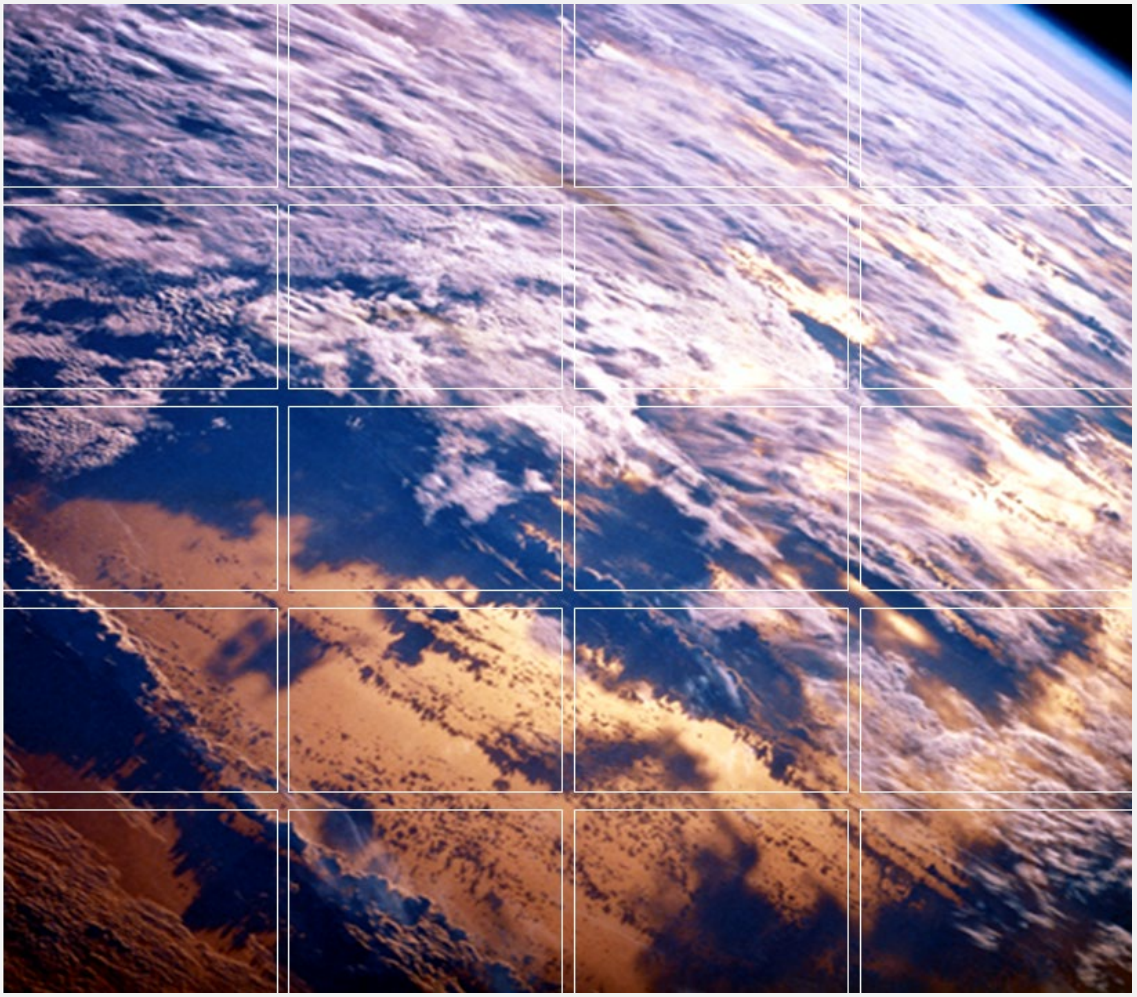

Level 1 Risk Assessment Modeling Protocol Revision 1

QTS Investment Properties Hillsboro, LLC

8 November 2019

Project No.: 0483509

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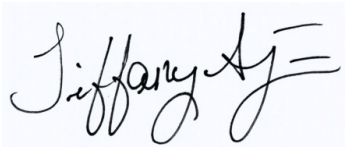
8 November 2019

Level 1 Risk Assessment Modeling Protocol

QTS Investment Properties Hillsboro, LLC



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1. INTRODUCTION

On behalf of QTS Investment Properties Hillsboro, LLC (QTS), Environmental Resources Management, Inc. (ERM) submits this revised air quality modeling protocol to support a Level 1 Risk Assessment for their standard air contaminant discharge permit application as required by Cleaner Air Oregon (CAO). This modeling protocol has been updated in accordance with the requests made by the Oregon Department of Environmental Quality (ODEQ) in the letter dated October 11, 2019.

This air quality modeling protocol presents ERM's proposed approach for the Risk Assessment to be performed in support of the air permitting effort. This protocol follows the established guidance for a Level 1 Risk Assessment under OAR 340-245-0210(1). The protocol contains a characterization of the proposed sources along with the emission rates to be assessed on both a short and long-term basis, as well as locations for residential, non-residential child, non-residential worker, and acute exposures.

This protocol is intended only to support a Level 1 Risk Assessment and no further analysis; as such, it does not contain any methodology for the use of air dispersion modeling programs such as AERMOD. Should a different level of Risk Assessment be required, ERM will submit a revised modeling protocol detailing the refined parameters required for such an effort.

