DEPARTMENT OF
ECOLOGY
State of Washington

# Revised Health Impact Assessment Recommendation Document for

## Sabey Intergate-Quincy Data Center
## Quincy, Washington

Prepared by

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## 1. Executive Summary

This health impact assessment evaluates and summarizes the health risks from air pollutants emitted by 44 diesel engines at the Sabey Intergate-Quincy Data Center. This document updates a previous version to reflect permit changes requested by Sabey Corporation (Sabey). In general, toxic air pollutant impacts in the area near Sabey Intergate-Quincy Data Center will not result in excessive risk or cause serious long- or short-term health effects. Ecology concluded that the health risk is acceptable and is recommending approval of the revisions to the permit.

In August 2011, Ecology issued an air permit which allowed Sabey to install and operate equipment that emits pollutants into the air at the Sabey Intergate-Quincy Data Center. The permit specified limits on the emissions and operation of:

- Several cooling units
- Forty-four generators rated at up to 2,000 kilowatt (kW) electrical output

In March 2015, Sabey submitted an application to revise the permit to allow generators to operate over a wider range of operating loads, but Sabey did not request to add new generators or increase the runtime of the currently permitted generators (Landau Associates, 2015). This wider range results in an increase in the amount of air pollution the facility could emit. Specifically, Sabey requested an increase in the amount of diesel particles they are allowed to emit from 0.31 tons per year to 0.408 tons per year. Sabey's actual emissions will likely be less than their permitted limits, but Ecology required Sabey to revise the health impact assessment evaluating the health risks from exposure to diesel engine exhaust particles.

Sabey hired Landau Associates (Landau) to revise the health impact assessment (Landau Associates, 2015a). In this assessment, Landau estimated lifetime increased cancer risks associated with Sabey's diesel particles and other toxic air pollutant emissions.

The revised diesel particle emissions resulted in an increase lifetime cancer risk from the previous estimate of seven in one million to a new estimate of up to 9.9 in one million. The maximum risk was estimated at a location on a property that contains a home north of Sabey Intergate-Quincy Data Center. A lower risk estimate of 7.9 per million occurs at the house location on the same parcel. In assessing these risks, Ecology assumes that a person is exposed to Sabey's emissions continuously during their entire lifetime. Ecology allows an increased risk of up to 10 in one million from new sources of air pollutants. This risk can also be expressed as the number of cancers that might occur in addition to those normally expected in a population of one million people. The cancer risk estimates reported here are for increases above a baseline lifetime risk of cancer of about 40 percent in the United States.

To evaluate the cumulative effect of numerous sources of diesel particles in the area, Ecology assessed the cumulative health risk by adding estimated concentrations associated with Sabey's emissions to an estimated background concentration. The maximum cumulative cancer risk to a person who lives near Sabey Intergate-Quincy Data Center is about **58 in one million**. Most of the exposure to diesel particles at this location comes from highway vehicles. Additionally, exposure to diesel particles in the area is not likely to result in long-term non-cancer health effects.

Because the increase in cancer risk associated with Sabey Intergate-Quincy Data Center alone is less than the maximum risk allowed by a health impact assessment (10 in one million), and the non-cancer hazard is low, the project can be approved under WAC 173-460-090. Furthermore, the cumulative risks to residents living near Sabey Intergate-Quincy Data Center are below the cumulative risk threshold established by Ecology for permitting data centers in Quincy (100 per million or 100 x $10^{-6}$).

This summary document presents Ecology's review of the Sabey Intergate-Quincy Data Center revised health impact assessment and other requirements under WAC 173-460.

## 2. Second Tier Review Processing and Approval Criteria

### 2.1. 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 (NOC) Order of Approval 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 a health impact assessment (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 October 28, 2015.[1] Because Sabey was revising an earlier HIA, an HIA protocol (item (c)) was deemed to be unnecessary. Ecology's modeler confirmed that refined modeling (item (d)) was conducted appropriately.[2] The revised HIA (item (e)) was received by Ecology on March 4, 2015. After an initial review of the HIA, Ecology determined that the requested diesel engine exhaust particulate (DEEP) emission rate (0.467 tons per year) would result in unacceptable risk. Sabey agreed to an emission limit of 0.408 tpy. Ecology scaled the modeling results by a factor of 0.873662 to reflect the lower emission rate. The risks reported in this HIA review reflect an annual average DEEP emission rate of 0.408.

