STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

August 5, 2019

David Knight
Department of Ecology
Eastern Regional Office
4601 N. Monroe Street
Spokane, WA 99205-1295

Re: Second Tier Petition by Schweitzer Engineering Laboratories Inc. Regarding TAP Emissions Increases from Seven Emergency Engines

Dear David Knight:

The Washington Department of Ecology's Air Quality Program (Ecology) has completed a review of health risks from diesel engine exhaust particulate emissions from seven emergency engines at the Schweitzer Engineering Laboratories Inc. (SEL) campus in Pullman, WA. We concluded that the health risk is acceptable and recommends approval of the project.

SEL applied for a notice of construction approval order (i.e., permit) for the following emission units spread across their campus:

- One 125 kilowatt diesel powered emergency generator
- One 300 kilowatt diesel powered emergency generator
- Five 600 kilowatt diesel powered emergency generators

Although the proposed engines will only operate over a limited time (up to 78 hours per year per engine), diesel engine exhaust particulate matter may be emitted at a rate that exceeds screening thresholds. As a result, SEL submitted a health impact assessment describing the increased health risks from their potential emissions.

Based on our review of the health impact assessment, diesel particle emissions resulted in a maximum increase lifetime cancer risk of about 2.6 in one million. The maximum risk was estimated for nearby residents' exposure.

Our review of non-cancer hazards indicates that exposure to diesel particles in the area is not likely to result in long-term non-cancer health effects.

We recommend approval of the project because:

- We determined that the 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, and
- We determined that the non-cancer hazard is acceptable.

SEL has satisfied all requirements of a second tier toxics review. We recommend that you incorporate our findings as part of your ambient air impacts analysis and you may begin the public comment period when you are ready to do so.

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

Sincerely,

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

Enclosure

cc: Karin Baldwin, Ecology
Kristin Irish, SEL
Andrew Kruse, Ecology

Health Impact Assessment Recommendation Document for

Schweitzer Engineering Laboratories, Inc.
Pullman, Washington

August 2019

Publication and Contact Information

For more information contact:

Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-6800

Washington State Department of Ecology — www.ecology.wa.gov

- Headquarters, Olympia 360-407-6000
- Northwest Regional Office, Bellevue 425-649-7000
- Southwest Regional Office, Olympia 360-407-6300
- Central Regional Office, Union Gap 509-575-2490
- Eastern Regional Office, Spokane 509-329-3400

To request ADA accommodation including materials in a format for the visually impaired, call Ecology at 360-407-6800 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with speech disability may call TTY at 877-833-6341.

Health Impact Assessment Recommendation Document for

Schweitzer Engineering Laboratories, Inc.
Pullman, Washington

Air Quality Program

Washington State Department of Ecology

Olympia, Washington

This page is purposely left blank

Table of Contents

List of Tables and Figures

Executive Summary

This health impact assessment review evaluates and summarizes the health risks from air pollutants emitted by seven (7) diesel-powered emergency generators Schweitzer Environmental Laboratories (SEL) in Pullman, WA. In general, toxic air pollutant impacts in the area near SEL 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.

SEL applied for a notice of construction approval order (i.e., permit) to install and operate seven emergency engines across their Pullman, WA campus. While the proposed engines will only operate intermittently (up to 78 hours per year per engine), the engines may emit diesel engine exhaust particles at a rate triggering a second tier toxics review.

To satisfy a key requirement of second tier review, SEL submitted a health impact assessement that describes health risks associated with increased emissions of diesel particles.

Conclusions

- SEL's diesel particle emissions result in an increased lifetime cancer risk of up to 2.6 in one million. The maximum risk was estimated for the maximally impacted residence east of SEL. In assessing cancer risk to residents, Ecology assumes people are exposed to SEL's diesel particle emissions continuously over their entire lifetime.
    - 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 diesel particles in the area is not likely to result in long-term non-cancer health effects.

Ecology's recommendation

Ecology recommends approval of the project because:

- Ecology determined that the 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 under a second tier review.
- Ecology determined that the non-cancer hazard is acceptable.

Second Tier Review Processing and Approval Criteria

The health impacts assessment (HIA) submitted by SEL is part of the second tier toxics review process under WAC 173-460 (SEL, 2019). 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 April 19, 2019.[1] Ecology approved an HIA protocol (item (c)), and the final HIA (item (e)) was received by Ecology on April 15, 2019. Ecology's modeler confirmed that refined modeling (item (d)) was conducted appropriately.[2]

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] Andrew Kruse, "SEL-Updated permit and Tier 2 Review," e-mail message with attachment, addressed to Gary Palcisko April 19, 2019.
[2] Tesfamichael Ghidey, "SEL, Pullman dispersion modeling results review" email addressed to Gary Palcisko April 19, 2019.

