Air Dispersion Modeling for the INL Application for a Synthetic Minor Sitewide Air Quality Permit to Construct with a Facility Emission Cap Component

A. Jeffrey Sondrup

October 2015

iNL
Idaho National Laboratory

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**Idaho National Laboratory
Idaho Falls, Idaho 83415**

http://www.inl.gov

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DOE Idaho Operations Office**

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Approved by:

_____   _____
Scott D. Lee   9-24-15
Manager, BEA Regulatory and Monitoring Services   Date

_____   _____
Mark A. Verdoorn   9/24/15
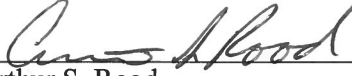BEA Regulatory and Monitoring Services   Date

_____   _____
A. Jeffrey Sondrup   9/24/15
BEA, Energy Resource, Recovery and Sustainability   Date

_____   _____
Arthur S. Rood   9/24/2015
K-Spar Incorporated (Reviewer)   Date

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FIGURES

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ACRONYMS

AAC	Acceptable Ambient Concentrations
AACC	Acceptable Ambient Concentrations for Carcinogens
AMWTF	Advanced Mixed Waste Treatment Facility
AMWTP	Advanced Mixed Waste Treatment Project
ATR	Advanced Test Reactor
BAE	baseline actual emission
BLM	Bureau of Land Management
Btu	British thermal unit
CAP	criteria air pollutant
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EBR	Experimental Breeder Reactor
EL	Emission Level
EPA	Environmental Protection Agency
FEC	facility emissions cap
HAP	hazardous air pollutant
ICE	internal combustion engine
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTU	Integrated Waste Treatment Unit
MFC	Material and Fuels Complex
NAAQS	National Ambient Air Quality Standards
NAD	North American Datum
NOAA	National Oceanic and Atmospheric Administration
NRF	Naval Reactors Facility
PM	particulate matter
POM	polycyclic organic matter
PTC	Permit to Construct
PTE	potential to emit
RCRA	Resource Conservation and Recovery Act

RWMC	Radioactive Waste Management Complex
SIL	Significant Impact Level
SMC	Specific Manufacturing Capability
TAN	Test Area North
TAP	toxic air pollutant
UTM	Universal Transverse Mercator

Air Dispersion Modeling for the INL Application for a Synthetic Minor Sitewide Air Quality Permit to Construct with a Facility Emission Cap Component

1. SUMMARY

The Department of Energy Idaho Operations Office (DOE-ID) is applying for a synthetic minor, Sitewide, air quality permit to construct (PTC) with a facility emission cap (FEC) component from the Idaho Department of Environmental Quality (DEQ) for Idaho National Laboratory (INL) to limit its potential to emit to less than major facility limits for criteria air pollutants (CAPs) and hazardous air pollutants (HAPs) regulated under the Clean Air Act. This document is supplied as an appendix to the application, *Idaho National Laboratory Application for a Synthetic Minor Sitewide Air Quality Permit to Construct with a Facility Emissions Cap Component*, hereafter referred to as "permit application" (DOE-ID 2015).

Air dispersion modeling was performed as part of the permit application process to demonstrate pollutant emissions from the INL will not cause a violation of any ambient air quality standards. INL submitted an air dispersion modeling protocol, *Modeling Protocol for Evaluation of Air Emissions for the Idaho National Laboratory Site-wide Permit to Construct and Facility Emission Cap*, hereafter referred to as "modeling protocol" (Sondrup and Verdoorn, 2015) to DEQ on February 5, 2015, which was approved by DEQ contingent on the resolution of 6 comments noted in a letter received via email on April 16, 2015. A copy of the modeling protocol and DEQ approval is provided in Appendix D of the permit application (DOE-ID 2015).

This report documents the modeling methodology and results for the air dispersion impact analysis. All CAPs regulated under Section 109 of the Clean Air Act were modeled with the exception of lead (Pb) and ozone which are not required to be modeled by DEQ. Modeling was not performed for toxic air pollutants (TAPs) as uncontrolled emissions did not exceed screening emission levels for carcinogenic and non-carcinogenic TAPs. This is explained in Section 3.

Modeling for CAPs was performed with the EPA-approved AERMOD dispersion modeling system (Version 14134) (EPA 2004a) and five years (2000-2004) of meteorological data. The meteorological data set was produced with the companion AERMET model (Version 14134) (EPA 2004b) using surface data from the Idaho Falls airport, and upper-air data from Boise International Airport supplied by DEQ. Onsite meteorological data from the Grid 3 Mesonet tower located near the center of the INL (north of INTEC) and supplied by the local National Oceanic and Atmospheric Administration (NOAA) office was used for surface wind directions and wind speeds. Surface data (i.e., land use data that defines roughness, albedo, Bowen ratio, and other parameters) were processed using the AERSURFACE utility (Version 13016) (EPA 2013).

Emission sources were modeled as point sources using actual stack locations and dimensions. Emissions, flow rates and exit temperatures were based on the design operating capacity of each source. Emission increases up to FEC limits were modeled assuming the FEC component (growth and operational flexibility) for each pollutant were released from each facility one at a time. The FEC component emissions were assumed to be released from an existing boiler stack at each facility. For facilities without a boiler stack, the emissions were assumed to be released from a generic, conservative stack at a location near an existing non-boiler source. All structures close enough to produce an area of wake effect were included for all sources. For multi-tiered structures, the heights of the tiers were included or the entire building height was assumed to be equal to the height of the tallest tier.

