

DATE: March 30, 2022

TO: Samantha Lernout
President, Citizens for Safe Ground Water Inc.
1827 Will Scarlett Drive
Mississauga, Ontario L5K 1J6
Tel: (519) 404-0134
E-mail: slernout@ugcloud.ca

FROM: Scott Manser
E-mail: smanser@ortech.ca

**Re: Initial Peer Review Comments and Results – Hallman Pit
ORTECH Reference #92514**

ORTECH Consulting Inc. (ORTECH) has been retained by the Citizens for Safe Ground Water Inc. (CSGW or the Client) to conduct an independent air quality peer review regarding the proposed Hallman Pit, Jackson Harvest Farms, located in the Township of Wilmot, Ontario. This memo provides a brief overview of ORTECH's findings and recommendations to date.

Based upon a review of publicly available information ORTECH has arrived at a list of sixteen (16) recommendations, of which four (4) are considered key or critical to the results of the assessment. The four critical areas include:

1. All sources of emissions not included in assessment (i.e., tertiary crusher, multiple material stockpiles/ transfer points).
2. The control factor used represents the upper end of what is considered achievable and use of a more realistic control factor to demonstrate conformance with the air quality criteria should be used.
3. There is no assessment of impacts related to Phase 1, 2 or 3 operations. During Phase 1 and 2 there is the expectation that some operations would occur essentially at grade level.
4. Emissions from transfer points such as conveyors are wind dependent and ORTECH is of the opinion that AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles is a more appropriate approach.

The full table of recommendations is provided in Attachment 1.

At the request of CSGW ORTECH conducted an initial air quality assessment on the Hallman Pit incorporating the above four (4) recommendations, as well as other recommendations as provided in Attachment 1. In addition, ORTECH assessed a “what if” assessment assuming that the Best Management Practices (BMP) for the control of fugitive dust was not carried out at Hallman Pit as committed to. This “what if” scenario is useful for review agencies to consider as it identifies the project’s potential for adverse impacts and the need for additional monitoring and reporting requirements to ensure that the project commitments are not only carried out but are effective.

Table 1 provides a summary of ORTECH’s initial air quality assessment covering a few of operational phases and conditions which may be of interest.

Table 1: Summary Table of Dispersion Modelling Results

Contaminant	Scenario [1]	Averaging Period	Background Conc. [2] ($\mu\text{g}/\text{m}^3$)	Air Quality Threshold ($\mu\text{g}/\text{m}^3$)	Maximum Cumulative Concentration at Sensitive Receptor			
					Impact - All Pits		Impact - Hallman Pit Only	
					Max. Conc. ($\mu\text{g}/\text{m}^3$)	% of Air Quality Threshold	Max. Conc. ($\mu\text{g}/\text{m}^3$)	% of Air Quality Threshold
Silica	Phase 2 (Controlled)	24-hour	1.7	5	10.85	217%	7.46	149%
	Phase 2 (Uncontrolled)				21.42	428%	21.42	428%
	Phase 3 (Controlled)				10.94	219%	7.12	142%
	Phase 3 (Uncontrolled)				20.66	413%	20.66	413%
PM _{2.5}	Phase 2 (Controlled)	Annual	7.6	8.8	8.65	98%	8.19	93%
	Phase 2 (Uncontrolled)				9.69	110%	9.37	106%
	Phase 3 (Controlled)				8.66	98%	8.11	92%
	Phase 3 (Uncontrolled)				9.49	108%	9.17	104%
PM _{2.5}	Phase 2 (Controlled)	24-hour	15	22	18.46	84%	17.36	79%
	Phase 2 (Uncontrolled)				22.22	101%	22.10	100%
	Phase 3 (Controlled)				18.47	84%	17.08	78%
	Phase 3 (Uncontrolled)				21.62	98%	21.46	98%
PM ₁₀	Phase 2 (Controlled)	24-hour	28	50	81.91	164%	61.88	124%
	Phase 2 (Uncontrolled)				144.17	288%	144.17	288%
	Phase 3 (Controlled)				82.45	165%	59.87	120%
	Phase 3 (Uncontrolled)				139.73	279%	139.73	279%
TSP	Phase 2 (Controlled)	24-hour	51	120	210.22	175%	147.41	123%
	Phase 2 (Uncontrolled)				410.04	342%	410.04	342%
	Phase 3 (Controlled)				211.98	177%	145.86	122%
	Phase 3 (Uncontrolled)				406.30	339%	406.30	339%

1. Controlled - Emissions from all pits are controlled
Uncontrolled - Only Hallman Pit emissions are uncontrolled and emissions from all other pits are controlled
2. Background concentration values were adopted from proponent's report
3. Table 1 values represent ORTECH’s assessment of publicly available information, which in some cases lacks sufficient detail and professional judgement was required to fill in these data gaps

Table 1 is by no means a comprehensive analysis of all operational project phases or impacts but does identify a few of the project’s potential impacts.

The following is a brief overview of the key operational and emission assumptions associated with the scenarios identified in Table 1.

Phase 2 (Controlled):

- Excavation/Scraping at grade in Phase 2 of Hallman Pit; all other pit operations 8 meters below grade located in Phase 1 (first lift)
- Inclusion of missing emission sources based on anticipated (typical) process flow diagram
- Dust control efficiencies for Hallman Pit operations – water suppressant (75%); three sided enclosures (90%)
- Existing neighboring pits operating at 10 meters depth (controlled emission rates)

Phase 2 (Uncontrolled):

- Excavation/Scraping at grade in Phase 2 of Hallman Pit; all other pit operations 8 meters below grade located in Phase 1 (first lift)
- Inclusion of missing emission sources based on anticipated (typical) process flow diagram
- Dust control efficiency 0% (“what if”) for Hallman Pit operations
- Existing neighboring pits operating at 10 meters depth (controlled emission rates)

Phase 3 (Controlled):

- Excavation/Scraping at grade in Phase 3 of Hallman Pit; all other pit operations 8 meters below grade located in Phase 1/2 (first lift)
- Inclusion of missing emission sources based on anticipated (typical) process flow diagram
- Dust control efficiencies for Hallman Pit operations – water suppressant (75%); three sided enclosures (90%)
- Existing neighboring pits operating at 10 meters depth (controlled emission rates)

Phase 3 (Uncontrolled):

- Excavation/Scraping at grade in Phase 3 of Hallman Pit; all other pit operations 8 meters below grade located in Phase 1/2 (first lift)
- Inclusion of missing emission sources based on anticipated (typical) process flow diagram
- Dust control efficiency 0% (“what if”) for Hallman Pit operations
- Existing neighboring pits operating at 10 meters depth (controlled emission rates)

Contaminant concentration contour plots showing the area of impact are provided in Attachment 2.

Conclusions:

ORTECH is of the opinion that considerable information gaps exist within the Hallman Pit Air Quality Assessment report. In conducting this initial Air Quality Assessment ORTECH has attempted to fill in these gaps using professional judgement and alternate information sources as appropriate. The results presented by ORTECH therefore differ from those reached by Hallman Pit.

Silica, Particulate Matter less than 10 microns (PM₁₀), and Total Suspended Particulate Matter (TSP) all indicate some potential to exceed the Ambient Air Quality Criteria (AAQC) for both the controlled and uncontrolled ORTECH scenarios over a 24-hour time period. Exceedances of these AAQC parameters remain if only contribution from the Hallman Pit are included in the assessment.

Emissions of Particulate Matter less than 2.5 microns (PM_{2.5}) are predicted to achieve the CAAQS under the controlled emission scenario for both the 24 hour and Annual time periods although exceed the CAAQS under an uncontrolled 24 hour scenario.

From the contour plots provided in Attachment 2 Silica (24 hour) represents the worst-case scenario amongst the scenarios assessed. Cumulative impact of operations of all pits exceed the 24 hour AAQC extend between 2 km to 2.7 km and 2 km to 2.9 km m based upon the controlled and uncontrolled emission scenario respectively. The impact related to the uncontrolled emission scenario extends beyond the hamlet of Singletown.

Recommendations:

ORTECH has provided a list of recommendations in Attachment 1. Of these recommendations, four (4) are considered key in that incorporation of these recommendations would appear to influence the conclusions of the Hallman Pit's Air Quality Assessment. Several recommendations relate to the request for additional information to ensure that the emission scenario assessed represents a realistic worst-case emission scenario (such as the length of haul roads and the number of trucks passing over these roads). Other recommendations may have minimal impact on the air quality assessment results but may become important to consider as the predicted values approach 80% or greater of an AAQC/CAAQS.

ORTECH recommends that the four (4) key recommendations be incorporated by Hallman Pit in a revised Air Quality Assessment Report with consideration for the remaining recommendations if contaminant concentrations should approach an AAQC/CAAQS criteria. Although the Ontario Ministry of Environment, Conservation and Parks (MECP) does not provide specific guidance for the assessment of air emissions from quarries, other regulatory bodies do. Attachment 3 provides such an example, which is generally consistent with ORTECH's recommendations, and may assist Hallman Pit in providing a revised Air Quality Assessment report.

In the event that the revised Hallman Pit Air Quality assessment continues to require a high effectiveness of emission controls to meet acceptable standards, monitoring and reporting requirements should be added to the approval process.

ATTACHMENT 1

**Peer Review Comments
(1 page)**

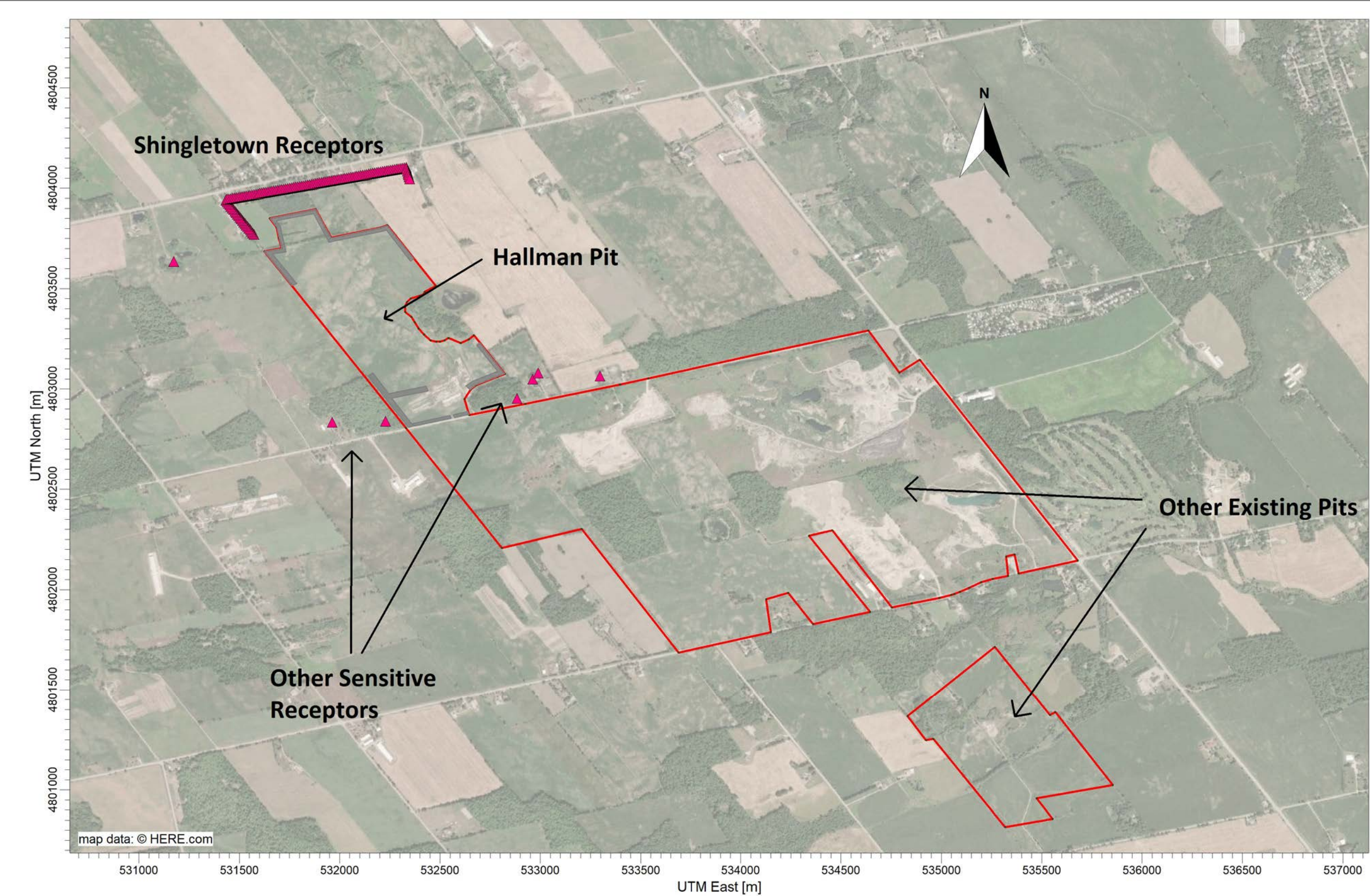
Item #	General Topic	Description	Document Name	Document Section	Document Page #	Peer Review Comments
1	Planned Operations	Emission estimates were completed for the truck traffic as well as on-Site operations. On-Site operations included the following sources: – Primary Crusher – Secondary Crusher – Tertiary Crusher – Cement Recycling Crusher – Handling, Transferring, and Conveying of Material – Loading Stockpiles – Unloading from Stockpiles – LPrimary Stacker Conveyor – Truck Loading at Working Face	Cumulative Air Assessment Dated: August 5, 2021	2.1	1, 2	On-site operations include a tertiary crusher. Emission calculations do not show emissions associated with operation of a tertiary crusher. In addition to crushing operations, quarry operations typically also include process screening, which is not reflected in the report. Please verify that process screening is not part of the operations or include the associated emissions. A process flow diagram of on-site operations is not provided in the report. The process flow diagram should identify the number of conveyor transfer points, loading/unloading of stockpiles, truck loading points etc. ORTECH is of opinion that a process flow diagram should be provided and emissions from all potential sources of emissions be accounted for or excluded based upon a negligibility assessment, prior to final dispersion modelling.
2	Dust Control	It was conservatively assumed that all roads were unpaved and 90% dust mitigation would be achieved.	Cumulative Air Assessment Dated: August 5, 2021	2.1	2	The report uses a 90% control efficiency with reference to the document (Dust Control at Hazardous Waste Sites, 1985), which talks about fugitive dust control, predominantly at coal mines at various locations. Control efficiencies in the range of 90% were repored at sites with a low number of samples (3). Significantly lower control efficiencies (12% to 77%) were reported for larger sample sizes (12 to 26). In ORTECH's opinion the reference data supports the use of a more realistic control efficiency of 75% (or less) for water suppression method. The use of higher control efficiencies should be supported by an on-site measurement / monitoring effort to support the effectiveness of these measures. ORTECH is of opinion that the emission calculations be revised based on a reasonable control efficiency. One of the reference documents which can be used to revise the emission calculations is WRAP Fugitive Dust Handbook (2006), which provides control efficiencies of 10%-74% for fugitive dust emissions from unpaved roads and 50% - 90% fugitive dust emissions from material handling.
3	AERMOD Sources	The Site and all adjacent pits were modelled using AERMOD's Open Pit source. Source parameters were based on the following assumptions: – Volume of pit – Maximum pit depth of 20 m – Process release height of 4 m above pit floor	Cumulative Air Assessment Dated: August 5, 2021	5.6	5	It is typical to model below grade emission sources from mining operations by using a single AERMOD Open Pit Source. However, modelling various phases of pit life (including initial operations, closure/rehabilitation) is required in order to demonstrate that the project complies with the air quality criteria. Based on Figure 2 in the report, it appears that the excavation would happen in 2 lifts (typically) and the maximum pit depth planned to be reached is 19 meters below grade. Use of 20 meters pit depth in AERMOD model is less conservative. It should be noted that the noise report for the development assesses noise impacts during the various operational phases of the project. ORTECH's understanding is that the aggregate resource begins within 1 metre of the surface which may put the emission sources above grade. Use of AERMOD Open Pit source category should not be used to assess these emission sources. ORTECH recommends modelling various phases/stages of excavation and identification of worst-case emissions scenario. Also, ORTECH agrees with alternative modelling approach of using volume sources/point sources to represent pit operations by using modified terrain files which incorporate various stages of pit depths.
4	Emission Estimation	AP-42 Emission factors used for transfer points	Cumulative Air Assessment Dated: August 5, 2021	Table 2	-	It was noted that AP-42 chapter 11.19.2 emission factors were used for emission estimation from transfer points such as conveyor transfer point, loading and unloading of stockpiles etc. The assigned data quality rating for these factors is "D" or "E" representative of low data quality / high uncertainty. These emission points are wind dependant. ORTECH is of opinion that AP-42 Chapter 13.2.4 Aggregate Handling And Storage Piles is more appropriate document for emission estimation from conveyor transfer points and stockpiles. These emission estimates are assigned a data quality rating of "A" which is the highest level of data quality assigned by US EPA.
5	Emission Estimation	Unpaved road length - 0.72 km	Cumulative Air Assessment Dated: August 5, 2021	Table 1	-	Please confirm if maximum length of unpaved roads/haul roads during all phases of operations will remain 0.72 km.
6	Truck Traffic	50 trips/day	Cumulative Air Assessment Dated: August 5, 2021	Table 1	-	Please provide a rationale how maximum trips per day were calculated. Noise report suggests that a maximum of 34 trucks/hour (worst-case) are expected.
7	Receptors	Receptors were chosen based on recommendations provided in Section 7.1 of the ADMGO, which is in accordance with s.14 of O. Reg. 419/05.	Cumulative Air Assessment Dated: August 5, 2021	5.5	5	In addition to ground level receptor grid, ORTECH recommends setting up of discrete receptors at nearby sensitive land uses/residential units
8	Receptors	No sensitive receptors were assessed. The assessment only examined the potential off-Site concentrations for the purpose of determining compliance. As compliance with the air quality standards was demonstrated at all off-Site locations no assessment was completed at sensitive receptors.	Cumulative Air Assessment Dated: August 5, 2021	7.6	7	See comment for Item #8. It should be noted that if receptors are placed within the boundaries of OPEN PIT source, AERMOD automatically allots zero concentration to those receptors. Upon reviewing AERMOD files, it was noted that many intermediate property line receptors fall within the boudaries of various OPEN PIT sources. Hence, the reported modelled concentration may not be the maximum value
9	Emission Estimation	Fuel Combustion Emissions	-	-	-	Emissions from operation of ancilliary equipment such as generators for crushers, screeners, conveyors etc. are not addressed in the report. Assuming fuel combustion emissions as negligible may be regarded as less conservative approach, especially if the emissions from process operations are close to threshold values (CAQS/AAQC) Further, NOx is a predominant contaminant from fuel combustion. Please respond why NOx emissions were not reported.