2. PROJECT OVERVIEW

QTS proposes to construct and operate four (4) diesel-fired emergency generators and associated fuel storage tanks at a new data center located at 4950 NE Huffman Street, Hillsboro, Oregon in Washington County (the facility). An updated Standard Air Contaminant Discharge Permit (ACDP) application (the permit application) detailing the project is being submitted to the Oregon Department of Environmental Quality simultaneously with this protocol. This application includes the Air Toxics Reporting Form (AQ405CAO). QTS will maintain compliance with the Generic Plant Site Emission Limits (PSEL) for all criteria pollutants pursuant to OAR 340-200-0020(72). The new emergency generators will additionally be subject to New Source Performance Standards (NSPS), Subpart IIII. They will be equipped with a non-resettable hour meter and will not operate for greater than 100 hours per year for maintenance and testing purposes. The generators will comply with EPA Tier 2 emission standards, and the engines will comply with the fuel requirements of this subpart by using only 15 ppm or lower sulfur diesel fuel.

2.1 Source Characterization

Figure 2-1 shows the facility location. Figure 2-2 shows the proposed layout with the emergency generators labeled. Section 2.4 of this protocol details the exposure locations in the surrounding area based on area zoning, site surveys and existing land use.

For the Level 1 Risk Assessment, stack orientation and height were the only parameters considered. The proposed emergency generators are identical units with vertical stacks. Each emergency generator is conservatively estimated to be equipped with a stack of five (5) meters.

2.2 Modeling Emission Rates

The derivation of emission rates for toxic air contaminants for the Level 1 Risk Assessment for the proposed emergency generators is based on the South Coast Air Quality Management District (SCAQMD) Supplemental Instructions of Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory, Table B-2. As specified by ODEQ, emission rates of diesel particulate matter (DPM) include condensable particulate matter (PM) represented by emission rates of hydrocarbons (HC), which are based on manufacturer specifications for MTU 16V4000G84S for standby

operation. The toxic pollutant potential emissions were determined using the emission rates discussed in this section and fuel consumption rates from manufacturer specifications. These calculations also include a “black puff” emission factor to account for engine cold starts, and benzo[a]pyrene is calculated for non-cancer risk only, as directed by ODEQ.

The nearest exposure locations for *residential*, *non-residential child*, *non-residential worker* and *acute* were used to reference the most conservative dispersion factors from OAR 340-245-8050, Table 5. The corresponding risk based concentration (RBC) values for both cancer and non-cancer risks were then determined using the dispersion factors in conjunction with the emission rate of each toxic air pollutant and the respective RBC as referenced in OAR 340-245-8040, Table 4. The acute RBC for the facility is based on a maximum of five aggregate operating hours from the generators operating at 100% load, or the maximum potential short-term operating scenario proposed for the site. This scenario is represented by one generator operating for 20 hours in this assessment. Four generators operating for five hours each, or any other equivalent combination of daily generator operation, can also represent this scenario.

The RBC values for both cancer and non-cancer risks for all emergency generators are summarized in Table 2-1.

Table 2-1: Emission Rates and Facility Wide RBC Summary

Chemical Name	Emission Factor (lb/Mgal) (BAAQMD)	Fuel Usage [2] (gal/hour per generator)	Facility Wide Annual Emission Rate (lb/year)	Excess Cancer Risk and Chronic Noncancer Risk [3]						Acute Noncancer Risk [4]	
				Residential Cancer RBC (Risk per Million)	Residential Non- cancer RBC (Hazard Index)	Child Cancer RBC	Child Non-Cancer RBC	Worker Cancer RBC	Worker Non-cancer RBC	24 Hr Average Emission Rate (lb/day)	Acute RBC
Benzene	0.1863		12.15	9.3E-03	4.0E-04	8.1E-05	2.1E-05	3.7E-03	4.3E-04	0.61	0.03
1,3-Butadiene	0.2174		14.17	0.043	7.1E-04	3.6E-04	3.5E-05	0.016	7.4E-04	0.71	1.5E-03
Benzo[a]pyrene	0.0000355		0.0023	-	1.2E-04	-	5.8E-06	-	1.2E-04	1.2E-04	0.081
Cadmium	0.0015		0.10	0.017	2.0E-03	1.5E-04	5.8E-05	6.7E-03	1.2E-03	4.9E-03	0.228
Formaldehyde	1.7261		112.54	0.066	1.3E-03	5.8E-04	6.2E-05	0.026	1.3E-03	5.63	0.161
Hexavalent Chromium	0.0001		0.007	0.021	7.9E-06	2.8E-04	1.6E-07	3.0E-03	3.4E-06	3.3E-04	1.5E-03
Arsenic	0.0016		0.10	0.43	0.061	1.8E-03	9.6E-04	0.077	0.020	5.2E-03	0.04
Lead	0.0083		0.54	-	3.6E-04	-	1.8E-05	-	3.8E-04	0.03	0.253
Nickel	0.0039		0.25	6.7E-03	1.8E-03	5.6E-05	9.0E-05	2.5E-03	1.9E-03	0.01	0.089
Acolein	0.0339		2.21	-	6.3E-04	-	3.2E-05	-	6.8E-04	0.111	0.02
Ammonia	0.8		52.16	-	1.0E-05	-	5.2E-07	-	1.1E-05	2.61	3.0E-03
PAHs (*excluding Naphthalene*)	0.0362	163	2.36	5.49	-	0.03	-	0.36	-	0.118	-
Naphthalene	0.0197		1.28	4.4E-03	3.5E-05	3.7E-05	1.8E-06	1.7E-03	3.7E-05	0.064	4.5E-04
Acetaldehyde	0.7833		51.07	0.011	3.6E-05	9.4E-05	1.8E-06	4.3E-03	3.8E-05	2.55	7.6E-03
Copper	0.0041		0.27	-	-	-	-	-	-	0.01	1.9E-04
Ethyl Benzene	0.0109		0.71	1.8E-04	2.7E-07	1.6E-06	1.4E-08	6.8E-05	3.0E-07	0.04	2.3E-06
Hexane	0.0269		1.75	-	2.5E-07	-	1.2E-08	-	2.6E-07	0.088	-
Hydrogen Chloride	0.1863		12.15	-	6.1E-05	-	3.0E-06	-	6.3E-05	0.61	4.0E-04
Manganese	0.0031		0.20	-	2.2E-04	-	1.1E-05	-	2.3E-04	0.01	0.047
Mercury	0.002		0.13	-	1.7E-04	-	4.6E-06	-	9.5E-05	6.5E-03	0.02
Selenium	0.0022		0.14	-	-	-	-	-	-	7.2E-03	5.0E-03
Toluene	0.1054		6.87	-	1.4E-07	-	6.9E-09	-	1.4E-07	0.344	6.4E-05
Xylenes	0.0424		2.76	-	1.3E-06	-	6.3E-08	-	1.3E-06	0.138	2.2E-05
Diesel Particulate Matter [1,2,5]	68.8	42	1,158	1.16	0.023	9.8E-03	1.2E-03	0.444	0.024	57.23	-
			Total:	**7.26**	**0.09**	**0.05**	**0.025**	**0.95**	**0.05**	**-**	**0.98**

