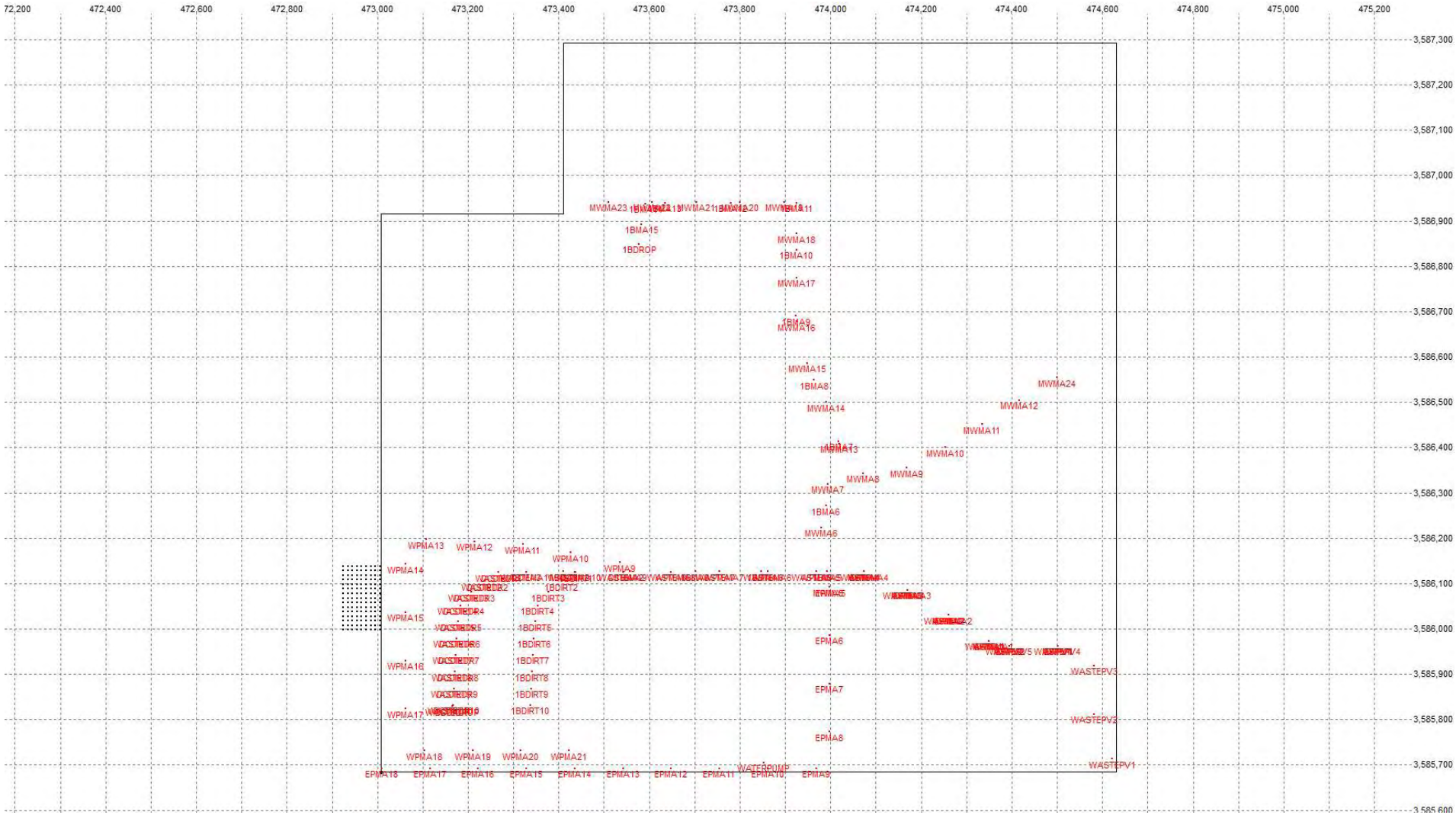


CORNERSTONE
Environmental Group, LLC

Date: 01/12/2012
DWN: SDM
APP:
REV: 0

Project Number
090250

FIGURE 2-5
MARANA REGIONAL LANDFILL
MARANA, AZ
PHASE II RECEPTORS
DENSE GRID



CORNERSTONE
Environmental Group, LLC

Date: 01/12/2012
DWN: SDM
APP:
REV: 0

Project Number
090250

FIGURE 2-6
MARANA REGIONAL LANDFILL
MARANA, AZ
PHASE III RECEPTORS
DENSE GRID

TABLES

Table 2-1
Emissions Summary

Emission Unit	Description	Calculated Emisisons		
		$PM_{2.5}$ (lb/hr)	PM_{10} (lb/hr)	PM_{30} (TSP) (lb/hr)
Construction - Module 1A				
--	Unpaved Dirt Road(s)	0.6	5.9	20.6
--	Unpaved Milled Asphalt Roads	0.71	7.1	26.2
--	Material Handling	0.0075	0.050	0.11
Waste				
--	Paved Road(s)	0.06	0.24	1.2
--	Unpaved Milled Asphalt Roads	0.17	1.74	6.5
--	Unpaved Dirt Road(s)	0.24	2.4	8.4
--	Waste/Storage Piles	0.0014	0.0093	0.020
Daily Cover				
--	Unpaved Dirt Road(s)	0.06	0.6	2.1
--	Unpaved Milled Asphalt Roads	0.0083	0.083	0.31
--	Material Handling	0.00046	0.0032	0.0068
Perimeter Roads				
--	West Perimeter Paved Road(s)	0.000026	0.00011	0.00053
--	West Perimeter Unpaved Milled Asphalt Road(s)	0.00091	0.0091	0.032
--	East Perimeter Paved Road(s)	0.000026	0.00011	0.00053
--	East Perimeter Unpaved Milled Asphalt Road(s)	0.00032	0.0032	0.012
--	East Perimeter Unpaved Dirt Road(s)	0.0016	0.016	0.057
--	Monitoring Well Paved Road(s)	0.000026	0.00011	0.00053
--	Monitoring Well Unpaved Milled Asphalt Road(s)	0.00054	0.0054	0.020
--	Monitoring Well Unpaved Dirt Road(s)	0.0015	0.015	0.052
Construction - Module 1B[(a)]				
--	Unpaved Dirt Road(s)	0.20	1.9	6.8
--	Unpaved Milled Asphalt Roads	0.21	2.1	7.9
--	Material Handling	0.0025	0.016	0.035
Point Sources				
--	Water Pump	0.24	0.24	0.24

(a) Emissions from construction of Module 1B are reduced by a factor of 19/24 to account for operating hours restricted to 19 hours per day.

Table 2-2
Ambient Background
PM_{10} Maximum Monitored 24-hour Concentrations
Tangerine Monitoring Station

Month-Year	Maximum Monitored 24-Concentration (ug/m^3)
January-09	12
February-09	16
March-09	40
April-09	23
May-09	31
June-09	19
July-09	25
August-09	20
September-09	18
October-09[(a)]	24
November-09	23
December-09	28
January-10	22
February-10	15
March-10	15
April-10	21
May-10	26
June-10	25
July-10	22
August-10	17
September-10	38
October-10	58
November-10	23
December-10	23
January-11	25
February-11	22
March-11	22
April-11	38
May-11	30
June-11	66
July-11	65