Other Considerations/Comments

10	AERMOD Sources	Particle Size Distribution	-	-	-	Dust particle size distribution for OPEN PIT sources may be considered for dispersion modelling
11	AERMOD Sources	As the physical quarries are not uniformly rectangular in shape, a best fit approximation was used to represent each pit.	Cumulative Air Assessment Dated: August 5, 2021	7.2	7	Modelling phased operations of shall result in better fitting of OPEN PIT source
12	AERMOD Sources	Other Pits In the area were modeled with 20 meters depth of OPEN PIT sources	Cumulative Air Assessment Dated: August 5, 2021	-	-	The report also says that other pits in the vicinity are either minimally excavated or have remained unexcavated. in this case, adopting 20 meters pit depth for modelling is also not representative of emission contributions from these pits. ORTECH recommends identifying reasonable worst case scenario of emissions contribution from pits nearby.
13	Meteorological Data	The AERMOD model was run using MECP regional screening meteorological data (i.e., surface and profile files) for the years 1996 to 2000. The Toronto (crops) dataset was used.	Cumulative Air Assessment Dated: August 5, 2021	5.2	4	AERMOD model was run with MECP's regional meteorological data but the wind rose plot and wind class distribution of meteorological data from a nearby airport was also provided. ORTECH's initial review suggests that wind classes of these datasets are materially different. MECP's regional meteorological data has higher percentage of strong winds as compared to local meteorological data. If the revised air quality assessment should indicate a potential for air quality exceedances, taking into account thye uncertainties surrounding the emission estimation methodology, a site specific meteorological dataset is frequently requested by MECP. In ORTECH's opinion, impact of site specific meteorological data on modelled concentration at nearby receptors can be further explored.
14	Meteorological Data	This assessment used MECP regional screening meteorological data, which may not accurately represent the meteorological conditions of the local. However, as the MECP screening data is considered a conservative data set, it was used for this assessment.	Cumulative Air Assessment Dated: August 5, 2021	7.5	7	
15	Meteorological Data	Windrose plot	Cumulative Air Assessment Dated: August 5, 2021	Dust BMPP	-	Does the windrose plot in the report shows the wind direction 'From' or 'To' ? The meterological data used for modelling (MECP's data) appear to have different characteristics than local meterological data. Please confirm the representative dataset for the site.
16	Terrain Data	Data used in this assessment was obtained from MECP (7.5-minute format).	Cumulative Air Assessment Dated: August 5, 2021	5.4	5	ORTECH cannot verify which dataset was used by the modeller, as the terrain data files were not provided along with modelling files. ORTECH recommends using current MECP terrain files in GeoTIFF format

ATTACHMENT 2

Contaminant Concentration Contour Plots (41 pages)



SOURCES:

9

RECEPTORS:

6118

COMPANY NAME:

ORTECH Consulting Inc.

SCALE: 1:20,000

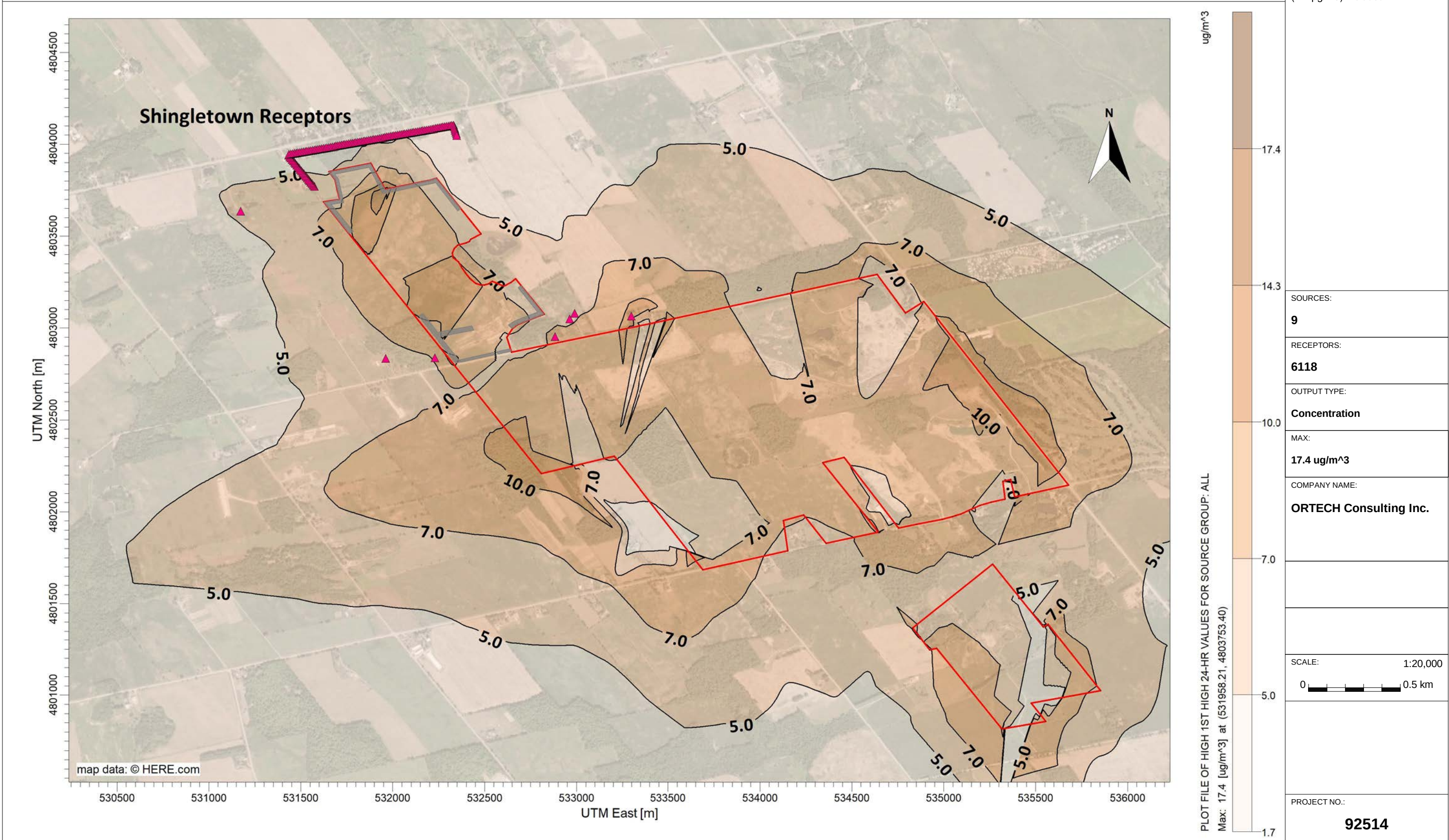
0 0.5 km

PROJECT NO.:

92514

PROJECT TITLE:
Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged Silica Concentrations (Impact of All Pits)

COMMENTS:
Background Concentration
(1.7 $\mu\text{g}/\text{m}^3$) Included



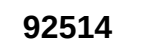
Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged Silica Concentrations (Impact of HP Only)

Background Concentration
(1.7 µg/m³) Included



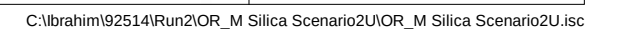
Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged Silica Concentrations (Impact of All Pits)

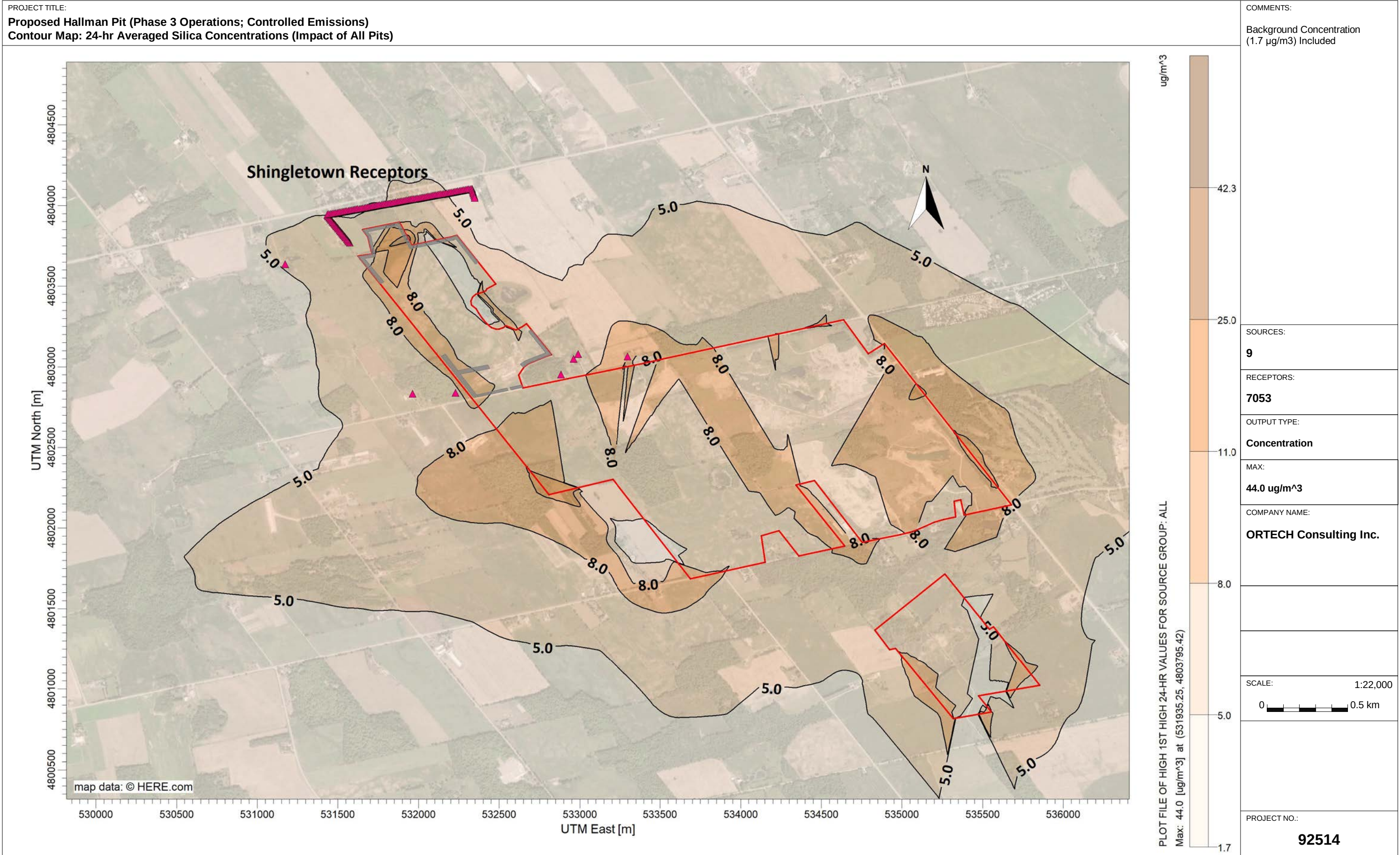
Background Concentration
(1.7 µg/m³) Included

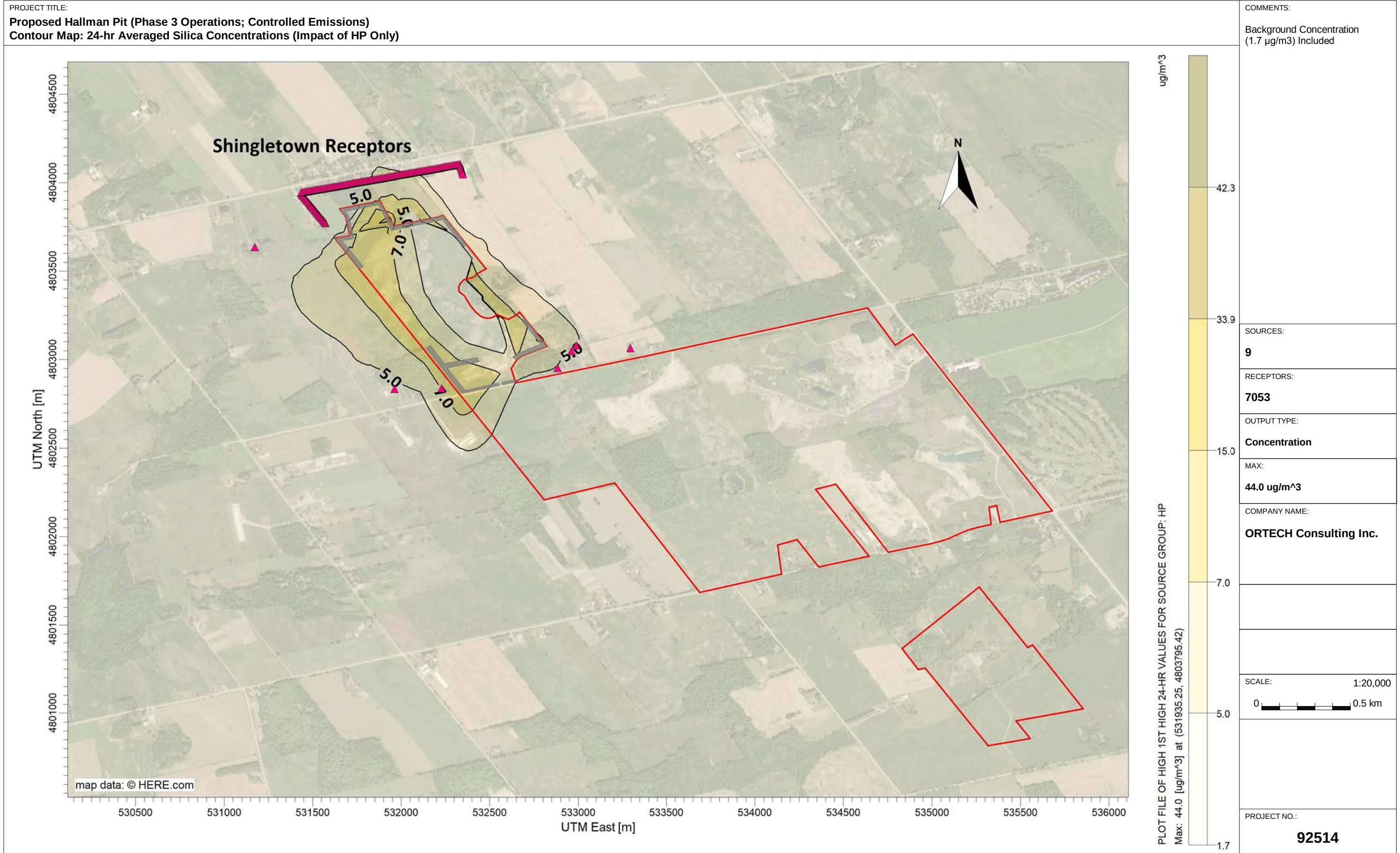


Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged Silica Concentrations (Impact of HP Only)

