STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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May 29, 2020

David Knight
Air Quality Program
Eastern Regional Office
4601 N. Monroe Street
Spokane, WA 99205-1295

Re: Second Tier Toxics Review Petition by Sabey Data Center Properties

Dear David Knight:

The Washington Department of Ecology's Air Quality Program (Ecology) has completed their review of health risks posed by diesel engine exhaust particulate (DEEP) and nitrogen dioxide (NO_2) emissions from 32 proposed emergency engines at Sabey Intergate Quincy Data Center in Quincy, WA.

Sabey proposes to expand their Intergate Quincy Data Center in Quincy, WA. The proposed project will include two new buildings (Buildings D & E) and:

- Thirty diesel-powered emergency generators (of up to 2.5 MW each) to provide backup power to the data center during periods of interrupted line power.
- Two diesel-powered emergency generators (300 kW each) to provide emergency lighting at each new building in the event of a complete power outage.

Sabey also proposes to reduce the number of currently permitted emergency engines at their existing facility (Buildings A, B, & C) from 44 to 37.

Sabey proposes to limit the operation of new emergency engines to an average of 55 hours per year per engine. The increased emissions of DEEP from these engines could result in an increased cancer risk of up to about 5.6 in one million (5.6×10^{-6}) at the maximally impacted residential location, which occurs south of Sabey Intergate Quincy Data Center. Added to an existing "background" risk of about 62 in one million, the cumulative risk related to diesel emissions in the area is about 68 in one million.

We also considered long- and short-term non-cancer hazards associated with Sabey's proposed diesel emissions and existing sources. We determined that non-cancer health effects are not

likely to occur from long-term exposure to DEEP. Short-term respiratory hazards posed by peak emissions of NO_2 during power outage scenarios could occur in some areas near the facility, but Grant County Public Utility District reports very stable power. Therefore, the likelihood that infrequent high emission scenarios coincide with unfavorable pollutant dispersion is very low.

We find that Sabey's project-related health risks are permissible under WAC 173-460-090 because:

- The increase in emissions of TAPs is not likely to result in an increase cancer risk of more than one in one hundred thousand (10 in one million) which is the maximum risk allowed by a Second Tier review.
- The non-cancer hazard is acceptable.

The applicant has satisfied all requirements of a second tier analysis.

If you would like to discuss this project further, please contact Gary Palcisko at gary.palcisko@ecy.wa.gov or 360-407-7338.

Sincerely,

Chris Hanlon-Meyer
Science and Engineering Section Manager
Air Quality Program

ch-m/te

Enclosure

DEPARTMENT OF ECOLOGY
State of Washington

Health Impact Assessment Recommendation Document for

Sabey Intergate Quincy Data Center Buildings D & E Quincy, Washington

May 2020

Contact Information

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To request ADA accommodation, email gary.palcisko@ecy.wa.gov or call 360-407-7338, 711 (relay service), or 877-833-6341 (TTY).

Health Impact Assessment Recommendation Document for

Sabey Intergate Quincy Data Center Quincy, Washington

Air Quality Program

Washington Department of Ecology

Olympia, Washington

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Executive Summary

This document presents and summarizes a review of health risks from air pollutants emitted by 32 new diesel engines at Sabey Intergate Quncy Data Center (Sabey) in Quincy, WA. In general, toxic air pollutant impacts in the area near Sabey will not result in excessive risk or cause serious short- or long-term health effects. Ecology concludes that the health risk is acceptable and recommends approval of the project.

Sabey proposes to expand their data center in Quincy, Washington. They will add two new buildings (Buildings D & E) that house computer servers. To ensure uninterrupted electrical power, Sabey will add:

- Thirty diesel-powered emergency generators (of up to 2.5 megawatts each) to provide backup power to the data center during periods of interrupted line power.
- Two diesel-powered emergency generators (300 kilowatts each) to provide emergency lighting at each new building in the event of a complete power outage.

Sabey also proposes to reduce the number of currently permitted emergency engines at their existing facility (Buildings A, B, & C) from 44 to 37.

While the proposed engines will operate infrequently (average of up to 55 hours per year per engine), the engines may emit two toxic air pollutants—diesel engine exhaust particles and nitrogen dioxide—at rates triggering a requirement to prepare a health impact assessment. A health impact assessment describes the increased health risks from exposure to toxic air pollutants.

Sabey hired Trinity Consultants to prepare a health impact assessment. Trinity Consultants estimated increased health risks associated with Sabey's diesel particles, nitrogen dioxide, and other toxic air pollutant emissions.

Conclusions

- Long-term impacts:
    - Sabey's increased diesel particle emissions result in a lifetime cancer risk of about 5.6 in one million. The maximum risk occurs for residents living at a location south of Sabey. Ecology assumes continuous lifetime exposure in assessing cancer risks from residents' exposure to project-related diesel engine exhaust particulate.
        - Cancer risk can be expressed either as an increase in an individual's risk of disease, or as the number of cancers that might occur in addition to those normally expected in a population of one million people. The reported diesel engine exhaust particulate-related cancer risk estimates represent increases above a baseline lifetime cancer risk of about 40 percent in the United States.

  - Exposure to "background" levels of diesel particles in the area results in a risk of about 62 in one million.
  - Exposure to diesel particles in the area is not likely to result in long-term non-cancer health effects.

- Short-term impacts:
  - Nitrogen dioxide emitted from Sabey's diesel-powered engines that operate during a power outage could rise to levels of short-term concern for people with respiratory problems. Emissions probably will not cause levels of concern at residential or other occupied areas.
    - The occurrence of high concentrations of nitrogen dioxide depends on the frequency of line power interruptions coinciding with unfavorable dispersion. We do not expect power outages affecting Sabey to occur frequently, therefore concentrations responsible for these hazards probably will not occur frequently or last long.

Ecology's recommendation

Ecology recommends approval of the project because:

- Emission controls for the new and modified emission units represent best available control technology for toxics.
- The applicant demonstrated that the increase in emissions of toxic air pollutants is not likely to result in an increased cancer risk of more than one in one hundred thousand (10 in one million) which is the maximum risk allowed by a second tier review.
- The non-cancer hazard is acceptable.
- Grant County Public Utility District power system is reliable.

Second Tier Review Processing and Approval Criteria

The health impacts assessment (HIA) for Sabey submitted by Trinity Consultants is part of the second tier toxics review process under WAC 173-460 (Trinity Consultants, 2020). Ecology is responsible for processing and reviewing second tier review petitions statewide.