[1] Gary Huitsing to Gary Palcisko, "RE: Memo with Recommendations from Sabey," e-mail message, October 28, 2015.
[2] Clint Bowman to Gary Palcisko, "PSD_Modeling_Review_Checklist_cb1_sabey-quincy-2015.doc," e-mail message, September 4, 2015.

All five processing requirements above are satisfied.

### 2.2. 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.

(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.

#### 2.2.1. 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 at Sabey Intergate-Quincy Data Center (Ecology, 2015). BACT and tBACT for diesel particulate was determined to be met through the use of EPA Tier 2 certified engines if the engines are installed and operated as emergency engines, as defined at 40 CFR §60.4219; compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII; and use of ultra-low sulfur diesel fuel containing no more than 15 parts per million by weight of sulfur.

## 3. HIA Review

As described above, 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 surrounding community's risk from a new project.

For the Sabey Intergate-Quincy project, the HIA focused on health risks attributable to DEEP exposure as this was the only TAP in which Sabey requested increased limits from the existing permit and the modeled concentration in ambient air exceeded an ASIL. Landau briefly described emissions and exposure to other TAPs (nitrogen dioxide ($NO_2$), carbon monoxide (CO), benzene, 1-3 butadiene, acrolein, and naphthalene) because these pollutants exceeded a small quantity emission rate (SQER), and Ecology requested that health hazards from exposure to these pollutants be quantified.

### 3.1. 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 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" available at http://www.ecy.wa.gov/pubs/0802032.pdf.

The HIA prepared by Landau quantifies the non-cancer hazards and increased cancer risks attributable to the proposed Sabey Intergate-Quincy Data Center's DEEP emissions.

### 3.2. DEEP Toxicity Reference Values

To quantify non-cancer hazards and cancer risk from exposure to DEEP, quantitative toxicity values must be identified. Landau identified toxicity values for DEEP from two agencies: the U.S. Environmental Protection Agency (EPA) (EPA, 2002; EPA, 2003), and California EPA's Office of Environmental Health Hazard Assessment (OEHHA) (CalEPA, 1998). These toxicity values are derived from studies of animals that were exposed to a known amount (concentration) of DEEP, or from epidemiological studies of exposed humans. They are intended to represent a level at or below which adverse non-cancer health effects are not expected, 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 Landau.

EPA's reference concentration (RfC) and OEHHA's reference exposure level (REL) for diesel engine exhaust (measured as DEEP) was derived from dose-response data on inflammation and changes in the lung from rat inhalation studies. Each agency established a level of 5 $\mu g/m^3$ as the concentration of DEEP in air at which long-term exposure is not expected to cause adverse non-cancer health effects.

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

OEHHA derived a unit risk factor (URF) for estimating cancer risk from exposure to DEEP. The URF is based on a meta-analysis of several epidemiological studies of humans occupationally exposed to DEEP. In these studies, DEEP exposure was estimated from measurements of elemental carbon and respirable particulate representing fresh diesel exhaust. 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 $\mu g/m^3$), and are expressed in units of inverse concentration [i.e., $(\mu g/m^3)^{-1}$]. OEHHA's URF for DEEP is 0.0003 per $\mu g/m^3$ meaning that a lifetime of exposure to 1 $\mu g/m^3$ 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.

**Table 1. Toxicity Values Used to Assess and Quantify Non-Cancer Hazard and Cancer Risk**

| Pollutant | Agency | Non-cancer | Cancer |
|---|---|---|---|
| DEEP | EPA | RfC = 5 µg/m3 | NA[1] |
| | California EPA–OEHHA | Chronic REL = 5 $\mu g/m^3$ | URF = 0.0003 per $\mu g/m^3$ |

[1] EPA considers DEEP to be a probable human carcinogen, but has not established a cancer slope factor or unit risk factor.

### 3.3. Affected Community/Receptors

While Sabey Intergate-Quincy Data Center is located in an industrially zoned area surrounded largely by agricultural land uses and other data centers, air dispersion modeling indicated that proposed DEEP emissions could result in concentrations in excess of the ASIL at two parcels with residential land use codes (Figure 1) [Ecology, 2013; Grant County, 2015]. U.S. Census data show that approximately 23 people live in the Census Blocks intersected by the area in which DEEP concentrations are estimated to exceed the ASIL (U.S. Census Bureau, 2010).