Background Concentration
(1.7 µg/m³) Included

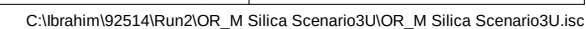






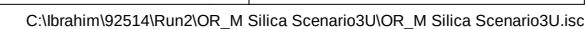
Proposed Hallman Pit (Phase 3 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged Silica Concentrations (Impact of All Pits)

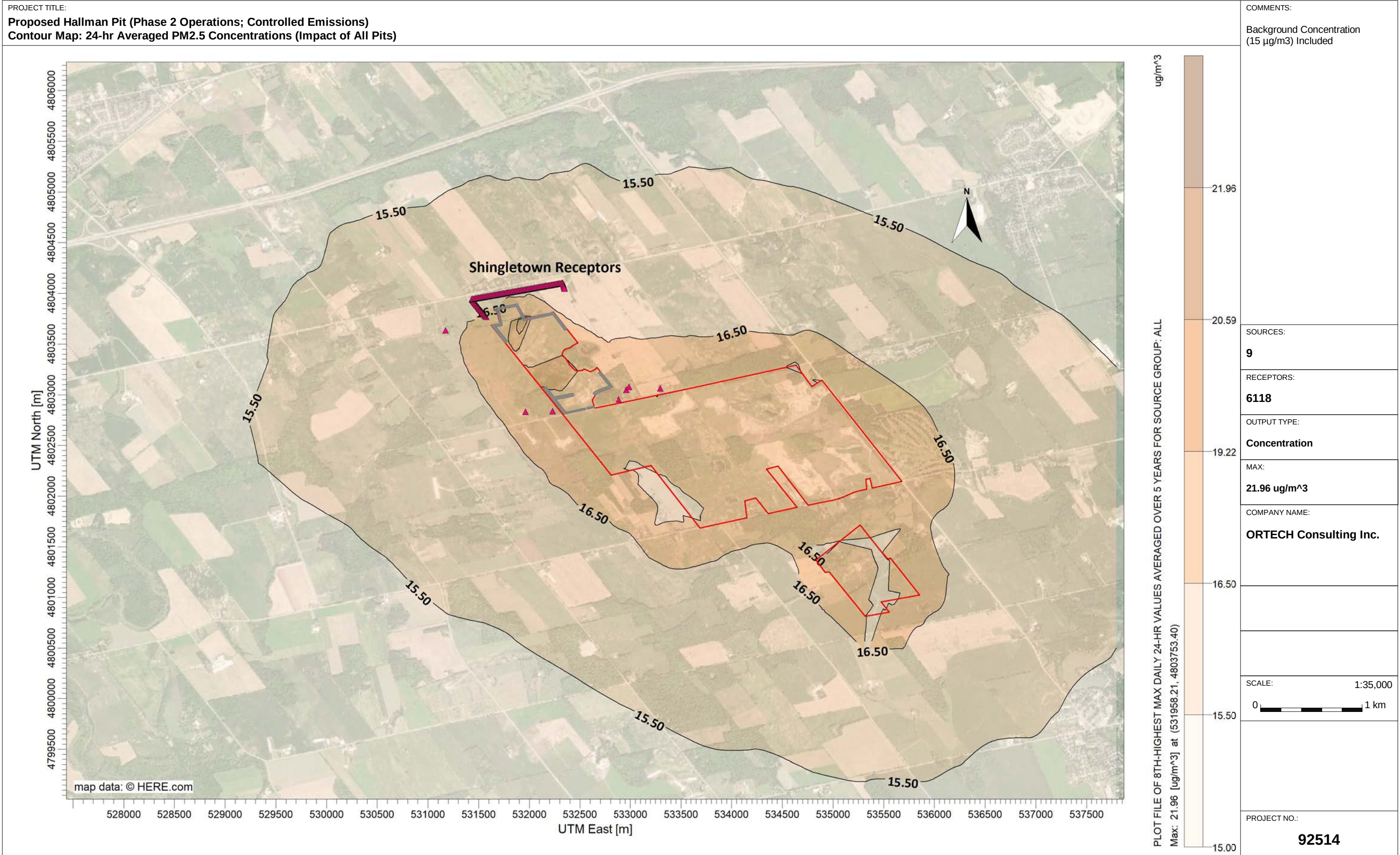
Background Concentration
(1.7 µg/m³) Included



Proposed Hallman Pit (Phase 3 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged Silica Concentrations (Impact of HP Only)

Background Concentration
(1.7 µg/m³) Included





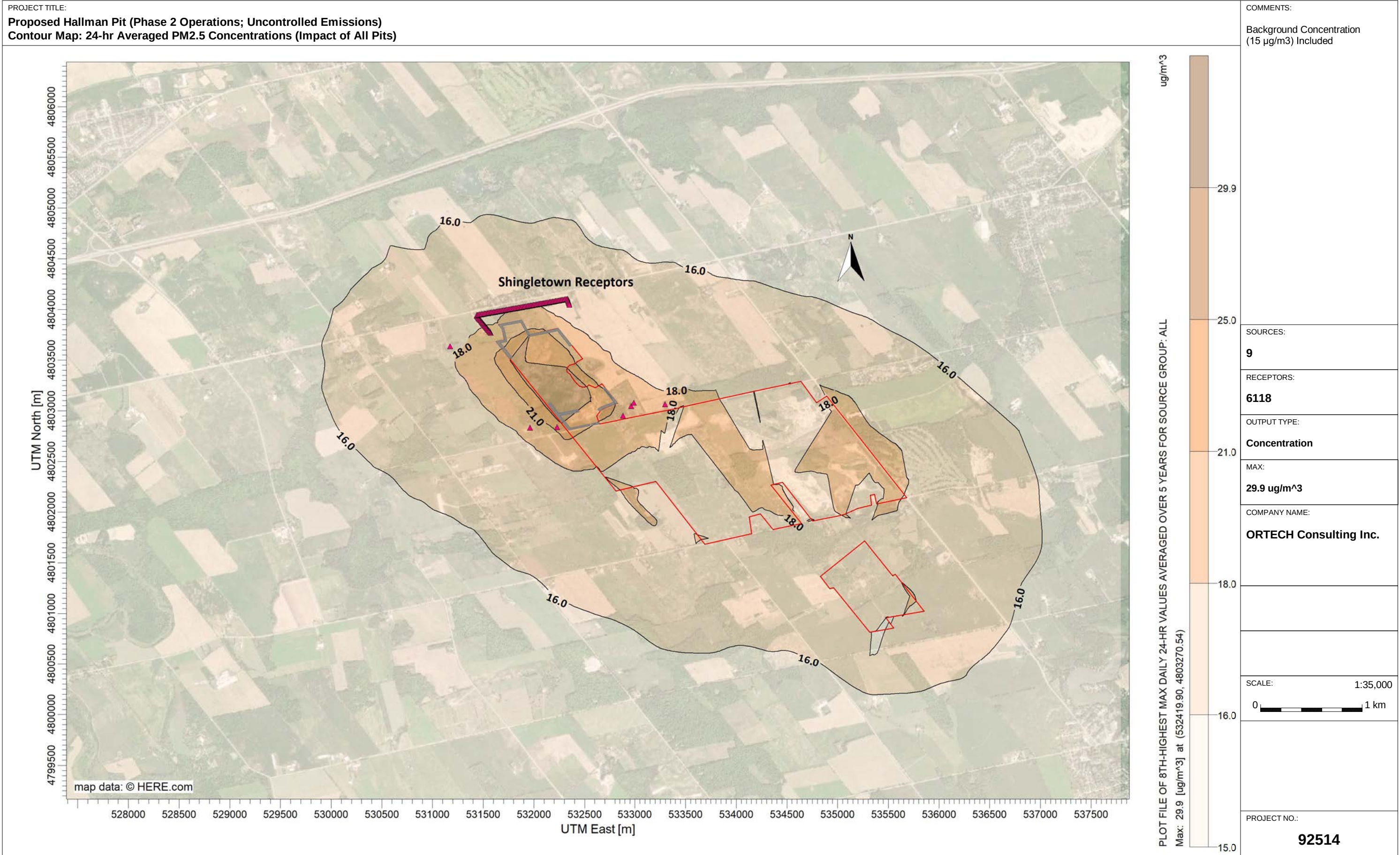
Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged PM_{2.5} Concentrations (Impact of HP Only)

Background Concentration
(15 µg/m³) Included

**ORTECH Consulting Inc.**

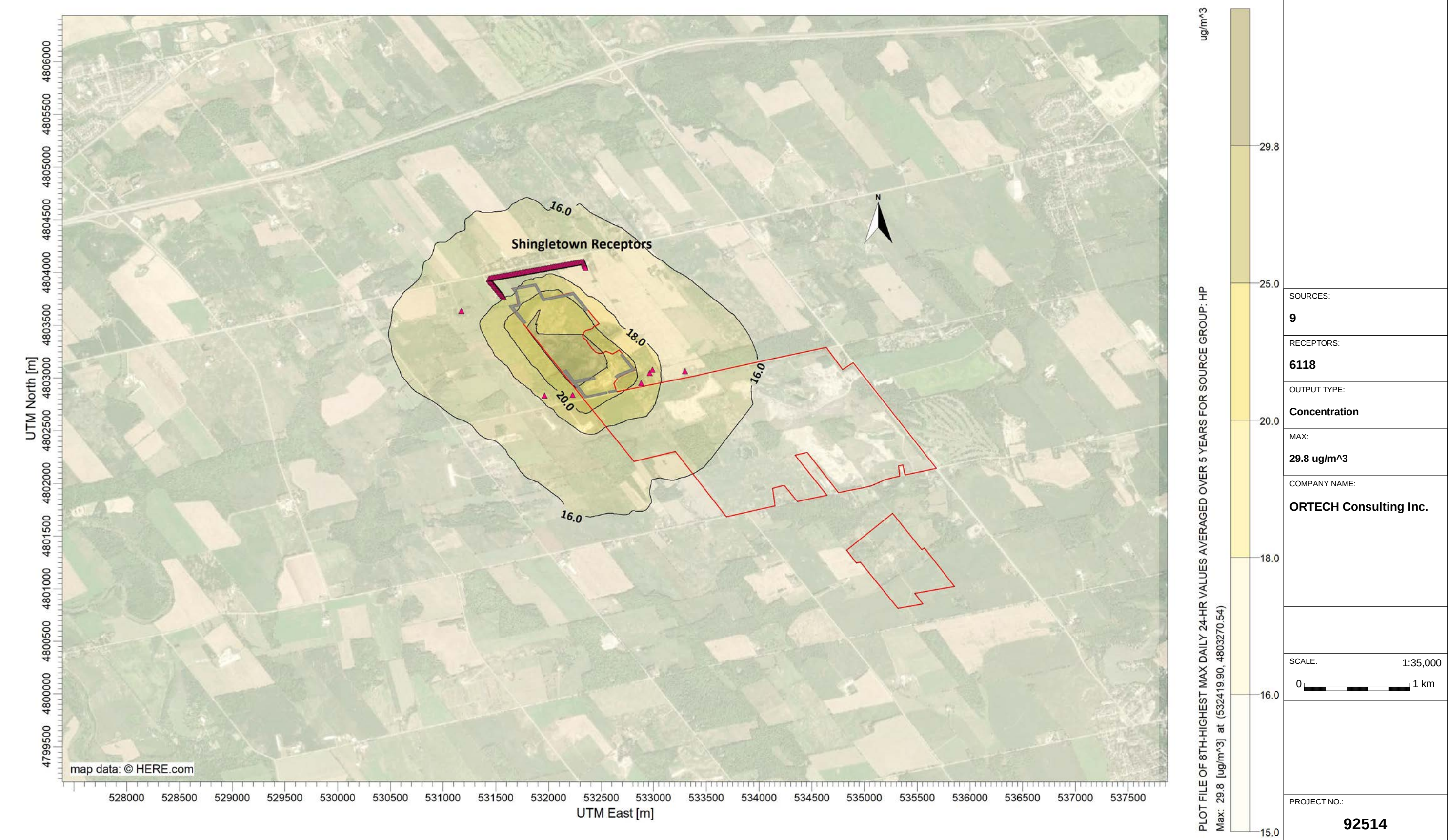
0 1 km

92514



PROJECT TITLE:
Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged PM2.5 Concentrations (Impact of HP Only)

COMMENTS:
Background Concentration
(15 µg/m³) Included



Proposed Hallman Pit (Phase 3 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged PM_{2.5} Concentrations (Impact of All Pits)

Background Concentration
(15 µg/m3) Included



Proposed Hallman Pit (Phase 3 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged PM_{2.5} Concentrations (Impact of HP Only)

Background Concentration
(15 µg/m3) Included



Max: 35.8 [ug/m^3] at (531935.25, 4803795.42)

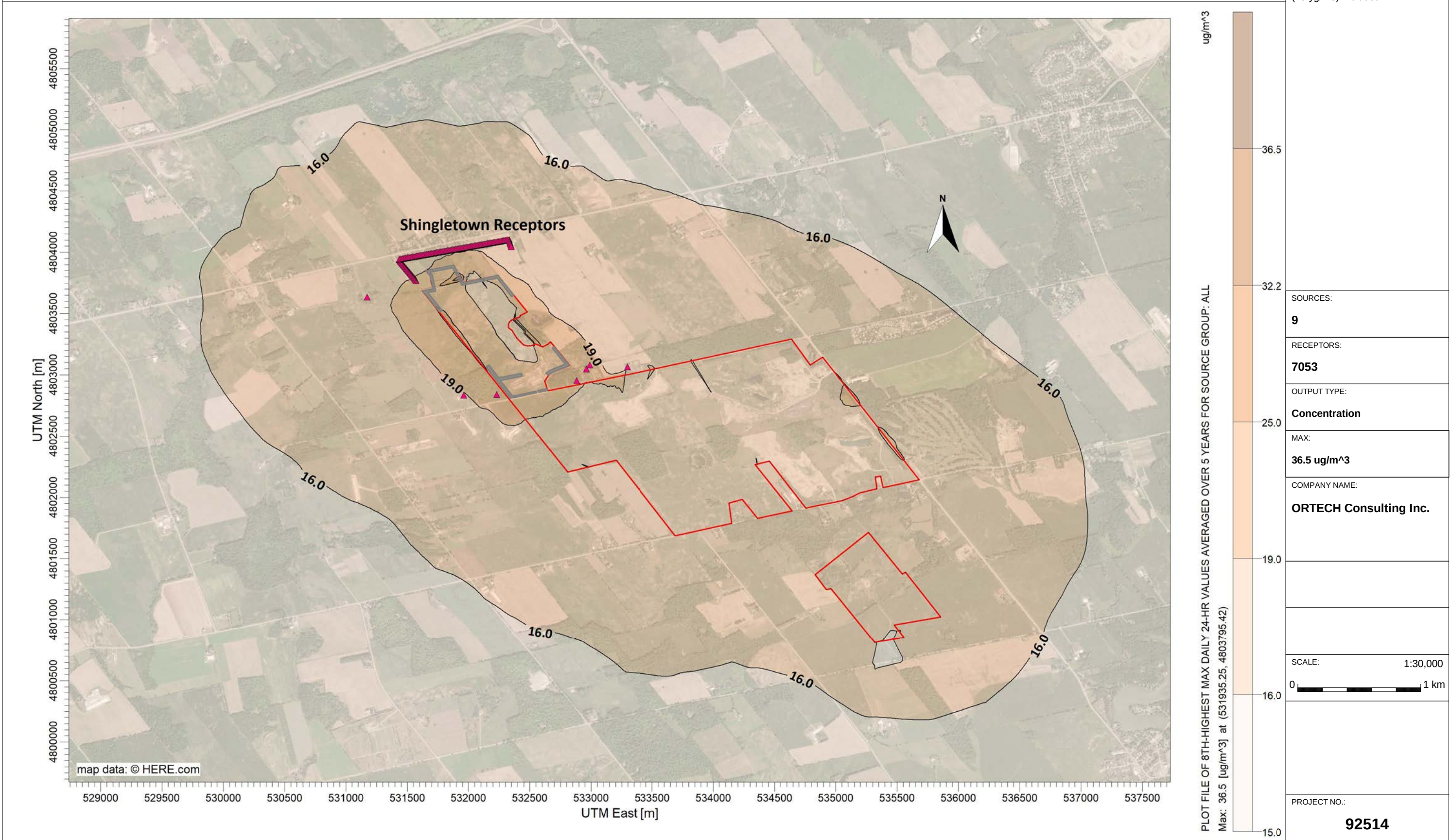
ORTECH Consulting Inc.