August-11	36
September-11	38
Average	***28.1***

(a) On October 28, 2009, an anomalously high concentration of 101 ug/m^3 was recorded. Since that concentration represents a statistical anomaly, that reading was replaced by the next highest value recorded in that month.

Table 3-1
AERMOD Modeling

Phase	Description	Averaging Period (hr)	Rank	Concentrations			NAAQS ($\mu g/m^3$)	Location (UTM)[a]		Location (Local)[c]	
				Max Modeled ($\mu g/m^3$)[a]	Monitored ($\mu g/m^3$)[b]	Total ($\mu g/m^3$)		East (m)	North (m)	Dist. (m)	Direction (^{o})
1	Module 1A Construction	24	H2H	104.1	28.1	132.2	150	473,410	3,587,057	748	324
2	Module 1A Operation	24	HSH	112.9	28.1	141.0	150	473,008	3,586,053	934	245
3	Module 1A Operation/Module 1B Construction	24	H2H	121.6 [d]	28.1	149.7	150	473,005	3,586,070	929	246

[a] Source: AerMod version 11353

[b] Highest concentration of representative background data acquired by Cornerstone

[c] Relative to an arbitrary facility "mid point," East UTM, North UTM (m): → 473,852 3,586,454

[d] Accounts for 19 hours per day operation of vehicular traffic on site roads

NAAQS- National Ambient Air Quality Standard, **H2H** – highest second high concentration over all receptors

APPENDIX A
TSP EMISSION CALCULATIONS

Marana Landfill Fugitive PM Assumptions

Phase I - Construction of Module 1A

Construction Material - Module 1A:

Initial excavation soil volume

Excavation Volume	2,900,000	cy/yr	(assume excavation in one year)
Days of Construction per Year	365	days/yr	
Volume of Soil Excavated per Day	7,945	cy/day	
Soil density	100	lb/cf	(typical soil density)
Cubic feet per cubic yard	27	cf/cy	
Soil density	2,700	lb/cy	(conversion from lb/cf to lb/cy)
Weight of Soil Excavated per Day	10,726	tons/day	

Vehicle Information

Soil Hauling Capacity per Truck (Articulated Truck)	40	ton/truck	(per Caterpillar specifications)
Total Vehicles Needed Per Day	268	vehicles/day	

	Unloaded (tons)	Loaded (tons)	Average (tons)	Vehicles Per Day
Articulated Truck	36	36	51	268

Road lengths based on site drawing

Refer to dark blue roadways on site map

Dirt Roads	0.3	mile
Asphalt Milled Roads	1.1	mile

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Soil Material Moisture Content	14.20%	
Assumed Dirt Road Control Efficiency	75%	*

* Construction contractors will be required to apply extensive dust control measures such as frequent watering or application of a chemical dust suppressant to construction roads.