For the purposes of assessing increased cancer risk and non-cancer hazards, Landau identified receptor locations where the highest exposure to project-related air pollutants could occur: at the project boundary, nearby residences, and on-site tenant occupied commercial locations (Figure 2).

Ecology's review of the HIA found that Landau identified appropriate receptors to capture the highest Sabey attributable exposures for residential, commercial, and fence line receptors.

### 3.4. Increased Cancer Risk

#### 3.4.1. Cancer Risk Attributable to Sabey's DEEP and Other TAP Emissions

Table 2, adapted from the HIA, shows the estimated Sabey-specific cancer risk per million for each of the receptors. The highest increase in risks attributable to Sabey's emissions is 9.9 per million[3] and occurs at the closest edge of a property that contains an existing house to the north of Sabey Intergate-Quincy Data Center.[4] A lower risk estimate of 7.9 per million occurs at the house location on the same parcel. Landau also calculated risks posed by other carcinogenic TAPs (i.e., acetaldehyde, benzene, formaldehyde, 1,3-butadiene, and carcinogenic polycyclic aromatic hydrocarbons). They estimated a negligible increased risk attributable to these other TAPs of about 0.05 per million at the maximally impacted residential receptor (MIRR).

For non-residential exposure scenarios, workers at on-site facilities may have increased risks of about 3.5 per million, and increased cancer risks to potential bystanders exposed near the point of maximum off-site impact (i.e., fence line receptor) may be about 0.4 per 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.

[4] Ecology's initial review of the HIA determined that concentrations exceeding 0.0333 ug/m3 (corresponding to a lifetime increased risk of 10 in one million) occurred on portions of a residential parcel. Sabey agreed to accept lower emission limits than what was reported in the HIA.

| Table 2. Estimated Increased Cancer Risk for Residential, Commercial, and Boundary Receptors Attributable to Sabey's DEEP Emissions | | | | | |
|---|---|---|---|---|---|
| | Risk Per Million from DEEP Exposure at Various Receptor Locations | | | | |
| Attributable to: | Fence Line Receptor[1] | R-1 North Residence (property) (MIRR)[2] | R-1 North Residence (home) [2] | R-2 South Residential Parcel[2] | C-1 Industrial Building (MICR)[3] |
| Sabey | 0.4 | 9.9 | 7.9 | 6.2 | 3.5 |
| [1] Fence line scenario assumes intermittent exposure 250 days per year, two hours per day for 30 years. | | | | | |
| [2] Residential scenarios assume continuous lifetime exposure. | | | | | |
| [3] Workplace scenarios assume exposure occurs 250 days per year, eight hours per day for 40 years. | | | | | |
| Note: Landau also calculated risks posed by other carcinogenic TAPs (i.e., acetaldehyde, benzene, formaldehyde, 1,3-butadiene, and carcinogenic polycyclic aromatic hydrocarbons). They estimated a negligible increased risk attributable to these TAPs of about 0.05 per million at the north residence (R-1). | | | | | |

### 3.4.2. Cancer Risk Attributable to Cumulative DEEP Emissions

Ecology conducted an analysis of cumulative exposure to DEEP in Quincy in 2014 during the permitting process for the Oxford Data Center located three miles west of Sabey.[5] Ecology adjusted the results of this analysis to include updated emissions rates requested by Sabey, and the revised emission rates allowed in a draft permit for the Oxford Data Center (Ecology, 2015a). In total, the cumulative analysis includes allowable emissions estimates from:

- Microsoft Columbia Data Center
- Yahoo! Data Center
- Intuit Data Center
- Dell Data Center
- Vantage Data Center
- Microsoft Oxford Data Center (results adjusted to reflect contribution from increased emissions reflected in a revised permit out for public comment in 2015)
- Sabey Intergate-Quincy Data Center (results adjusted to account for emissions increase requested by Sabey)

Ecology also included 2011 estimates for vehicles on State Routes (SR) 28 and 281 and locomotives on the BNSF railroad.

[5] Landau reported cumulative risks associated with DEEP exposure in the area around Sabey based on earlier modeling results. Ecology recently updated these community-wide models during a recent permitting action. Ecology reported the updated modeling results in this HIA review document.