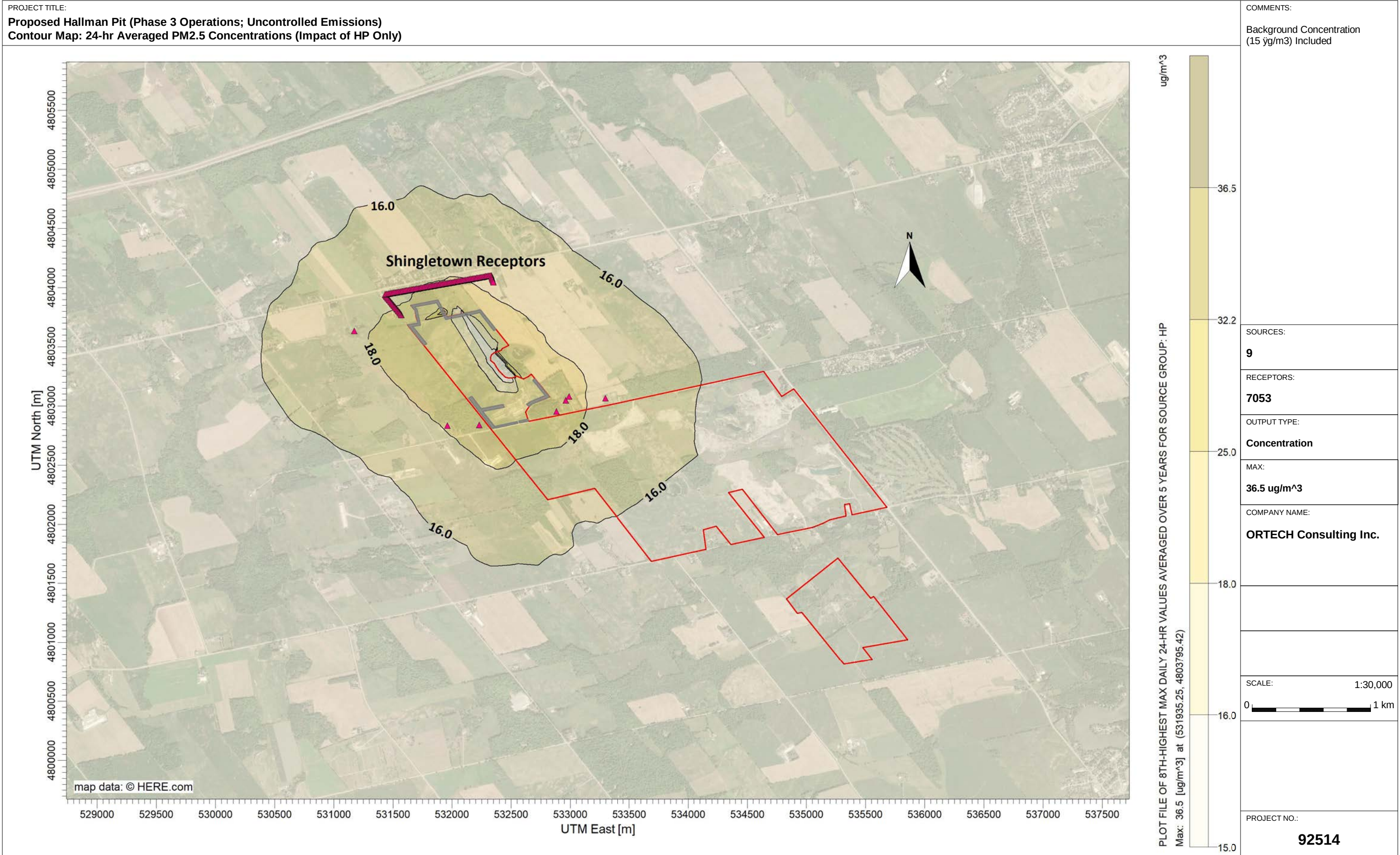
A horizontal scale bar with a black bar between the '0' and '1 km' labels.

92514

PROJECT TITLE:
Proposed Hallman Pit (Phase 3 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged PM2.5 Concentrations (Impact of All Pits)

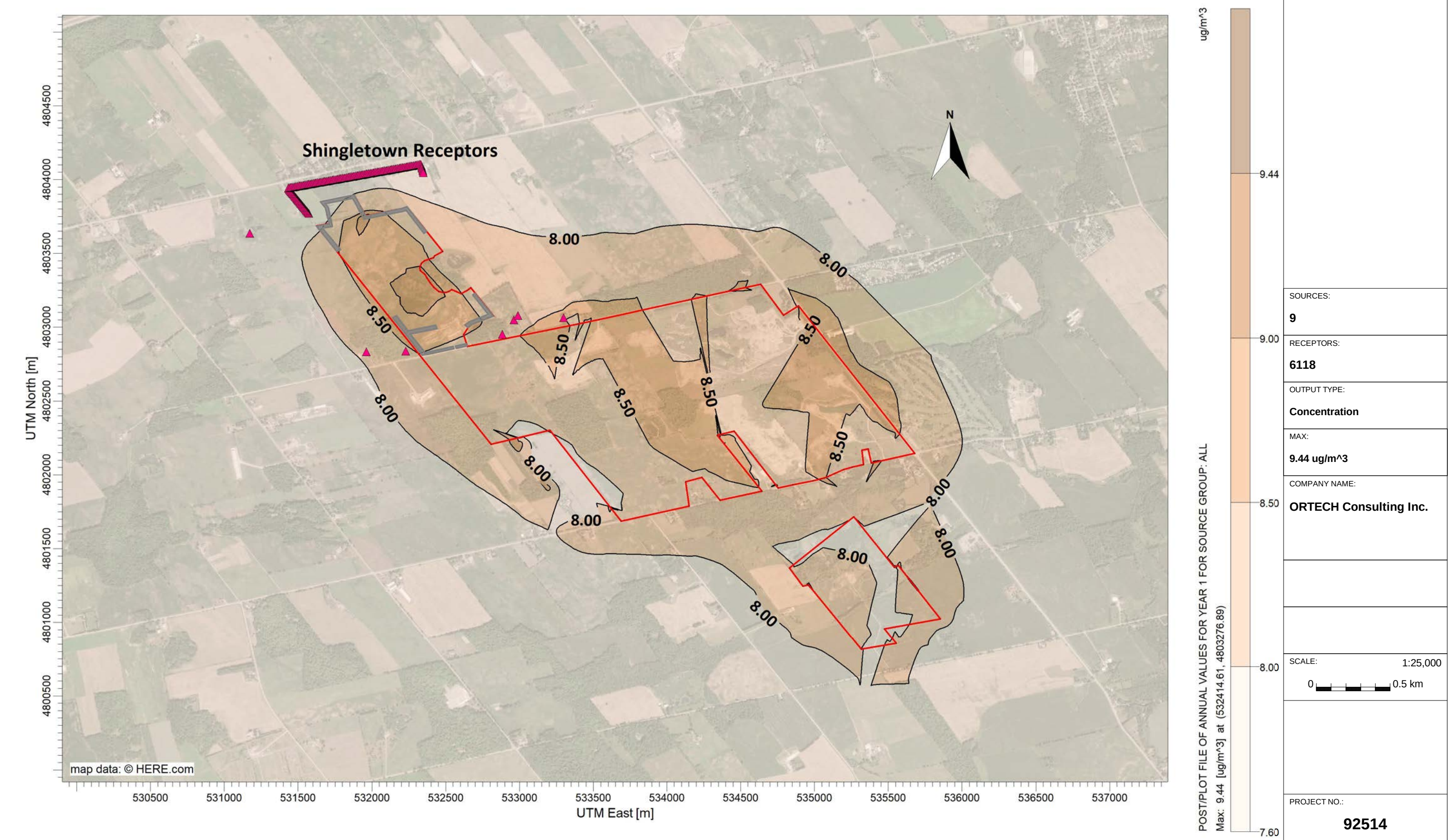
COMMENTS:
Background Concentration
(15 $\mu\text{g}/\text{m}^3$) Included





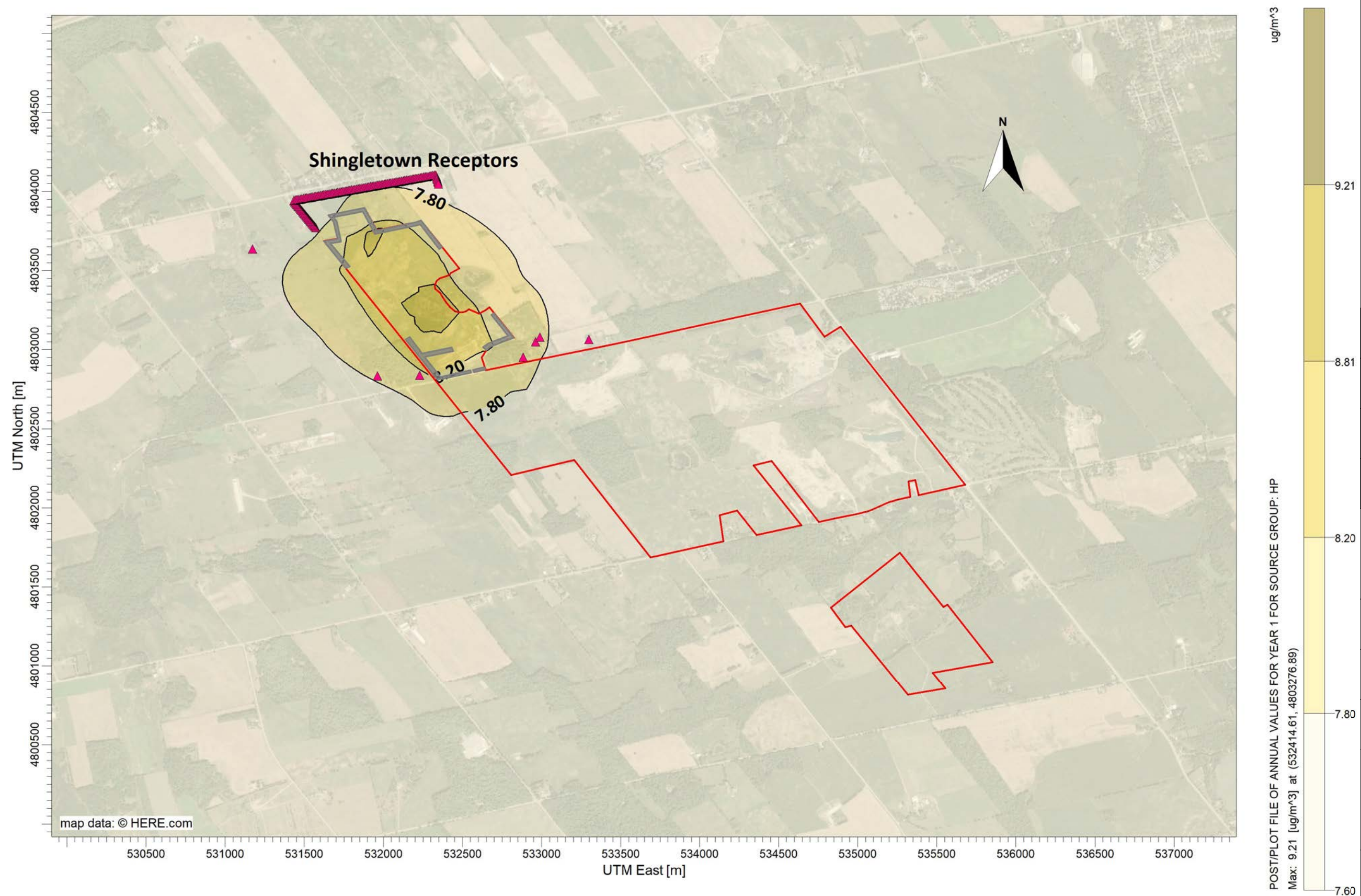
PROJECT TITLE:
Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: Annual Averaged PM2.5 Concentrations (Impact of All Pits)

COMMENTS:
Background Concentration
(7.6 ug/m3) Included



Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: Annual Averaged PM2.5 Concentrations (Impact of HP Only)

Background Concentration
(7.6 µg/m³) Included



9

6118

Concentration

9.21 ug/m³

ORTECH Consulting Inc.