Assumed Asphalt Milled Control Efficiency 90%

Phase II - Landfill Operation (also included in Phase III)

Waste:

2000 tons/day waste accepted (site provided)

Vehicle Information

	Unloaded (tons)	Loaded (tons)	Average (tons)	Vehicles Per Day
Transfer Trailer	17	40	29	60
Front Loader	20	30	25	10
Rear Loader	20	35	28	5
Rolloff	15	25	20	25
Pickup	2	4	3	100

Road lengths based on site drawing

Refer to light blue roadways on site map

Paved Roads	0.3	mile
Dirt Roads	0.3	mile
Asphalt Milled Roads	0.7	

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Waste Material Moisture Content	14.20%	
Assumed Paved Control Efficiency	50%	(based on watering as necessary)
Assumed Dirt Control Efficiency	75%	
Assumed Asphalt Milled Control Efficiency	90%	

Daily Cover Material:

Daily cover soil needs

Volume of Daily Soil	512	cy/day	(based on 2000 ton/day waste accepted, 1300 lb/CY waste density, and 5:1 waste:cover ratio)
Soil Density	100	lb/cf	
Cubic feet per cubic yard	27	cf/cy	
Soil Density	2700	lb/cy	conversion from lb/cf to lb/cy
Weight of Daily Soil	691.2	tons/day	

Vehicle Information

Soil Moving Capacity per Truck (Scraper)	31	ton/truck (per Caterpillar specifications)
Total Vehicles Needed Per Day	22	vehicles/day

	Unloaded (tons)	Loaded (tons)	Average (tons)	Vehicles Per Day
Scraper	20	20	25	22

Road lengths based on site drawing

Refer to purple roadways on site map

Unpaved Dirt Roads	0.4	mile
Asphalt Milled Roads	0.2	mile

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Soil Material Moisture Content	14.20%	
Assumed Dirt Control Efficiency	75%	(based on watering as necessary)
Assumed Asphalt Milled Control Efficiency	90%	

Perimeter Roads:

Used for inspections and for monitoring wells

Vehicle Information

	Unloaded (tons)	Loaded (tons)	Average (tons)	Vehicles Per Day
Pickup	2	2	2	1

West Perimeter Road lengths based on site drawing

Refer to orange roadways on site map

Paved Roads	0.1	mile
Dirt Roads	0.0	mile
Asphalt Milled Roads	1.3	mile

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Assumed Paved Control Efficiency	50%	(based on watering as necessary)
Assumed Asphalt Milled Control Efficiency	90%	

East Perimeter Road Lengths based on site drawing

Refer to green roadways on site map

Paved Roads	0.1	mile
Dirt Roads	0.5	mile
Asphalt Milled Roads	0.6	mile

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Assumed Paved/Dirt Control Efficiency	50%	(based on watering as necessary)
Assumed Asphalt Milled Control Efficiency	90%	

Monitoring Well Road lengths based on site drawing

Refer to yellow roadways on site map

Paved Roads	0.1	mile
Dirt Roads	0.4	mile
Asphalt Milled Roads	1.0	mile

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Assumed Paved/Dirt Control Efficiency	50%	(based on watering as necessary)
Assumed Asphalt Milled Control Efficiency	90%	

Weather Data:

Weather information gathered for Marana Regional Airport Weather Station via weatherunderground.com.

Number of "wet" days	32 days
Mean Wind Speed	7 mph

Phase III - Landfill Operation and Future Construction
(includes Phase II landfill operation data as well)

Future Construction Material:

Initial excavation soil volume

Total Excavation Volume	1,400,000	cy/yr	(For construction of Module 1B, assumed representative of future construction projects)
Soils used for daily cover for Module 1A	512	cy/day	(using soil excavated from Module 1B as daily cover in Module 1A)
Excavated Soils in Module 1B going to stockpile	1,213,120	cy/yr	(= total excavated volume - (daily cover soils * 365 days/yr))
Days of Construction per Year	365	days/yr	
Volume of Soil Excavated per Day	3,324	cy/day	
Soil density	100	lb/cf	(typical soil density)
Cubic feet per cubic yard	27	cf/cy	
Soil density	2,700	lb/cy	(conversion from lb/cf to lb/cy)
Weight of Soil Excavated per Day	4,487	tons/day	

Vehicle Information

Soil Hauling Capacity per Truck (Articulated Truck)	40	ton/truck (per Caterpillar specifications)
Total Vehicles Needed Per Day	112	vehicles/day

	Unloaded (tons)	Loaded (tons)	Average (tons)	Vehicles Per Day
Articulated Truck	36	36	51	112

Road lengths (based on removal of 560 feet of asphalt millings and replacing with dirt road)
Refer to dark blue roadways on site map

Dirt Roads	0.3	mile
Asphalt Milled Roads	1.0	mile

Asphalt Milled Surface Material Silt Content	6.40%	
Dirt Surface Material Silt Content	8.40%	
Soil Material Moisture Content	14.20%	
Assumed Dirt Road Control Efficiency	75%	*

* Construction contractors will be required to apply extensive dust control measures such as frequent watering or application of a chemical dust suppressant to construction roads.