The cumulative cancer risk from all known sources of DEEP emissions in the vicinity[6] of Sabey Intergate-Quincy Data Center (Table 3) is highest for a residential location on an agricultural parcel south of SR 28. This parcel is about ¾ mile south of the Sabey Intergate-Quincy Data Center property boundary (Figure 3). The cumulative DEEP risk at this home is about 58 per million, and the majority (~86 percent) of exposure to DEEP is estimated to be attributable to emissions from vehicles travelling on SR 28.

**Table 3. Estimated Cumulative Cancer Risk at Residential Locations near Sabey Data Center**

| Attributable to: | Risk Per Million from DEEP Exposure at Various Receptor Locations | | |
|---|---|---|---|
| | R-1 North Residence (property) (MIRR)[1] | R-2 South Residence (parcel)[1] | R-3 South Home on Agricultural parcel |
| Sabey | 9.2 | 6.0 | 1.2 |
| Vantage | 6.2 | 0.9 | 0.5 |
| Intuit | 4.7 | 3.2 | 1.4 |
| Yahoo! | 2.9 | 1.7 | 1.6 |
| SR 28 | 2.1 | 4.4 | 49.7 |
| Rail | 1.4 | 11.0 | 2.5 |
| Microsoft Columbia | 0.5 | 0.4 | 0.3 |
| SR 281 | 0.5 | 0.6 | 0.6 |
| Microsoft Oxford | 0.2 | 0.2 | 0.2 |
| Dell | 0.1 | 0.1 | 0.1 |
| Cumulative | 27.7 | 28.4 | 58.1 |

[1] Locations of R-1 and R-2 slightly different than those in Table 2.
R-3 was not evaluated in HIA prepared by Landau.
Residential scenarios assume continuous lifetime exposure.

### 3.5. Non-cancer Hazard

Landau evaluated chronic non-cancer hazards associated with long-term exposure to DEEP emitted from Sabey Intergate-Quincy Data Center and other local sources. Hazard quotients were much

[6] For the purposes of this analysis, the "vicinity" of Sabey encompasses the area in which Sabey's estimated impact exceeds the DEEP ASIL.

lower than unity (one) for all receptors' exposure to Sabey-related and cumulative DEEP.[7] This indicates that chronic non-cancer hazards are not likely to occur as a result of exposure to DEEP in the vicinity of Sabey.

Landau also evaluated short-term exposures to $NO_2$, CO, benzene, 1,3-butadiene, and acrolein emitted from Sabey's engines and determined that under outage scenarios, hazard indices could exceed unity at the maximally impacted boundary receptor. This hazard primarily results from $NO_2$ emissions. The frequency of this potential occurrence is further discussed in Section 4.2.

## 4. Other Considerations

### 4.1. 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, Landau did not quantify short-term risks from DEEP exposure. Generally, Ecology assumes that compliance with the 24-hour $PM_{2.5}$ NAAQS is an indicator of acceptable short-term health effects from DEEP exposure. Ecology's Technical Support Document (TSD) 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, 2015).

### 4.2. Cumulative Short-Term $NO_2$ Hazard

Sabey and Ecology previously evaluated short-term nitrogen oxides ($NO_X$) emissions as part of the previous Second Tier review process (Ecology, 2011). Because Sabey agreed to restrict its maximum-hourly $NO_X$ and $NO_2$ emissions during a power outage to the currently-permitted values, Sabey's recent application will not affect its previously estimated contribution to cumulative regional $NO_2$ concentrations. Furthermore, Ecology recently conducted an analysis of a system-wide outage in Quincy during permitting of the Microsoft Oxford Data Center in 2014 (Ecology, 2014; Ecology, 2015b). This analysis incorporated potential $NO_X$ emission rates from each of the engines at all of Quincy's data centers during a power outage. The analysis showed that while $NO_2$ levels could indeed rise to levels of concern[8] during a system-wide outage, the outage would have to occur at a time when the dispersion conditions were optimal for concentrating $NO_2$ at a given location. Ecology estimated the combined probability of a system-wide outage coinciding with unfavorable meteorology and found the likelihood of this occurrence to be relatively low throughout Quincy.

## 5. 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

[7] The highest chronic hazard quotient attributed to cumulative exposure to DEEP (0.065) occurred at the maximum impacted commercial on-site receptor location.
[8] The level of concern in this case is 462 $\mu g/m^3$. This represents California OEHHA's acute REL of 470 $\mu g/m^3$ minus an estimated regional background concentration of 8.3 $\mu g/m^3$.

underestimate the health risks estimated in the HIA. Key aspects of uncertainty in the HIA for project Sabey are exposure assumptions, emissions estimates, air dispersion modeling, and toxicity of DEEP.

