Countywide Recycling & Disposal Facility
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April 30, 2007

Ohio Environmental Protection Agency, Central Office
Division of Solid and Infectious Waste Management
Attn: Mr. Ed Gortner
PO Box 1049
Columbus, Ohio 43216-1049

RE: SUBMITTAL OF AIR MODELING PROTOCOL, ORDER 5.A
DIRECTOR'S FINAL FINDINGS AND ORDERS OF MARCH 28, 2007
COUNTYWIDE RECYCLING AND DISPOSAL FACILITY

Dear Mr. Gortner:

Attached, please find a copy of Countywide Recycling & Disposal Facility's (Countywide) Modeling Protocol. This protocol is being submitted in accordance with Ohio EPA's March 28, 2007, letter from Bryan Zima regarding ambient air monitoring at Countywide. The March 28th letter had requested modeling to be completed and approved by April 30, 2007. Due, however, to difficulties encountered in collecting modeling information and assessing its usefulness and applicability to Countywide's situation, development of the modeling protocol took longer than expected. Countywide believes it can complete the modeling and develop a report identifying the downwind monitoring locations proposed as a result of the monitoring within 14 days of approval of the modeling protocol. Upon approval of the locations, sampling will be conducted at the downwind locations at the first scheduled sampling event pursuant to the approved air monitoring protocol.

Please call me if you have any questions.

Tim Vandersall, P.E.
General Manager

cc/ec: Bill Skowronski, OEPA-NEDO
Kirk Norris, SCHD
Dan Aleman, CHD
Brian Zima. OEPA - CO
ec: Gina Gerbasi, OEPA-CO
Jeff Martin, OEPA-CO
Todd Hamilton, CWRDF
Jason Perdion, B&H
Deb Gray, Lawhon Associates
Mike Beaudoin, Earth Tech

cc = printed copy
ec = email pdf copy

Draft
April 30, 2007

Countywide Recycling & Disposal Facility
Modeling Protocol
April 30, 2007

To Fulfill the Requirements Set Forth in Order 5.A. of the Ohio EPA Director's Findings and Orders Dated March 28, 2007

Republic Services of Ohio II, LLC
Countywide Recycling & Disposal Facility
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April 30, 2007

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Introduction

Air dispersion modeling will be performed at the Countywide Recycling & Disposal Facility located north of Bolivar, Ohio in Stark County. The purpose of the modeling is to provide information on the locations of expected maximum concentrations due to air emissions from the facility. This information will be used in selecting one or more monitoring sites. This modeling analysis is being done to fulfill requirements set forth in the Agency's March 28, 2007 letter from Bryan Zima regarding Order 5.A.

This modeling protocol presents the technical approach to be followed in performing the required air dispersion modeling. The following sections describe model selection, site location, source parameters, Good Engineering Practice (GEP) stack height/building downwash, modeling scenarios, terrain data, meteorological data, receptor selection, model output settings, and documentation. Figures are located at the end of the document. All modeling will be done consistent with procedural policies of USEPA (USEPA 2005a) and Ohio EPA (Ohio EPA 2003).

Model Selection

Modeling will be done using AERMOD (07026), which is the model currently recommended by USEPA and Ohio EPA for regulatory use (USEPA 2005a). AERMOD is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources, including point, area, and volume sources (USEPA 2004a, 2006a). The Lakes Environmental software package ISC-AERMOD View will be used to prepare the AERMOD input files and process output data for presentation.

AERMOD will be run to compute concentrations; deposition will not be considered. Unless specified differently elsewhere in this protocol, the model will be run in its default, regulatory mode.

Location

As shown on Figure 1, the facility is a landfill located just east of Interstate 77 and approximately 2 km north of Bolivar, Ohio. Terrain in the area around the landfill is hilly. Much of the surrounding land is undeveloped farmland with small forested areas scattered within, and the remainder is primarily residential. As shown in Figure 1, the area within 3 km of the site is predominantly rural for modeling purposes.

