June 1, 2022

Protocol for Emission Point Modeling Using AERMOD Software

Shelter Enterprises Inc.
8 Saratoga Street
Cohoes, New York Facility

Prepared for:

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PROTOCOL FOR EMISSION POINT MODELING USING AERMOD SOFTWARE
SHELTER ENTERPRISES INC. FACILITY
CITY OF COHOES, ALBANY COUNTY, NEW YORK

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1.0 PROJECT OVERVIEW

The Shelter Enterprises Inc. facility is located at 8 Saratoga Street in the City of Cohoes, Albany County, New York (see Figure 1). Shelter Enterprises Inc. is a manufacturer of expanded polystyrene (EPS) building material products for residential, commercial, and civil markets. Emissions from the facility include pentane (a volatile organic compound) generated during production processes and combustion emissions from exempt sources.

The facility's previous New York State Department of Environmental Conservation (NYSDEC) Air State Facility Permit (4-0103-00057/00002) expired on June 22, 2021 and the facility is in the process of submitting a permit application to reinstate a State Facility Permit to continue operations as previously permitted. As a step in the permitting process, NYSDEC requires that the facility submit a protocol to conduct air dispersion modeling of the facility operations in order to evaluate the level of impacts associated with emissions from the facility with respect to the NYSDEC Annual Guidance Concentrations (AGCs) and Short-Term Guidance Concentrations (SGCs) in order to demonstrate compliance with 6 NYCRR Part 212.

Under this protocol, air dispersion modeling will be completed in accordance with generally accepted modeling practices and will utilize software which runs the current version of the USEPA AERMOD software. The hourly emission rate of pentane will be estimated based on maximum facility operations under the existing VOC emission cap listed within the permit application. A maximum annual concentration for pentane will be derived from the model to assess compliance with the applicable AGC. A maximum hourly concentration will not be derived from the model as pentane does not have an SGC to compare the model results against.

2.0 SELECTION OF MODELING SOFTWARE

In accordance with NYSDEC Policy DAR-10: NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis, this protocol intends to follow the Division of Air Resources' recommended dispersion modeling procedures for conducting ambient impact analyses. By following these procedures, the protocol also follows the Environmental Protection Agency's (EPA) approved methodologies, as incorporated in Appendix W of 40 CFR Part 51 regulations. In performing such assessments, a set of recommended and acceptable procedures has been defined by EPA and NYSDEC to assist source applicants to assure the proper application of the modeling analysis. As detailed within DAR-10, source analyses at major sources should adhere strictly to the requirements and preferred modeling procedures described in the EPA Guidelines, with the added requirements of NYSDEC on the application of AERMOD.

EPA's Modeling Guideline revisions of November 9, 2005 allowed the substitution of AERMOD for ISC3 during the one year transition period until December 9, 2006, after which AERMOD has been the recommended refined model.

2.1 Description of AERMOD Software

AERMOD is a regulatory steady-state plume modeling system with three separate components: AERMOD (Dispersion Model), AERMAP (Terrain Preprocessor), and AERMET (Meteorological Preprocessor). AERMAP characterizes the terrain, and generates receptor grids for the AERMOD dispersion model, while AERMET provides AERMOD with the meteorological information it needs to characterize the planetary boundary layer.

AERMET uses meteorological data and surface characteristics to calculate boundary layer parameters (e.g. mixing height, friction velocity, etc.) needed by AERMOD. This data is representative of the meteorology in the modeling domain.

AERMAP uses gridded terrain data for the modeling area to calculate a representative terrain-influence height associated with each receptor location. The gridded data is supplied to AERMAP in the format of the Digital Elevation Model (DEM) data from the

United States Geological Survey (USGS). The terrain preprocessor can also be used to compute elevations for both discrete receptors and receptor grids.

In developing AERMOD, AERMIC adopted design criteria to yield a model with desirable regulatory attributes. It was felt that the model should: 1) provide reasonable concentration estimates under a wide variety of conditions with minimal discontinuities; 2) be user friendly and require reasonable input data and computer resources as is the case with the ISCST3 model; 3) capture the essential physical processes while remaining fundamentally simple; and, 4) accommodate modifications with ease as the science evolves.