Assumed Asphalt Milled Control Efficiency	90%

Emissions Summary

Emission Unit	Description	Calculated Emisisons		
		$PM_{2.5}$ (tpy)	PM_{10} (tpy)	PM_{30} (TSP) (tpy)
--	Unpaved Dirt Road(s)	2.58	25.76	90.36
--	Asphalt Milled Road(s)	3.09	30.92	114.53
--	Material Handling	3.29E-02	2.18E-01	4.60E-01
	Total	**5.70**	**56.89**	**205.4**

Site Specific Information	Value	
Unpaved Dirt Road Length, 1-way (1)	0.3 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	8.4%	
Control Efficiency, CE (1,5)	75%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Vehicle Weight[1] Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Articulated Truck	36	76	56	268

Total Vehicle Count	268 per day
Mean Vehicle Weight, W	56.0 ton
Tons Hauled per truck	40.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4)	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k	0.15	
Particle Size Multiplier - PM10, k	1.50	
Particle Size Multiplier2 - PM30, k	4.90	
Calculated Emission Factor - PM2.5, E	0.37 lb/VMT	
Calculated Emission Factor - PM10, E	3.71 lb/VMT	
Calculated Emission Factor - PM30, E	13.00 lb/VMT	
Total Miles Travelled - Unpaved Roads	55,611 VMT/yr	
Calculated Emissions - PM2.5	2.58 tpy	0.59 lb/hr
Calculated Emissions - PM10	25.76 tpy	5.88 lb/hr
Calculated Emissions - PM30	90.36 tpy	20.63 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of unpaved roadways during the construction process.

Site Specific Information	Value	
Asphalt Milled Road Length, 1-way (1).....	1.1 mi	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	6.4%	
Control Efficiency, CE (1,5).....	90%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Articulated Truck.....	36	76	56	268

Total Vehicle Count..... 268 per day
Mean Vehicle Weight, W..... 56.0 ton
Tons Hauled per truck..... 40.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.29 lb/VMT	
Calculated Emission Factor - PM10, E.....	2.90 lb/VMT	
Calculated Emission Factor - PM30, E.....	10.75 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	213,174 VMT/yr	
Calculated Emissions - PM2.5.....	3.09 tpy	0.71 lb/hr
Calculated Emissions - PM10.....	30.92 tpy	7.06 lb/hr
Calculated Emissions - PM30.....	114.53 tpy	26.15 lb/hr

[1] See Site Drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Amount of Material Handled Per Day (1).....	10,726 ton/day	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
Mean Wind Speed, U (2).....	7 mph	2
Surface Material Moisture Content, M (3).....	14.2%	

Material Handling Emissions	Value	
Predictive Emission Factor Equation (3).....	$E = [k*0.0032]*[((U/5)^{1.3})/((M/2)^{1.4})]$	
Particle Size Multiplier - PM2.5, k.....	0.053	
Particle Size Multiplier - PM10, k.....	0.35	
Particle Size Multiplier2 - PM30, k.....	0.74	
Calculated Emission Factor - PM2.5, E.....	1.68E-05 lb/ton	
Calculated Emission Factor - PM10, E.....	1.11E-04 lb/ton	
Calculated Emission Factor - PM30, E.....	2.35E-04 lb/ton	
Calculated Emissions - PM2.5.....	3.29E-02 tpy	7.52E-03 lb/hr
Calculated Emissions - PM10.....	2.18E-01 tpy	4.97E-02 lb/hr
Calculated Emissions - PM30.....	4.60E-01 tpy	1.05E-01 lb/hr

[1] Site Specific - Specify Actual Source

[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.

[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.4, Nov. 2006.

Emissions Summary

Emission Unit	Description	Calculated Emisisons		
		$PM_{2.5}$ (tpy)	PM_{10} (tpy)	PM_{30} (TSP) (tpy)
--	Paved Road(s)	0.26	1.05	5.27
	Asphalt Milled Roads	0.76	7.64	28.30
--	Unpaved Dirt Road(s)	1.05	10.45	36.68
--	Waste/Storage Piles	6.14E-03	4.06E-02	8.58E-02
	Total	**2.07**	**19.19**	**70.3**

Site Specific Information	Value	
Paved Road Length, 1-way (1).....	0.3 mi	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (3).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	6.4%	
Control Efficiency, CE (1,5).....	75%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Vehicle Weight[1] Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Transfer Trailer.....	17	40	29	60
Front Loader.....	20	30	25	10
Rear Loader.....	20	35	28	5
Roll Off	15	25	20	25
Pickup.....	2	4	3	100

Total Vehicle Count..... 200 per day
Mean Vehicle Weight, W..... 14.5 ton

Paved Road Emissions	Value	
Predictive Emission Factor Equation (3).....	$E = \{[k*(sL)^{0.91}*(W)^{1.02}]*(1-P/4N)\}*CE$	
Particle Size Multiplier - PM2.5, k.....	0.00054	
Particle Size Multiplier - PM10, k.....	0.0022	
Particle Size Multiplier2 - PM30, k.....	0.011	
Calculated Emission Factor - PM2.5, E.....	0.05 lb/VMT	
Calculated Emission Factor - PM10, E.....	0.20 lb/VMT	
Calculated Emission Factor - PM30, E.....	1.02 lb/VMT	
Total Miles Travelled - Paved Roads.....	41,477 VMT/yr	
Calculated Emissions - PM2.5.....	0.26 tpy	0.059 lb/hr
Calculated Emissions - PM10.....	1.05 tpy	0.241 lb/hr
Calculated Emissions - PM30.....	5.27 tpy	1.203 lb/hr

[1] See site drawing.