Source Description

The facility consists of a 258 acre municipal solid waste landfill, the southerly 88 acres of which has been identified as the source of the odors and emmissions. An aerial map of the site showing property lines and the area that has been used as a landfill is shown on Figure 2. The landfill area is divided into cells as shown on Figure 3. Landfill cells 1 through 6A constitute the original landfill area. Cells 7 and 8A have been used more recently, and the remainder of the cells will be used in the future. In addition to the landfill cells, flares that are used to burn off landfill gas from the gas collection system will also be modeled. A list of all the sources to be modeled are listed in Table 1 and shown on Figure 3.

In Table 1, landfill cells that are rectangular in shape are designated as the source type AREA. Other cells designated as source type AREAPOLY are non-rectangular. All area sources will be modeled with release heights set to zero and with initial vertical dispersion parameters also equal to zero.

As noted in Table 1, the flares are modeled as point sources. Because flares have open flames instead of a typical stack exhaust, "equivalent" point source parameters will be assumed or computed for modeling purposes using the following procedure (Ohio EPA 2003):

1. Compute the equivalent release height from

$$\text{Height}_{\text{equiv.}} = \text{Height}_{\text{actual}} + 0.944(Q)^{0.478}$$

Where the heights are in units of meters and Q is the heat release rate in MMBtu/hour.

2. Assume temperature of 1273 K.

3. Assume exit velocity of 20 m/s.

4. Compute the equivalent diameter in units of meters from

$$\text{Diameter}_{\text{equiv.}} = 0.1755(Q)^{0.5}$$

Table 1. Summary of sources to be modeled

Source ID	Description	Source Type
CELL1	Landfill cell 1	AREAPOLY
CELL2	Landfill cell 2	AREAPOLY
CELL3	Landfill cell 3	AREAPOLY
CELL4A	Landfill cell 4A	AREAPOLY
CELL4B	Landfill cell 4B	AREA
CELL5A	Landfill cell 5A	AREA
CELL5B	Landfill cell 5B	AREA
CELL5C	Landfill cell 5C	AREAPOLY
CELL5D	Landfill cell 5D	AREAPOLY
CELL6A	Landfill cell 6A	AREAPOLY
LAND	Extent of waste in landfill, including Cells 1 through 8A	AREAPOLY
FLA1	Flare Station #1	POINT (flare)
FLA2	Flare Station #2	POINT (flare)
FLA3	Flare Station #3	POINT (flare)
FLA4	Flare Station #4	POINT (flare)
FLA5	Flare Station #5	POINT (flare)
FLA6	Flare Station #6	POINT (flare)
FLA7	Reserve Flare	POINT (flare)

Good Engineering Practice (GEP) Stack Height/Building Downwash

No buildings are located near enough to the flares to need to be included in the modeling. Therefore, GEP stack height and building downwash are not important in this study.

Modeling Scenarios

As specified in Zima (2007), the following three source scenarios will be modeled: (1) Cells 1 through 6A, (2) the entire landfill area, and (3) the flares. For all scenarios, both 24-hour and annual averaging times will be modeled. Sources and emission rates to be modeled in each scenario are described below.

Scenario 1: Cells 1 through 6A

In this scenario, only landfill Cells 1 through 6A will be included in the modeling. This includes the following sources as listed in Table 1: CELL1, CELL2, CELL3, CELL4A, CELL4B, CELL5A, CELL5B, CELL5C, CELL5D, and CELL6A. As directed in Zima (2007), surrogate emission rates of 1 gram/second/square meter (1 g/s/m^2) will be used for all sources.

Scenario 2: Entire Landfill Area

In this scenario, the entire landfill will be modeled as a single area source. Only the source LAND will be included in the modeling. As in Scenario 1, the source will be modeled using a surrogate emission rate of 1 g/s/m^2.

Scenario 3: Flares

In this scenario, only the flares listed in Table 1 will be included in the modeling. As directed in Zima (2007), each flare will be modeled using a surrogate emission rate of 1 g/s.

Meteorological Data

National Weather Service (NWS) meteorological data for the years 1986 through 1990 will be used in the modeling analysis. These are the most recent five years of data available on the USEPA's SCRAM internet site. Surface data for the Akron/Canton Airport (station 14895) and upper air data for the Pittsburgh Airport (station 94823) will be obtained from the internet site http://www.webmet.com/. Data will be processed for use in AERMOD using the preprocessing program AERMET (06341) (USEPA 2004b, 2006b). On-site meteorological data will be used to supplement the NWS data if available and suitable for use.