SCALE: 1:25,000

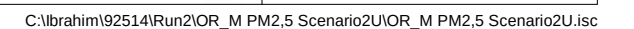
0 0.5 km

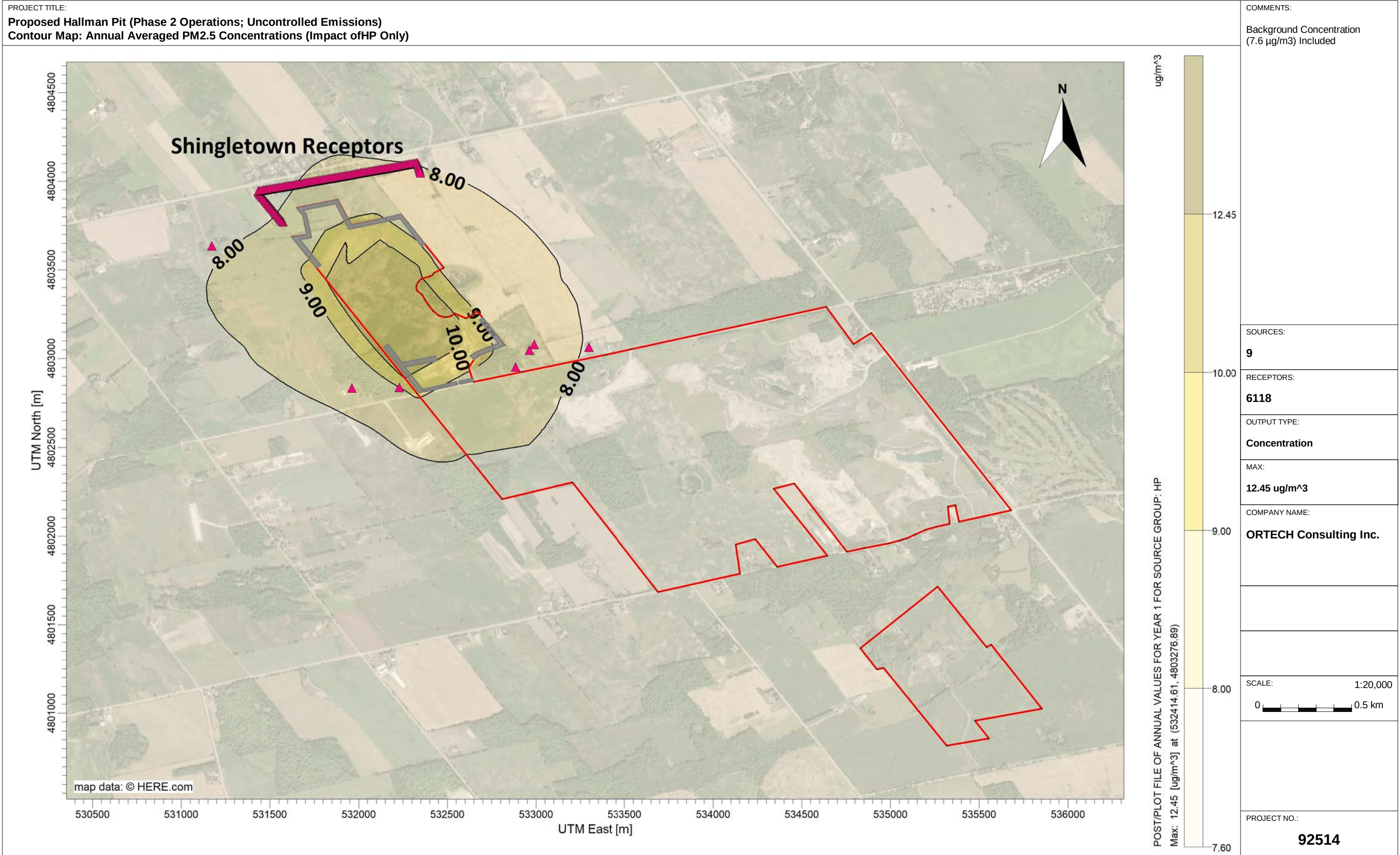
PROJECT NO.:

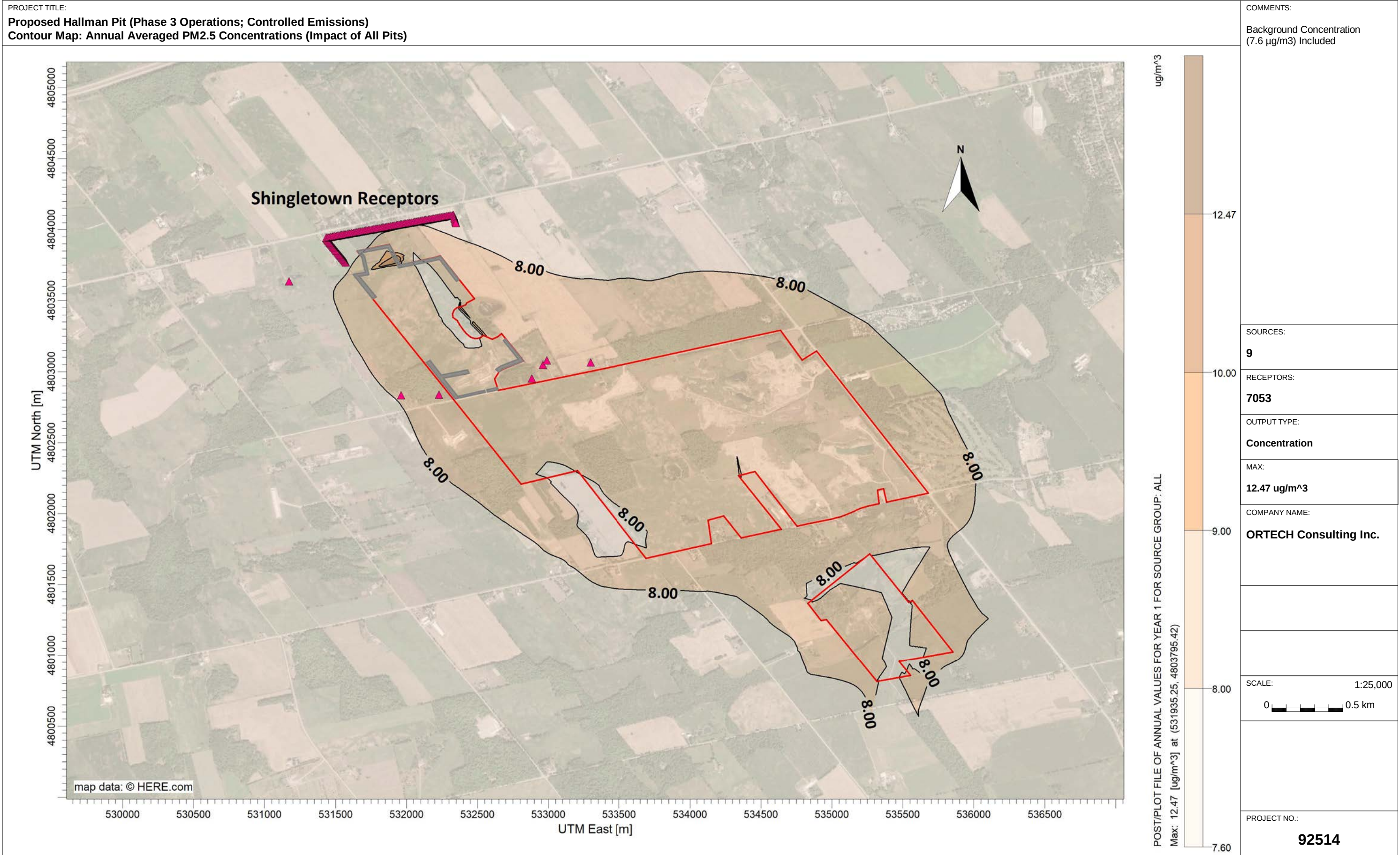
92514

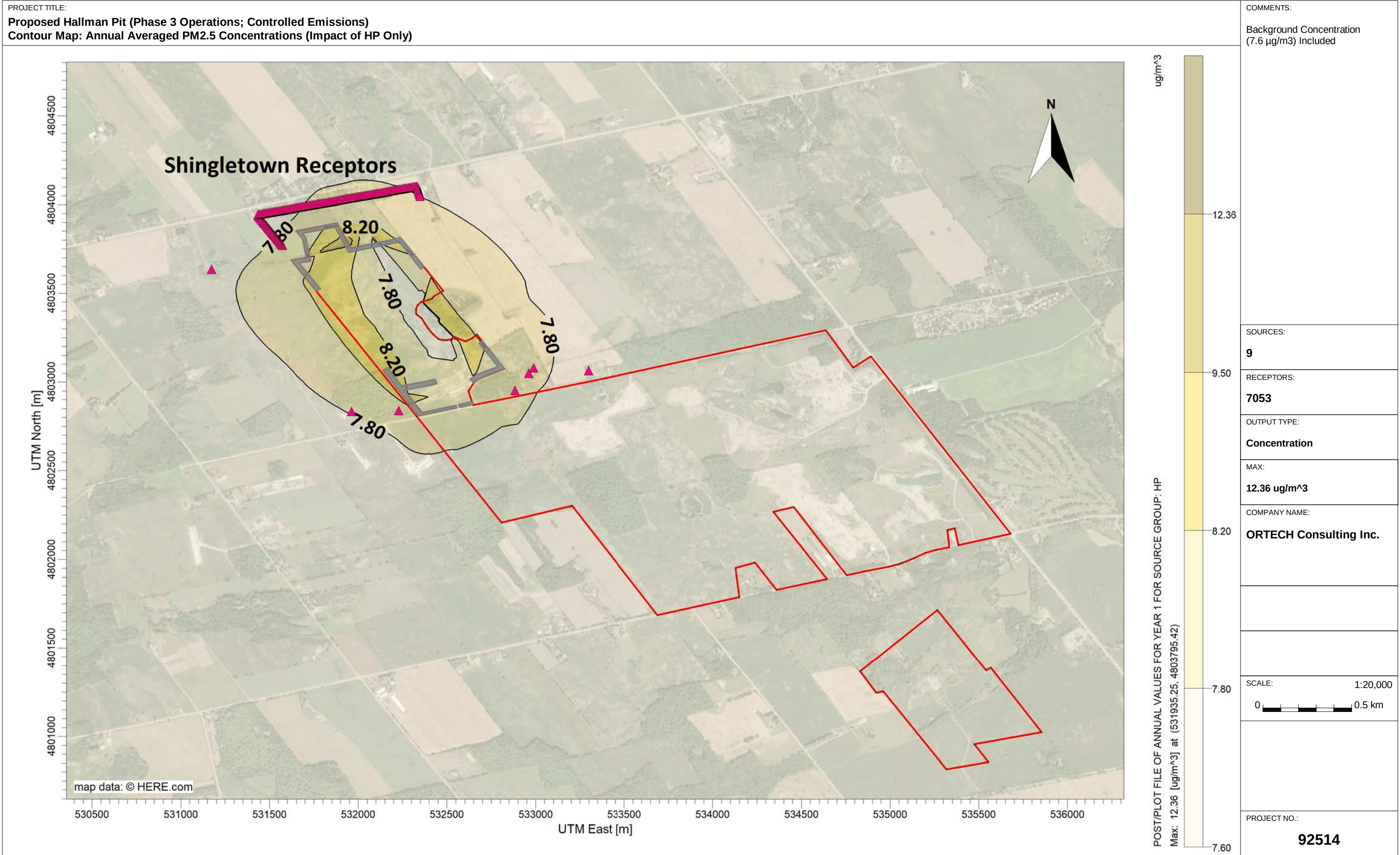
Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: Annual Averaged PM2.5 Concentrations (Impact of All Pits)

Background Concentration
(7.6 µg/m³) Included



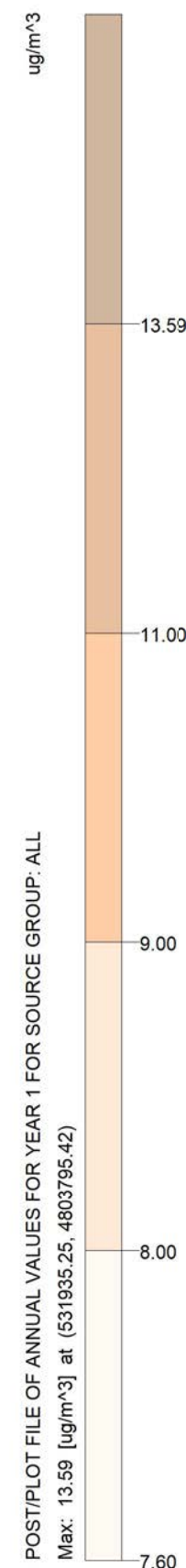






Proposed Hallman Pit (Phase 3 Operations; Uncontrolled Emissions)
Contour Map: Annual Averaged PM2.5 Concentrations (Impact of All Pits)

Background Concentration
(7.6 µg/m³) Included



POST/PLOT FILE OF ANNUAL VALUES FOR YEAR 1 FOR SOURCE GROUP: ALL
Max: 13.59 [ug/m^3] at (531935.25, 4803795.42)

9

7053

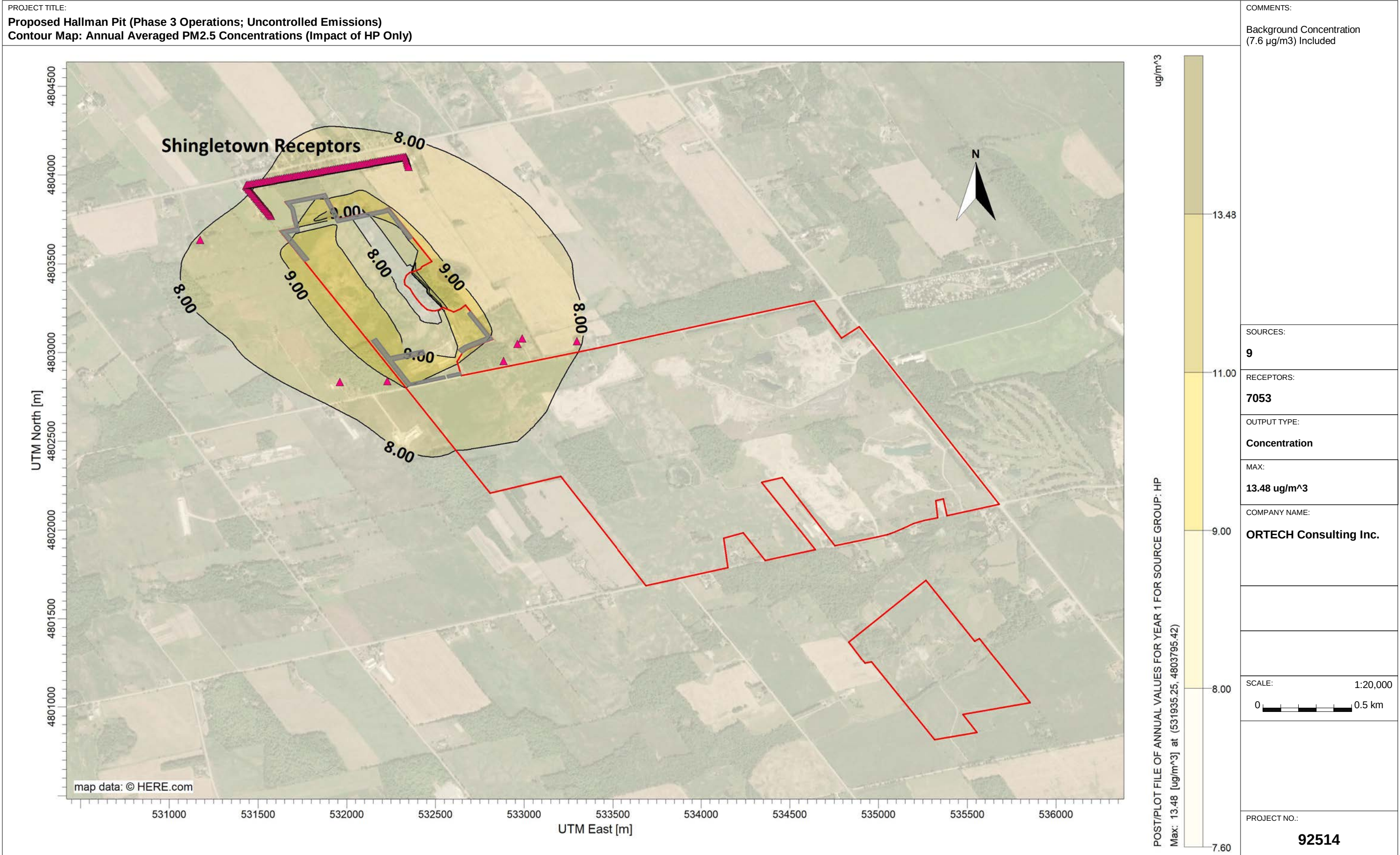
Concentration

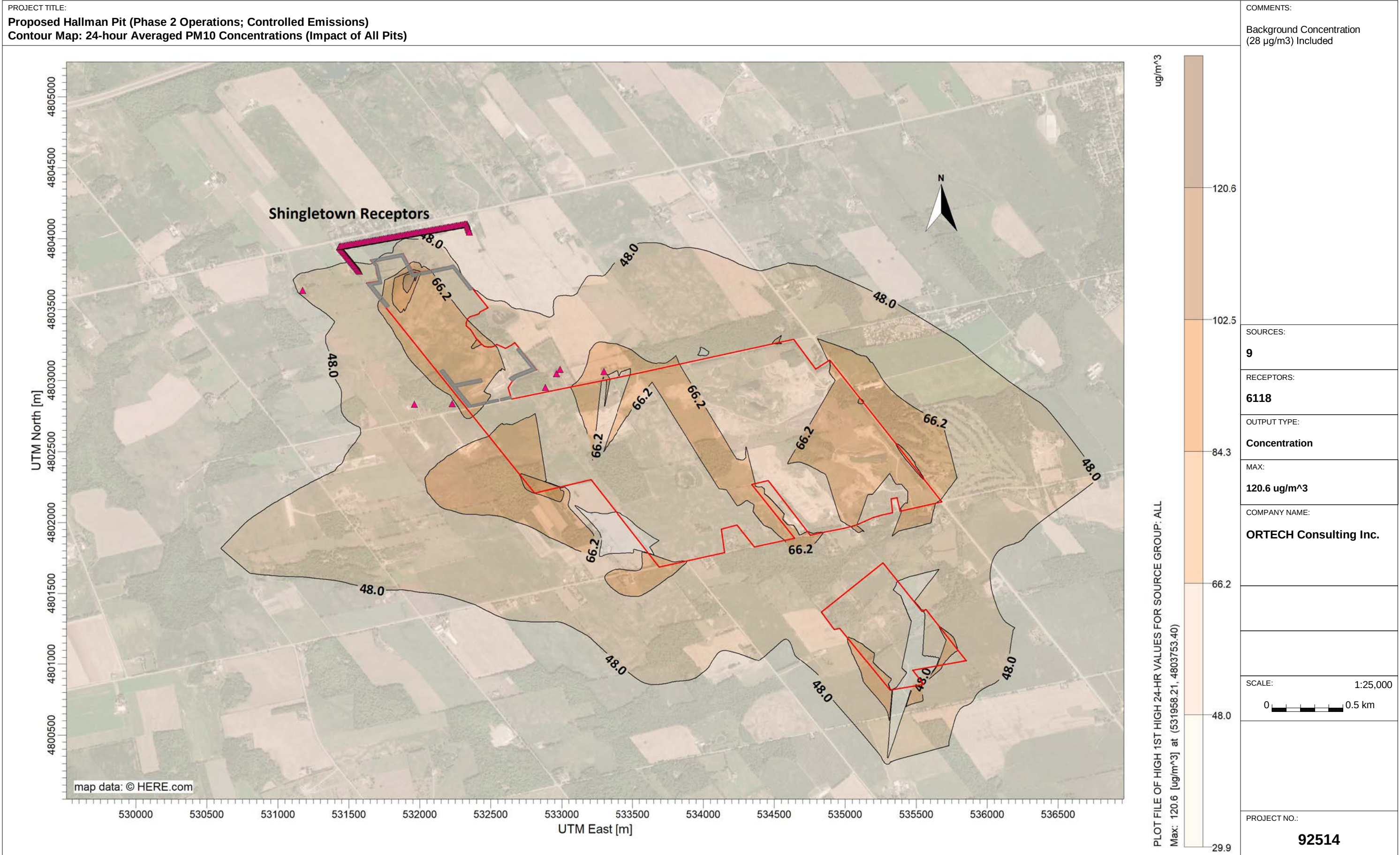
13.59 ug/m^3

ORTECH Consulting Inc.