Notes:

1. *Diesel Particulate Matter Emission factor based on maximum PM + HC emission factor from MTU 16V4000G84S emission specifications which occurs at 25% operating load.*
2. *Fuel usage at 100% operating load used for all pollutants except Diesel Particulate Matter, which uses fuel usage at 25% load to correspond with maximum PM + HC emission factor in lb./hr.*
3. *Excess Cancer Risk and Chronic Noncancer Risk based on operation of all generators at 100% operating load (except for DPM as noted above) for 100 hours per year.*
4. *Acute Noncancer Risk based on operation of four generator operating hours at 100% operating load, meaning operation of one generator for 20 hours per day, operation of four generators for five hours per day, or any scenario in between.*

5. *Cold-start "black-puff" factor applies to the first 60 seconds of PM+HC emissions after engine startup and is calculated as part of the annual and 24-hour Average emission rates. The facility is conservatively assumed to have 20 cold starts per generator per year.*

$$DPM\left(\frac{lb}{hr}\right) \times \left(Annual\ Operational\ Hr - \frac{\#of\ cold\ starts}{60\ min}\right) + DPM\left(\frac{lb}{hr}\right) \times Cold\ Start\ Factor \times \left(\frac{\#of\ cold\ starts}{60\ min}\right)$$

2.3 Exposure Locations

OAR 340-245-0210 requires that exposure locations where ambient concentrations will be modeled be described in the modeling protocol. Specifically, the owner or operator must consider both the zoning of the area and the actual use. A zoning map indicating surrounding residential, commercial/industrial, and school/daycare zones are included in Figure 2-7. In a Level 1 Risk Assessment, the nearest exposure locations for each risk category will drive the Risk Assessment.

1. *Residential: any area zoned residential, or where satellite imagery or local knowledge indicates a home (e.g., a farm house on a parcel zoned for agriculture).*

   The surrounding residential area was physically surveyed prior to making the residential risk receptor determination. Abandoned residential structures located in agricultural zones closer to the facility were excluded. As shown in Figure 2-3, the closest residential location to the proposed emission units is 5840 NW Birch Ave, Hillsboro, OR 97124. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 400 meters.

2. *Non-Residential Child: Any non-residential building where a child is expected to spend significant time during the day. This includes schools and daycares.*

   As shown in Figure 2-4, the closest school or daycare, including all registered in-home daycares, is the Bright Start Learning Center, located at 5170 NE Five Oaks Dr, Hillsboro, OR 97124. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 1,850 meters.

3. *Non-Residential Worker: Any area zoned industrial/commercial where the general public is not expected to spend much time.*

   The closest area or facility zoned either industrial or commercial is the Topgolf located at 5505 NE Huffman St, Hillsboro, OR 97124, shown in Figure 2-5. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 170 meters.

4. *Acute: Any area where people congregate for a few hours but exposure is not expected to occur each day. This includes parks, pools, golf courses, cemeteries, etc.*

   After a review of nearby potential areas of public congregation, Topgolf was found to be the closest such location. The location is listed above for Non-Residential Worker exposure location. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 170 meters, as shown in Figure 2-6.