(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 SEL's proposed pollution control equipment satisfies the BACT and tBACT requirement for diesel engines powering backup generators. BACT and tBACT for diesel particulate was determined to be met through restricted operation of EPA Tier-2 certified engines operated as emergency engines as defined in 40 CFR §60.4219, and compliance with the operation and maintenance restrictions of 40 CFR Part 60, Subpart IIII.

Health Impact Assessment 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 risks to the surrounding community from a new project.

For the SEL project, the HIA focused on health risks attributable to diesel engine exhaust particulate (DEEP) exposure because the modeled ambient air concentrations exceeded the 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).

DEEP 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, SEL identified toxicity values for DEEP from 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 SEL.

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. OEHHA 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. Therefore, DEEP is defined as the filterable fraction of particulate emitted by diesel engines.[3] 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 or Comparison Values Considered in Assessing and Quantifying Non-cancer Hazard and Cancer Risk

Pollutant	Agency	Non-cancer	Cancer
DEEP	California EPA–Office of Environmental Health Hazard Assessment	Chronic REL = 5 $\mu g/m^3$	URF = 0.0003 per $\mu g/m^3$
REL – Reference Exposure Level URF – Unit Risk Factor			

Community/receptors

SEL is located in an industrially zoned area surrounded largely by undeveloped/agricultural land uses, apartment complexes, and single-family residences (Figure 1).

For the purposes of assessing increased cancer risk and non-cancer hazards, SEL identified receptor locations where the highest exposure to project-related air pollutants could occur: at the project boundary, nearby residences, and on-site and nearby commercial locations (Figure 2). Ecology's review of the HIA found that SEL identified appropriate receptors to capture the highest project attributable exposures.[4]

Increased cancer risk

SEL assessed the increased risk of cancer from lifetime exposure to DEEP emitted from their emergency engines. Cancer risk was calculated in a manner consistent with EPA guidance for inhalation risk assessment (EPA, 2009) as follows:

---

[3] Condensable particulate is not considered to represent DEEP for the purposes assessing health risks from DEEP exposure, however, both the filterable and condensable fractions of PM are considered when determining compliance with NAAQS for the purposes of the NOC application.
[4] SEL identified other sensitive receptor locations including schools and nursing homes. Project-related pollutant impacts were lower at these locations than maximally impacted residential, commercial and boundary receptor locations.

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 SEL-related DEEP

Table 2, adapted from the HIA, shows the estimated SEL-specific cancer risk per million for residential, commercial, and boundary receptors. Figure 2 shows the location of these receptors relative to SEL. The highest increase in risks attributable to SEL's emissions is 2.6 per million[5] for maximally impacted residential receptors located east of the facility.

For non-residential exposure scenarios, the maximally impacted commercial receptor (MICR) and the maximally impacted boundary receptor (MIBR) may have increased risks of about 0.2 and 0.7 per million, respectively.

Cancer risk attributable to background exposure to DEEP

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*

[5] 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.

- *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.*

SEL chose to evaluate background using the most recent publically available National Ambient Toxics Assessment (NATA) (EPA, 2018). Generally, the residential receptor's background risk attributable to existing DEEP exposures is much higher (45 in one million) than risk attributable to project-related increases (2.6 in one million).

Table 2: Estimated Increased Cancer Risk for Residential, Commercial, and Boundary Receptors Attributable to SEL's DEEP Emissions and Background Levels

Exposure Parameter	MIRR	MICR	MIBR
CA_{SEL} – Concentration in air from SEL's emissions (µg/m^3)	**0.00864**	**0.00564**	**0.1052**
$CA_{background}$ – Concentration in air from "background" sources (µg/m^3)	0.150	0.150	0.150
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_{SEL} – SEL Project Related Exposure Concentration (µg/m^3)	**0.00864**	**0.00074**	**0.0026**
$EC_{background}$ – Background source related Exposure Concentration (µg/m^3)	0.15	0.020	0.0037
IUR – Inhalation Unit Risk (µg/m^3)$^{-1}$	0.000013	0.000013	0.000013
Cancer risk from SEL's increased emissions	**2.6E-06**	**2.2E-07**	**7.7E-07**
Cancer risk from "background" sources	4.5E-05	5.9E-06	1.1E-06
Total cancer risk from DEEP near SEL	4.8E-05	6.1E-06	1.9E-06
Risk = IUR x EC EC = (CA x ET x EF x ED)/AT			