Second tier review processing requirements

In order for Ecology to review the second tier petition, each of the following regulatory requirements under Chapter 173-460-090 must be satisfied:

(a) The permitting authority has determined that other conditions for processing the Notice of Construction Order of Approval (NOC) have been met, and has issued a preliminary approval order.

(b) Emission controls contained in the preliminary NOC approval order represent at least best available control technology for toxics (tBACT).

(c) The applicant has developed an HIA protocol that has been approved by Ecology.

(d) The ambient impact of the emissions increase of each toxic air pollutant (TAP) that exceed acceptable source impact levels (ASILs) has been quantified using refined air dispersion modeling techniques as approved in the HIA protocol.

(e) The second tier review petition contains an HIA conducted in accordance with the approved HIA protocol.

Acting as the "permitting authority" for this project, Ecology's project permit engineer satisfied item (a) and verified item (b) above on May 7, 2020. Ecology approved an HIA protocol (item (c)), and the final HIA (item (e)) was received by Ecology on April 3, 2020. Ecology's modeler determined that Trinity Consultants conducted the refined modeling (item (d)) appropriately.[1]

All five processing requirements above are satisfied.

Second tier review approval criteria

As specified in WAC 173-460-090(7), Ecology may recommend approval of a project that is likely to cause an exceedance of ASILs for one or more TAPs only if it:

(a) Determines that the emission controls for the new and modified emission units represent tBACT.

[1] Tesfamichael Ghidey, "RE: confirming that Sabey-Quincy modeling is appropriate," e-mail message, May 7, 2020.

(b) The applicant demonstrates that the increase in emissions of TAPs is not likely to result in an increased cancer risk of more than one in one hundred thousand.

(c) Ecology determines that the non-cancer hazard is acceptable.

tBACT determination

Ecology's permit engineer determined that Sabey's proposed pollution control equipment satisfies the BACT and tBACT requirement for diesel engines powering backup generators (Ecology, 2020). BACT and tBACT for nitrogen oxides (NO_X) and diesel particles was determined to be met through restricted operation of EPA Tier-2 (for the larger engines) and Tier-3 (for the smaller 300 kilowatt engines) certified engines operated as emergency engines as defined in 40 C.F.R. 60.4219, and compliance with the operation and maintenance restrictions of 40 C.F.R. Part 60, Subpart IIII.

Health Impact Assessment Review

As described previously, the applicant is responsible for preparing the HIA under WAC 173-460-090. Ecology's project team consisting of an engineer, a toxicologist, and a modeler review the HIA to determine if the methods and assumptions are appropriate for assessing and quantifying risks to the surrounding community from a new project.

For the Sabey Intergate-Quincy Data Center, Buildings D & E project, the HIA focused on health risks attributable to diesel engine exhaust particulate (DEEP) and nitrogen dioxide (NO_2) exposure because the modeled ambient air concentrations exceeded respective ASILs. Trinity Consultants briefly described emissions and exposure to other TAPs (acrolein, benzene, carbon monoxide, naphthalene, and sulfur dioxide) because emissions exceeded a small quantity emission rate (SQER).

Health effects summary

The HIA prepared by Trinity Consultants quantifies the non-cancer hazards and cancer risks attributable to Sabey's increased TAP emissions. The HIA focused on potential exposure to diesel particles and NO_2 as these were the two TAPs with emissions causing an exceedance of an ASIL.

DEEP health effects summary

Diesel engines emit very small fine (<2.5 micrometers [µm]) and ultrafine (<0.1 µm) particles. These particles can easily enter deep into the lung when inhaled. Mounting evidence indicates that inhaling fine particles can cause or contribute to numerous adverse health effects.

Studies of humans and animals specifically exposed to DEEP show that diesel particles can cause both acute and chronic health effects including cancer. Ecology has summarized these health effects in "Concerns about Adverse Health Effects of Diesel Engine Emissions" (Ecology, 2008).

Nitrogen dioxide health effects summary

NO_2 is present in diesel exhaust. It forms when nitrogen, present in diesel fuel and as a major component of air, combines with oxygen to produce oxides of nitrogen.

NO_2 and other oxides of nitrogen are of concern for ambient air quality because they are part of a complex chain of reactions responsible for the formation of ground-level ozone. Additionally, exposure to NO_2 can cause both long-term (chronic) and short-term (acute) health effects.

Long-term exposure to NO_2 can lead to chronic respiratory illness such as bronchitis and increase the frequency of respiratory illness due to respiratory infections.

Short-term exposure to extremely high concentrations (>180,000 µg/m^3) of NO_2 may result in serious effects including death (National Research Council, 2012). Moderate levels (~ 30,000 µg/m^3) may severely irritate the eyes, nose, throat, and respiratory tract, and cause shortness of

breath and extreme discomfort. Lower level NO_2 exposure (<1,000 µg/m^3), such as that experienced near major roadways, or perhaps downwind from stationary sources of NO_2, may cause increased bronchial reactivity in some asthmatics, decreased lung function in patients with chronic obstructive pulmonary disease, and increased risk of respiratory infections, especially in young children (CalEPA, 2008).

For the Sabey proposed project, emissions from emergency engines during a utility power interruption present the greatest potential for producing high enough short-term concentrations of NO_2 to be of concern for respiratory health effects.

Toxicity reference values

Agencies develop toxicity reference values for use in evaluating and characterizing exposures to chemicals in the environment. As part of the HIA, Trinity Consultants identified appropriate toxicity values for DEEP and NO_2.

DEEP toxicity values

Trinity Consultants identified toxicity values for DEEP from California EPA's Office of Environmental Health Hazard Assessment (OEHHA) (CalEPA, 1998). OEHHA derived toxicity values from studies of animals exposed to a known amount (concentration) of DEEP, or from epidemiological studies of exposed humans. These values represent a level at or below which we do not expect adverse non-cancer health effects and a metric by which to quantify increased risk from exposure to a carcinogen. Table 1 shows the appropriate DEEP non-cancer and cancer toxicity values identified by Trinity Consultants.

OEHHA derived a unit risk factor (URF) for estimating cancer risk from exposure to DEEP. They based the URF on a meta-analysis of several epidemiological studies of humans occupationally exposed to DEEP. In these studies, researchers based exposure on measurements of elemental carbon and respirable particulate representing fresh diesel exhaust. Therefore, we define DEEP as the filterable fraction of particulate emitted by diesel engines.[2] The URF is expressed as the upper-bound probability of developing cancer, assuming continuous lifetime exposure to a substance at a concentration of one microgram per cubic meter (1 µg/m^3), and are expressed in units of inverse concentration [i.e., (µg/m^3)$^{-1}$]. OEHHA's URF for DEEP is 0.0003 per µg/m^3 meaning that a lifetime of exposure to one µg/m^3 of DEEP results in an increased individual cancer risk of 0.03 percent or a population cancer risk of 300 excess cancer cases per million people exposed.