[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.

[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.

[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.

[5] Control efficiency based on watering of paved roadways when necessary.

Site Specific Information	Value	
Asphalt Milled Length, 1-way (1)	0.7 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (3)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	6.4%	
Control Efficiency, CE (1,5)	90%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Vehicle Weight[1] Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Transfer Trailer	17	40	29	60
Front Loader	20	30	25	10
Rear Loader	20	35	28	5
Roll Off	15	25	20	25
Pickup	2	4	3	100

Total Vehicle Count..... 200 per day
Mean Vehicle Weight, W..... 14.5 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4)	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k	0.15	
Particle Size Multiplier - PM10, k	1.50	
Particle Size Multiplier2 - PM30, k	4.90	
Calculated Emission Factor - PM2.5, E	0.16 lb/VMT	
Calculated Emission Factor - PM10, E	1.58 lb/VMT	
Calculated Emission Factor - PM30, E	5.85 lb/VMT	
Total Miles Travelled - Unpaved Roads	96,780 VMT/yr	
Calculated Emissions - PM2.5	0.76 tpy	0.17 lb/hr
Calculated Emissions - PM10	7.64 tpy	1.74 lb/hr
Calculated Emissions - PM30	28.30 tpy	6.46 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Unpaved Dirt Length, 1-way (1)	0.3 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (3)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	8.4%	
Control Efficiency, CE (1,5)	75%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Vehicle Weight[1] Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Transfer Trailer	17	40	29	60
Front Loader	20	30	25	10
Rear Loader	20	35	28	5
Roll Off	15	25	20	25
Pickup	2	4	3	100

Total Vehicle Count..... 200 per day
Mean Vehicle Weight, W..... 14.5 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4)	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k	0.15	
Particle Size Multiplier - PM10, k	1.50	
Particle Size Multiplier2 - PM30, k	4.90	
Calculated Emission Factor - PM2.5, E	0.20 lb/VMT	
Calculated Emission Factor - PM10, E	2.02 lb/VMT	
Calculated Emission Factor - PM30, E	7.07 lb/VMT	
Total Miles Travelled - Unpaved Roads	41,477 VMT/yr	
Calculated Emissions - PM2.5	1.05 tpy	0.24 lb/hr
Calculated Emissions - PM10	10.45 tpy	2.39 lb/hr
Calculated Emissions - PM30	36.68 tpy	8.37 lb/hr

[1] See site drawing.

[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.

[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.

[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.

[5] Control efficiency based on watering of unpaved roadways when necessary.

Site Specific Information	Value	
Amount of Waste Handled Per Day (1).....	2,000 ton/day	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
Mean Wind Speed, U (2).....	6.98 mph	2
Surface Material Moisture Content, M (3).....	14.2%	

Waste Handling Emissions	Value	
Predictive Emission Factor Equation (3).....	$E = [k*0.0032]*[((U/5)^{1.3})/((M/2)^{1.4})]$	
Particle Size Multiplier - PM2.5, k.....	0.053	
Particle Size Multiplier - PM10, k.....	0.35	
Particle Size Multiplier2 - PM30, k.....	0.74	
Calculated Emission Factor - PM2.5, E.....	1.68E-05 lb/ton	
Calculated Emission Factor - PM10, E.....	1.11E-04 lb/ton	
Calculated Emission Factor - PM30, E.....	2.35E-04 lb/ton	
Calculated Emissions - PM2.5.....	6.14E-03 tpy	1.40E-03 lb/hr
Calculated Emissions - PM10.....	4.06E-02 tpy	9.26E-03 lb/hr
Calculated Emissions - PM30.....	8.58E-02 tpy	1.96E-02 lb/hr

[1] Site provided daily waste acceptance, operational data based on worst-case scenario.

[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.

[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.4, Nov. 2006.

Emissions Summary

Emission Unit	Description	Calculated Emisisons		
		$PM_{2.5}$ (tpy)	PM_{10} (tpy)	PM_{30} (TSP) (tpy)
--	Unpaved Dirt Road(s)	0.26	2.62	9.18
--	Asphalt Milled Road(s)	0.04	0.36	1.35
--	Material Handling	2.12E-03	1.40E-02	2.96E-02
	Total	**0.30**	**2.99**	**10.6**

Site Specific Information	Value	
Unpaved Dirt Road Length, 1-way (1)	0.4 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	8.4%	
Control Efficiency, CE (1,5)	75%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Scraper	20	51	36	22

Total Vehicle Count 22 per day
Mean Vehicle Weight, W 35.5 ton
Tons Hauled per truck 31.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4)	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365]$	
Particle Size Multiplier - PM2.5, k	0.15	
Particle Size Multiplier - PM10, k	1.50	
Particle Size Multiplier2 - PM30, k	4.90	
Calculated Emission Factor - PM2.5, E	0.30 lb/VMT	
Calculated Emission Factor - PM10, E	3.02 lb/VMT	
Calculated Emission Factor - PM30, E	10.59 lb/VMT	
Total Miles Travelled - Unpaved Roads	6,936 VMT/yr	
Calculated Emissions - PM2.5	0.26 tpy	0.06 lb/hr
Calculated Emissions - PM10	2.62 tpy	0.60 lb/hr
Calculated Emissions - PM30	9.18 tpy	2.10 lb/hr

[1] See Site Drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of unpaved roadways when necessary.