Non-cancer hazard

SEL assessed the chronic non-cancer hazards from long-term exposure to DEEP emissions. Non-cancer hazard was characterized consistent with EPA guidance for inhalation risk assessment (EPA, 2009). Hazards were quantified using the following equations:

HQ = EC/Toxicity Value

Where:

HQ (unitless) = hazard quotient;

EC (µg/m3) = exposure concentration;

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

Where:

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

An HQ of one or less indicates that the exposure to a substance is not likely to result in adverse health effects. As the HQ increases above one, the probability of human health effects increases by an undefined amount. However, it should be noted that an HQ above one is not necessarily indicative of health impacts due to the application of uncertainty factors in deriving toxicological reference values (e.g., REL).

All hazard quotients attributable to SEL and background DEEP are far below unity, therefore long-term adverse respiratory health effects are not likely to occur among people exposed to DEEP in the area near SEL (Table 4).

Table 3: Estimated Long-term DEEP Non-cancer Hazards Attributable to SEL's DEEP Emissions and Background Levels

Exposure Parameter	MIRR	MICR	MIBR
CA_{SEL} – Concentration in air from SEL emissions (µg/m^3)	**0.00864**	**0.00564**	**0.1052**
$CA_{background}$ – Concentration in air from "background" sources (µg/m^3)	0.150	0.150	0.150
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	350400	262800
EC_{SEL} – SEL Related Exposure Concentration (µg/m^3)	**0.00864**	**0.00129**	**0.0060**
$EC_{background}$ – Background source related Exposure Concentration (µg/m^3)	0.15	0.034	0.0086
RfC – Reference Concentration (µg/m^3)	5	5	5
HQ_{SEL} – SEL Related Hazard Quotient	**<0.01**	**<0.01**	**<0.01**
$HQ_{background}$ – Background sources related Hazard Quotient	0.03	**<0.01**	**<0.01**
HQ_{total} – Total Hazard Quotient	0.03	**<0.01**	**<0.01**
HQ = EC/RfC EC = (CA x ET x EF x ED)/AT			

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, SEL did not quantify short-term risks or hazards 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. As part of evaluating SEL's notice of construction application, Ecology's permit engineer determined that SEL's emissions are not expected to cause or contribute to an exceedance of the $PM_{2.5}$ NAAQS.

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 SEL's emissions. The assumptions used in the face of uncertainty may tend to over- or underestimate the health risks determined in the HIA. Key aspects of uncertainty in the HIA for SEL's proposed data center are exposure assumptions, emissions estimates, air dispersion modeling, and toxicity of DEEP.

Table 4: Qualitative Summary of How Uncertainty Affects the Quantitative Estimate of Risks or Hazards Attributable to SEL Emissions

Source of Uncertainty	How Does it Affect Estimated Risk from this Project?
Exposure assumptions	Continuous lifetime exposure is likely an overestimate of DEEP exposure.
Emissions estimates	Possible overestimate of emissions because SEL used worst-case emission rate to estimate DEEP 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

It is difficult to characterize the amount of time that people can be exposed to SEL's DEEP emissions. For simplicity and to ensure public health protection, Ecology assumes 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 SEL's diesel-powered generators is uncertain. SEL estimated emissions assuming engines would operate at loads that produce the most DEEP, 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 they may be used less frequently than allowed in the draft permit.

Air dispersion uncertainty

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.

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 (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 1×10^{-3} per $\mu g/m^3$. OEHHA's DEEP URF (3×10^{-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.

Conclusions and Recommendation

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

(a) The TAP emissions estimates presented by SEL represent a reasonable 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 SEL adequately assesses project-related increased health risk attributable to TAP emissions.

In the HIA, SEL estimated lifetime increased cancer risks attributable to DEEP emissions. These emissions resulted in an increase cancer risk of about 2.6 in one million at the maximally impacted residential receptor.

SEL also assessed chronic and acute non-cancer hazards attributable to the project's emissions and those from background sources and determined that long-term adverse non-cancer health effects from exposure to DEEP are not likely to occur.

Because the increase in cancer risk attributable to SEL's proposed emissions 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.

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

- The cancer risk from SEL'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.

References

CalEPA, California Environmental Protection Agency: Air Resources Board and Office of Environmental Health Hazard Assessment, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, 1998, <http://www.arb.ca.gov/toxics/dieseltac/staffrpt.pdf>.