For evaluating non-cancer effects, OEHHA based its reference exposure level (REL) for diesel engine exhaust (measured as DEEP) on dose-response data on inflammation and changes in the

[2] Condensable particulate does not represent DEEP for the purposes assessing health risks from DEEP exposure; however, we consider both the filterable and condensable fractions of particulate when determining compliance with NAAQS for the purposes of the NOC application.

lung from rat inhalation studies. They established a level of five $\mu g/m^3$ as the concentration of DEEP in air at which long-term exposure is unlikely to cause adverse non-cancer health effects.

EPA promulgated National Ambient Air Quality Standards (NAAQS) and other regulatory toxicological values for short- and intermediate-term exposure to particulate matter, but values specifically for DEEP exposure at these intervals do not currently exist.

Nitrogen dioxide toxicity values

OEHHA developed an acute reference exposure level for NO_2 based on inhalation studies of asthmatics exposed to NO_2. These studies found that some asthmatics exposed to about 0.25 ppm (i.e., 470 $\mu g/m^3$) experienced increased airway reactivity following inhalation exposure to NO_2 (CalEPA, 2008). Not all exposed subjects experienced an effect.

The acute REL derived for NO_2 does not contain any uncertainty factor adjustment, and therefore does not provide any additional buffer between the derived value and the exposure concentration at which effects may occur in sensitive populations. This implies that exposure to NO_2 at levels equivalent to the acute REL (which is also the same as Ecology's ASIL) could result in increased airway reactivity in a subset of asthmatics. People without asthma or other respiratory disease are less likely to experience effects at NO_2 levels at or below the REL. OEHHA intended for acute RELs to be "for infrequent one hour exposures that occur no more than once every two weeks in a given year" (CalEPA, 2015).

Acute Exposure Guidance Levels (AEGLs) developed by the National Research Council (NRC) are also relevant to acute NO_2 exposures (National Research Council, 2012). Emergency planners and responders use AEGLs as guidance in dealing with rare releases of chemicals into the air. AEGLs are expressed as specific concentrations of airborne chemicals at which health effects, ranging from non-disabling to severe, may occur. The varying AEGL levels (1, 2, or 3) are dictated by the severity of the toxic effects caused by the exposure, with Level 1 being the least and Level 3 being the most severe. They are designed to protect the elderly and children, and other individuals who may be susceptible. The AEGL1 (non-disabling effects) for NO_2 is 940 $\mu g/m^3$. Potential effects include slight burning of the eyes, headache, and chest tightness or labored breathing with exercise in people with asthma.

Table 1: Toxicity Values or Comparison Values Considered in Assessing and Quantifying Non-cancer Hazard and Cancer Risk

Pollutant	Agency	Non-cancer	Cancer
NO_2	California EPA–Office of Environmental Health Hazard Assessment	Chronic REL = 5 µg/m^3	URF = 0.0003 per µg/m^3
NO_2	California EPA–Office of Environmental Health Hazard Assessment	Acute REL = 470 µg/m^3	NA
NO_2	National Research Council – Committee on Acute Exposure Guideline Levels.	AEGL – 1 = 940 µg/m^3	NA
REL – Reference Exposure Level URF – Unit Risk Factor AEGL – Acute Exposure Guidance Level			

Community/receptors

While Sabey proposed to expand the Intergate-Quincy Data Center in an industrially zoned area surrounded largely by other data center properties and agricultural land uses, air dispersion modeling indicated that proposed DEEP emissions could result in long-term concentrations in excess of the ASIL at about 65 parcels with residential land use codes (Figure 1) [Ecology, 2019]. Relevant to short-term impacts, levels of NO_2 could exceed the ASIL at about 10 residential parcels northeast of Sabey. These NO_2 impacted residential parcels are located more than two miles from Sabey's boundary (Figure 2).

For the purposes of assessing increased cancer risk and non-cancer hazards, Trinity Consultants identified receptor locations where the highest exposure to project-related air pollutants could occur: at the maximally impacted location (maximally impacted boundary or extra-boundary receptor), nearby residences, and nearby commercial locations (Table 2, Figures 3 and 4). Trinity Consultants identified and considered other sensitive receptors such as children at schools, but no schools were located in the area in which Sabey's ambient impacts exceed ASILs.

Ecology's review of the HIA found that Trinity Consultants identified appropriate receptors to capture the highest Sabey attributable exposures for residential, commercial, and maximally impacted receptors.

Table 2: Estimated Annual Average DEEP and Maximum 1-hr NO_2 Concentrations at Key Receptor Locations

Receptor	UTM Coordinates Zone 11N	Annual DEEP Concentration ($\mu g/m^3$)	UTM Coordinates Zone 11N	Maximum 1-hr NO_2 Concentration ($\mu g/m^3$)
MIRR	(287111, 5235875)	0.0185	(283186, 5241350)	1033
MIBR / MICR	(287141, 5236212)	0.0539	(281386, 5244350)	1213
MIRR – Maximally impacted residential receptor MICR – Maximally impacted commercial receptor MIBR – Maximally impacted boundary receptor (or maximally impacted receptor)				

Background concentrations of TAPs in ambient air

When reviewing increases in TAP emissions under second tier review, WAC 173-460-090 specifies that:

- Background concentrations of TAPs will be considered as part of a second tier review. Background concentrations can be estimated using:
    - The latest National Ambient Toxics Assessment data for the appropriate census tracts; or
    - Ambient monitoring data for the project's location; or
    - Modeling of emissions of the TAPs subject to second tier review from all stationary sources within 1.5 kilometers of the source location.

Table 3 shows the background levels considered by Trinity Consultants in the HIA. For background DEEP levels, Trinity Consultants used background concentrations at key locations near Sabey derived from previous cumulative data center emissions modeling. These estimated levels include emissions from locomotives, trucks, agricultural equipment, construction equipment and allowable emissions from existing data center emergency engines.

For background NO_2 levels, Trinity Consultants used a conservative value of 68 $\mu g/m^3$ based on 98th percentile of the daily maximum 1-hr concentration obtained from previous cumulative NO_2 modeled concentrations in the area near Sabey. This estimated concentration includes emissions from locomotives, trucks, agricultural equipment, construction equipment and emissions from existing data center emergency engines.