### 5.1. Exposure

It is difficult to characterize the amount of time that people can be exposed to Sabey's DEEP emissions. For simplicity, Landau 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 exposure.

### 5.2. Emissions

The exact amount of DEEP emitted from Sabey's diesel-powered generators is uncertain. Landau estimated emissions assuming engines would operate at a load that produces the most DEEP. In reality, the engines will operate at a variety of loads in which emissions may be lower than assumed. Landau also attempted to account for higher emissions that would occur during initial start-up. The resulting values are considered to be an appropriate estimate of DEEP emissions. Periodic engine emission testing will be conducted to ensure that engines meet appropriate emission limits.

### 5.3. Air Modeling

The transport of pollutants through the air is a complex process. Regulatory air dispersion models are developed to estimate the transport and dispersion of pollutants as they travel through the air. The models are frequently updated as techniques that are more accurate become known, but are written to avoid underestimating the modeled impacts. Even if all of the numerous input parameters to an air dispersion model are known, 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 the Sabey analysis may slightly overestimate the short-term (1-hour average) impacts and somewhat underestimate the annual concentrations.

### 5.4. Toxicity

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 (e.g., RfCs), EPA and other agencies apply "uncertainty" factors to doses or concentrations that were observed to cause adverse non-cancer effects in animals or humans. Agencies apply these uncertainty factors so that they derive a toxicity value that is considered protective of humans including susceptible populations. In the case of DEEP exposure, the non-cancer reference values used in this assessment were generally derived from animal studies. These reference values are probably protective of the majority of the population including sensitive individuals, but in the case of EPA's DEEP RfC, EPA acknowledges (EPA, 2002):

> "…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."

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 $1x10^{-5}$ to $1 \times 10^{-3}$ per $\mu g/m^3$. OEHHA's DEEP URF ($3 \times 10^{-4}$ per $\mu g/m^3$) 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.

Table 4 presents a summary of how the uncertainty affects the quantitative estimate of risks or hazards.

**Table 4. Qualitative Summary of How the Uncertainty Affects the Quantitative Estimate of Risks or Hazards**

| Source of Uncertainty | How Does it Affect Estimated Risk from this Project? |
|---|---|
| Exposure assumptions | Likely overestimate of exposure |
| Emissions estimates | Possible overestimate of emissions concentrations |
| 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 |

## 6. Conclusions and Recommendation

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

a) The TAP emissions estimates presented by Landau represent a reasonable estimate of the project's future emissions.

b) Emission controls for the new and modified emission units meet or exceed 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 Landau on behalf of Sabey adequately assesses project-related increased health risk attributable to TAP emissions.

In the HIA, Landau estimated lifetime increased cancer risks attributable to Sabey's DEEP and other TAP emissions. The revised DEEP emissions resulted in an increase from the previous risk estimate of about seven in one million to a new estimate of **9.9 in one million**. The maximum risk was estimated at an undeveloped portion of a parcel that contains a house to the north of the Sabey Intergate-Quincy Data Center property. A lower risk estimate of 7.9 per million occurs at the house location on the same parcel.

Landau also assessed chronic and acute non-cancer hazards attributable to the project's emissions and determined that Sabey's emissions by themselves are not likely to result in adverse non-cancer health effects.

Finally, Ecology assessed the cumulative health risk by adding estimated concentrations attributable to Sabey's emissions to an estimated background DEEP concentration. The maximum cumulative cancer risk from resident's exposure to DEEP in the vicinity of Sabey Intergate-Quincy Data Center is approximately **58 in one million**. Most of the exposure to diesel particulate at this location comes from vehicles travelling on State Route 28. Additionally, exposure to DEEP in the area is not likely to result in non-cancer health effects. These DEEP-related health risks in the vicinity of Sabey Intergate-Quincy Data Center are generally much lower than those estimated in urban areas of Washington.

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 could be approvable under WAC 173-460-090. Furthermore, the cumulative risks to residents living near the Sabey Intergate-Quincy Data Center are below the cumulative risk threshold established by Ecology for permitting data centers in Quincy (100 per million or $100 \times 10^{-6}$).