In using AERMET to prepare the meteorological data for AERMOD, three surface characteristics must be provided as inputs, the surface roughness (z_o), the Albedo (r), and the Bowen ratio (B_o). In rural settings such as this one, USEPA recommends using values of r and B_o determined for the meteorological site, in this case, the Akron/Canton airport, and determining z_o values representative of the site to be modeled (USEPA 2005b). AERMET allows the values of these parameters to vary seasonally or monthly and by downwind direction. For this project, values will be adjusted seasonally and by direction segment as shown in Table 2. Sector angles were determined by visual examination of available topographic and aerial images.

Table 2. Meteorological parameter values.

Sector Angle (°)/ Land Use Near Site	Season	Albedo, r	Bowen Ratio, B_o	Surface Roughness, z_o (m)
330 – 150 Deciduous forest	Winter	0.35	1.5	0.5
	Spring	0.14	1.0	1.0
	Summer	0.16	2.0	1.3
	Autumn	0.18	2.0	0.8
150 – 330 Cultivated	Winter	0.35	1.5	0.01
	Spring	0.14	1.0	0.03
	Summer	0.16	2.0	0.2
	Autumn	0.18	2.0	0.05

Note: Values of r and B_o are based on an urban land use around the Akron-Canton Regional Airport. B_o values are for average wetness conditions. Values of z_o are for the land use near the site. All values are taken from USEPA (2004b). Sector angles are defined clockwise from North = 0°.

Receptors

Receptors will be placed at the locations of nearby residences and in grids that will be located around the landfill at intervals sufficient to find the 24-hour and annual points of maximum concentration for each scenario. Initially, a 100-meter grid will be placed along the property line and out to a distance of 1 km. Once points of maximum impact are found for each averaging time of each scenario, one or more sub-grids with spacing of 10 meters will be added around the maximum impact points. In the event that concentrations are still increasing with distance at 1 km, which may happen in Scenario 3 due to the elevated, heated sources being modeled, the 100-meter grid will be extended until the maximum locations are found. Then, the maximum locations will be refined using 10-meter sub-grids as described above.

Terrain Data

Digital terrain data files will be obtained from the internet site (http://data.geocomm.com/catalog/US/61070/807/group4-3.html). These 30-Meter Digital Elevation Model (DEM) files will be processed using the program SDTSEDEM (a utility program by Mr. Sol Katz, available on the internet at http://data.geocomm.com/dem/sdts2dem.html). Receptor elevations and terrain height scales needed for AERMOD will be determined from the DEM files using the terrain preprocessor program AERMAP (06341) (USEPA 2004c, 2006c).

Model Output

As discussed above, the model will be set to generate concentrations at all receptors for two averaging times (24-hour and annual) and three scenarios. For each scenario, results will be generated for each source individually as well as for all the sources in the scenario as a group. For the group results, ISC-AERMOD View will be used to generate maps showing the locations of the receptors with the highest predicted concentrations for each scenario. In addition, isopleths will be drawn to show general concentration trends and hotspot areas.

Because surrogate emission rates will be used for all sources, the predicted concentrations will only be useful in a relative sense in comparing concentrations at different locations. In particular, Scenario 3 must be considered independently of the other scenarios because the relative source strengths of flares versus the landfill areas have not been evaluated here.

Report

A report will be prepared that documents the modeling results discussed above. The report will also clearly note any deviations from the approach detailed in this protocol. Modeling output files that show all input and output values will be available on disk.

References

Ohio EPA (2003) *Air Dispersion Modeling Guidance*, Division of Air Pollution Control, Air Quality Modeling and Planning Section, Engineering Guide #69.

USEPA (2004a) *Users Guide for the AMS/EPA Regulatory Model - AERMOD*, EPA-454/B-03-001, September.

USEPA (2004b) *Users Guide for the AERMOD Meteorological Preprocessor (AERMET)*, EPA-454/B-03-002, November.

USEPA (2004c) *Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, EPA-454/B-03-003, October.

USEPA (2005a) *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W, November 9.