Table 3: Estimated "Background" Concentrations of Average DEEP and 1-hr NO_2 Levels near Sabey Intergate-Quincy Data Center

Spatially Allocated "Background"	Average Annual Diesel Particulate Concentration ($\mu g/m^3$)	1-hr NO_2 Concentration ($\mu g/m^3$)
MIBR (or maximally impacted receptor)	0.244	68
MIRR	0.208	68

Increased cancer risk

Trinity Consultants assessed the increased risk of cancer from lifetime exposure to DEEP emitted from Sabey's engines. They characterized cancer risk in a manner consistent with EPA guidance for inhalation risk assessment (EPA, 2009) using the following equations:

Risk = IUR x EC

Where:

IUR $(\mu g/m^3)^{-1}$ = inhalation unit risk (i.e., unit risk factor); and

EC $(\mu g/m^3)$ = exposure concentration

EC = (CA x ET x EF x ED)/AT

Where:

EC (EC $(\mu g/m^3)$ = exposure concentration;

CA $(\mu g/m^3)$ = contaminant concentration in air;

ET (hours/day) = exposure time;

EF (days/year) = exposure frequency;

ED (years) = exposure duration; and

AT (ED in years x 365 days/year x 24 hours/day) = averaging time

Cancer risk attributable to Sabey project-related DEEP and "background" DEEP levels

Table 4, adapted from the HIA, shows the estimated increased cancer risk per million for residential, commercial, and boundary (by-stander) receptors. These receptors received the highest exposure to Sabey's project-related diesel emissions. Figure 3 shows the location of

these receptors relative to Sabey. The highest increase in risks attributable to Sabey's increased emissions is 5.6 per million[3] for people living on a residential parcel south of Sabey.

For commercial exposure scenarios, the maximally impacted commercial receptor (MICR) may have increased risks of about two per million.

Continuous lifetime exposure to estimated "background" levels of DEEP near Sabey result in a cancer risk of about 62 in one million.

[3] Number per million represents an upper-bound theoretical estimate of the number of excess cancers that might result in an exposed population of one million people compared to an unexposed population of one million people. Alternatively, an individual's increase in risk of one in one million means a person's chance of getting cancer in their lifetime increases by one in one-million or 0.0001 percent.

Table 4: Estimated Increased Cancer Risk for Residential and Commercial Receptors Attributable to Sabey's DEEP Emissions and Background Concentrations

Exposure Parameter	MIRR	MICR	MIBR
CA Sabey - concentration in air from Sabey's increased emissions (µg/m^3)	0.0185	0.0185	0.0539
CA background - concentration in air from "background" sources (µg/m^3)	0.208	0.208	0.244
ET - Exposure Time (hours per day)	24	8	2
EF - Exposure Frequency (days per year)	365	250	250
ED - Exposure Duration (years)	70	40	30
AT - Averaging Time (hours)	613200	613200	613200
EC Sabey - Sabey project-related exposure concentration (µg/m^3)	0.019	0.002	0.001
EC background - Background source related exposure concentration (µg/m^3)	0.208	0.027	0.006
IUR - Inhalation Unit Risk (µg/m^3)$^{-1}$	0.0003	0.0003	0.0003
Cancer risk from Sabey's increased emissions	5.6E-06	7.2E-07	4.0E-07
Cancer risk from "background" sources	6.2E-05	8.1E-06	1.8E-06
Total cancer risk from diesel particle exposures near Sabey	6.8E-05	8.9E-06	2.2E-06
Trinity Consultants also calculated risks posed by other project-related carcinogenic TAPs (i.e., benzene and naphthalene). They estimated a negligible increased risk attributable to these other TAPs of < 0.01 per million.			

Non-cancer hazard

Trinity Consultants assessed the acute non-cancer hazards from exposure to NO_2 and chronic non-cancer hazards from DEEP exposure. They estimated non-cancer hazards consistent with EPA guidance for inhalation risk assessment (EPA, 2009) using the following equations:

HQ = EC/Toxicity Value

Where:

HQ (unitless) = hazard quotient;

EC (µg/m^3) = exposure concentration;

Toxicity Value (µg/m^3) = inhalation toxicity value (e.g., REL) that is appropriate for the exposure scenario (acute, subchronic, or chronic).

EC = CA

Where:

EC ($\mu g/m^3$) = exposure concentration;

CA ($\mu g/m^3$) = containment concentration in air.

Acute non-cancer hazards attributable to Sabey's worst-case project-related NO_x emissions and "background" NO_2 levels

Trinity Consultants evaluated short-term (acute) exposures to NO_2 emitted during power outage scenarios and determined hazard quotients (HQs) could exceed unity at a few locations (Table 5, Figure 4). This indicates that there is potential for short-term respiratory hazards from exposure to NO_2. We present and discuss the frequency of these potential occurrences under the "Other Considerations" heading of this document.

Table 5: Estimated Short-term NO_2 Non-cancer Hazards Attributable to Sabey Emissions

Receptor	Sabey Project – Max 1-hr NO_2 ($\mu g/m^3$)	1-hr NO_2 "Background" ($\mu g/m^3$)	NO_2 Acute REL	Project-related HQ	"Background" Related HQ	Total HQ
MIBR/MICR	1213	68	470	2.6	0.1	2.7
MIRR	1033	68	470	2.2	0.1	2.3

Chronic non-cancer hazards attributable to Sabey's allowable project-related DEEP emissions and "background" DEEP levels

Trinity Consultants also evaluated chronic non-cancer hazard associated with long-term exposure to DEEP emitted from Sabey's proposed emergency engines. Long-term exposure to DEEP in the area results in HQs much lower than unity (Table 6). Additionally, HQs would remain low even when considering "background" exposures. This indicates that chronic non-cancer hazards are not likely to occur because of exposure to DEEP near Sabey.

Table 6: Estimated Long-term Non-cancer Hazards Attributable to Sabey's DEEP Emissions and Background Levels

Receptor	Sabey Project – Max Annual DEEP ($\mu g/m^3$)	Annual DEEP "Background" (ug/m3)	DEEP Chronic REL	Project-related HQ	"Background" Related HQ	Total HQ
MIBR/MICR	0.0539	0.244	5	0.01	0.05	0.06
MIRR	0.0185	0.208	5	0.00	0.04	0.05

Other Considerations

Short-term exposures to DEEP

Exposure to DEEP can cause both acute and chronic health effects. However, as discussed previously, reference toxicity values specifically for DEEP exposure at short-term or intermediate intervals do not currently exist. Therefore, Trinity Consultants did not quantify short-term risks or hazards from DEEP exposure. Generally, Ecology assumes that compliance with the 24-hour $PM_{2.5}$ NAAQS indicates acceptable short-term health effects from DEEP exposure. Ecology's Technical Support Document for the draft preliminary NOC approval concludes that Sabey's emissions are not expected to cause or contribute to an exceedance of any NAAQS (Ecology, 2020).