The project review team concludes that the HIA represents an appropriate estimate of potential increased health risks posed by Sabey's TAP emissions. The risk manager may recommend approval of the revised permit because total project-related health risks are permissible under WAC 173-460-090 and the cumulative risk from DEEP emissions in Quincy is less than the cumulative additional cancer risk threshold established by Ecology for permitting data centers in Quincy (100 per million or $100 \times 10^{-6}$).

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U.S. Census Bureau, 2010 TIGER/Line Files, viewed with ESRI ArcGIS 10 Software, 2010.


**Figure 1. Residential parcels in the area where Sabey DEEP concentrations could exceed the ASIL**

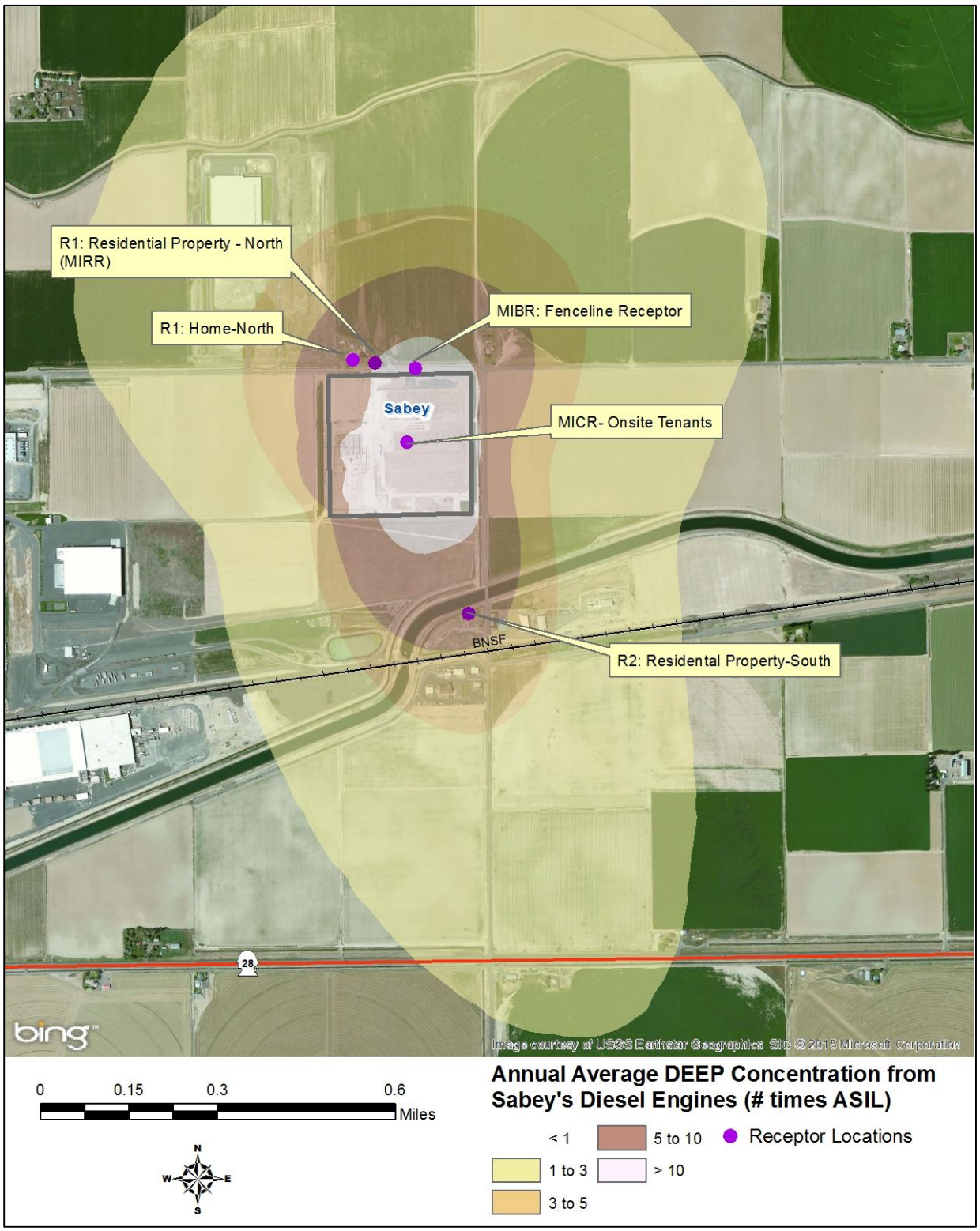


**Figure 2. DEEP concentrations attributable to Sabey's Engines and receptor locations evaluated in the HIA. Concentrations reported as the number of times higher than the ASIL.**