USEPA (2005b) *AERMOD Implementation Guide*, September 27, Available on website (visited on April 17, 2007): http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide.pdf.

USEPA (2006a) *Addendum: Users Guide for the AMS/EPA Regulatory Model - AERMOD*, EPA-454/B-03-001, December.

USEPA (2006b) *Addendum: Users Guide for the AERMOD Meteorological Preprocessor (AERMET)*, EPA-454/B-03-002, December.

USEPA (2006c) *Addendum: Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, EPA-454/B-03-003, December.

Zima, Bryan (2007) Letter from Ohio EPA to Jason Perdion, Baker & Hostetler, LLP, March 28.

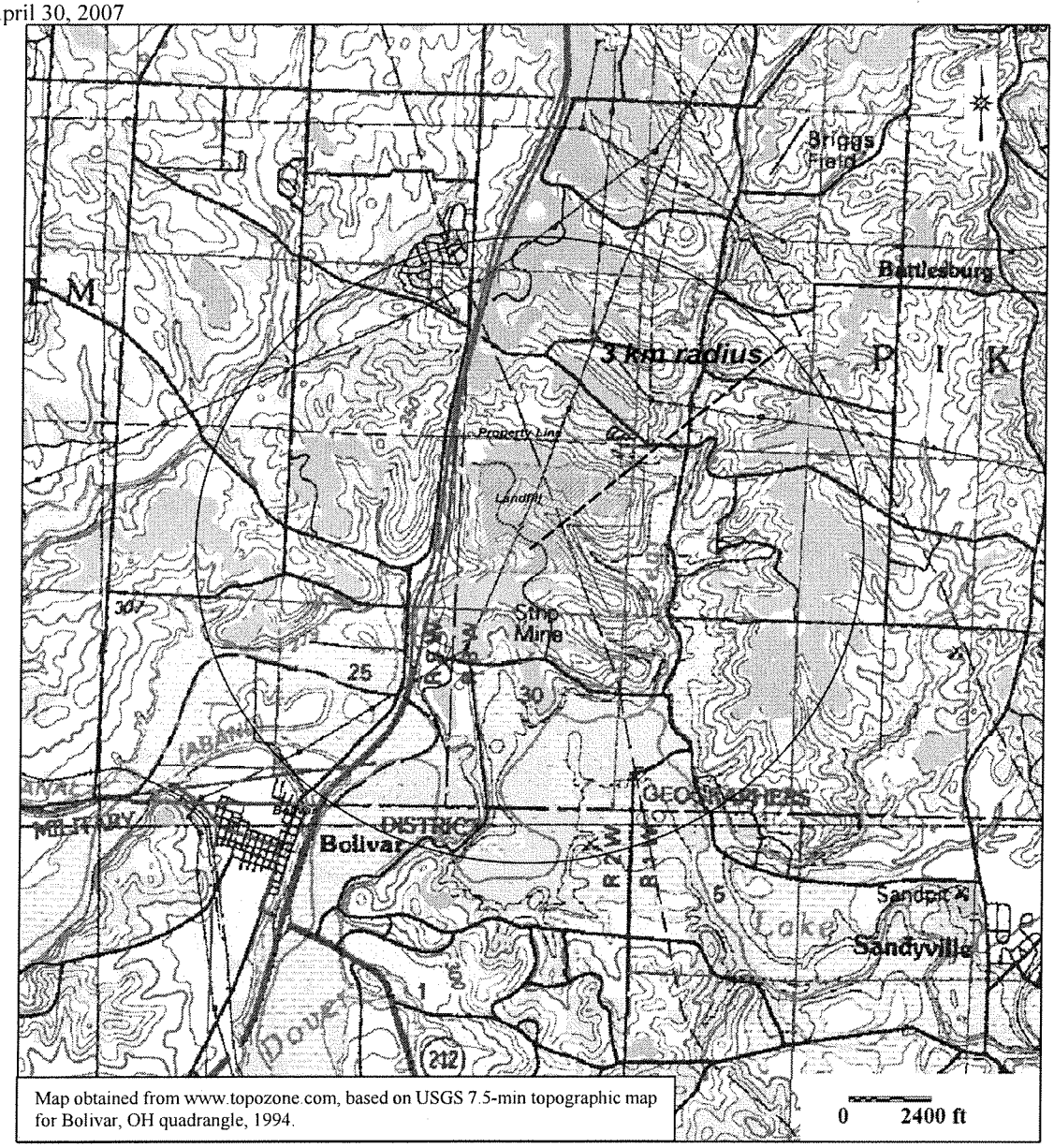

Figure 1. USGS topographic map showing location of Countywide Facility with 3-km circle.