Ecology, Washington State Department of Ecology, Concerns about Adverse Health Effects of Diesel Engine Emissions: White Paper, December 3, 2008, <https://fortress.wa.gov/ecy/publications/publications/0802032.pdf>.

------, Draft Approval Order, Schweitzer Engineering Labs, Inc. Pullman, WA Campus, April 19, 2019.

EPA, United States Environmental Protection Agency, Health Assessment Document for Diesel Exhaust, EPA/600/8-90/057F, May 2002.

------, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), January 2009, <https://www.epa.gov/sites/production/files/2015-09/documents/partf_200901_final.pdf>.

------, United States Environmental Protection Agency, National Air Toxics Assessment: 2014 NATA: Assessment Results, Released August 2018, <https://www.epa.gov/national-air-toxics-assessment/2014-nata-assessment-results>.

SEL, Schweitzer Engineering Laboratories Inc. Health Impact Assessment Report, April 15, 2019.

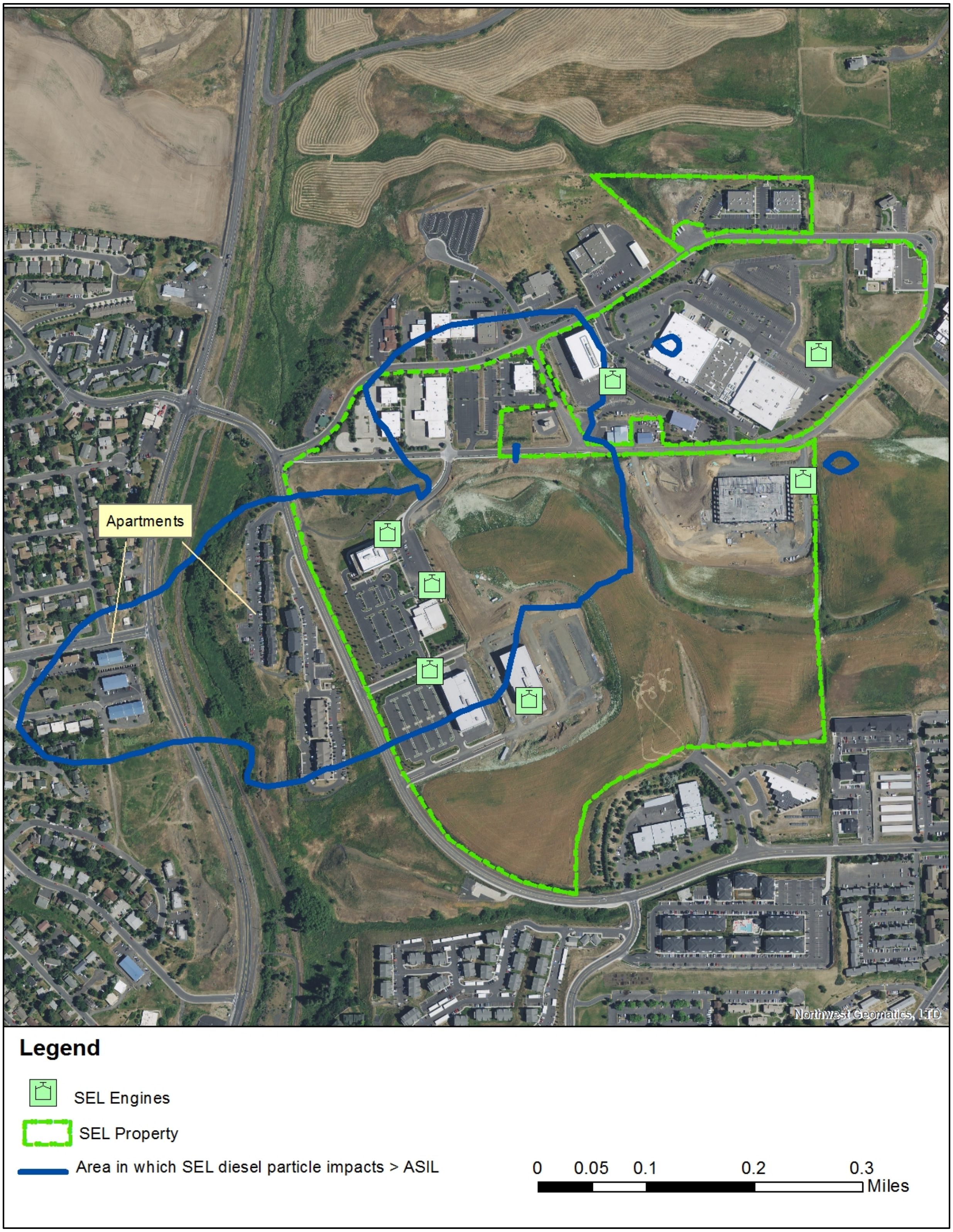

Figure 1: Area where proposed SEL DEEP emissions may cause impacts that exceed the ASIL