Concentrations were calculated at 1,352 receptor locations provided by DEQ. The receptors are spaced approximately every 500 meters around the INL boundary and along highways that transect the INL. Finer spacing (~100 meters) was used near facilities where concentrations may be higher (i.e. along Highway 20/26 between AMWTP and CFA, from Highway 20 to the MFC guard gate, and along Highway 33 near the entrance to SMC. Finer spacing was also used in gridded areas around EBR-I (~40 m) and Atomic City (~200 meters). All receptors were considered for each pollutant and averaging period.

Maximum modeled CAP concentrations summed with average background concentration values were presented and compared to National Ambient Air Quality Standards (NAAQS). The background concentration values used were obtained using the Washington State University's Laboratory for Atmospheric Research North West Airquest web-based retrieval tool (http://lar.wsu.edu/nw-airquest/lookup.html). The air dispersion modeling results show the maximum impacts for CAPs are less than applicable standards and demonstrate the INL will not cause a violation of any ambient air quality standards.

1.1 Report Format

The format of this report follows the template provided by DEQ for documenting air modeling analyses (DEQ 2014). Checklist statements preceded by a blank underlined spaced at the front of the statement are part of the provided template and have been included to demonstrate compliance with applicable rules and policies.

2. GENERAL FACILITY/PROJECT DESCRIPTION

There are currently 7 major facility areas at the INL Site that are potential sources of pollutant emissions that were considered for this analysis. They are:

- Radioactive Waste Management Complex (RWMC) and the neighboring Advanced Mixed Waste Treatment Project (AMWTP),
- Advanced Test Reactor (ATR) Complex,
- Central Facilities Area (CFA),
- Idaho Nuclear Technology and Engineering Center (INTEC),
- Materials and Fuels Complex (MFC),
- Naval Reactors Facility (NRF), and
- Test Area North (TAN) that includes the Specific Manufacturing Capability (SMC) facility.

The facility area locations are shown in Figure 1 and a description of air pollution sources at each facility area is included in Section 3 of the permit application (DOE-ID 2015).

Non radiological regulated emissions for INL come primarily from fuel burning equipment and remediation projects. Table 1 lists the sources of regulated emission sources that are currently permitted. Sources that could be exempted from permitting under IDAPA 58.01.01.220-223 exemption regulations are identified as such.

Table 1. Regulated sources of air pollution at the INL Site.

Facility	Source Description	Emission Controls	IDAPA 58.01.01.220 Exemptible[a]
INTEC	CPP-606, 36.4 MMBtu/hr boiler	Good combustion control	No
INTEC	CPP-606, 36.4 MMBtu/hr boiler	Good combustion control	No
INTEC	CPP-606, 36.4 MMBtu/hr boiler	Good combustion control	No
INTEC	CPP-606, 36.4 MMBtu/hr boiler	Good combustion control	No
INTEC	CPP-1696, Integrated Waste Treatment Unit	Process HEPA filter system	No
SMC	TAN-679-067a, 25 MMBtu/hr boiler	Good combustion control	No
SMC	TAN-679-068, 25 MMBtu/hr boiler	Good combustion control	No
AMWTP	WMF-676-004A, 12.55 MMBtu/hr boiler	Good combustion control	Yes
AMWTP	WMF-676-005B, 12.55 MMBtu/hr boiler	Good combustion control	Yes
AMWTP	WMF-676-006C, 12.55 MMBtu/hr boiler	Good combustion control	Yes
AMWTP	WMF-676-007, 2.0 MMBtu/hr boiler	Good combustion control	Yes
ATR Complex	670-M-42 emergency ICE[b]	None	Yes
ATR Complex	670-M-43 emergency ICE[b]	None	Yes
ATR Complex	674-M-6 emergency ICE[b]	None	Yes

a. Unit under its rated capacity or current operation would qualify for an exemption from permitting requirements in accordance with IDAPA 58.01.01.220.

b. Unit began operation as an emergency stationary internal combustion engine (ICE) April 30, 2015.

In addition to the regulated sources, additional sources of BAE air pollution include sources that predate prevention of significant deterioration regulations, exemptible boilers, internal combustion engines, analytical and research laboratories, maintenance shops, storage tanks, and various remediation projects not subject to air regulations. A description of emissions and source characteristics for modeled sources is contained in Sections 3 and 4.

2.1   Location of Project

The INL Site occupies approximately 2,305 km^2 (890 mi^2) in southeastern Idaho, extending approximately 63 km (36 mi) from north to south and approximately 58 km (36 mi) from east to west at its broadest point. It is located on the eastern Snake River Plain, west of the Snake River and encompasses portions of five Idaho counties: Bingham, Bonneville, Butte, Clark, and Jefferson (see Figure 2). Population centers near the INL Site are Idaho Falls to the east, Blackfoot to the southeast, Pocatello to the south-southeast, and Arco to the west.

DOE controls all activities within the INL Site boundary. The Site has no permanent residents and ingress and egress of Site personnel and visiting personnel are strictly controlled. No casual visits are permitted, except for persons driving through INL on one of five public highways and visitors to the Experimental Breeder Reactor I (EBR-I), a national historic monument, which is open during the summer months. Security forces may interrupt traffic on INL roads or public roads that transverse INL during emergencies and other times to support operations of the laboratory.

Land use on the INL Site is associated with facility operations, agriculture, and recreation. INL operations are performed within the Site's primary facility areas. A 345,000-acre security and safety buffer surrounds the developed areas. Approximately 6% of INL (i.e., 34,000 acres) is devoted to utility rights of way and public roads. Up to 340,000 acres of INL are leased for cattle and sheep grazing; grazing permits are administered by BLM. However, grazing is not permitted within 1/2 mile of any

primary facility boundary or within 2 miles of any nuclear facility. Recreational uses of INL include public tours of the general facility areas and EBR-I (a national historic landmark). Controlled hunting also is permitted on INL, but it is restricted to specific locations.