Frequency of short-term NO_2 hazards

Sabey's emergency engines could emit a high rate of NO_X if required to supply power during a line power interruption. Generally, line power is reliable in Quincy. Grant County Public Utility District (Grant County PUD) reliability indices from 2006 through 2016 report an average service availability index (ASAI) of greater than 99.99 percent, which equates to less than one hour of interrupted service per average customer per year. Over the same timeframe, Grant County PUD reports a customer average interruption duration index (CAIDI) of 150 minutes, which means that when customers experience power interruption, it lasts an average of two and a half hours.

As previously described, Trinity Consultants evaluated short-term NO_X emissions as part of the second tier review. The analysis showed that while NO_2 levels could indeed rise to levels of concern[4] during a line power interruption, the interruption would have to occur at a time when the dispersion conditions were optimal for concentrating NO_2 at a given location.

Trinity Consultants estimated the combined probability of Sabey Intergate-Quincy Data Center experiencing a power outage that coincides with unfavorable meteorology. Table 7 shows the recurrence interval of NO_2 concentrations exceeding 402 $\mu g/m^3$ from Sabey's project-related power outage NO_x emissions. The most frequent NO_2 impacts reaching levels of concern occur near the boundary of Sabey Intergate Quincy Data Center where eight hours of outage emissions per year could result in levels of concern about once every 14 years. With a recurrence interval of over 1300 years (assuming eight hours of outage at Sabey every year), NO_X emissions from Sabey's proposed project probably will not impact residential locations at levels of concern.

[4] The level of concern in this case is 470 $\mu g/m^3$. This represents California OEHHA's acute reference exposure level of 470 $\mu g/m^3$.

Table 7: Estimated Years between Occurrence of NO_2 Levels > ASIL Depending on Frequency of Line Power Interruption at Sabey's Intergate Quincy Data Center, Quincy, WA

Hypothetical Average Annual Number of Hours per Year Sabey Experiences Line Power Interruption (hr/yr)	Recurrence (yr) of NO_2 Levels > ASIL at Most Frequently Impacted Residence	Recurrence (yr) of NO_2 Levels > ASIL at Most Frequently Impacted Receptor
2.5	4380	45
8	1370	14
24	450	5
55	200	3

Uncertainty

Many factors of the HIA are prone to uncertainty. Uncertainty relates to the lack of exact knowledge regarding many of the assumptions used to estimate the human health impacts of Sabey's emissions. The assumptions used in the face of uncertainty may tend to over- or underestimate the health risks estimated in the HIA. Key aspects of uncertainty in the HIA for Sabey's proposed data center are exposure assumptions, emissions estimates, air dispersion modeling, and toxicity of DEEP.

Table 8: Qualitative Summary of How Uncertainty Affects the Quantitative Estimate of Risks or Hazards Attributable to Sabey's Project-related Emissions

Source of Uncertainty	How Does it Affect Estimated Risk from this Project?
Exposure assumptions	Assuming continuous lifetime exposure among area residents is likely an overestimate of DEEP exposure.
Emissions estimates	Possible overestimate of emissions because Trinity Consultants used worst-case emission rates to estimate DEEP and NO_2 emissions.
Air modeling methods	Possible underestimate of average long-term ambient concentrations and overestimate of short-term ambient concentration.
Toxicity of DEEP at low concentrations	Possible overestimate of cancer risk, possible underestimate of non-cancer hazard for sensitive individuals.

Exposure uncertainty

We can only estimate the amount of time people will be exposed to Sabey's DEEP emissions. To ensure public health protection, Trinity Consultants and Ecology assumed a residential receptor is at one location for 24 hours per day, 365 days per year for 70 years. These assumptions tend to overestimate an individual's exposure and risk.

Emissions uncertainty

The exact amount of DEEP emitted from Sabey's diesel-powered generators is uncertain. Trinity Consultants estimated emissions assuming engines would operate at loads that produce the highest amounts and that engines would operate for the full extent of hours allowed in the draft permit. In reality, the engines will operate at a variety of loads in which emissions may be lower than assumed, and Sabey will probably use the engines less frequently than allowed in the draft permit. Trinity Consultants also attempted to account for higher emissions that would occur during initial start-up. We consider the resulting values an appropriately conservative estimate of DEEP emissions.

Trinity Consultants also assessed short-term NO_X impacts assuming that each of the 32 proposed engines operate at 100 percent load during a power outage. Engine loads during an outage are likely to be much lower than assumed because it is not likely that Sabey would design their

facility to require emergency engines to operate at the highest possible loads. If engines operate at around 75 percent load instead, NO_X emissions would be about 62 percent of those at 100 percent load (Trinity Consultants, 2020). Therefore, estimated NO_X emissions are likely overestimated.

Forecasting the amount of time Sabey uses their data center engines under emergency conditions is also uncertain. While we cannot predict future outages, Grant County PUD reports a stable power supply, so we do not anticipate frequent use of these engines during unplanned power interruptions.

Air dispersion uncertainty

The transport of pollutants through the air is a complex process. Agencies develop regulatory air dispersion models to estimate the transport and dispersion of pollutants as they travel through the air. They update these models when new techniques are developed. Generally, agencies develop these models to avoid underestimating the modeled impacts. Even if we confidently know all of the numerous input parameters to an air dispersion model, random effects found in the real atmosphere will introduce uncertainty. Typical of the class of modern steady-state Gaussian dispersion models, the AERMOD model used for Sabey's proposed emissions may slightly overestimate the short-term (1-hr average) concentrations and somewhat underestimate the annual concentrations.