In order to provide consideration to downwash, cavity impacts, and building wakes and eddies, the software incorporates a feature known as the Building Profile Input Program (BPIP). The BPIP incorporates a program that calculates building heights (BH) and projected building widths (PBW), and is designed to determine whether or not a stack is being subjected to wake effects from a structure or structures, and may lead to different BH and PBW values than those calculated for GEP. These calculations are performed only if a stack is being influenced by structure wake effects.

The current version of AERMOD, version 21112 will be used to complete the proposed Air Dispersion Modeling. If a newer version of AERMOD is released during the review period for this protocol, the most current version would be used in place of 21112.

3.0 SUMMARY OF MODEL INPUTS

3.1 Facility Modeling Parameters

Design data for the facility's layout and emission points will be used as the basis for running the model in conjunction with the facility's requested emission cap for VOC per year. The emission sources will be modeled as shown in Table 1. For fugitive emissions generated as part of manufacturing activities at the facility, volume sources from the Bagroom (Prepuff Aging) Area and the Molding Area will be used as these areas do not discharge via a point source.

Table 1 – Summary of Emission Sources

Emission Source	Source Description	Model Source Type
Regenerative Thermal Oxidizer (RTO)	Post-control emissions routed from production	Point Source
Expansion	All emissions from this process are fully routed to the RTO	N/A
Bagroom (Prepuff Aging) Area	Fugitive emissions from process area (i.e., emissions not routed to the RTO)	Volume Source
Molding Area	Fugitive emissions from process area (i.e., emissions not routed to the RTO)	Volume Source

The input data includes emission point parameters for each emission source (including diameter, emission rate, exit velocity, stack height, exit temperature and flow rate for point sources and release height, emission rate, and process area dimensions for volume sources), as well as building footprints and heights. The model is capable of being run using specific area settings (i.e., urban or rural settings), and will utilize the rural setting based on the layout of the facility and surrounding area. Figure 2 depicts the facility layout, inclusive of buildings, emission points, elevations and property line.

3.2 Receptor Area to be Modeled

The modeling will be conducted for the area in the vicinity of the site, with the receptors oriented in a Cartesian grid pattern set up following the initial receptor grid spacing

suggested in DAR-10: NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis:

- Receptor spacing of 25m along the fence line;
- 70m receptor spacing from the center of the facility to 1km;
- 100m spacing from 1km to 2km; and
- 250m spacing from 2km to 5km.

A total of 3,572 receptors (including sensitive receptors) will be modeled under this scenario, covering an area of approximately 25,000,000 square meters (±6,178 acres), excluding the acreage within the site property line, where the public would not routinely have access. All receptor data corresponds to the interpolated ground level elevation as calculated by AERMAP. For the purposes of the air dispersion modeling, AERMAP will be used to assign elevations to the receptor grid points.

Online resources were consulted to identify the location of additional, discrete sensitive receptors such as schools, hospitals, parks, nursing homes and daycares within the modeling area. A summary of the sensitive receptors within 2 km of the site are summarized in Table 2. Figure 3 provides a depiction of the receptor grid including the sensitive receptors.

Table 2 – Summary of Sensitive Receptors

Facility Name	Location (UTM Coordinates)	Approximate Distance from Facility (km)
Abram Lansing School	605647.37, 4735942.98	1.31
Berkley Park	604784.03, 4737375.86	1.79
Cohoes Falls	605697.02, 4737632.59	1.10
Cohoes High School	604804.45, 4736629.66	1.72
Cohoes Middle School	605493.62, 4736134.78	1.26
Craner Park	605639.76, 4737599.84	1.10
Joyful Beginnings Early Education Program	606717.80, 4737424.03	0.57

Facility Name	Location (UTM Coordinates)	Approximate Distance from Facility (km)
Learning Essentials Childcare	606497.08, 4738613.12	1.72
Peebles Island State Park	607552.49, 4737449.46	0.73
Samaritan Hospital	606346.23, 4736782.87	0.36
Sonshine Patch Pre School	606377.05, 4736482.12	0.41
St. Peter's Hospital Addiction Recover Center	606205.80, 4736736.17	0.17
Van Schaick Grade School	607388.92, 4735920.76	1.25

3.3 AERMAP Data Input

The AERMAP terrain preprocessor will utilize USGS 7.5 Minute Native Format DEM topographical data for the Troy North, Troy South, Albany and Niskayuna, New York quadrangles, data which provides a resolution of 10 meters.