0 0.5 km

92514





Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: 24-hour Averaged PM₁₀ Concentrations (Impact of HP Only)

Background Concentration
(28 µg/m³) Included



A horizontal scale bar with a black background and white markings. It is labeled '0' at the left end and '0.5 km' at the right end. There are four vertical tick marks between the ends, dividing the bar into five equal segments.

92514

PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: HP
Max: 117.7 [ug/m^3] at (531958.21, 4803753.40)

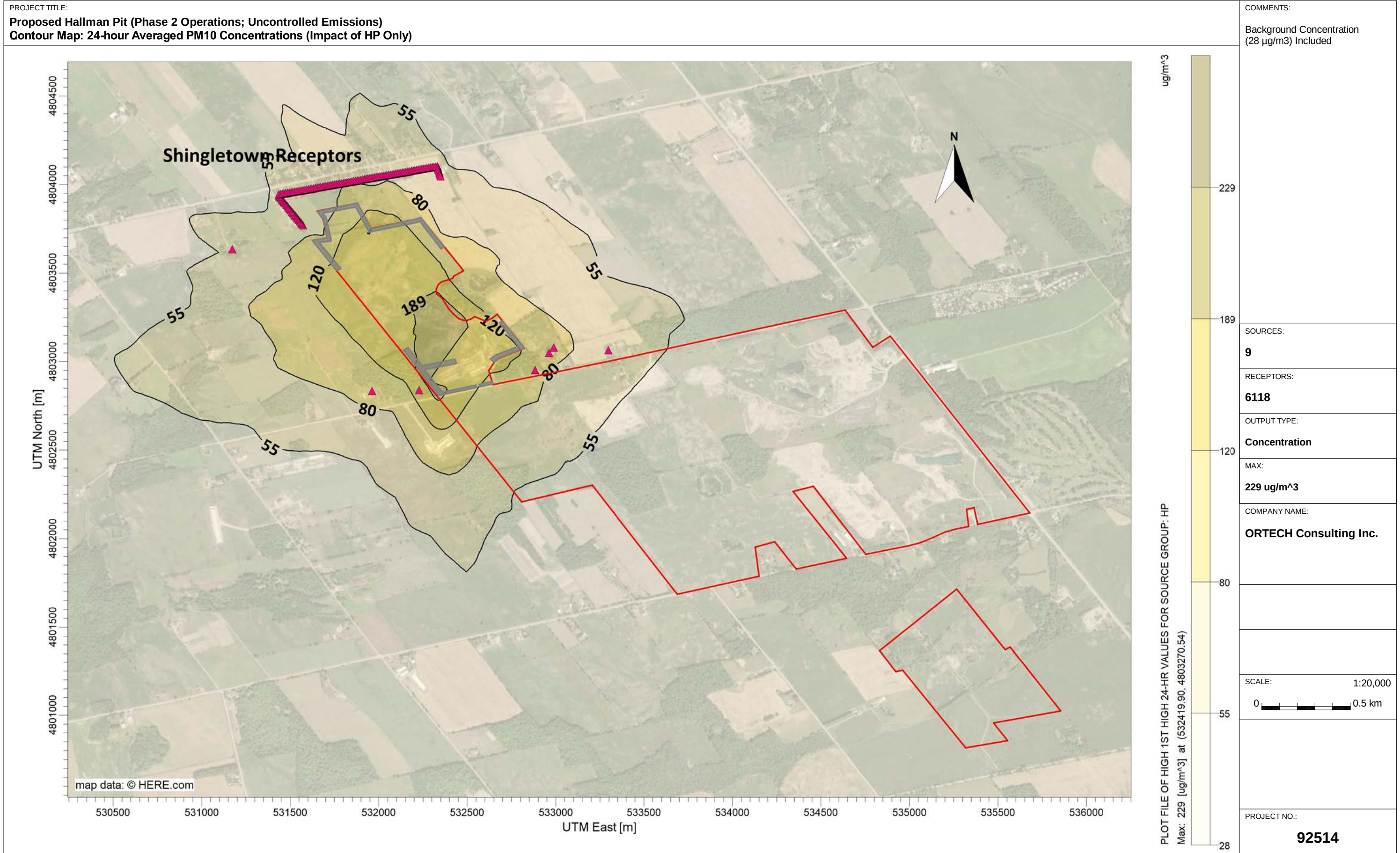
 $\mu\text{g}/\text{m}^3$

Government	Percentage
Current government	117.7
Previous government	99.8

Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: 24-hour Averaged PM10 Concentrations (Impact of All Pits)

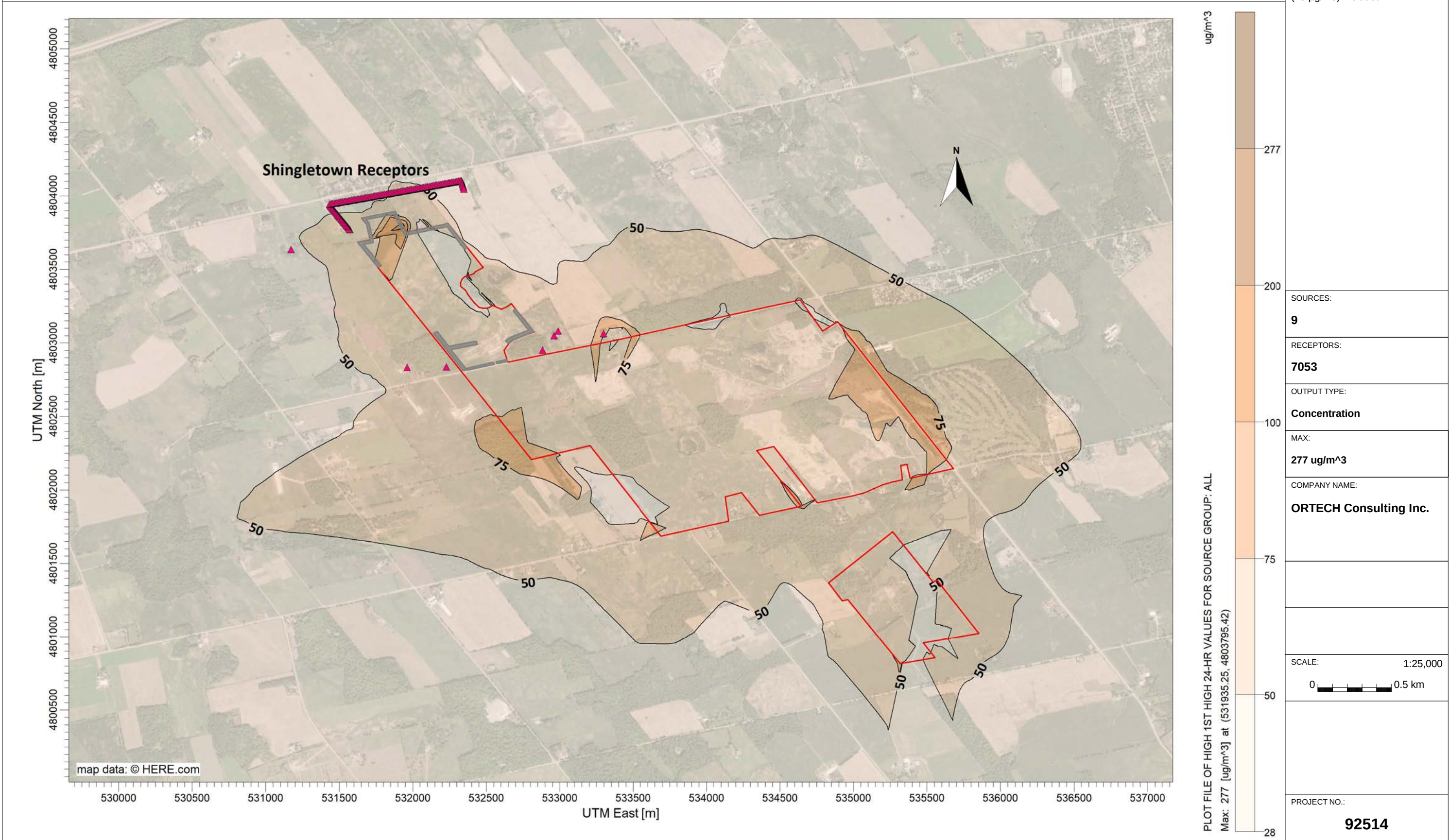
Background Concentration
(28 µg/m3) Included





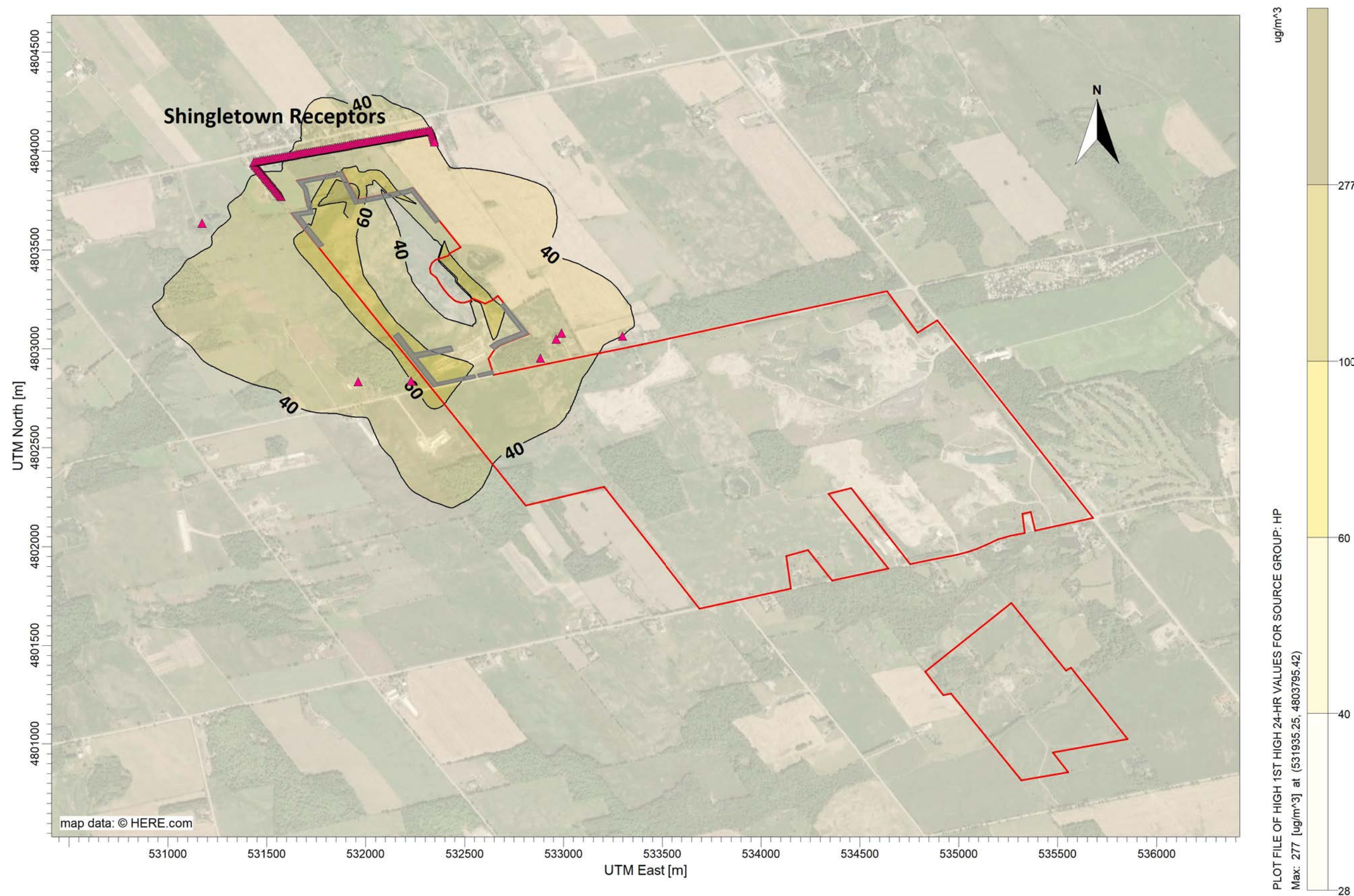
PROJECT TITLE:
Proposed Hallman Pit (Phase 3 Operations; Controlled Emissions)
Contour Map: 24-hour Averaged PM10 Concentrations (Impact of All Pits)

COMMENTS:
Background Concentration
(28 µg/m³) Included



Proposed Hallman Pit (Phase 3 Operations; Controlled Emissions)
Contour Map: 24-hour Averaged PM₁₀ Concentrations (Impact of HP Only)