Toxicity uncertainty

One of the largest sources of uncertainty in any risk evaluation is associated with the scientific community's limited understanding of the toxicity of most chemicals in humans following exposure to the low concentrations generally encountered in the environment. To account for uncertainty when developing toxicity values, regulatory agencies apply "uncertainty" factors to observed doses or concentrations that cause adverse non-cancer effects in animals or humans. Agencies apply these uncertainty factors so that they derive a toxicity value considered protective of humans including susceptible populations. In the case of DEEP exposure, OEHHA derived non-cancer reference values used in this assessment from animal studies. EPA also developed a similar reference value (i.e., reference concentration) based on these same studies. This reference value is probably protective of the majority of the population including sensitive individuals, but

> "…the actual spectrum of the population that may have a greater susceptibility to diesel exhaust (DE) is unknown and cannot be better characterized until more information is available regarding the adverse effects of diesel particulate matter (DPM) in humans (EPA, 2002):"

Quantifying DEEP cancer risk is also uncertain. Although EPA classifies DEEP as probably carcinogenic to humans, they have not established a URF for quantifying cancer risk. In their health assessment document, EPA determined that "human exposure-response data are too

uncertain to derive a confident quantitative estimate of cancer unit risk based on existing studies." However, EPA suggested that a URF based on existing DEEP toxicity studies would range from 1 x10^{-5} to 1 x 10^{-3} per µg/m^3. OEHHA's DEEP URF (3 x 10^{-4} per µg/m^3) falls within this range. Regarding the range of URFs, EPA states in their health assessment document for diesel exhaust (EPA, 2002):

> "Lower risks are possible and one cannot rule out zero risk. The risks could be zero because (a) some individuals within the population may have a high tolerance to exposure from [diesel exhaust] and therefore not be susceptible to the cancer risk from environmental exposure, and (b) although evidence of this has not been seen, there could be a threshold of exposure below which there is no cancer risk."

Other sources of uncertainty cited in EPA's health assessment document for diesel exhaust are:

- Lack of knowledge about the underlying mechanisms of DEEP toxicity.
- The question of whether toxicity studies of DEEP based on older engines is relevant to current diesel engines.

Conclusions and Recommendation

The project review team has reviewed the HIA and determined that:

(a) The TAP emissions estimates presented by Trinity Consultants represent a reasonable and conservative estimate of the project's future emissions.

(b) Emission controls for the new and modified emission units meet the tBACT requirement.

(c) The ambient impact of the emissions increase of each TAP that exceeds ASILs has been quantified using appropriate refined air dispersion modeling techniques.

(d) The HIA submitted by Trinity Consultants on behalf of Sabey adequately assesses project-related increased health risk attributable to TAP emissions.

In the HIA, Trinity Consultants estimated lifetime increased cancer risks attributable to Sabey-related DEEP and other toxic air pollutant emissions. DEEP emissions resulted in an increase cancer risk of about 5.6 in one million at the maximally impacted residential receptor.

Trinity Consultants also assessed chronic and acute non-cancer hazards attributable to the project's emissions added to "background" concentrations attributable to other nearby sources and determined that long-term adverse non-cancer health effects from exposure to DEEP are not likely to occur. Acute respiratory hazards, however, are possible from exposure to NO_2 during power outage scenarios that occur during periods of unfavorable pollutant dispersion. If they do happen, these impacts could occur for short periods at locations near Sabey. These impacts may affect sensitive individuals with existing respiratory conditions such as asthma resulting in chest tightness or labored breathing with exercise. Symptoms related to these high exposure episodes would improve once cleaner air conditions resume. Because we do not anticipate frequent or sustained power outages affecting Sabey Intergate Quincy Data Center, we do not expect concentrations responsible for these hazards to occur frequently.

Finally, Trinity Consultants and Ecology assessed the cumulative health risk by adding estimated concentrations attributable to Sabey emissions to an estimated background DEEP concentration. The maximum cumulative cancer risk from resident's exposure to DEEP near Sabey is approximately 68 in one million.

Because the increase in cancer risk attributable to the new data center alone is less than the maximum risk allowed by a second tier review, which is 10 in one million, and the non-cancer hazard is acceptable, the project is approvable under WAC 173-460-090.

The project review team concludes that the HIA represents an appropriate estimate of potential increased health risks posed by Sabey TAP emissions. The risk manager may recommend approval of the permit because:

- The cancer risk from Sabey's TAP emissions is less than the maximum risk (10 in one million) allowed by a second tier review.

- Ecology determined that the non-cancer hazard is acceptable.
- The likelihood of frequent or sustained power outages is low based on the reported reliability of the Grant County PUD power system.

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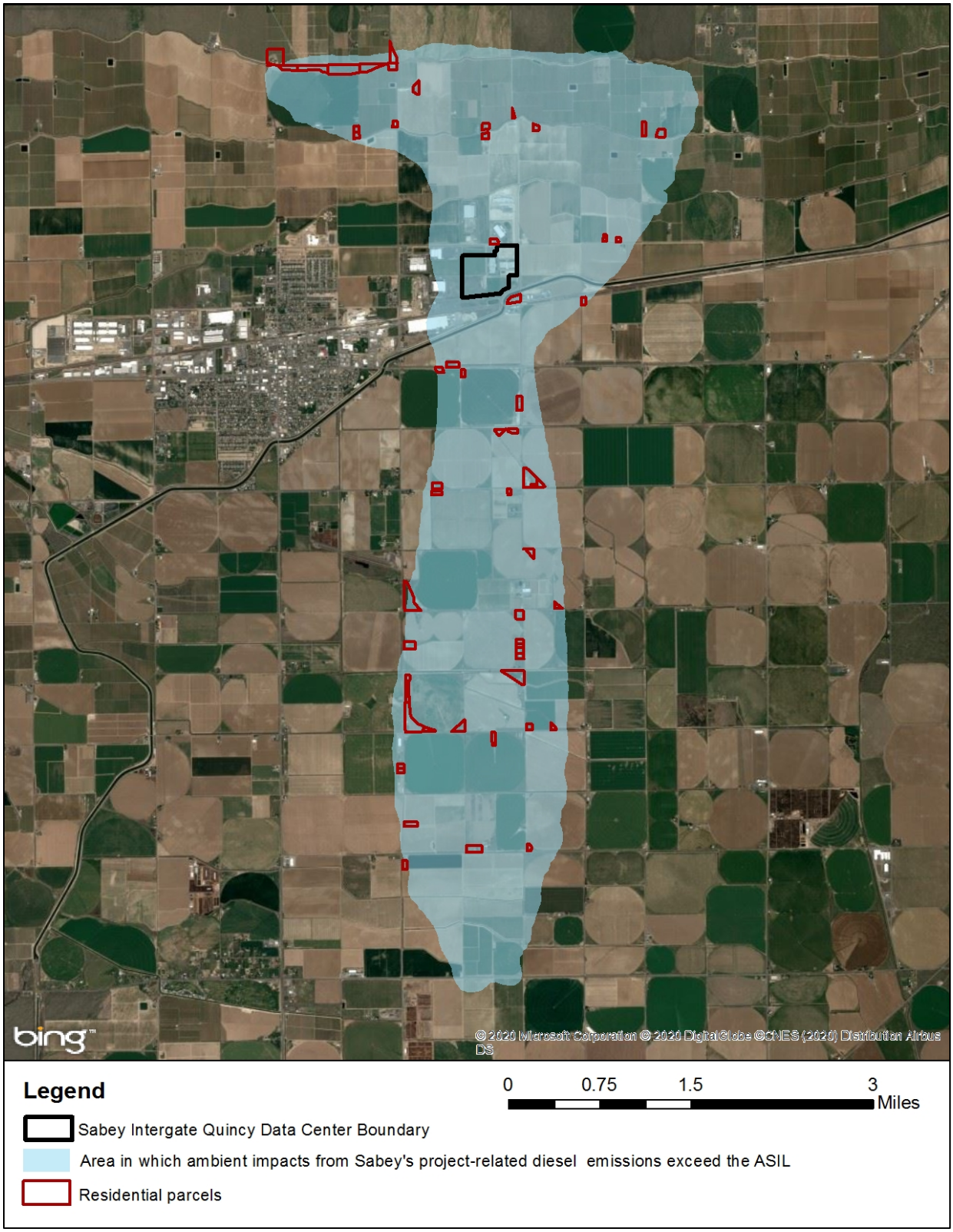