Site Specific Information	Value	
Asphalt Milled Road Length, 1-way (1).....	0.2 mi	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	6.4%	
Control Efficiency, CE (1,5).....	90%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Scraper.....	20	51	36	22

Total Vehicle Count..... 22 per day
Mean Vehicle Weight, W..... 35.5 ton
Tons Hauled per truck..... 31.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.24 lb/VMT	
Calculated Emission Factor - PM10, E.....	2.36 lb/VMT	
Calculated Emission Factor - PM30, E.....	8.75 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	3,083 VMT/yr	
Calculated Emissions - PM2.5.....	0.0364 tpy	0.0083 tpy
Calculated Emissions - PM10.....	0.3642 tpy	0.0832 tpy
Calculated Emissions - PM30.....	1.3491 tpy	0.3080 tpy

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Amount of Material Handled Per Day (1).....	691 ton/day	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
Mean Wind Speed, U (2).....	7 mph	2
Surface Material Moisture Content, M (3).....	14.2%	

Material Handling Emissions	Value	
Predictive Emission Factor Equation (3).....	$E = [k*0.0032]*[((U/5)^{1.3})/((M/2)^{1.4})]$	
Particle Size Multiplier - PM2.5, k.....	0.053	
Particle Size Multiplier - PM10, k.....	0.35	
Particle Size Multiplier2 - PM30, k.....	0.74	
Calculated Emission Factor - PM2.5, E.....	1.68E-05 lb/ton	
Calculated Emission Factor - PM10, E.....	1.11E-04 lb/ton	
Calculated Emission Factor - PM30, E.....	2.35E-04 lb/ton	
Calculated Emissions - PM2.5.....	2.12E-03 tpy	4.85E-04 lb/hr
Calculated Emissions - PM10.....	1.40E-02 tpy	3.20E-03 lb/hr
Calculated Emissions - PM30.....	2.96E-02 tpy	6.77E-03 lb/hr

[1] Site Specific - Specify Actual Source

[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.

[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.4, Nov. 2006.

Emissions Summary

Emission Unit	Description	Calculated Emisisons		
		$PM_{2.5}$ (tpy)	PM_{10} (tpy)	PM_{30} (TSP) (tpy)
--	West Perimeter Road(s)	0.0040	0.0400	0.1428
--	East Perimeter Road(s)	0.0087	0.0860	0.2508
--	Monitoring Well Road(s)	0.0089	0.0883	0.3151
	Total	**0.02**	**0.21**	**0.7**

Site Specific Information	Value	
Paved Road Length, 1-way (1)	0.1 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	6.4%	
Control Efficiency, CE (1,5)	50%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck	2	2	2	1

Total Vehicle Count 1 per day
Mean Vehicle Weight, W 2.0 ton

Paved Road Emissions	Value	
Predictive Emission Factor Equation (3)	$E = \{[k*(sL)^{0.91}*(W)^{1.02}]*(1-P/4N)\}*CE$	
Particle Size Multiplier - PM2.5, k	0.00054	
Particle Size Multiplier - PM10, k	0.0022	
Particle Size Multiplier2 - PM30, k	0.011	
Calculated Emission Factor - PM2.5, E	0.01 lb/VMT	
Calculated Emission Factor - PM10, E	0.03 lb/VMT	
Calculated Emission Factor - PM30, E	0.13 lb/VMT	
Total Miles Travelled - Paved Roads	69 VMT/yr	
Calculated Emissions - PM2.5	0.00011 tpy	0.000026 lb/hr
Calculated Emissions - PM10	0.00047 tpy	0.00011 lb/hr
Calculated Emissions - PM30	0.00233 tpy	0.00053 lb/hr

[1] See Site Drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of paved roadways when necessary.

Site Specific Information	Value	
Asphalt Milled Road Length, 1-way (1).....	1.3 mi	(to perimeter roads to the west)
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	8.4%	
Control Efficiency, CE (1,5).....	90%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck.....	2	2	2	1

Total Vehicle Count..... 1 per day
Mean Vehicle Weight, W..... 2.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365]$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.08 lb/VMT	
Calculated Emission Factor - PM10, E.....	0.83 lb/VMT	
Calculated Emission Factor - PM30, E.....	2.90 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	968 VMT/yr	
Calculated Emissions - PM2.5.....	0.0040 tpy	0.00091 lb/hr
Calculated Emissions - PM10.....	0.0400 tpy	0.00914 lb/hr
Calculated Emissions - PM30.....	0.1404 tpy	0.03206 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Paved Road Length, 1-way (1)	0.1 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	6.4%	
Control Efficiency, CE (1,5)	50%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck	2	2	2	1

Total Vehicle Count ..... 1 per day
Mean Vehicle Weight, W ..... 2.0 ton

Paved Road Emissions	Value	
Predictive Emission Factor Equation (3)	$E = \{[k*(sL)^{0.91}*(W)^{1.02}]*(1-P/4N)\}*CE$	
Particle Size Multiplier - PM2.5, k	0.00054	
Particle Size Multiplier - PM10, k	0.0022	
Particle Size Multiplier2 - PM30, k	0.011	
Calculated Emission Factor - PM2.5, E	0.01 lb/VMT	
Calculated Emission Factor - PM10, E	0.03 lb/VMT	
Calculated Emission Factor - PM30, E	0.13 lb/VMT	
Total Miles Travelled - Paved Roads	69 VMT/yr	
Calculated Emissions - PM2.5	0.000114 tpy	0.000026 lb/hr
Calculated Emissions - PM10	0.000466 tpy	0.000106 lb/hr
Calculated Emissions - PM30	0.002330 tpy	0.000532 lb/hr

[1] See Site Drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of paved roadways when necessary.