Background Concentration
(28 µg/m³) Included



9

7053

Concentration

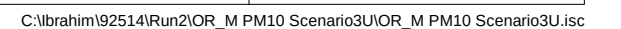
277 ug/m³**ORTECH Consulting Inc.**

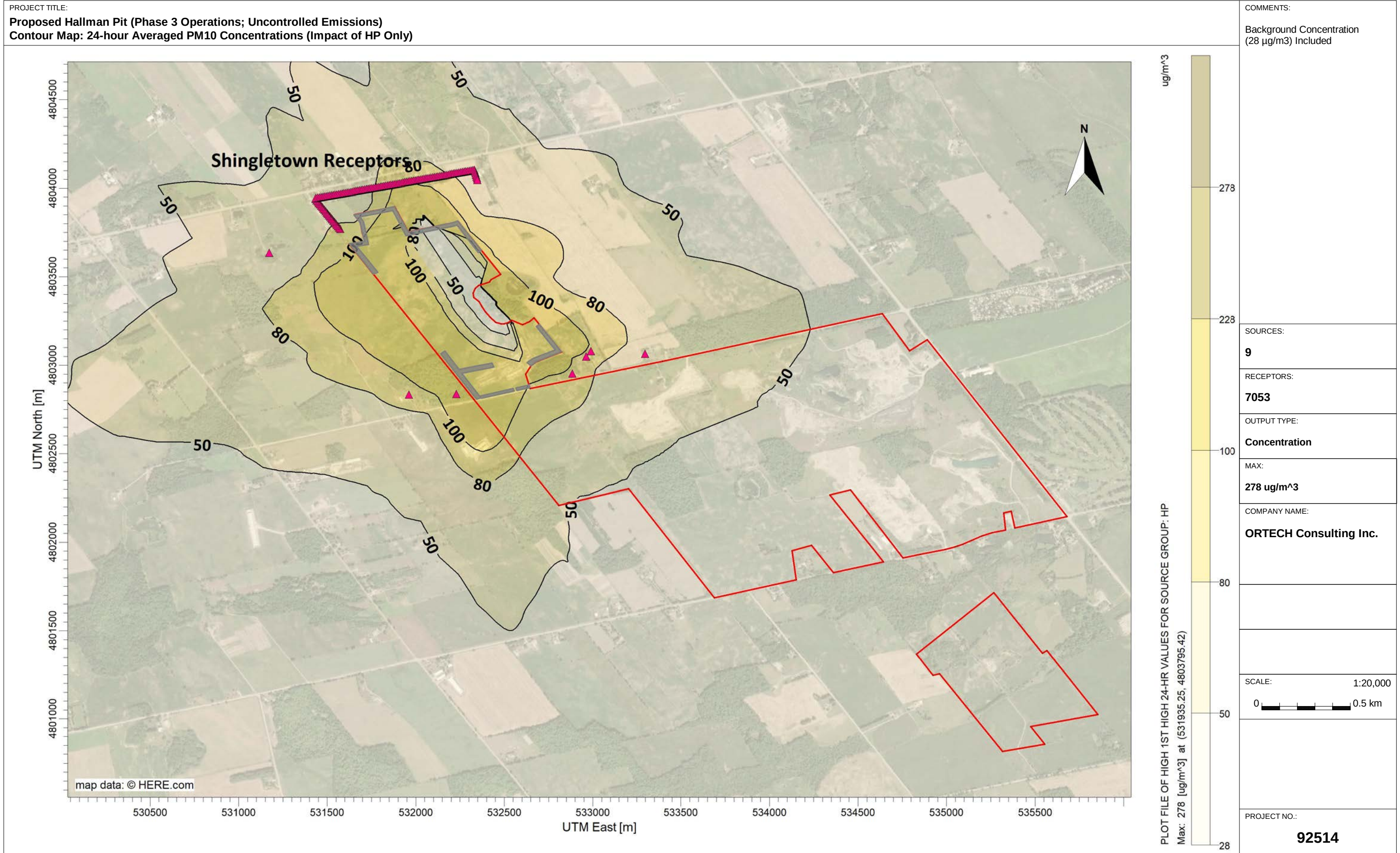
0 0.5 km

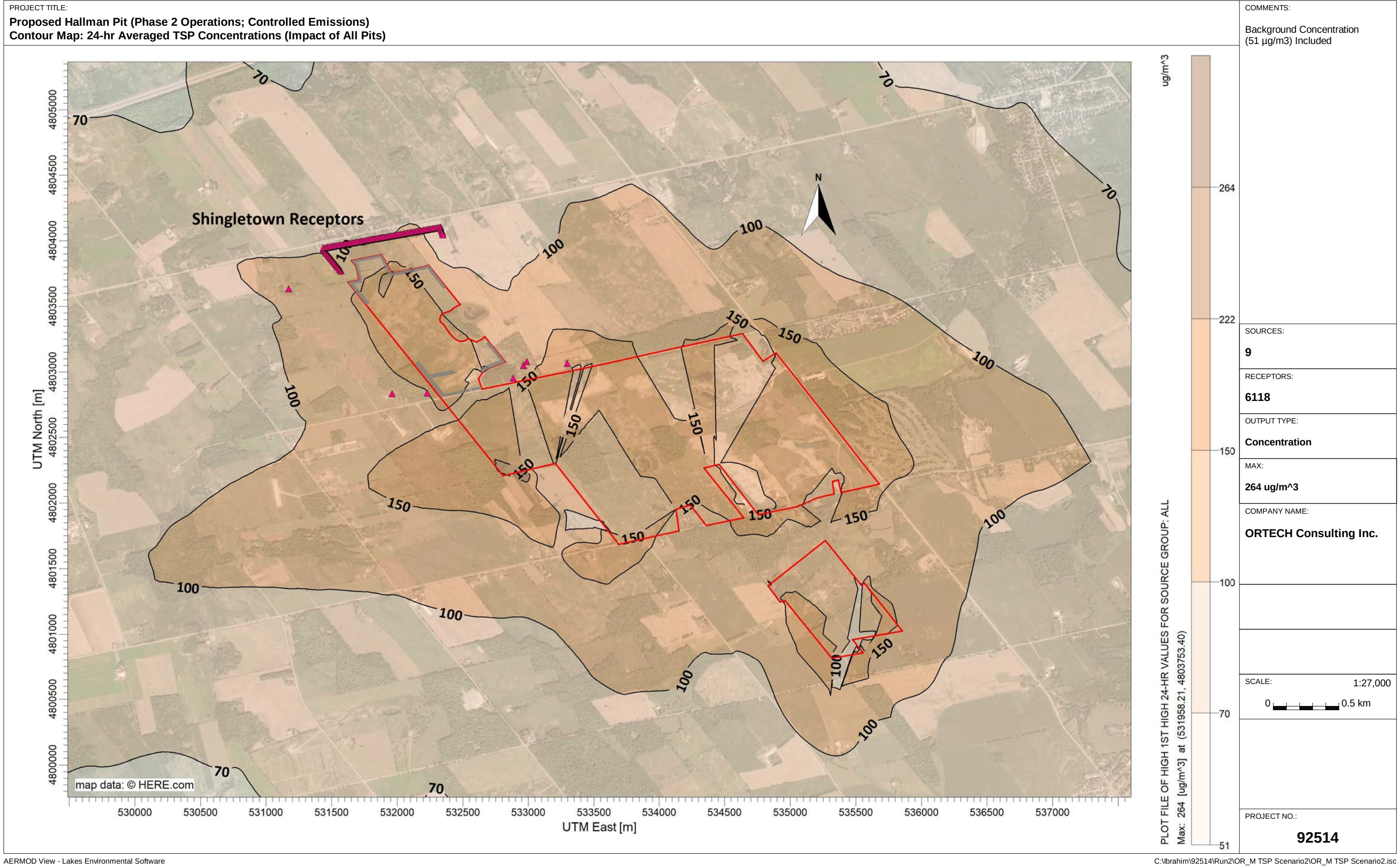
92514

Proposed Hallman Pit (Phase 3 Operations; Uncontrolled Emissions)
Contour Map: 24-hour Averaged PM10 Concentrations (Impact of All Pits)

Background Concentration
(28 µg/m³) Included

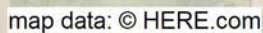






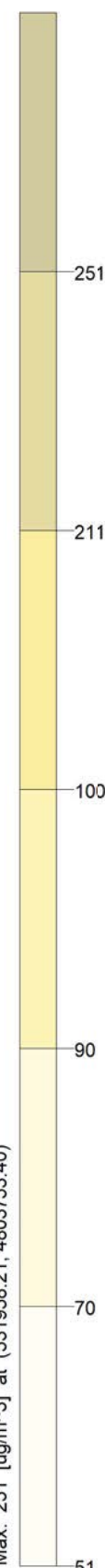
Proposed Hallman Pit (Phase 2 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged TSP Concentrations (Impact of HP Only)

Background Concentration
(51 µg/m3) Included



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: HP

Max: 251 [ug/m^3] at (531958.21, 4803753.40)



9

6118

Concentration

251 ug/m³

ORTECH Consulting Inc.

SCALE: 1:22,000



92514

Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged TSP Concentrations (Impact of All Pits)

Background Concentration
(51 µg/m³) Included



Max: 672 [ug/m^3] at (532419.90, 4803270.54)

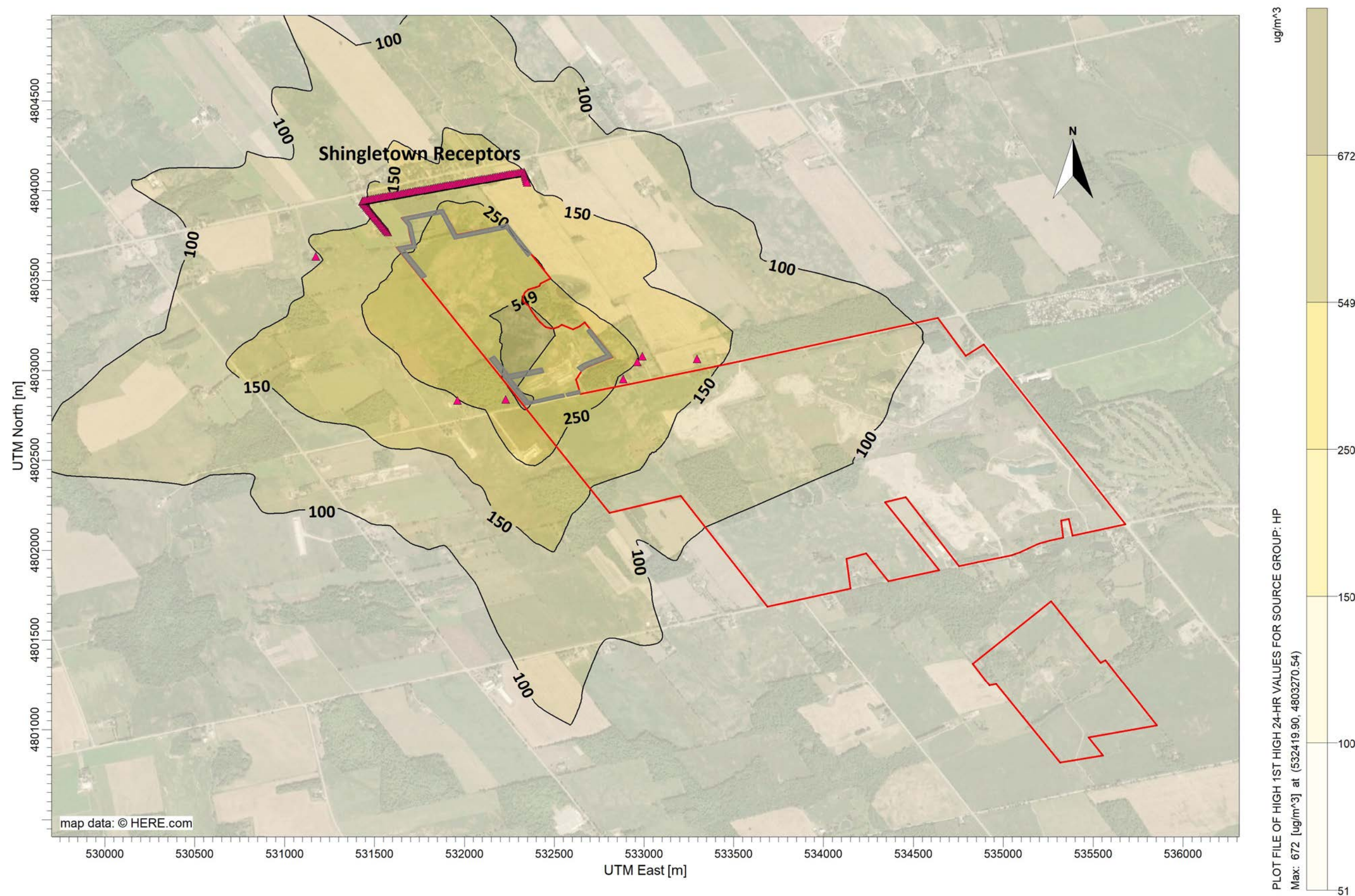
ORTECH Consulting Inc.

0 0.5 km

92514

**Proposed Hallman Pit (Phase 2 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged TSP Concentrations (Impact of HP Only)**

Background Concentration
(51 µg/m³) Included



9

6118

Concentration

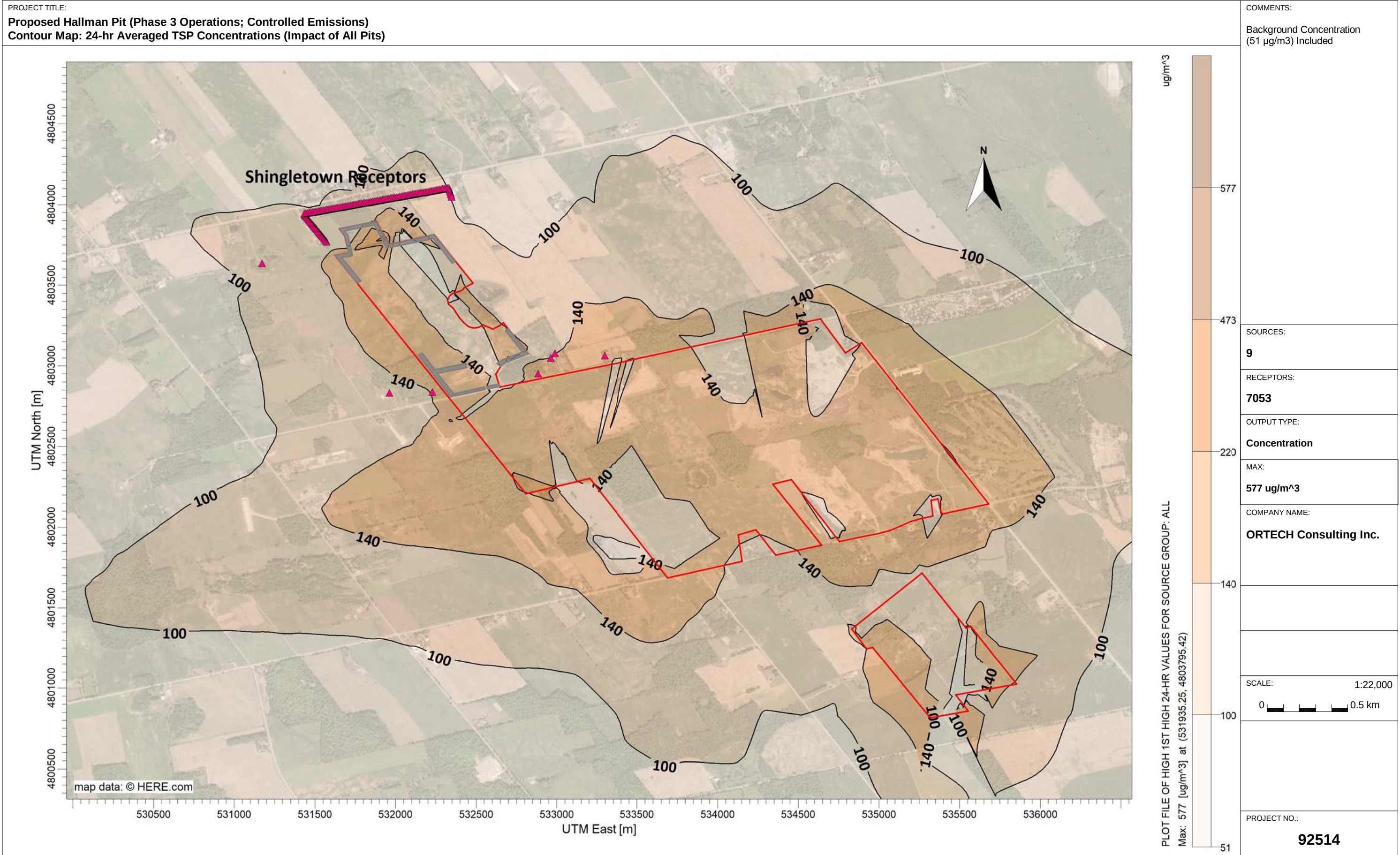
672 ug/m³

ORTECH Consulting Inc.