The dominant land uses in the area surrounding INL are agriculture and open land, each type accounting for 45% of the area, with the remaining 10% occupied by urban/built land and water (see Figure 3). About 75% of the land immediately adjacent to the INL site is owned by the federal government and is administered by BLM. Uses of the federally owned land consist of grazing, wildlife management, mineral and energy production, and recreation. The State of Idaho owns approximately 1% of the adjacent land. These state-owned lands are used for grazing, wildlife management, and recreation. Private lands near the INL site are used primarily for grazing and farming. Irrigated farmlands make up the remaining 24% of the land bordering the INL site. Livestock produced on land surrounding the INL site includes sheep, beef cattle, dairy cattle, hogs, and poultry. The major crops produced on the surrounding lands include wheat, alfalfa, barley, potatoes, oats, corn, and sugar beets.

The INL Site is situated on a high-desert plain with relatively flat terrain. Facility elevations range from 1460 m (4790 ft) above mean sea level at TAN to 1532 m (5025 ft) above mean sea level at RWMC. The climate of INL is affected by the surrounding mountains and its location in the eastern Snake River Plain. Because of the northeast-southwest orientation of the eastern Snake River Plain between the surrounding mountains, the prevailing wind is southwesterly. The Centennial and Bitterroot mountain ranges to the north act as a barrier to movement of most of the cold winter air masses passing to the south out of Canada. Air masses entering INL are typically dry because heavy precipitation usually has occurred while crossing nearby mountain barriers. Therefore, annual rainfall is light, cloud cover is sparse, and the air is relatively dry.

Winds at INL typically blow from the southwest, moving up the eastern Snake River Plain. Winds from the northeast also are common, especially at night when movement of cool air back down the eastern Snake River Plain reverses the daytime flows. Continuous measurements are made from 30 weather stations in and around INL by NOAA. The meteorological stations simultaneously measure the spatial variation of several meteorological parameters, such as temperature, wind speed, and wind direction up to a height of 76 m (250 ft). Telemetered wind measurements, usually at 15 m (50 ft) above ground, also are collected at those stations. Meteorological data from the GRID 3 weather station located just north of INTEC was used for the modeling because it is the most centrally located station among the major facilities.

The natural vegetation of INL consists of a shrub overstory with a forb and grass understory. General plant communities include shadescale-steppe vegetation with sagebrush and grass-dominated communities. Sagebrush communities are the dominant vegetation occupying approximately 80% of INL.