Site Specific Information	Value	
Unpaved Road Length, 1-way (1).....	0.6 mi	(to perimeter roads to the east)
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	6.4%	
Control Efficiency, CE (1,5).....	90%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck.....	2	2	2	1

Total Vehicle Count..... 1 per day
Mean Vehicle Weight, W..... 2.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365]$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.06 lb/VMT	
Calculated Emission Factor - PM10, E.....	0.65 lb/VMT	
Calculated Emission Factor - PM30, E.....	2.40 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	436 VMT/yr	
Calculated Emissions - PM2.5.....	0.00141 tpy	0.00032 lb/hr
Calculated Emissions - PM10.....	0.01410 tpy	0.00322 lb/hr
Calculated Emissions - PM30.....	0.05224 tpy	0.01193 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Unpaved Road Length, 1-way (1).....	0.5 mi	(to perimeter roads to the east)
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	8.4%	
Control Efficiency, CE (1,5).....	50%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck.....	2	2	2	1

Total Vehicle Count..... 1 per day
Mean Vehicle Weight, W..... 2.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365]$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.08 lb/VMT	
Calculated Emission Factor - PM10, E.....	0.83 lb/VMT	
Calculated Emission Factor - PM30, E.....	2.90 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	346 VMT/yr	
Calculated Emissions - PM2.5.....	0.00715 tpy	0.00163 lb/hr
Calculated Emissions - PM10.....	0.07148 tpy	0.01632 lb/hr
Calculated Emissions - PM30.....	0.25075 tpy	0.05725 lb/hr

[1] See Site Drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of unpaved roadways when necessary.

Site Specific Information	Value	
Paved Road Length, 1-way (1)	0.1 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	6.4%	
Control Efficiency, CE (1,5)	50%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck	2	2	2	1

Total Vehicle Count ..... 1 per day
Mean Vehicle Weight, W ..... 2.0 ton

Paved Road Emissions	Value	
Predictive Emission Factor Equation (3)	$E = \{[k*(sL)^{0.91}*(W)^{1.02}]*(1-P/4N)\}*CE$	
Particle Size Multiplier - PM2.5, k	0.00054	
Particle Size Multiplier - PM10, k	0.0022	
Particle Size Multiplier2 - PM30, k	0.011	
Calculated Emission Factor - PM2.5, E	0.01 lb/VMT	
Calculated Emission Factor - PM10, E	0.03 lb/VMT	
Calculated Emission Factor - PM30, E	0.13 lb/VMT	
Total Miles Travelled - Paved Roads	69 VMT/yr	
Calculated Emissions - PM2.5	0.000114 tpy	0.000026 lb/hr
Calculated Emissions - PM10	0.000466 tpy	0.000106 lb/hr
Calculated Emissions - PM30	0.002330 tpy	0.000532 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of paved roadways when necessary.

Site Specific Information	Value	
Asphalt Milled Road Length, 1-way (1).....	1.0 mi	(to monitoring points on north side)
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	6.4%	
Control Efficiency, CE (1,5).....	90%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck.....	2	2	2	1

Total Vehicle Count..... 1 per day
Mean Vehicle Weight, W..... 2.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365]$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.06 lb/VMT	
Calculated Emission Factor - PM10, E.....	0.65 lb/VMT	
Calculated Emission Factor - PM30, E.....	2.40 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	726 VMT/yr	
Calculated Emissions - PM2.5.....	0.0024 tpy	0.00054 lb/hr
Calculated Emissions - PM10.....	0.0235 tpy	0.00537 lb/hr
Calculated Emissions - PM30.....	0.0871 tpy	0.01988 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Unpaved Road Length, 1-way (1).....	0.4 mi	(to monitoring points on north side)
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	8.4%	
Control Efficiency, CE (1,5).....	50%	

Calculation of Mean Vehicle Weight

	Vehicle Weight[1]			
Vehicle Type	Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Pickup Truck.....	2	2	2	1

Total Vehicle Count..... 1 per day
Mean Vehicle Weight, W..... 2.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365]$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.08 lb/VMT	
Calculated Emission Factor - PM10, E.....	0.83 lb/VMT	
Calculated Emission Factor - PM30, E.....	2.90 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	311 VMT/yr	
Calculated Emissions - PM2.5.....	0.00643 tpy	0.00147 lb/hr
Calculated Emissions - PM10.....	0.06433 tpy	0.01469 lb/hr
Calculated Emissions - PM30.....	0.22568 tpy	0.05152 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of unpaved roadways when necessary.