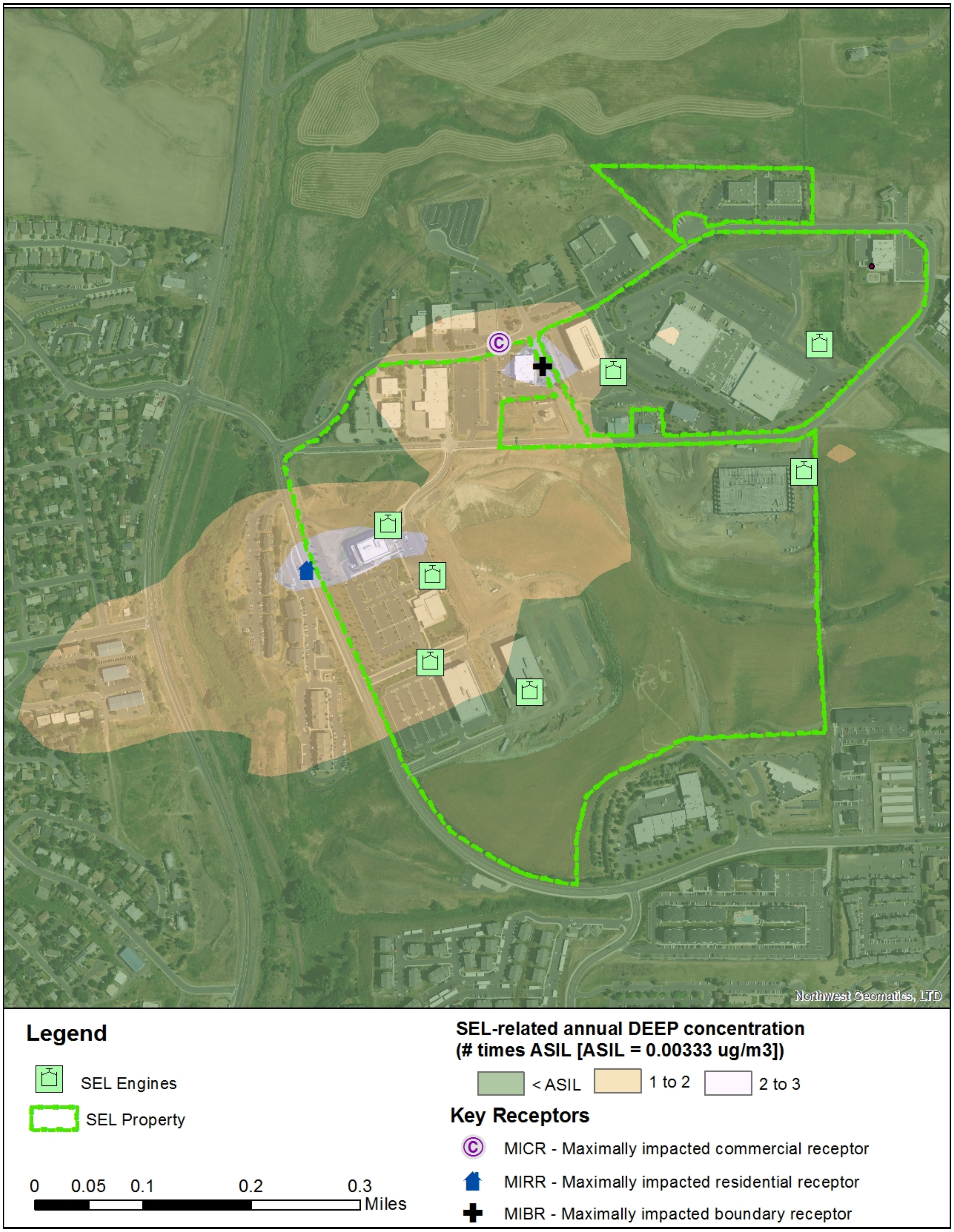

Figure 2: DEEP concentrations attributable to SEL's engines and key receptor locations evaluated in the HIA. Concentrations reported as the number of times greater than the ASIL