The INL is located in UTM Zone 12 and UTM coordinates for all source locations are provided in Section 4. The air quality status of the INL Site is designated as unclassifiable as described on the DEQ webpage http://www.deq.idaho.gov/air-quality/monitoring/attainment-versus-nonattainment.aspx and in IDAPA 58.01.01.006.128.
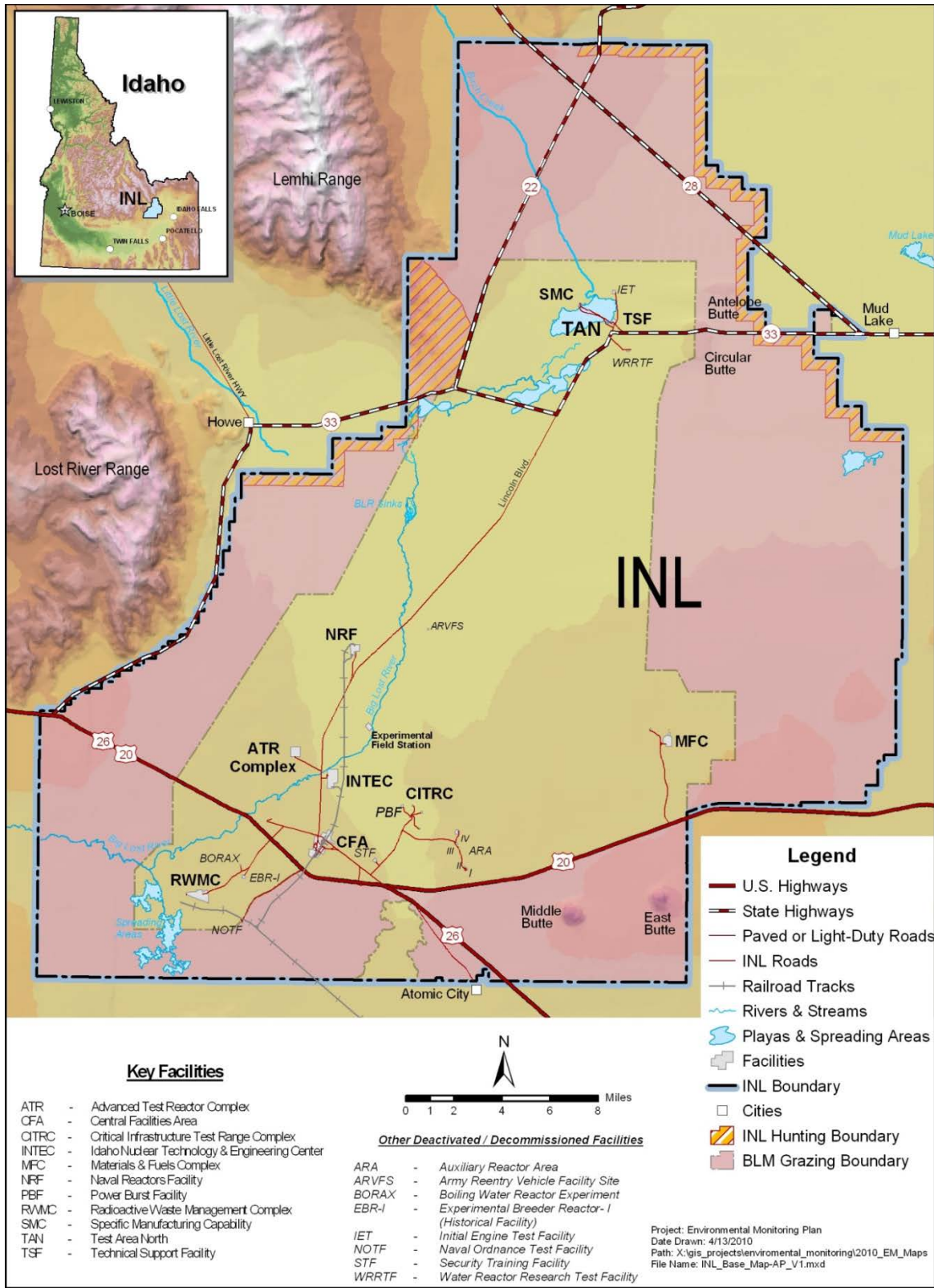
Figure 1. Idaho National Laboratory Site and major facilities.
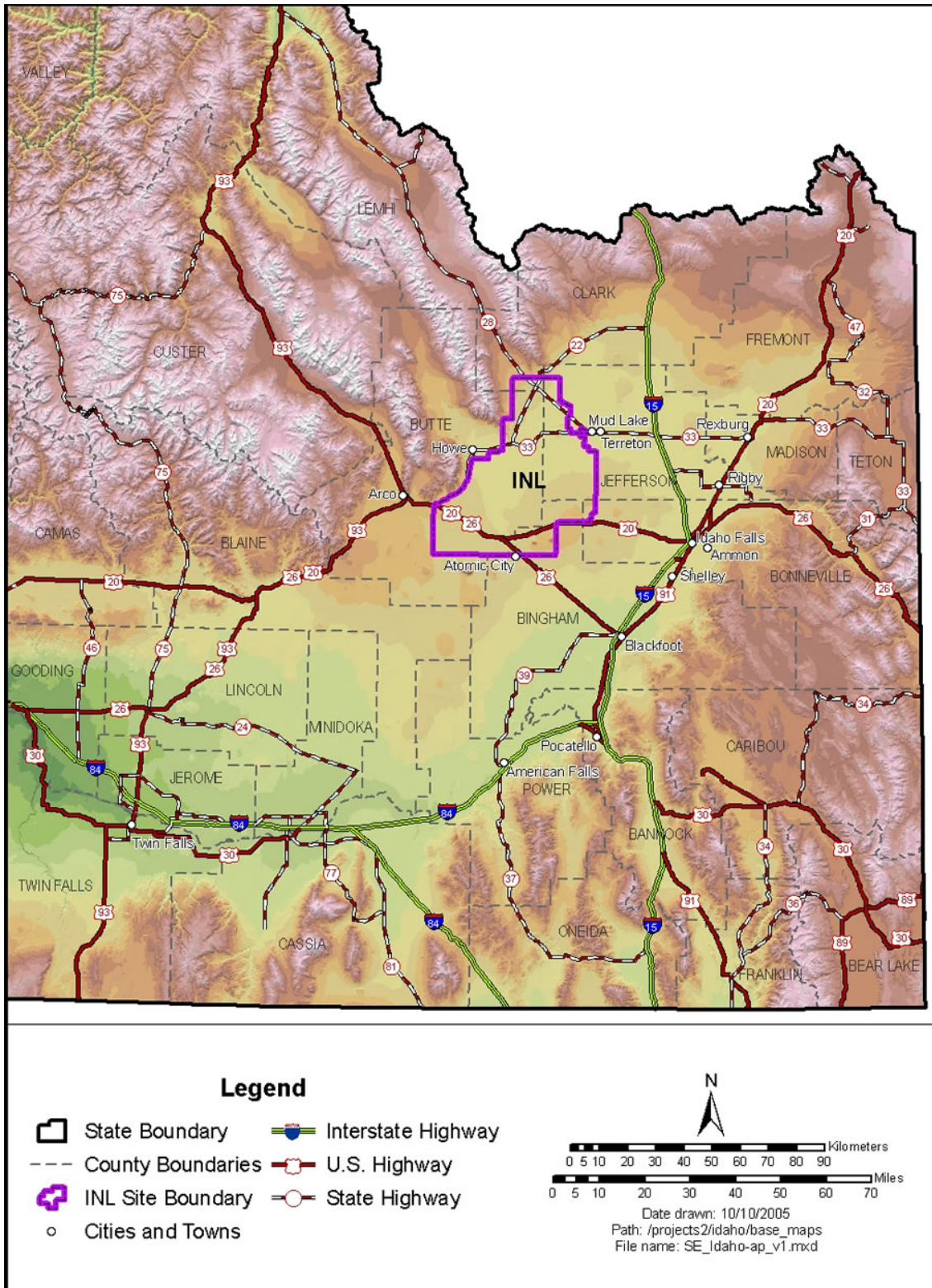
Figure 2. Populations centers near the INL Site.
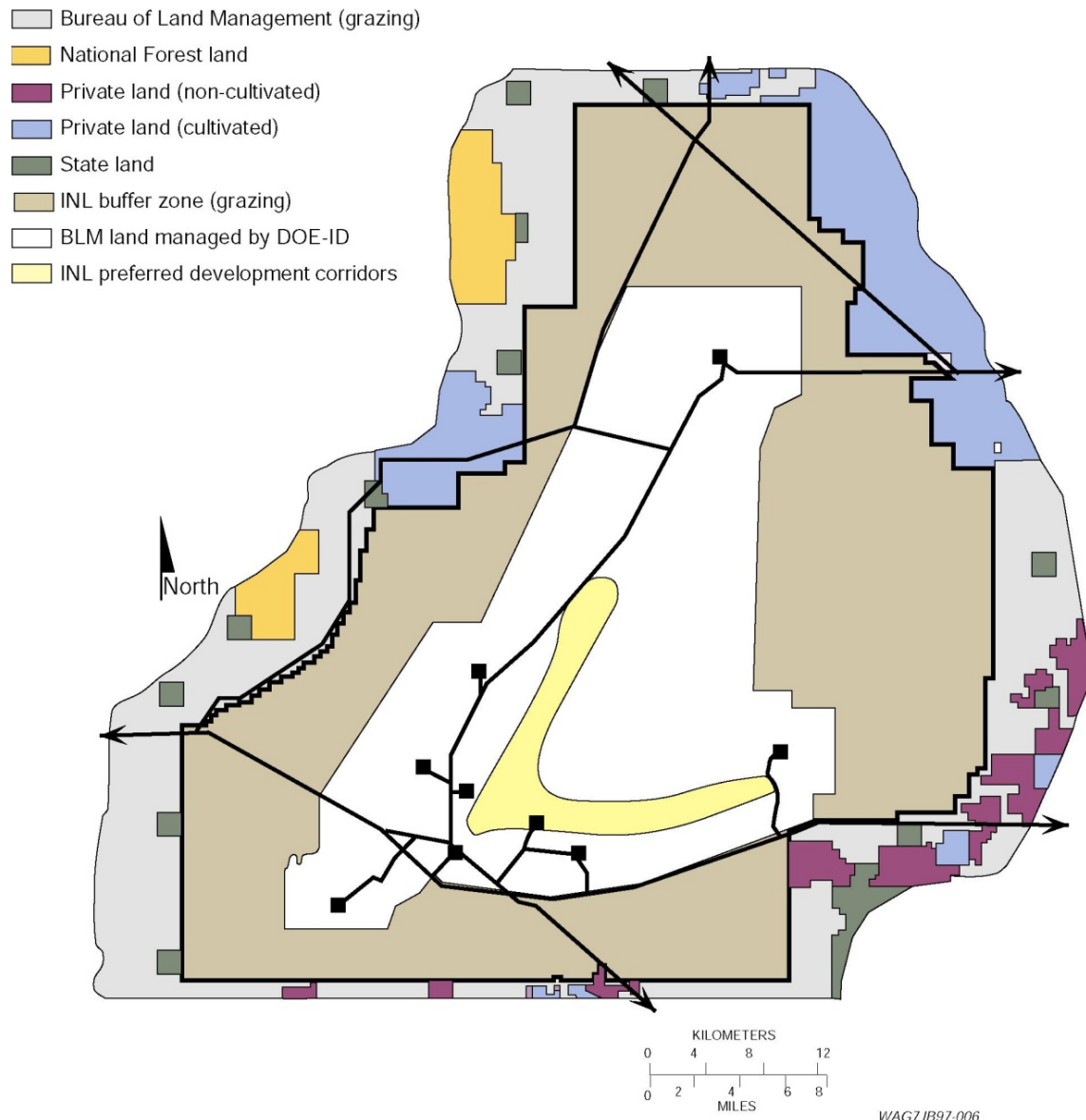
Figure 3. Land ownership distribution in the vicinity of the INL Site.