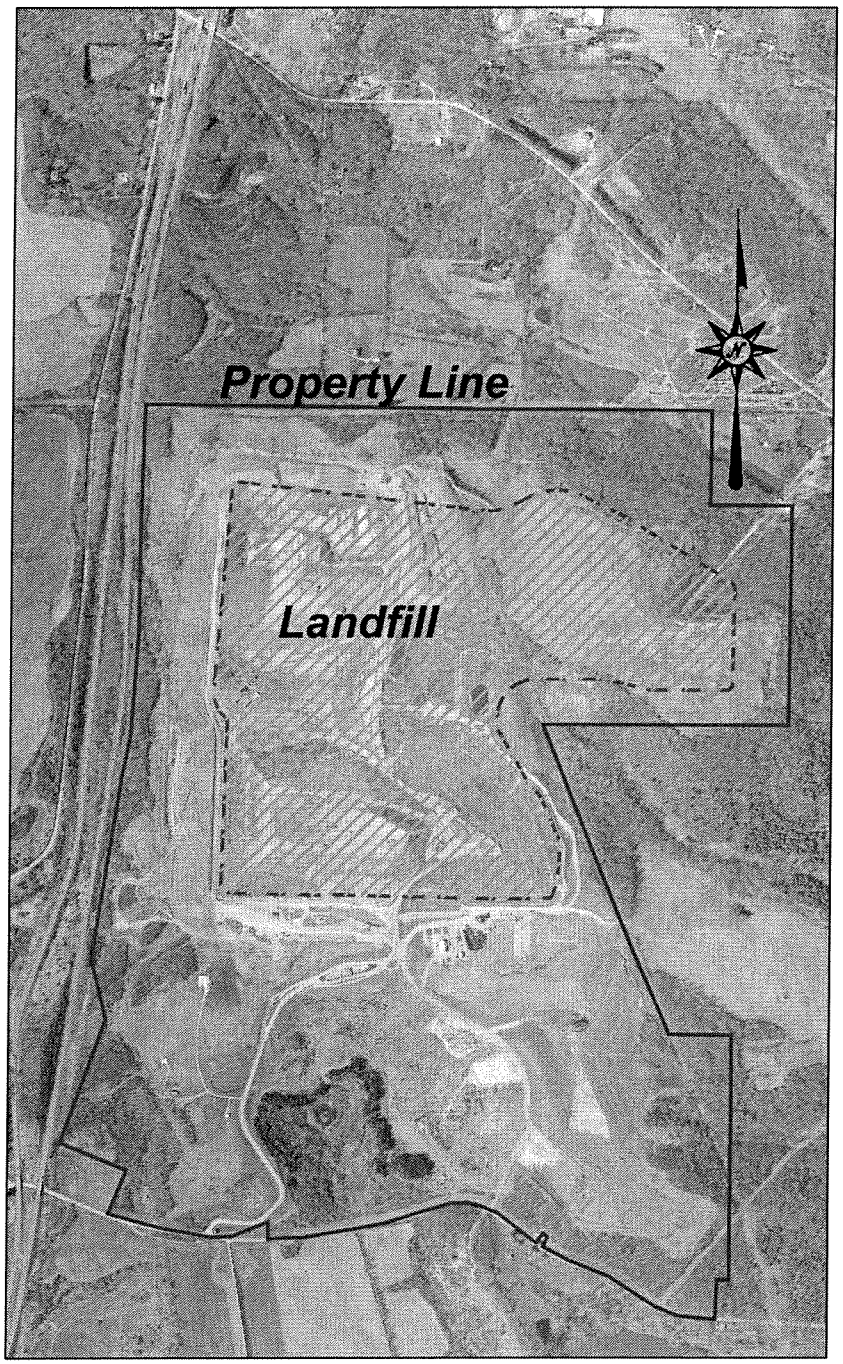

Figure 2. Aerial Map showing property line of the Countywide Facility.