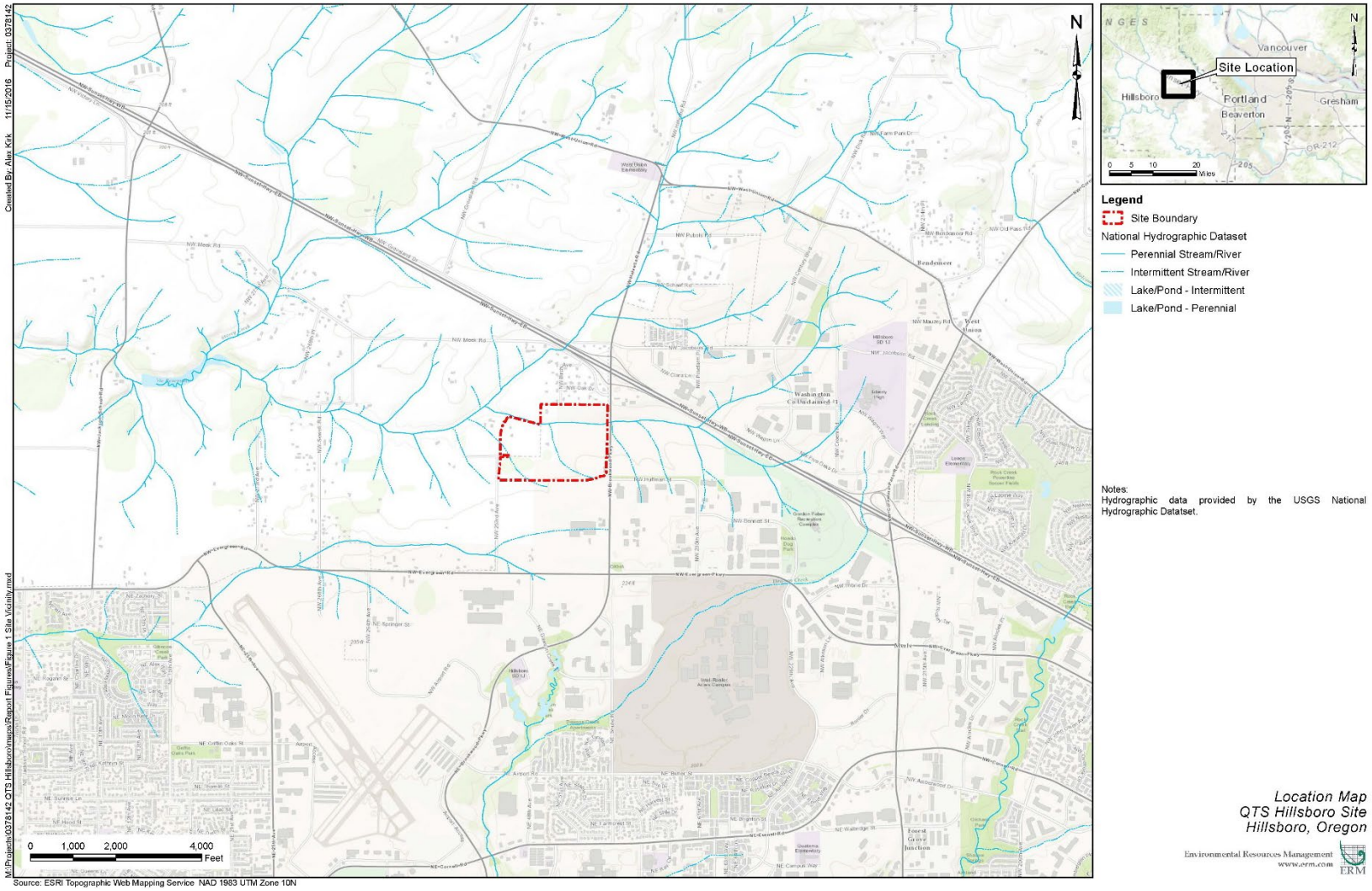

Figure 2-1: Proposed QTS Hillsboro Site Location

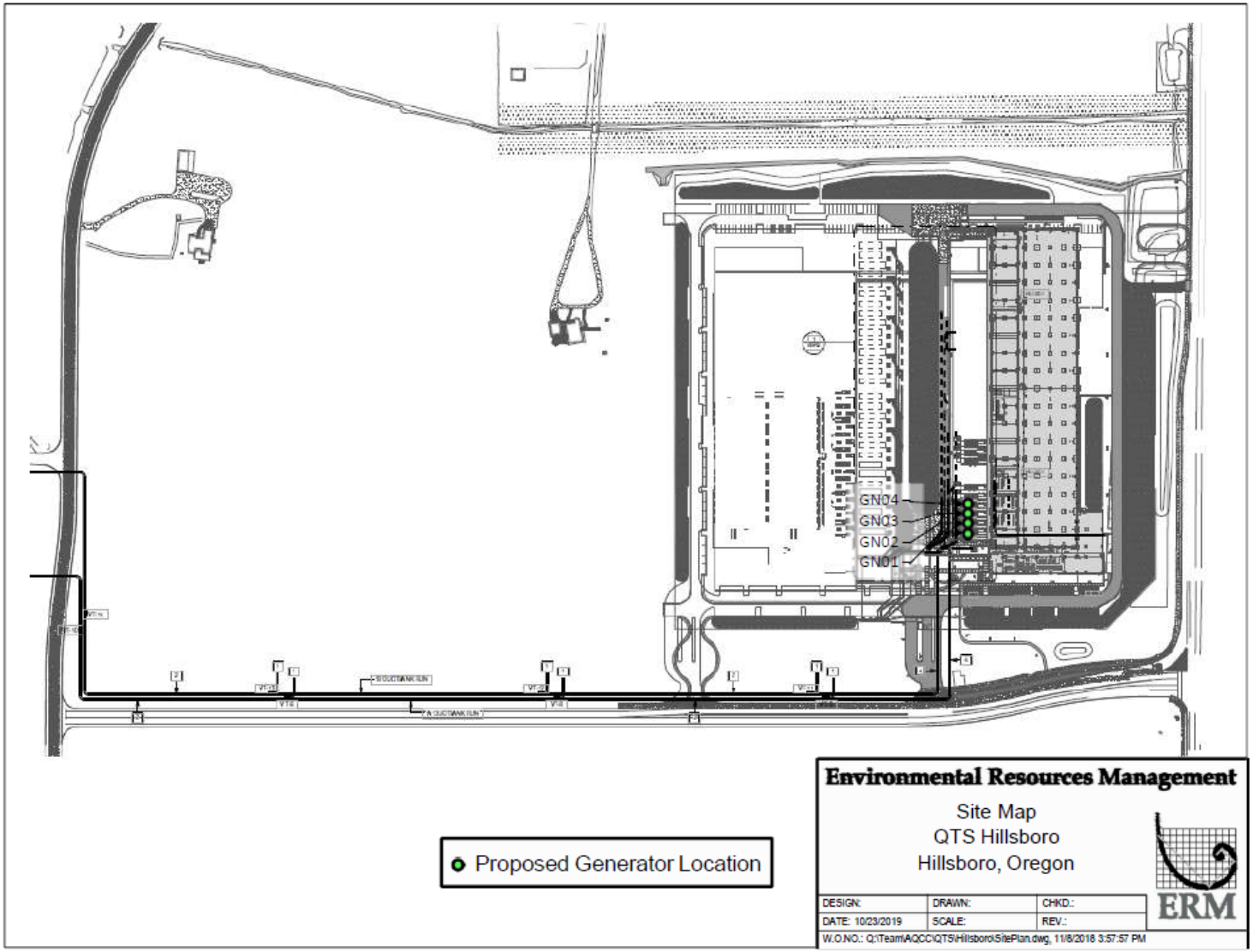