Figure 1: Residential parcels in the area where proposed Sabey DEEP emissions may cause impacts that exceed the ASIL

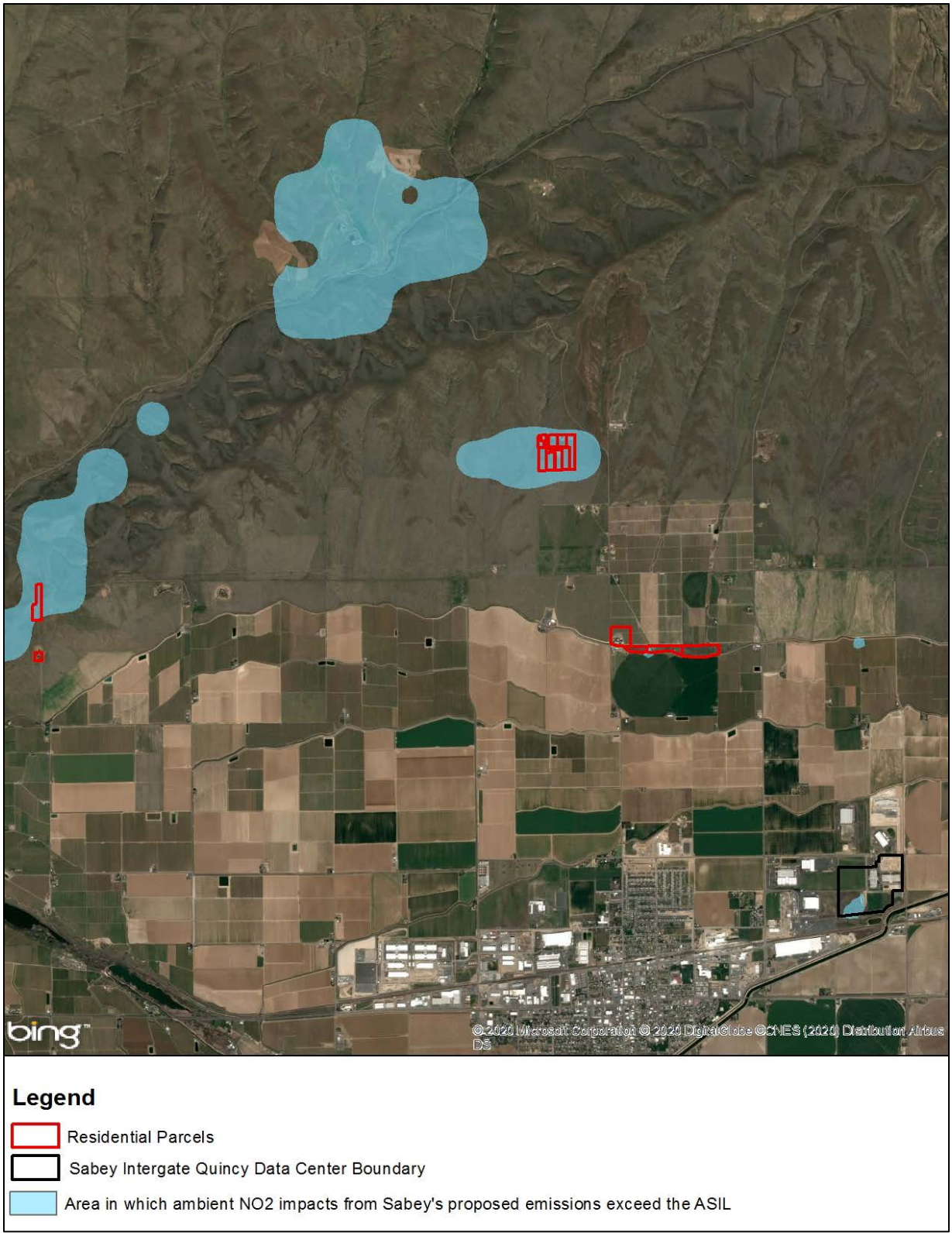

Figure 2: Residential parcels within or near areas where proposed Sabey power outage related NO_2 concentrations could exceed the ASIL