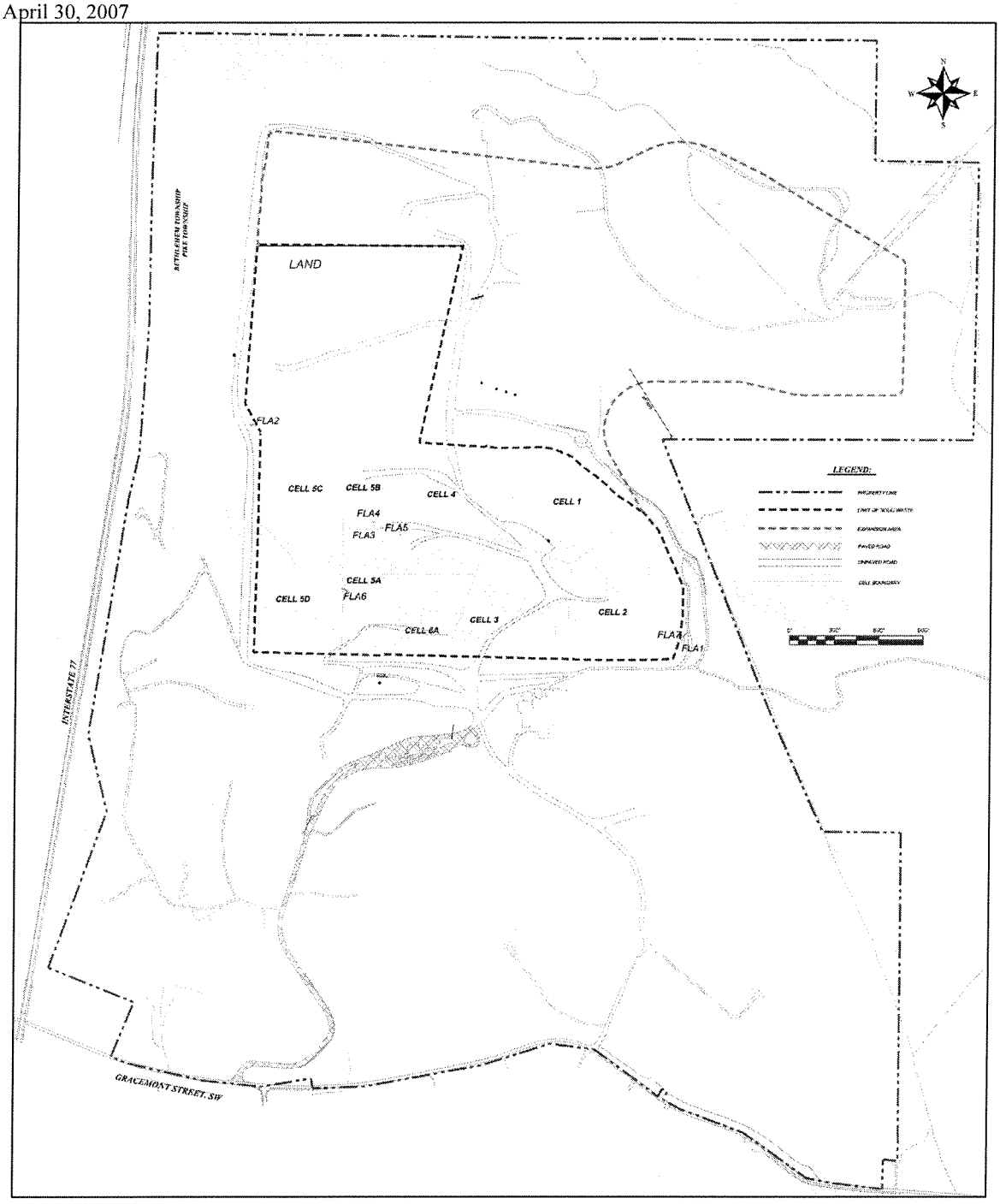

Figure 3. Site map of the Countywide Facility showing sources to be modeled.