CHECKLIST

_____A map showing the geographical location of the facility is provided in this section or a reference is provided to another location in the permit application where a map is provided.

2.2   Existing Permits and Modeling Analyses Performed

The INL is currently regulated under a Title V, Tier I Operating Permit T1-2009.0148. Issuance of the Sitewide PTC would rescind this permit and incorporate all the permits listed in Table 2.

Table 2. Existing INL PTCs for incorporation into the Sitewide PTC.

Permit No.	Issue Date	Facility	Emissions Source/Condition
P-2008.0199	August 31, 2009	INTEC	Integrated Waste Treatment Unit
P-2011.0092	October 18, 2011	TAN	Specific Manufacturing Capability—Fuel Burning Equipment
P-2012.0053	September 18, 2012	INTEC	Four distillate oil-fired boilers (CPP-606)
023-00001	June 7, 2002	AMWTP	Advanced Mixed Waste Treatment Facility
011-00022	February 20, 2003	MFC	Utility Spray Paint Booth/All
P-000534	May 18, 2004	ATR Complex	Diesel-Powered Generators/All
P-2011.0109	July 31, 2013	AMWTP	Transuranic Storage Area
023-00001	September 9, 2002	ATR Complex	TRA Evaporation Pond
P-2008.0073	June 10, 2008	MFC	Fuel Conditioning Facility
P-2011.0077	April 8, 2011	MFC	Fuel Manufacturing Facility
P-2011.0113	January 31, 2012	MFC	Irradiated Materials Characterization Laboratory
P-2011.0124	December 30, 2011	INTEC	Idaho Nuclear Technology and Engineering Center
023-00001	December 17, 1997	INTEC	New Waste Calcining Facility/Decontamination Area
P-2013.0023	August 30, 2013	INTEC	Distillation of Sodium from Wastes at the Idaho Nuclear Technology and Engineering Center

CHECKLIST

_____Any existing air quality permits are listed and described in this section, and any associated air quality modeling analyses have been described and referenced, and submitted if appropriate.