Figure 2-2: Proposed QTS Hillsboro Facility Layout

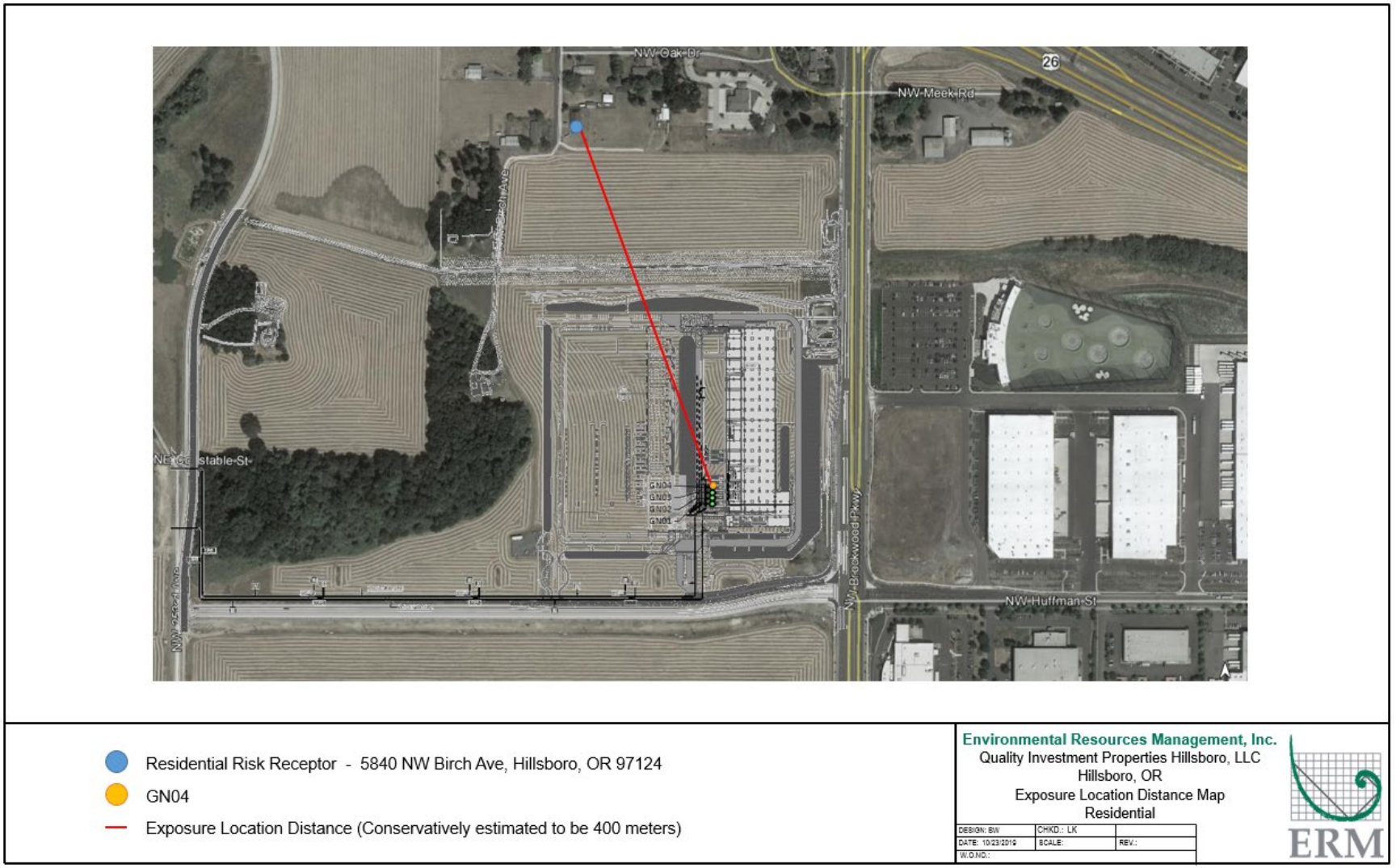

Figure 2-3: Residential Risk Receptor Location