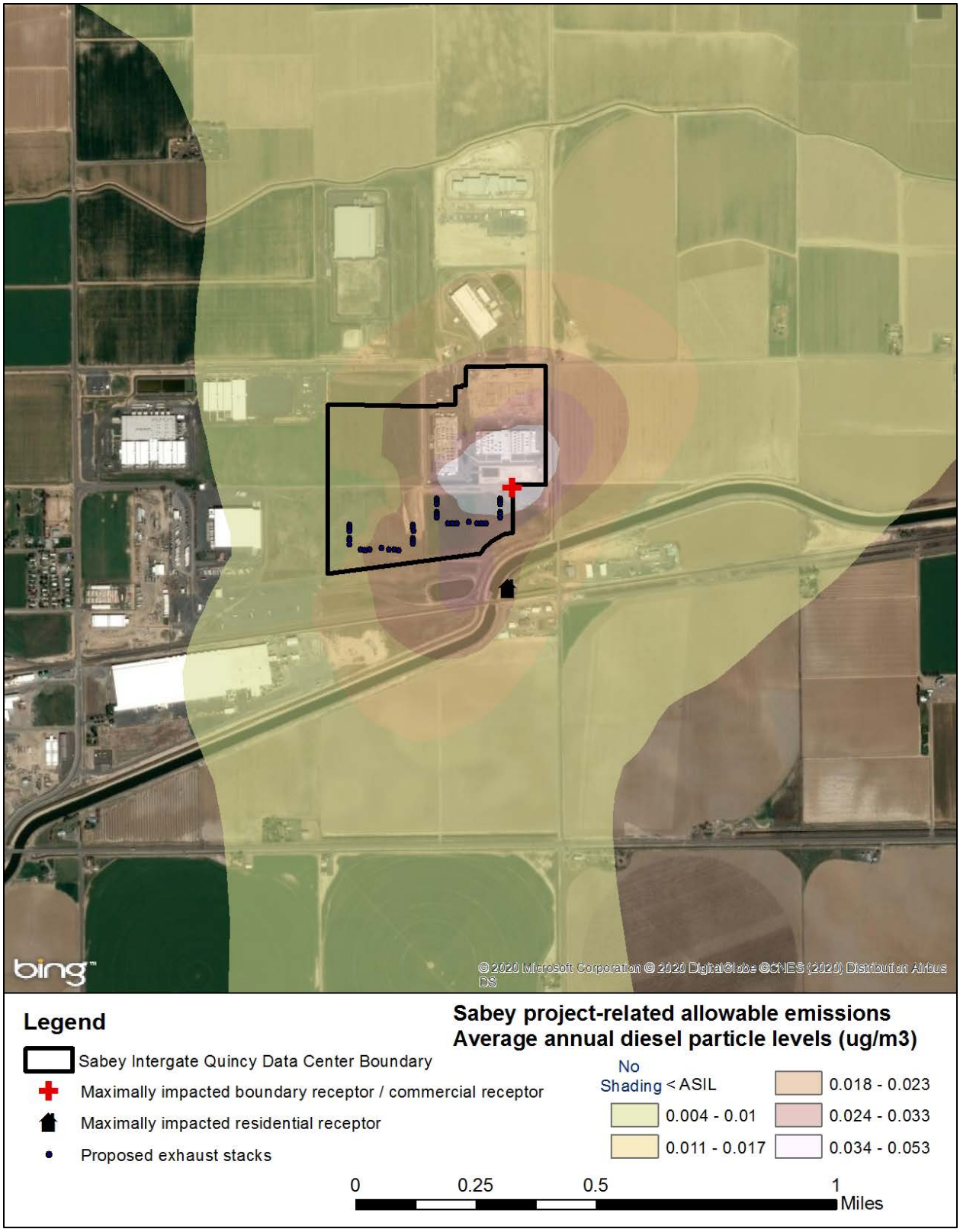

Figure 3: Average DEEP concentrations attributable to Sabey's proposed engines and key receptor locations evaluated in the HIA

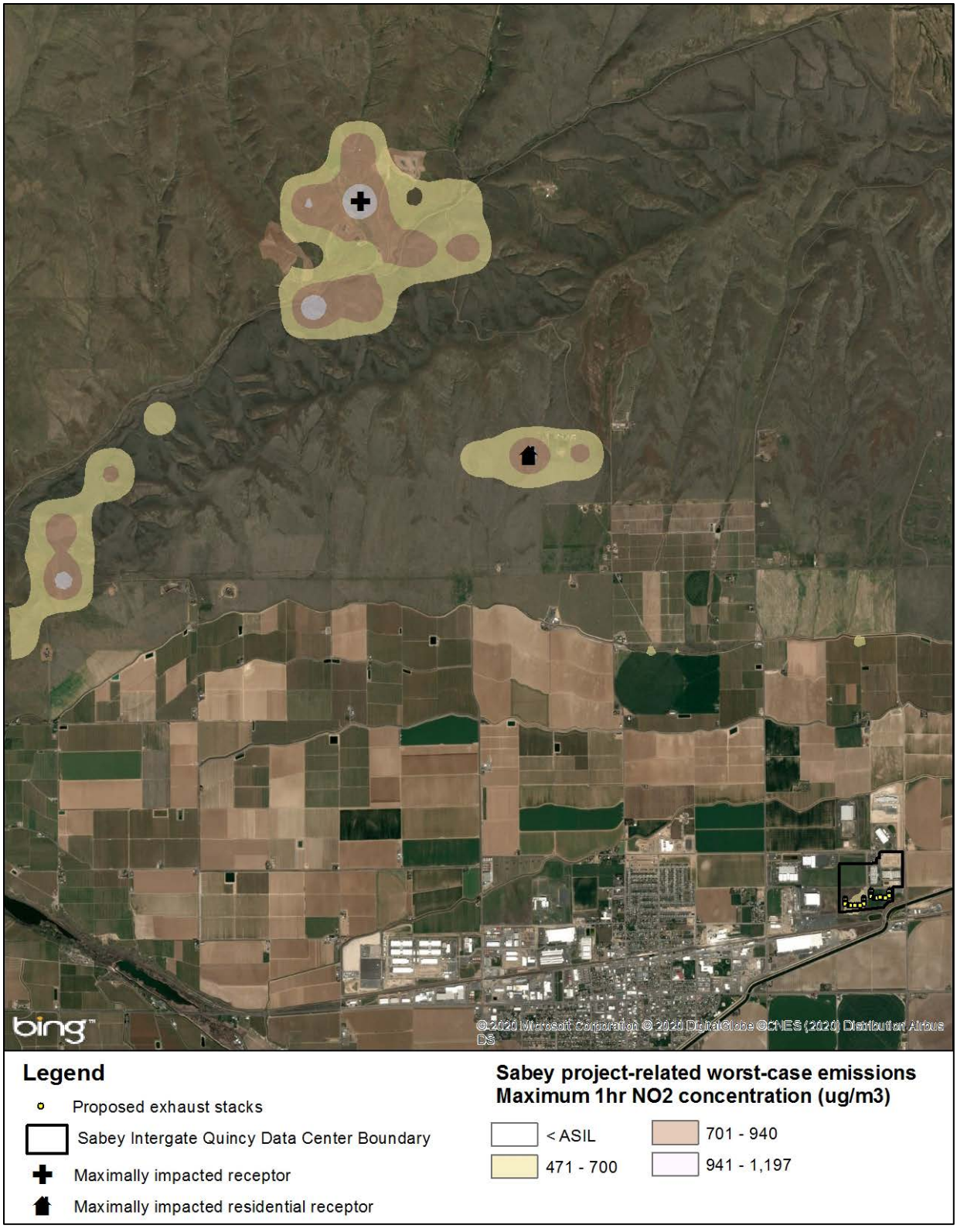

Figure 4: Maximum NO_2 concentrations attributable to Sabey's project-related outage emissions and key receptor locations evaluated in the HIA