3.   MODELING ANALYSES APPLICABILITY AND PROTOCOL

Section 3.1 identifies the applicable standards and Sections 3.2 and 3.3 provide the basis for pollutants that were included or excluded in the modeling analysis.

3.1   Applicable Standards

Criteria pollutant NAAQS are listed in Table 3, along with significant impact levels (SILs). However a SIL analysis was not performed and modeling for cumulative impacts was performed for all CAP emissions required to be modeled. In all cases the actual modeled design value reported is equal to or greater than the acceptable modeled design value.

TAPs identified in the emissions inventory are identified in Table 4. The table also includes screening Emission Levels (ELs) and 24-hour Acceptable Ambient Concentrations (AACs) or Acceptable Ambient Concentrations for Carcinogens (AACCs). Section 3.3 compares emission increases to ELs to identify pollutants to be modeled.

Table 3. Applicable regulatory limits for CAPs.

Pollutant	Averaging Period	Significant Impact Levels[a] ($\mu g/m^3$)[b]	Regulatory Limit[c] ($\mu g/m^3$)	Acceptable Modeled Design Value[d]	Actual Modeled Design Value Reported
PM$_{10}$[e]	24-hour	5.0	150[f]	Maximum 6th highest[g]	Maximum 1st highest[n]
PM$_{2.5}$[h]	24-hour	1.2	35[i]	Mean of maximum 8th highest[j]	Maximum 1st highest[n]
	Annual	0.3	12[k]	Mean of maximum 1st highest[l]	Maximum 1st highest[x]
Carbon monoxide (CO)	1-hour	2,000	40,000[m]	Maximum 2nd highest[n]	Maximum 1st highest[n]
	8-hour	500	10,000[m]	Maximum 2nd highest[n]	Maximum 1st highest[n]
Sulfur Dioxide (SO$_2$)	1-hour	3 ppb[o] (7.8 $\mu g/m^3$)	75 ppb[p] (196 $\mu g/m^3$)	Mean of maximum 4th highest[q]	Maximum 4th highest[n]
	3-hour	25	1,300[m]	Maximum 2nd highest[n]	Maximum 1st highest[n]
	24-hour	5	365[m]	Maximum 2nd highest[n]	Maximum 1st highest[n]
	Annual	1.0	80[r]	Maximum 1st highest[n]	Maximum 1st highest[x]
Nitrogen Dioxide (NO$_2$)	1-hour	4 ppb (7.5 $\mu g/m^3$)	100 ppb[s] (188 $\mu g/m^3$)	Mean of maximum 8th highest[t]	Maximum 8th highest NO$_X$
	Annual	1.0	100[r]	Maximum 1st highest[n]	Maximum 1st highest[x]
Lead (Pb)	3-month[u]	NA	0.15[r]	Maximum 1st highest[n]	Not modeled
	Quarterly	NA	1.5[r]	Maximum 1st highest[n]	Not modeled
Ozone (O$_3$)	8-hour	40 TPY VOC[v]	75 ppb[w]	Not typically modeled	Not modeled

[a.] Idaho Air Rules Section 006 (definition for significant contribution) or as incorporated by reference as per Idaho Air Rules Section 107.03.b.

[b.] Micrograms/cubic meter.

[c.] Incorporated into Idaho Air Rules by reference, as per Idaho Air Rules Section 107.

[d.] The maximum 1st highest modeled value is always used for the significant impact analysis unless indicated otherwise. Modeled design values are calculated for each ambient air receptor.

[e.] Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

[f.] Not to be exceeded more than once per year on average over 3 years.

[g.] Concentration at any modeled receptor when using five years of meteorological data.

[h.] Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

[i.] 3-year mean of the upper 98th percentile of the annual distribution of 24-hour concentrations.

[j.] 5-year mean of the 8th highest modeled 24-hour concentrations at the modeled receptor for each year of meteorological data modeled. For the SIL analysis, the 5-year mean of the 1st highest modeled 24-hour impacts at the modeled receptor for each year.

[k.] 3-year mean of annual concentration.

[l.] 5-year mean of annual averages at the modeled receptor.

[m.] Not to be exceeded more than once per year.

[n.] Concentration at any modeled receptor.

[o.] Interim SIL established by EPA policy memorandum.

[p.] 3-year mean of the upper 99th percentile of the annual distribution of maximum daily 1-hour concentrations.

[q.] 5-year mean of the 4th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of 1st highest modeled 1-hour impacts for each year is used.

[r.] Not to be exceeded in any calendar year.

[s.] 3-year mean of the upper 98th percentile of the annual distribution of maximum daily 1-hour concentrations.

[t.] 5-year mean of the 8th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of maximum modeled 1-hour impacts for each year is used.

[u.] 3-month rolling average.

[v.] An annual emissions rate of 40 ton/year of VOCs is considered significant for O$_3$.

[w.] Annual 4th highest daily maximum 8-hour concentration averaged over three years.

[x.] Only modeled receptors outside the INL boundary considered for annual averaging periods.

Table 4. TAP screening ELs and AACs/AACCs.