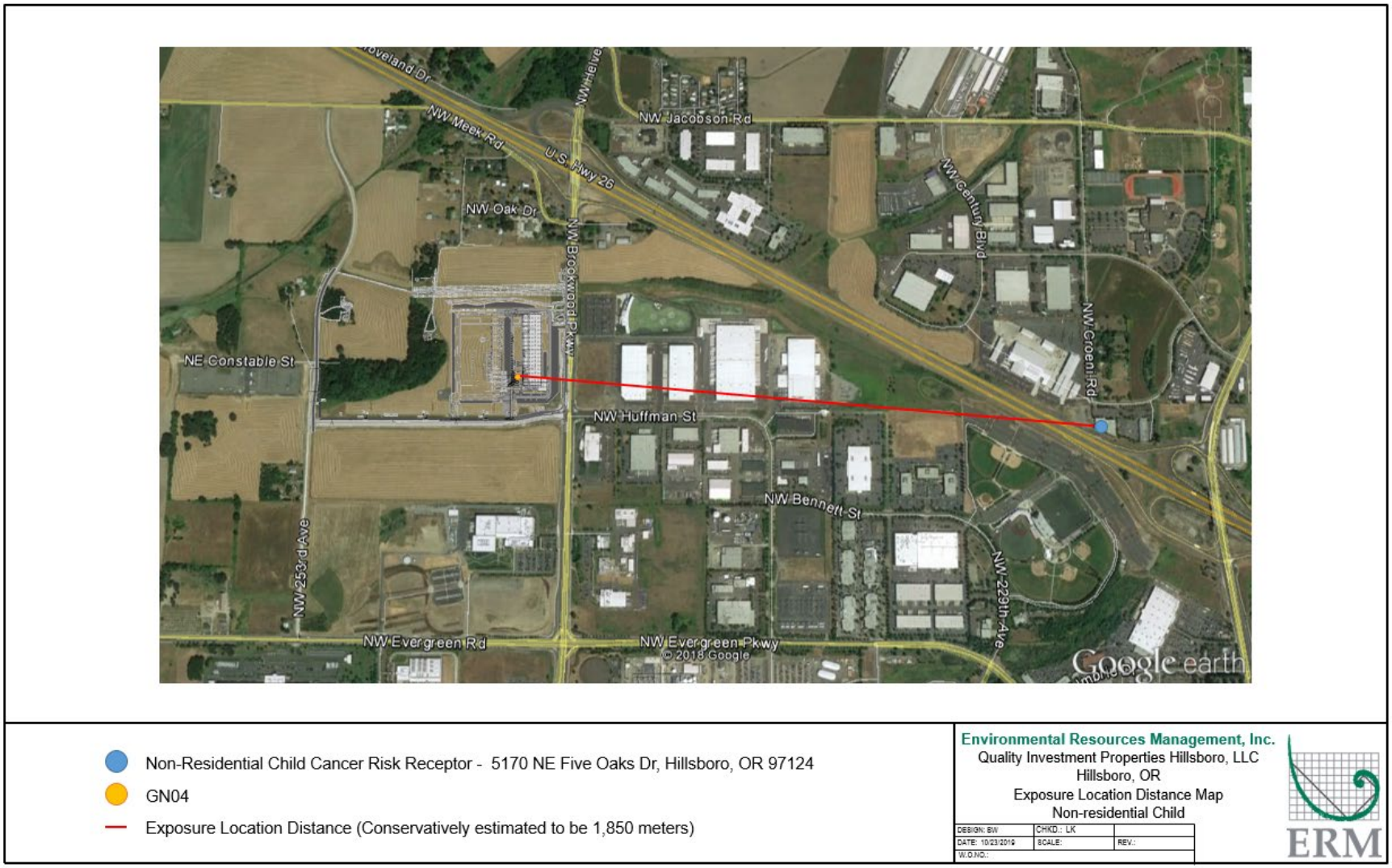

Figure 2-4: Non-Residential Child Cancer Risk Receptor Location

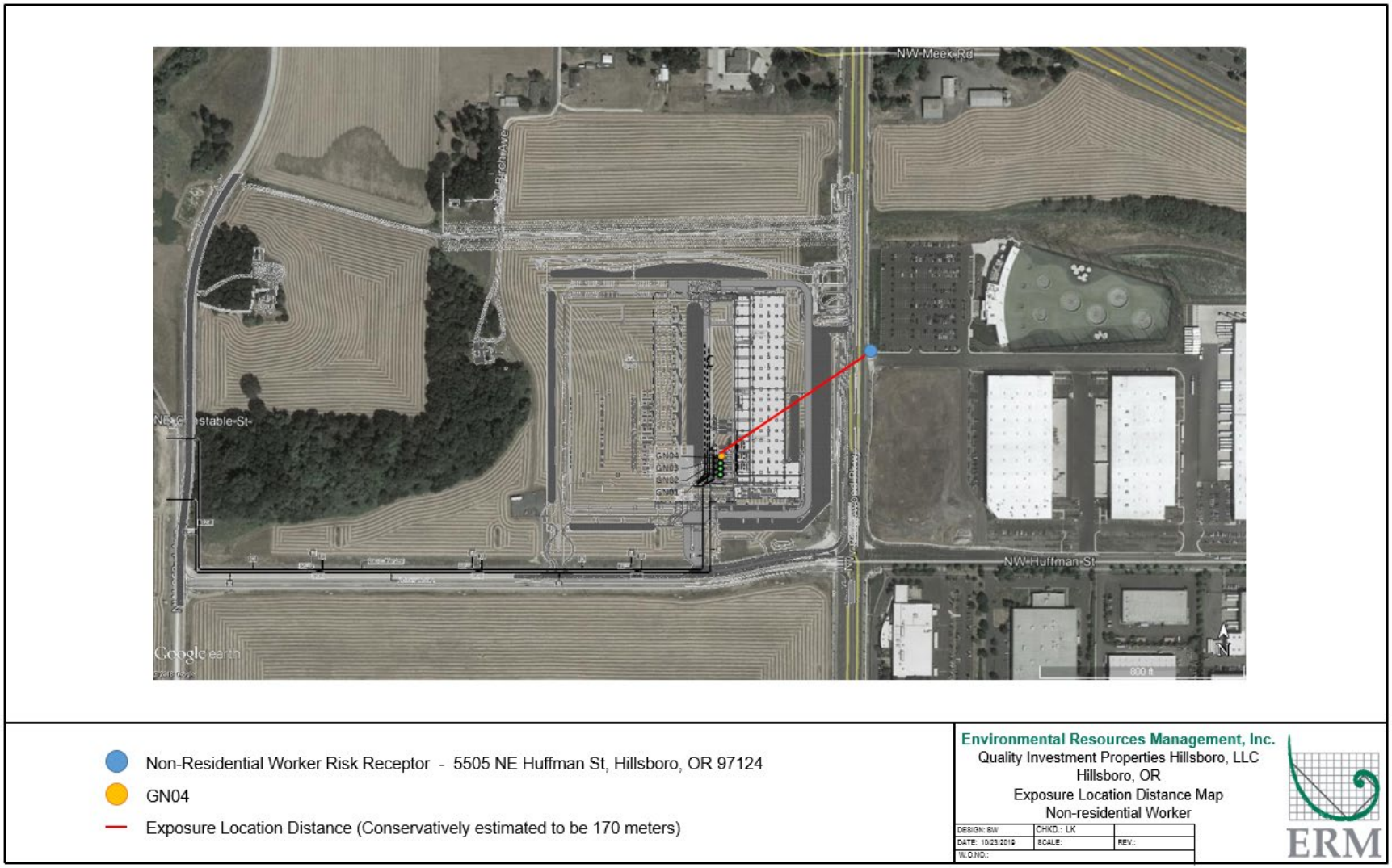