SCALE: 1:22,000

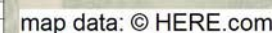
0 0.5 km

92514



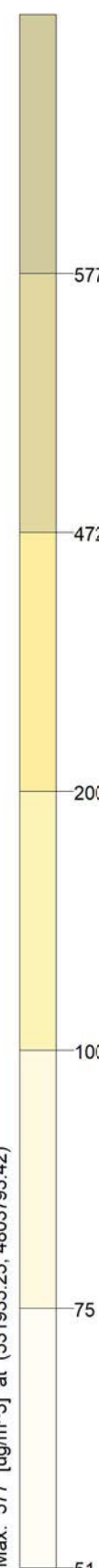
Proposed Hallman Pit (Phase 3 Operations; Controlled Emissions)
Contour Map: 24-hr Averaged TSP Concentrations (Impact of HP Only)

Background Concentration
(51 µg/m³) Included



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: HP

Max: 577 [$\mu\text{g}/\text{m}^3$] at (531935.25, 4803795.42)



9

7053

Concentration

577 ug/m³

ORTECH Consulting Inc.

SCALE: 1:22,000



92514

Proposed Hallman Pit (Phase 3 Operations; Uncontrolled Emissions)
Contour Map: 24-hr Averaged TSP Concentrations (Impact of All Pits)

Background Concentration
(51 µg/m³) Included



Max: 654 [ug/m^3] at (532110.47, 4803785.15)

9

7053

Concentration

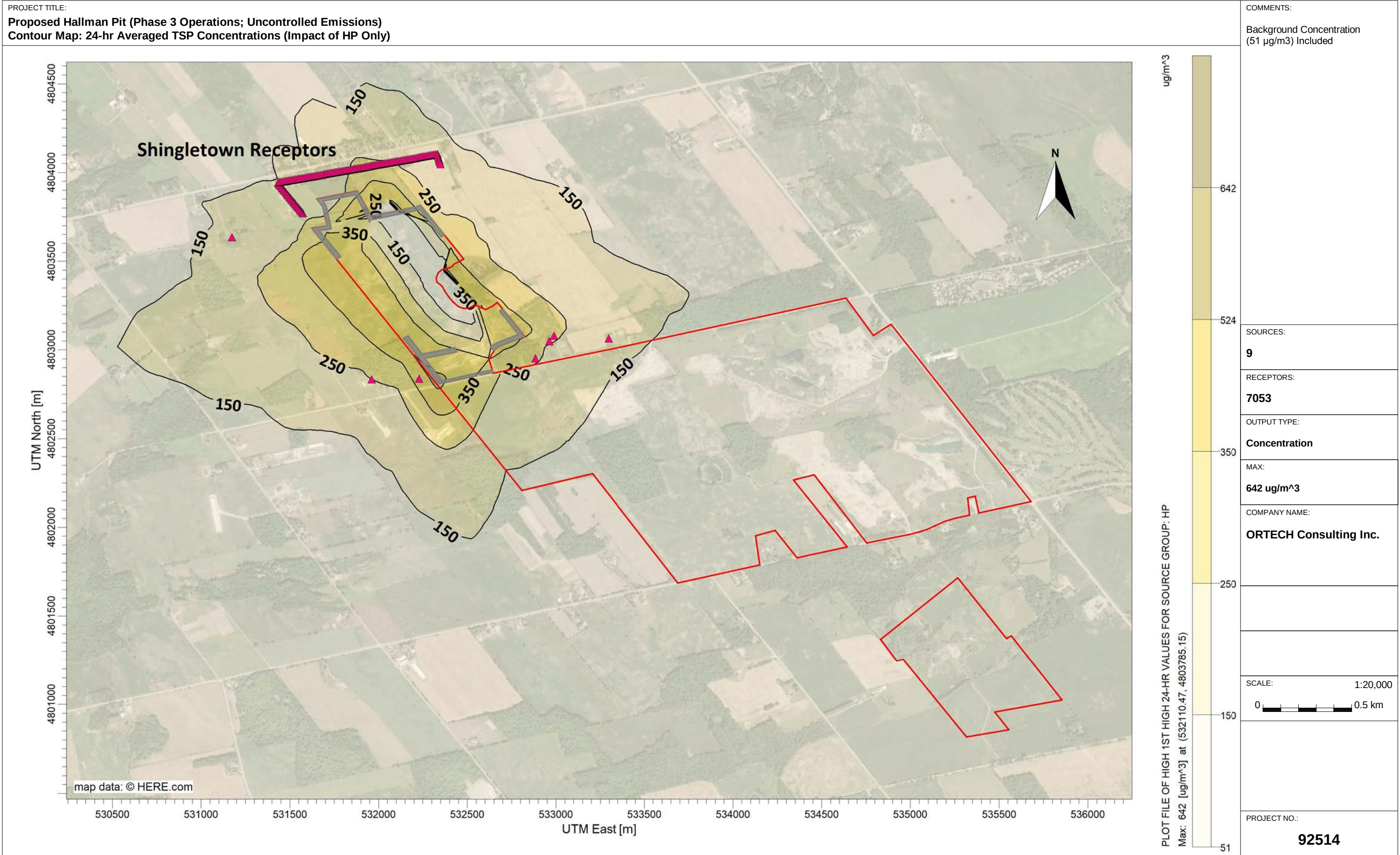
654 ug/m³

ORTECH Consulting Inc.

SCALE: 1:22,000

0 0.5 km

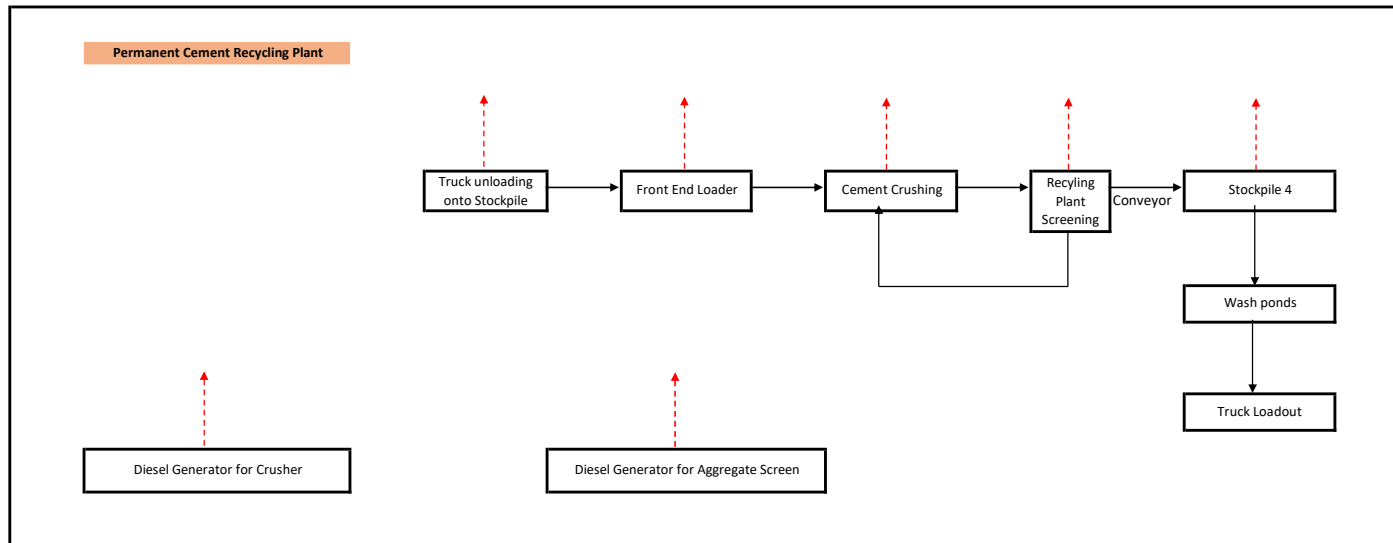
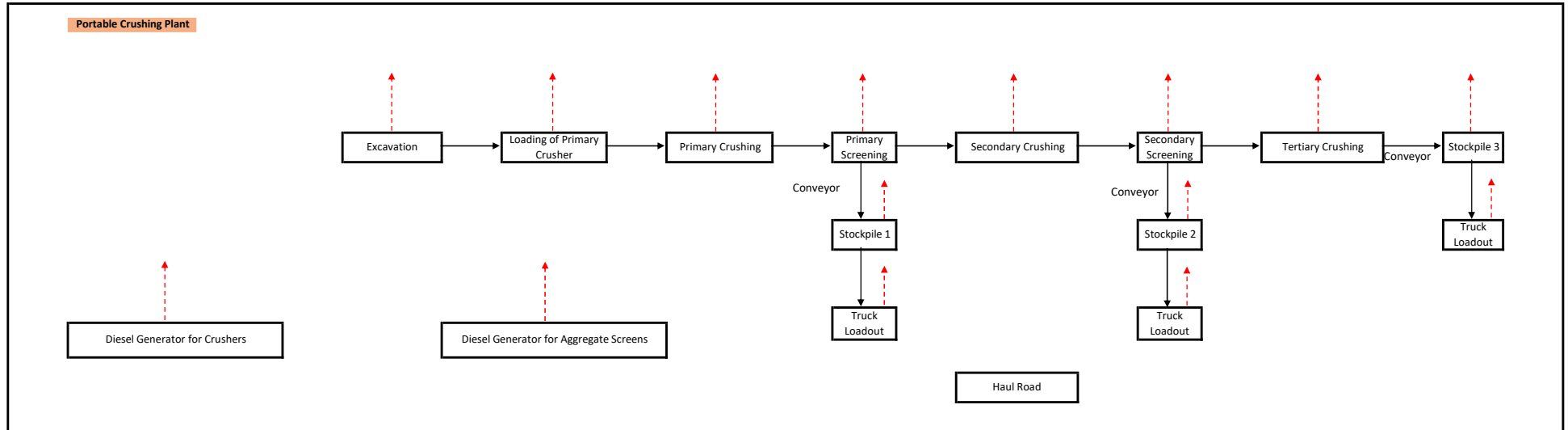
92514



ATTACHMENT 3

**Quarry Guidance Document for Air Dispersion Modelling
(4 pages)**

Anticipated Process Flow Diagram



Notes: In the absence of a proponent process flow diagram indicating emission sources ORTECH has created a simplified version containing emission sources which we feel would be typical of this type of operation

QUARRY GUIDANCE for Refined Modeling

INTRO:

The Director of the Division of Air Quality of North Carolina has instructed that all new quarries and existing quarries proposing modifications to the primary crusher will be required to submit dispersion modeling to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). Primary crusher modifications are those that increase the capability of that unit to produce comparable size and quality material. This guidance provides the Division's expectations for the modeling submitted. Assuming that the quarry is a non-PSD facility, no increment modeling will be required.

MODELS:

AERMOD is the preferred model. The use of deposition modeling is approved. Other models may possibly be used on a case-by-case basis, but should be approved beforehand by the Air Quality Analysis Branch (AQAB).

METEOROLGY:

AQAB preprocessed AERMOD meteorology is preferred and is available from the AQAB website (<http://daq.state.nc.us/permits/mets/metdata.shtml>). Other datasets (user produced) may be used on a preapproved case-by-case basis.

BACKGROUND:

For PM10, a background concentration from the nearest or most representative monitor must be added to the modeled impact concentrations. Contact AQAB for specific values. TSP modeling does not require a background to be added.

EMISSION SOURCES:

Typical sources will include crushers, screens, conveyor dumps, truck dumps, open pit, and haul roads. Although the primary pollutant of concern is PM10, both PM10 (24 hr period only) and TSP (particles 100 microns and smaller - 24 hr and annual periods) emissions are required to be modeled.

- **Production Sources.** Elevated sources like crushers should be treated as elevated volume sources. Typically, these sources, being suspended in metal girder-framed towers, are elevated volume sources not on or adjacent to a building. Release height should be the center of the actual area where the emissions are puffing out. Unless an alternative can be shown to be more conservative, each source (i.e. crusher, screen) should be treated as an independent volume source with separate parameters and emission rates. A case specific judgment must be made to arrive at the lateral side and vertical height of the volume sources. The dimensions should be based on the solid portion of the equipment as opposed to the support girder structure's dimensions. Conveyors are modeled only at the dumps from one conveyor to another or from a conveyor to a pile. The lateral dimensions used in the sigma calculations should be based on the width of the conveyer belt (slightly larger), not on the length. The vertical dimension used for sigma z calculations should be about the drop distance from belt-to-belt or belt-to-pile.

- **Open Pit.** The open pit source can be used under certain restrictions. A pit should be a walled pit, fully enclosed on all sides to accommodate the settling of particles assumed in the algorithm. If a quarry is new and the pit does not yet exist, the parameters for the modeling can be based on the depth and size of the pit at the point where the first production rock is expected to be obtained. Parameters may not be based on an expected operational size at some future date.

- **Haul Roads.** Haul roads are paved and unpaved roads used by the haul trucks to transport quarry material anywhere onsite and should be represented as a series of volume sources based on the haul truck dimensions. All haul roads should be modeled and include customer, production, and process haul roads. Truck dimensions should be provided. The guidance below is acceptable for haul road modeling in NC.
 - Volume Step 1: Determine the adjusted width of the “road”. The adjusted width is the actual width of the trucks plus 6 m. The additional width represents turbulence caused by the vehicle as it moves along the road. This width will represent a side of the base of the volume.
 - Volume Step 2: Determine the number of volume sources, N. Divide the length of the road by the adjusted width. The result is the maximum number of volume sources that could be used to represent the road.
 - Volume Step 3: Determine the height of the volume. The height will be equal to twice the height of the vehicle generating the emissions, round to the nearest meter.
 - Volume Step 4: Determine the initial horizontal sigma for each volume. Typically, this would be calculated by dividing the adjusted width by 2.15.
 - Volume Step 5: Determine the initial vertical sigma. Divide the height of the volume determined in Step 3 by 2.15.
 - Volume Step 6: Determine the release point. Divide the height of the volume by two. This point is in the center of the volume.
 - Volume Step 7: Determine the emission rate for each volume used to calculate the initial horizontal sigma in Step 4. Divide the total emission rate equally among the individual volumes used to represent the road, unless there is a known spatial variation in emissions.
 - Volume Step 8: Determine the UTM coordinate for the release point. The release point location is in the center of the base of the volume. This location must be at least one meter from the nearest receptor.

- **Storage Piles.** Storage piles must be modeled as emitting 8,760 hours per year as a volume source. If truck and conveyor dump activity cause a significant differentiation in emission rates for the piles, then a particular pile could be either broken down with time specific emission rates or treated as two separate collocated sources with the wind caused emissions being the only one emitting 8,760 hours per year. As with all sources, the permit engineer would have to approve the emission rates used.

MODEL OPTIONS AND TECHNIQUES:

Receptors must be placed, starting at the facility property lines at a density of at least 100 m on the property line, near the facility, and surrounding the modeled maximum-impact, and should extend far enough to ensure the maximum impact has been identified for each pollutant and averaging period modeled. Since quarry model run-times are quite large (large number of volume sources) and maximum impacts occur immediately at the property lines, receptors do not normally need to extend beyond 300 m from the property lines.

Dry deposition modeling is approved for quarries. We have adopted, as default, the use of unity density (1 g/cm³) and aerodynamic diameters when performing particulate modeling using the dry deposition modeling option. The following PM10 and TSP parameters should be used:

- PM10: particle density - 1 g/cm³ / aerodynamic diameter - 7.9 microns
- TSP: particle density - 1 g/cm³ / aerodynamic diameter – 79 microns

When modeling TSP, particle size distribution for the PM10 size range is not necessary; i.e., 79 microns can be used to represent all particles from 0 to 100 microns for TSP.

ANALYSIS PACKAGE:

An analysis submitted to AQAB will include at a minimum:

- A detailed, accurate map of the quarry site to include haul roads, location and footprint of all crushers, screens, conveyers, pit area, storage piles, and any other sources. Elevation contours are needed on the map, onsite and at least to the property boundaries.
- A certified plat map or surveyor's map is required as with all modeling.
- Input and output files via electronic medium.
- Any parameters used in special modeling such as processing of met data and deposition parameters.
- Results should be displayed in a table that shows the modeled impact, background concentration, and the sum total. As a reminder, the modeled PM10 (24hr) impact is the H6H over the entire 5-year met dataset. TSP is H2H over each year independently for the 24 hr period, and H1H for the annual period. The PM10 24 hr NAAQS is 150 ug/m³; the TSP SAAQS is 150 ug/m³ for the 24 hr period and 75 ug/m³ for the annual period.