TAP	Non-Carcinogen or Carcinogen	Screening EL[a] (lb/hr)	AAC or AACC[b] ($\mu g/m^3$)
1,1,1-Trichloroethane	Non-Carcinogen	1.27E+02	9.55E+04
1,4-Dichlorobenzene	Non-Carcinogen	3.00E+01	2.25E+04
1,2-Dichloropropane	Non-Carcinogen	2.31E+01	1.74E+04
2-Butanone	Non-Carcinogen	3.93E+01	2.95E+04
2,2,4-Trimethyl pentane	Non-Carcinogen	2.33E+01	1.75E+04
Acrolein	Non-Carcinogen	1.70E−02	1.25E+01
Chlorobenzene	Non-Carcinogen	2.33E+01	1.75E+04
Copper	Non-Carcinogen	6.7E-02	5.0E+01
Cresols (m, p & o)	Non-Carcinogen	1.47E+00	1.10E+03
Cyanide	Non-Carcinogen	3.33E-01	2.50E+02
Ethyl Benzene	Non-Carcinogen	2.9E+01	2.18E+04
Manganese	Non-Carcinogen	6.70E−02	5.00E+01
Methanol	Non-Carcinogen	1.73E+01	1.30E+04
Methyl isobutyl ketone	Non-Carcinogen	1.37E+01	1.03E+04
Naphthalene	Non-Carcinogen	3.33E+00	2.50E+03
Nitrobenzene	Non-Carcinogen	3.33E-01	2.50E+02
Selenium	Non-Carcinogen	1.30E−02	1.00E+01
Styrene	Non-Carcinogen	6.67E+00	1.00E+03
Toluene	Non-Carcinogen	2.50E+01	1.88E+04
Xylene	Non-Carcinogen	2.90E+01	2.18E+04
Zinc	Non-Carcinogen	6.67E−01	5.00E+01
1,1,2,2-Tetrachloroethane	Carcinogen	1.10E-05	1.70E-02
1,1,2-Trichloroethane	Carcinogen	4.20E-04	6.20E-02
1,3-Butadiene	Carcinogen	2.40E-05	3.60E-03
1,3-Dichloropropene	Carcinogen	1.90E-07	2.90E-06
1,1-Dichloroethane	Carcinogen	2.50E-04	3.80E-02
1,1-Dichloroethylene	Carcinogen	1.3E-04	2.00E-02
1,2-Dichloroethane	Carcinogen	2.50E-04	3.80E-02
1,4 Dioxane	Carcinogen	4.80E-03	7.10E-01
Acetaldehyde	Carcinogen	3.00E-03	4.50E-01
Arsenic	Carcinogen	1.50E-06	2.30E-04
Benzene	Carcinogen	8.00E-04	1.20E-01
Beryllium	Carcinogen	2.80E-05	4.20E-03
Cadmium	Carcinogen	3.70E-06	5.60E-04
Carbon Tetrachloride	Carcinogen	4.40E-04	6.70E-02
Chloroform	Carcinogen	2.80E-04	4.30E-02
Chromium	Carcinogen	5.60E-07	8.30E-05
Ethylene Dibromide	Carcinogen	3.00E-05	4.50E-03
Formaldehyde	Carcinogen	5.10E-04	7.70E-02
Hexachlorobenzene	Carcinogen	1.30E-05	2.00E-03
Hexachloroethane	Carcinogen	1.70E-03	2.50E-01
Methylene Chloride	Carcinogen	1.60E-03	2.40E-01
Naphthalene	Carcinogen	9.10E-05	1.40E-02
Nickel	Carcinogen	2.70E-05	4.20E-03
Polycyclic Aromatic Hydrocarbons	Carcinogen	9.10E-05	1.40E-02
Polycyclic Organic Matter	Carcinogen	2.00E-06	3.00E-04
Tetrachloroethylene	Carcinogen	1.30E-02	2.10E+00
Trichloroethylene	Carcinogen	5.10E-04	7.70E-01
Vinyl Chloride	Carcinogen	9.40E-04	1.40E-01

a. ELs from Idaho Air Rules Section 585 and 586 in lbs/hr.

b. AAC or AACC from Idaho Air Rules Section 585 and 586. AACs converted from mg/m^3 in Section 585 to $\mu g/m^3$.

CHECKLIST

_____All TAPs identified in the emissions inventory for the project are listed in the TAPs EL and AAC/AACC Table in this section.

3.2   Criteria Pollutant Modeling Applicability

All CAPs regulated under Section 109 of the Clean Air Act were modeled with the exception of lead (Pb) and ozone which are not required to be modeled by DEQ. Section 4 contains emission rates used in modeling for each CAP which are based on the design operating capacity of each source. However, a discussion of baseline actual emissions (BAEs) for CAPs is presented here because some of the information is applicable to determining the emission rate for TAPs used in the screening analysis presented in Section 3.3. The information on CAP BAEs is also used to determine the emission increases up to FEC limits for each CAP presented in Section 4.1.2.2.

3.2.1   Baseline Actual Emissions for CAPs

BAEs from existing emission units for CAPs were calculated in accordance with the definition in IDAPA 58.01.01.007.02.b. This estimate is required by both IDAPA 58.01.01.177.01 for FECs and 58.01.01.202.01.a.i for PTCs.

The consecutive 24 month period of calendar years 2011 and 2012 was chosen for calculating emissions from operating boilers for all pollutants. Sulfur oxides are calculated using ultra low sulfur distillate oil containing 15 parts per million sulfur that meets the requirements of 40 CFR 80.510(b) for non-road diesel fuel. This fuel is used in both emergency stationary ICE and distillate fired boilers at INL.

Emissions from emergency stationary ICE operating at INL were calculated from annual fuel use determined from the engines' typical frequency and duration of operation during testing and maintenance.

The IWTU is scheduled to commence treatment of sodium-bearing waste and, as such, will become a source of emissions at INL for the duration of its operation. As discussed in the pre-permit application meeting with DEQ on January 26, 2015, INL included estimated IWTU PTE for regulated air pollutants based on the maximum attainable production rate. This estimate also included the increased emissions from INTEC boilers from increased process steam demand.