Figure 2-5: Non-Residential Worker Risk Receptor Location

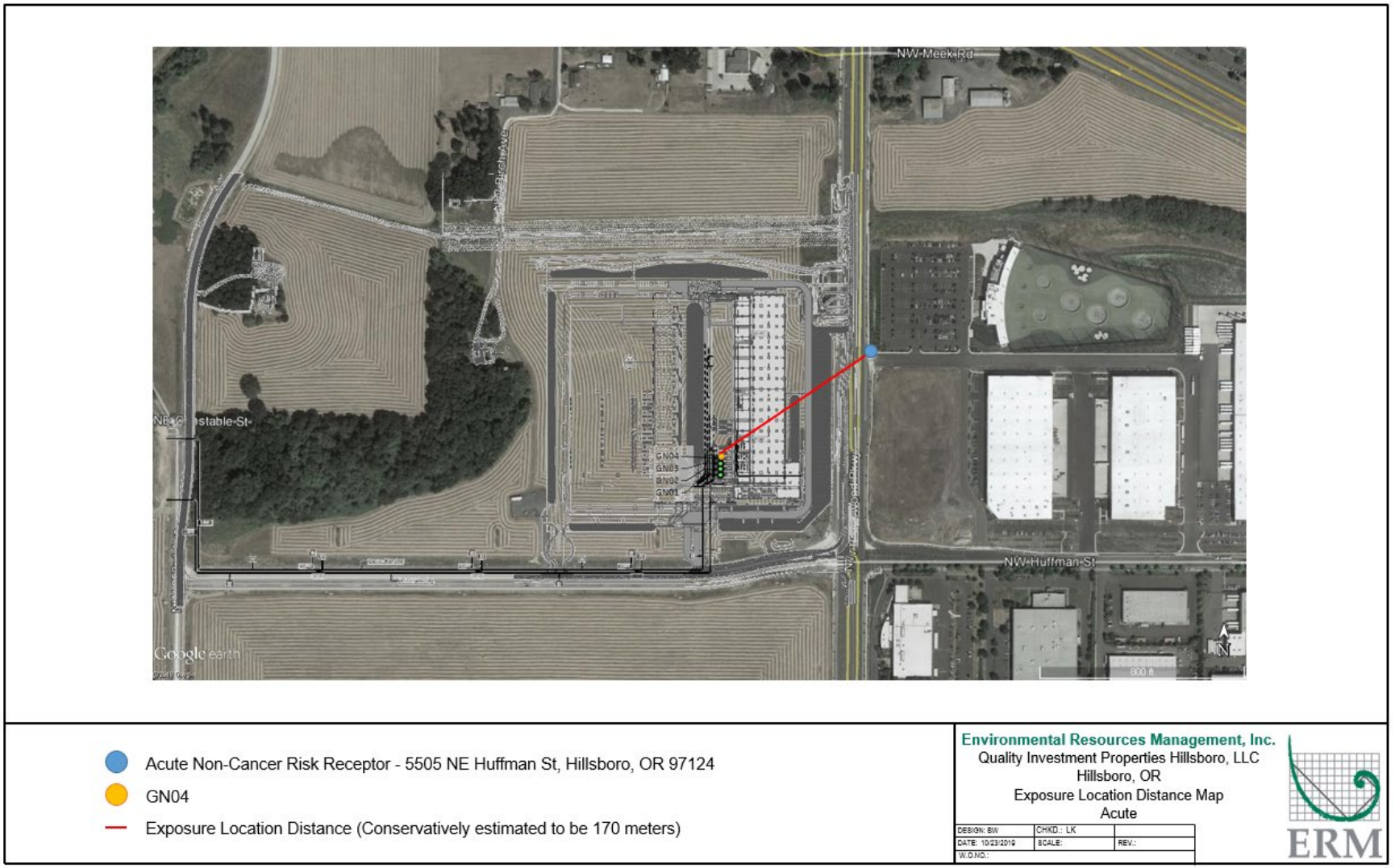

Figure 2-6: Acute Non-Cancer Risk Receptor Location