3.4 AERMET Data Input

The AERMET meteorological preprocessor will utilize surface and upper air data for a five year period for the Albany Airport. The National Weather Service (NWS) website indicates that climate data for the region of the project site is available from five regional climatology reporting locations: Albany, NY; Bennington, VT; Glens Falls, NY; Pittsfield, MA; and Poughkeepsie, NY. The Albany location is closest to the site, and as such, Albany was chosen as the most representative climate data for the facility.

3.5 AERMOD Data Input

Facility-wide emission rate estimates for on-site activities will be generated based on the proposed VOC annual emission cap, actual emission ratios between emission sources based on 2021 facility emission data (i.e., breakdown of each unit operation as a percentage of the VOC cap), and annual operating hours (assuming continuing operations of one shift per weekday). Using the emission source data, estimated

emission rates, and the layout of the facility and the fenceline for the facility, the model will calculate the maximum annual concentration of pentane from the facility operations.

The modeling scenario will not consider wet or dry deposition which would deplete mass from the plume, and as such, the modeled result will be conservative. The model will consider complex terrain through incorporating the AERMAP program into the modeling scenario. USGS topographical data will be imported into the modeling software to account for the complex terrain (i.e., those areas where the terrain exceeds the stack base elevation).

4.0 SUMMARY OF MODELING RESULTS

The AERMOD modeling analysis will account for the operations currently contemplated for the facility, including a portion of VOC emissions being captured and routed to the RTO as well as a portion of VOC emissions being emitted as fugitive emissions from the Bagroom (Prepuff Aging) Area and the Molding Area. Modeling data will include the dimensions and footprints of the facility's buildings, as well as specific information relative to the emission point. The model will incorporate topographical data from the USGS, and meteorological data from the Albany Airport. A summary of the modeled maximum hourly concentration values will be presented within the summary report.