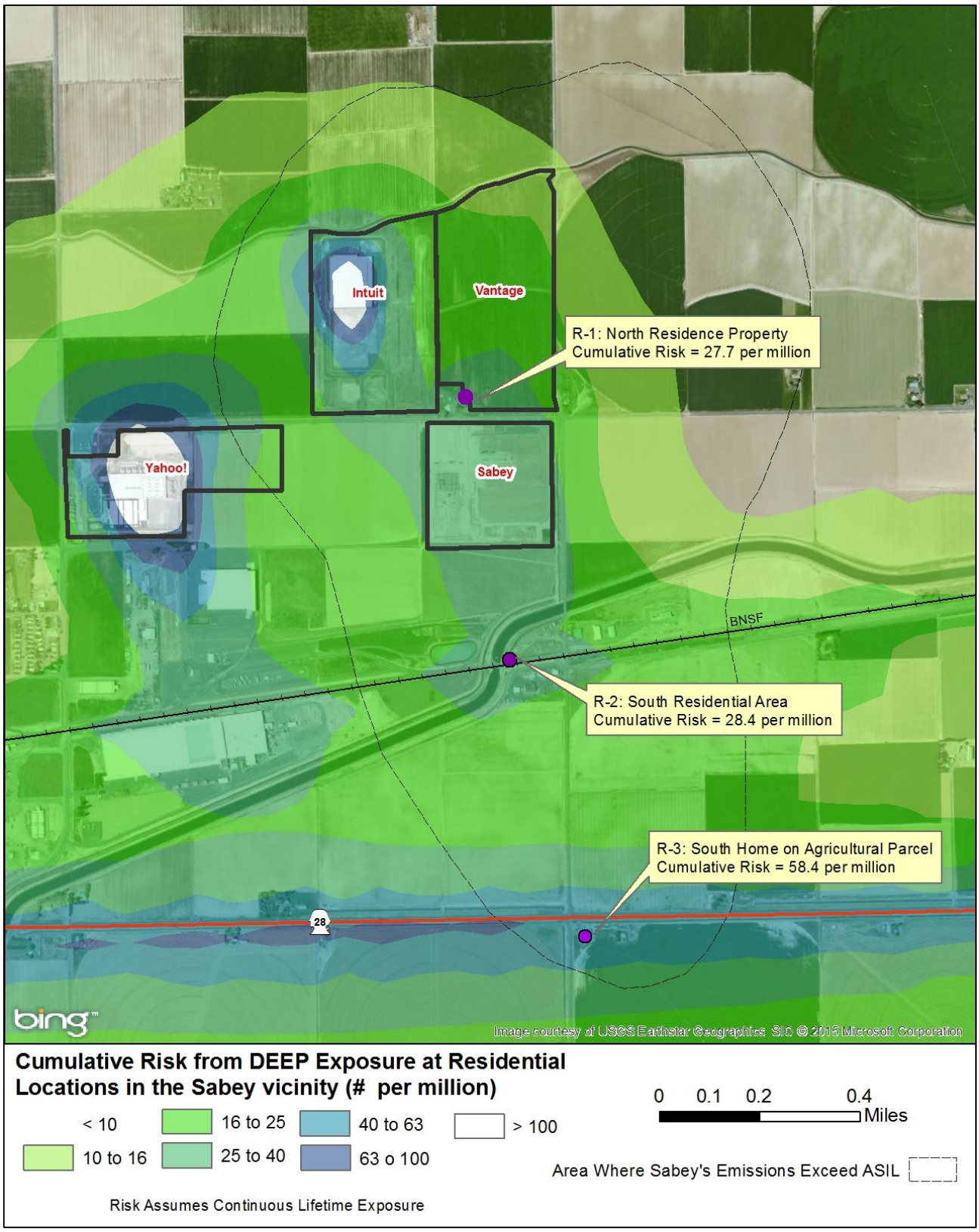


**Figure 3. Cumulative Risk from DEEP at residential locations (estimated by Ecology) in the Sabey vicinity**