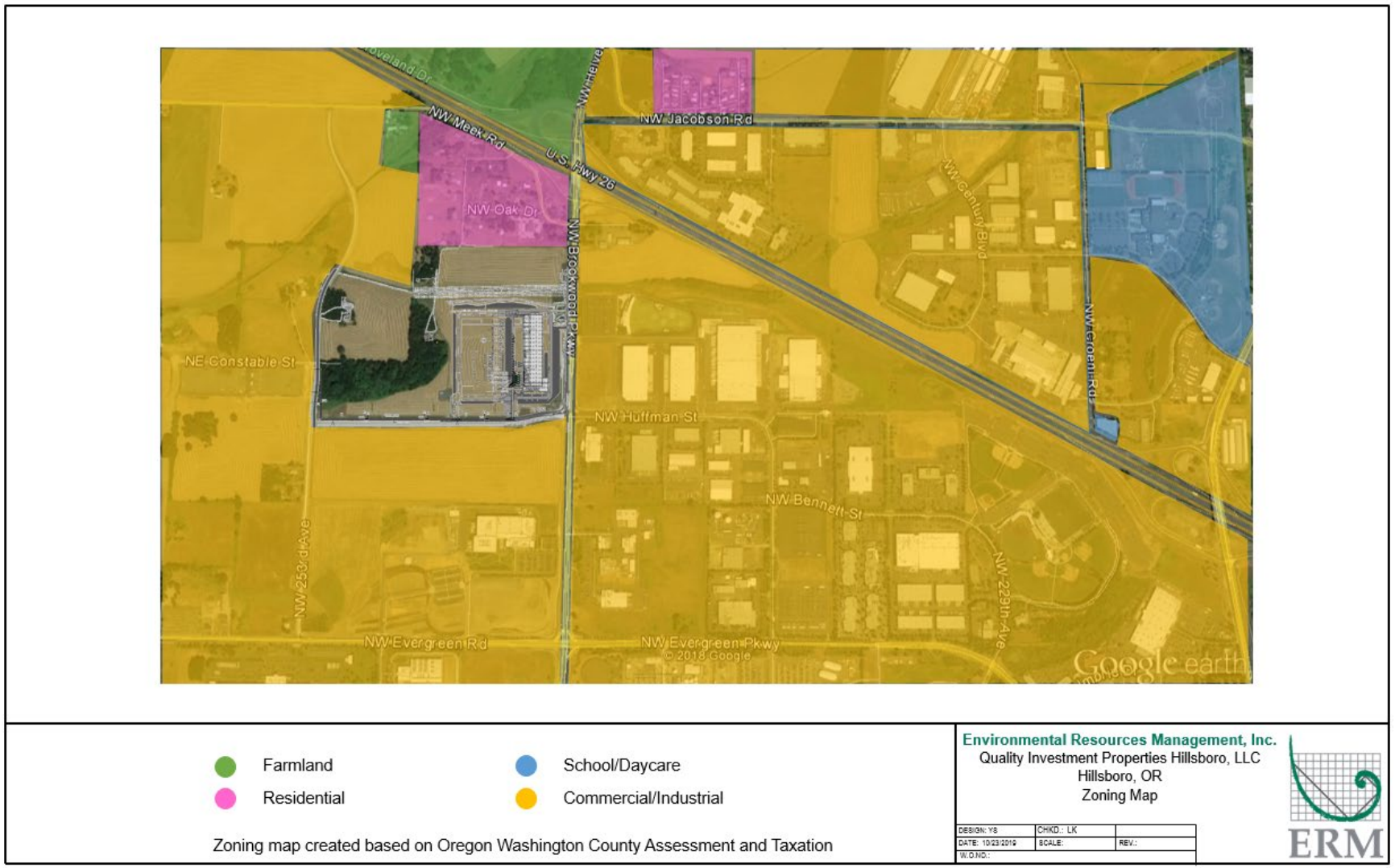

Figure 2-7: Zoning Map

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