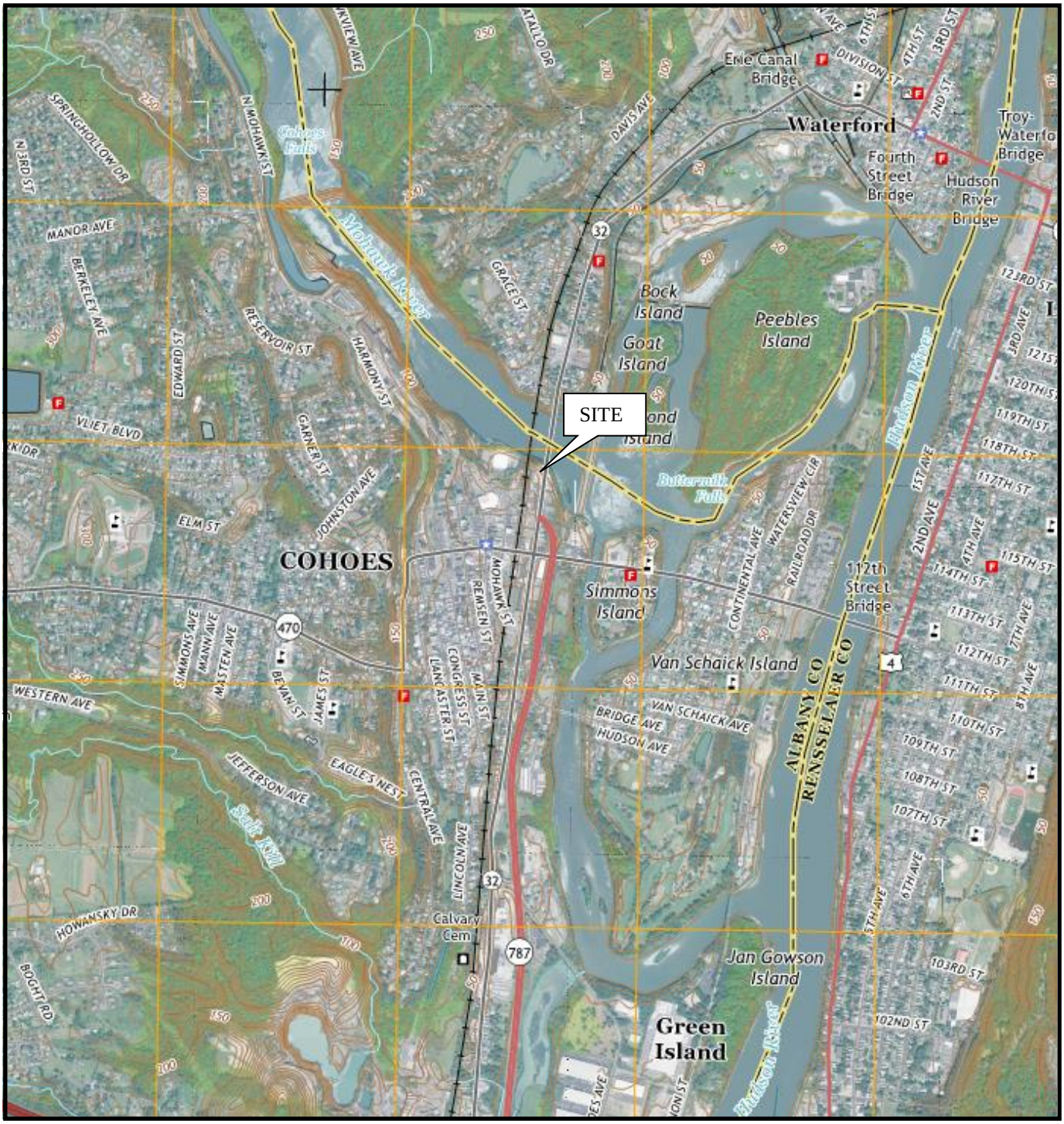
4.1 Locations of Maximum Concentration Receptor

The location of the receptor for the maximum concentration will be provided within the summary report. Isopleths indicating the results of the modeling demonstrating the concentration of emissions will also be included within the summary report.

FIGURES

Figure 1

Site Location Map



MAP REFERENCE
United States Geological Survey
7.5 Minute Series Topographic Maps
Quadrangle: Troy North, N.Y. (2016)