Emissions Summary

Emission Unit	Description	Calculated Emisisons		
		$PM_{2.5}$ (tpy)	PM_{10} (tpy)	PM_{30} (TSP) (tpy)
--	Unpaved Dirt Road(s)	1.08	10.77	37.80
--	Asphalt Milled Road(s)	1.19	11.88	44.00
--	Material Handling	1.38E-02	9.10E-02	1.92E-01
	Total	**2.28**	**22.74**	**82.0**

Site Specific Information	Value	
Unpaved Dirt Road Length, 1-way (1)	0.3 mi	
No. of Hours of Operation Per Day (1)	24 hr/day	
No. of Days in Averaging Period, N (1)	365 day/yr	
No. of Hours of Operation Per Averaging Period	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2)	32 day	3
Silt Loading, sL (3)	7.4 g/m2	
Surface Material Silt Content, s (3)	8.4%	
Control Efficiency, CE (1,5)	75%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Articulated Truck	36	76	56	112

Total Vehicle Count 112 per day
Mean Vehicle Weight, W 56.0 ton
Tons Hauled per truck 40.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4)	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k	0.15	
Particle Size Multiplier - PM10, k	1.50	
Particle Size Multiplier2 - PM30, k	4.90	
Calculated Emission Factor - PM2.5, E	0.37 lb/VMT	
Calculated Emission Factor - PM10, E	3.71 lb/VMT	
Calculated Emission Factor - PM30, E	13.00 lb/VMT	
Total Miles Travelled - Unpaved Roads	23,264 VMT/yr	
Calculated Emissions - PM2.5	1.08 tpy	0.25 lb/hr
Calculated Emissions - PM10	10.77 tpy	2.46 lb/hr
Calculated Emissions - PM30	37.80 tpy	8.63 lb/hr

[1] See site drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on watering of unpaved roadways during the construction process.

Site Specific Information	Value	
Asphalt Milled Road Length, 1-way (1).....	1.0 mi	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
No. of "Wet" Days (i.e., at least 0.01 in. precip), P (2).....	32 day	3
Silt Loading, sL (3).....	7.4 g/m2	
Surface Material Silt Content, s (3).....	6.4%	
Control Efficiency, CE (1,5).....	90%	

Calculation of Mean Vehicle Weight

Vehicle Type	Vehicle Weight[1] Unloaded (ton)	Vehicle Weight[1] Loaded (ton)	Average (ton)	Vehicles Per Day[1]
Articulated Truck.....	36	76	56	112

Total Vehicle Count..... 112 per day
Mean Vehicle Weight, W..... 56.0 ton
Tons Hauled per truck..... 40.0 ton

Unpaved Road Emissions	Value	
Predictive Emission Factor Equation (4).....	$[k*(s/12)^a*(W/3)^b]*[(365-P)/365)$	
Particle Size Multiplier - PM2.5, k.....	0.15	
Particle Size Multiplier - PM10, k.....	1.50	
Particle Size Multiplier2 - PM30, k.....	4.90	
Calculated Emission Factor - PM2.5, E.....	0.29 lb/VMT	
Calculated Emission Factor - PM10, E.....	2.90 lb/VMT	
Calculated Emission Factor - PM30, E.....	10.75 lb/VMT	
Total Miles Travelled - Unpaved Roads.....	81,888 VMT/yr	
Calculated Emissions - PM2.5.....	1.19 tpy	0.27 lb/hr
Calculated Emissions - PM10.....	11.88 tpy	2.71 lb/hr
Calculated Emissions - PM30.....	44.00 tpy	10.04 lb/hr

[1] See Site Drawing.
[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.
[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.1, Jan. 2011.
[4] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.2, Nov. 2006.
[5] Control efficiency based on placing asphalt millings on road surface to control dust.

Site Specific Information	Value	
Amount of Material Handled Per Day (1).....	4,487 ton/day	
No. of Hours of Operation Per Day (1).....	24 hr/day	
No. of Days in Averaging Period, N (1).....	365 day/yr	
No. of Hours of Operation Per Averaging Period.....	8760 hr/yr	
Mean Wind Speed, U (2).....	7 mph	2
Surface Material Moisture Content, M (3).....	14.2%	

Material Handling Emissions	Value	
Predictive Emission Factor Equation (3).....	$E = [k*0.0032]*[((U/5)^{1.3})/((M/2)^{1.4})]$	
Particle Size Multiplier - PM2.5, k.....	0.053	
Particle Size Multiplier - PM10, k.....	0.35	
Particle Size Multiplier2 - PM30, k.....	0.74	
Calculated Emission Factor - PM2.5, E.....	1.68E-05 lb/ton	
Calculated Emission Factor - PM10, E.....	1.11E-04 lb/ton	
Calculated Emission Factor - PM30, E.....	2.35E-04 lb/ton	
Calculated Emissions - PM2.5.....	1.38E-02 tpy	3.15E-03 lb/hr
Calculated Emissions - PM10.....	9.10E-02 tpy	2.08E-02 lb/hr
Calculated Emissions - PM30.....	1.92E-01 tpy	4.39E-02 lb/hr

[1] Site Specific - Specify Actual Source

[2] Actual weather data from www.wunderground.com for Marana Regional Airport Weather Station.

[3] EPA, "Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors," Section 13.2.4, Nov. 2006.