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FIGURE 1 SITE LOCATION MAP

SHELTER ENTERPRISES INC. FACILITY

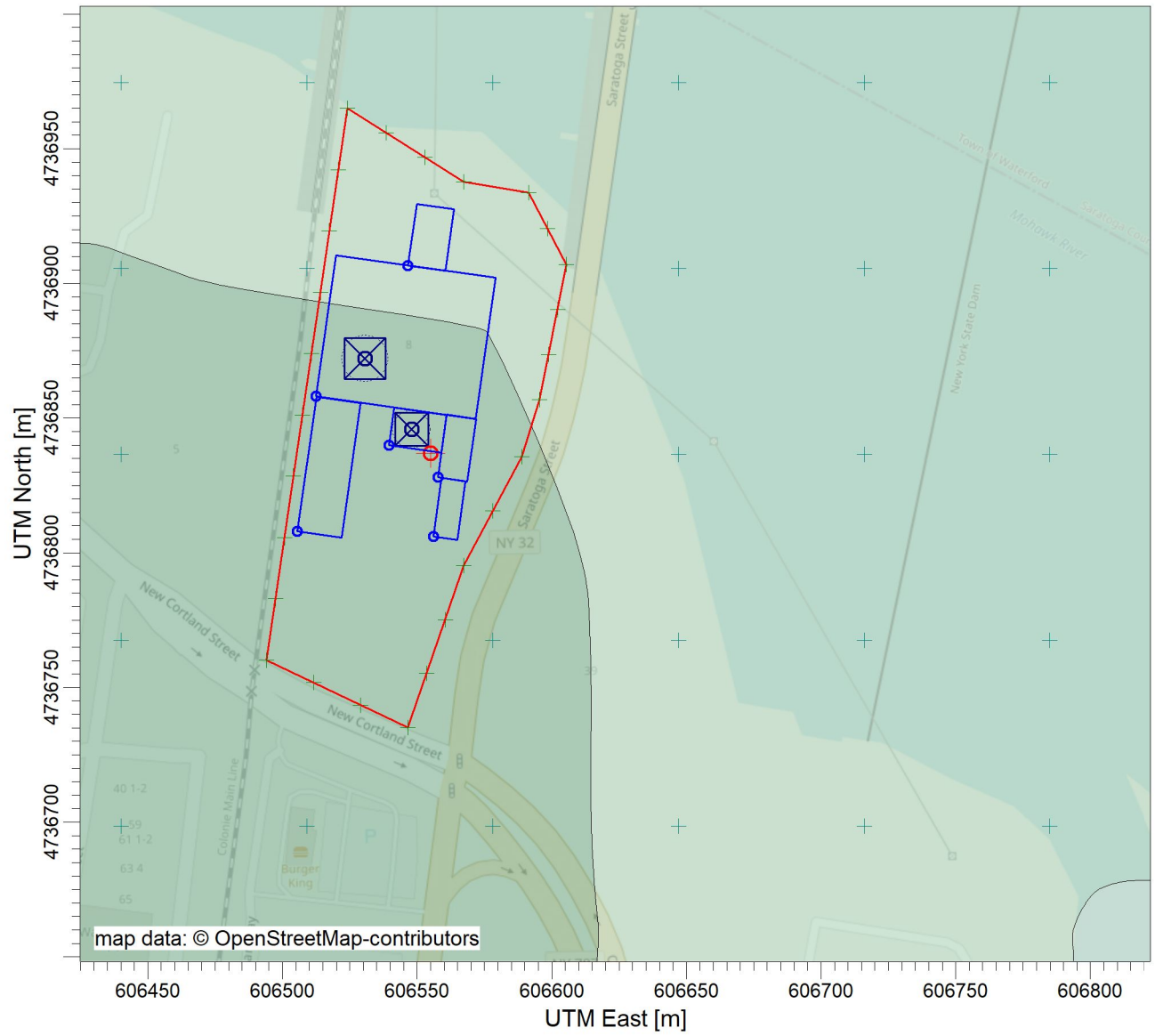
CITY OF COHOES	ALBANY COUNTY, NY
SCALE: ±1" = 2,000'	
DRAFTER: J.FARRON	
PROJECT No. 13.3449	

Figure 2

Facility Building, Emission Points, Elevations and Property Line Depiction

PROJECT TITLE:

Air Dispersion Modeling - Shelter Enterprises Inc.
Facility Building, Emission Points, Elevations, Property Line and Receptor Grid Depiction



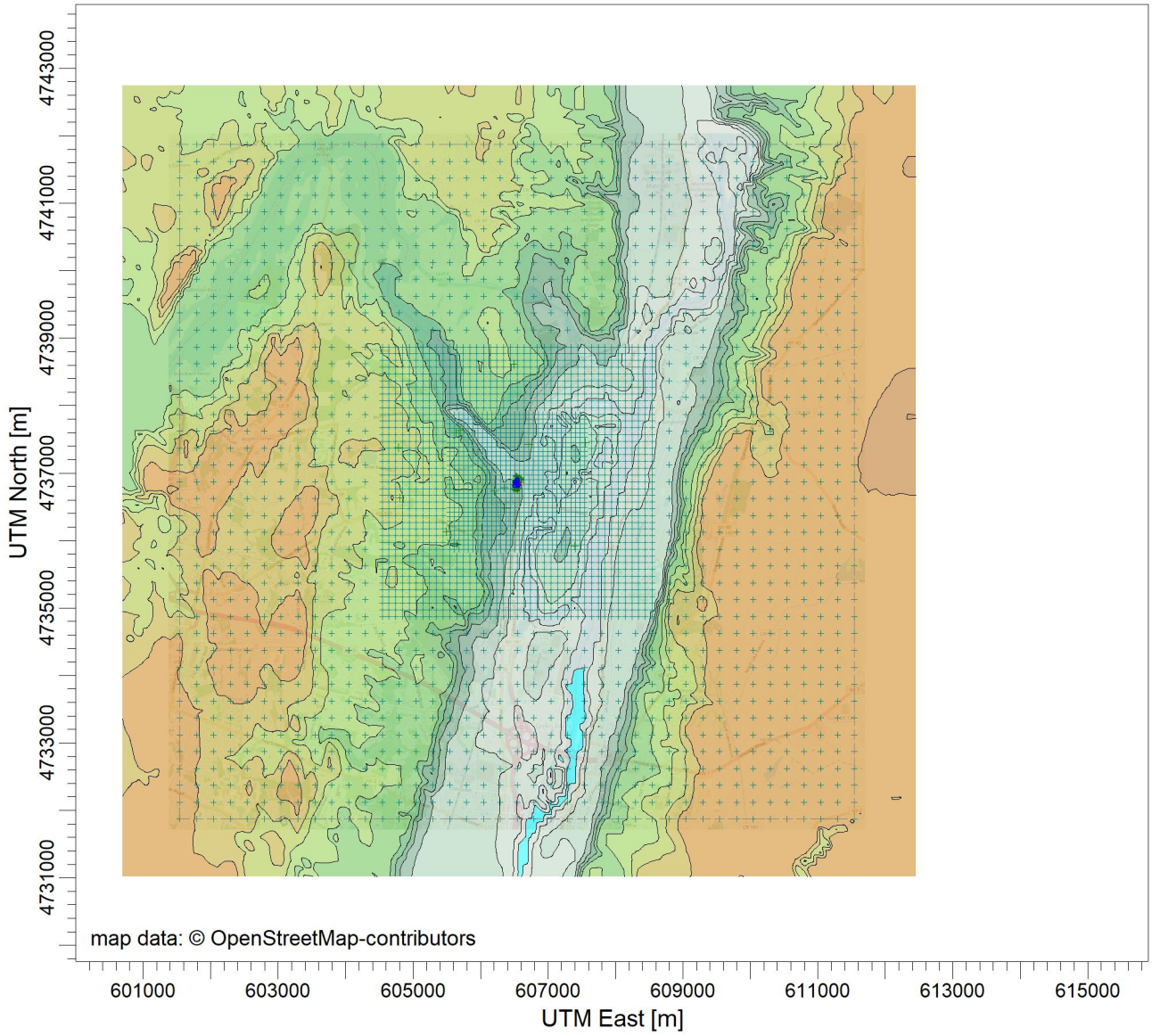
COMMENTS:	SOURCES: **3**	COMPANY NAME:	
	RECEPTORS: **3572**	MODELER:	
		SCALE: 1:2,500 — 0 — 0.05 km	
		DATE: **5/27/2022**	PROJECT NO.: **13.3449**

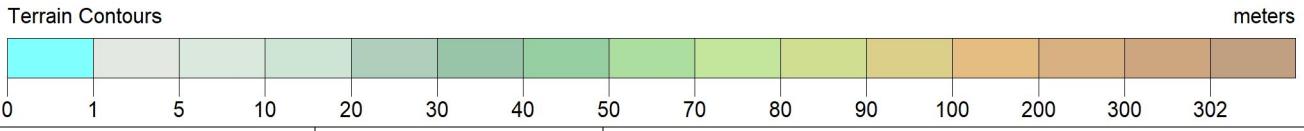
Figure 3

Receptor Grid Depiction

PROJECT TITLE:

Air Dispersion Modeling - Shelter Enterprises Inc.
Facility Building, Emission Points, Elevations, Property Line and Receptor Grid Depiction





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		SCALE: 1:100,000 0 4 km	
		DATE: **5/27/2022**	PROJECT NO.: **13.3449**