For sources subject to Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) operations, BAEs were estimated based on maximum throughput, PTC exemption levels, or actual emissions from the selected BAE averaging period when available. Hydrochloric acid from the Operable Unit 7-08, Vapor Vacuum Extraction with Treatment Units, was determined using data from calendar years 2013 and 2014.

The BAE calculation includes all significant sources at INL with the following exceptions:

1. Emissions data from boilers located in CFA-671 are not included. These boilers were shut down in November of 2014 and will no longer contribute to the INL baseline emissions.

2. Propane-fired water heaters and residential style propane-fired furnaces less than 1 MMBtu/hr used for heating individual office spaces are not included in this baseline.

3. Emissions from the non-emergency stationary ICE operating at the ATR Complex are omitted because the sources began operations as emergency stationary ICE on April 30, 2015, as part of a project to install an uninterruptable power supply at ATR. This action is taken to meet the requirements of the Voluntary Consent Order – Case No. E-2012.0012. This adjustment is made since the non-emergency stationary ICE operation will cease and will not contribute to INL baseline emissions as of that date. Two of these stationary ICE, 670-M-42 and 670-M-43, predate prevention of significant deterioration regulations.

There are no sources of regulated fugitive or secondary emissions at INL.

All emissions were calculated using emission and conversion factors from EPA AP 42, Fifth Edition, *Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources* (EPA 2009), unless otherwise noted.

Table 5 lists the sources included in INL's calculation of BAE. The list includes both sources regulated by the proposed permit and exempted and/or grandfathered sources that contribute significantly to BAEs that are not subject to PTC requirements.

Table 5. Sources considered for the BAE calculation.

Facility	Source Description
AMWTP	WMF-676-004A, 12.55 MMBtu/hr boiler (propane)
AMWTP	WMF-676-005B, 12.55 MMBtu/hr boiler (propane)
AMWTP	WMF-676-006C, 12.55 MMBtu/hr boiler (propane)
AMWTP	WMF-676-007, 2.0 MMBtu/hr boiler (propane)
AMWTP	TSA-RE, Mobile Equipment and Process Emissions[b]
AMWTP	Advanced Mixed Waste Treatment Facility, Process Emissions[b]
CFA	CFA-608, 1.5 MMBtu/hr boiler (diesel)
CFA	CFA-609-005, 2.1 MMBtu/hr boiler (diesel)
INL	Emergency Stationary ICE Testing and Maintenance[a]
INTEC	CPP-606, 36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-606, 36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-606, 36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-606, 36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-1696, Integrated Waste Treatment Unit[b]
INTEC	CPP-659, Repack[b]
INTEC	CPP-666, Repack and Sodium Distillation[b]
INTEC	CPP-708, INTEC Main Stack[b]
NRF	Boiler No. 1, 52.4 MMBtu/hr boiler (diesel)
NRF	Boiler No. 3 , 52.4 MMBtu/hr boiler (diesel)
NRF	Proposed New 26.4 MMBtu/hr boiler (diesel)
RWMC	OU 7-08, Vapor Vacuum Extraction[b]
RWMC	WMF-1617 Mobile Equipment[b]
RWMC	WMF-1621, Retrieval Operations[b]
SMC	TAN-679-067a, 25 MMBtu/hr boiler (diesel)
SMC	TAN-679-068, 25 MMBtu/hr boiler (diesel)

a. ICE sources are described in Section 4.1.2.
b. Treatment and/or remediation source

Table 6 summarizes the INL BAEs by source for CAPs. These rates are used to determine the emission increases up the FEC limit for INL (see Section 4.1.2.2). These emission rates are presented in Appendix C of the permit application (DOE-ID 2015) and calculated in the Excel spreadsheet "App C - Baseline Actual Emissions.xlsx" in the worksheet "INL Summary." The calculations are performed in multiple worksheets.

Table 6. INL baseline actual emissions (T/yr) for CAPs.

Emission Unit	SO$_2$	NO$_X$	CO	PM[a]-10/2.5 and Condensable
AMWTP Boilers	0.15	1.34	0.77	0.07
CFA Boilers	0.0	0.21	0.05	0.02
INTEC Boilers	0.07	6.24	1.56	0.72
INTEC Boilers (IWTU demand)[b]	0.06	6.00	1.5	0.69
NRF Boilers	0.05	4.58	1.14	0.53
SMC Boilers	0.02	1.74	0.43	0.20
AMWTP TSA-RE	0.09	1.39	0.30	0.10
IWTU - Treatment	10.15	32.86	0.61	0.44
WMF-1617	0.59	1.92	1.05	0.63
WMF-1621	1.05	7.1	3.95	0.28
CPP-666	0.05	0.0	0.02	0.0
INL Emergency Stationary ICE	0.22	6.83	1.67	0.31
INL Total	12.5	70.2	13.0	3.98

a. PM = particulate matter.

b. INTEC Boiler emission increase from process steam demand from IWTU operations.

CHECKLIST

_____Explanations/documentation why modeling was or was not performed for each criteria pollutant are provided in this section.

_____Emissions calculations that clearly show how the modeling applicability determination was performed are provided in this section.

3.3   TAP Modeling Applicability

Demonstration of preconstruction compliance with TAP standards is required by IDAPA 58.01.01.210, "Demonstration of Preconstruction Compliance with Toxic Standards," for new non-prevention of significant deterioration or modified minor sources. In accordance with IDAPA 58.01.01.007.06.c.iii, the contribution of treatment and remediation sources was not included in the net emission increase calculations.

In accordance with IDAPA 58.01.01.210.20, compliance demonstrations are not required to include TAPs that are regulated by an applicable New Source Performance Standard or National Emission Standard for Hazardous Air Pollutant. DEQ has determined that all TAPs from internal combustion engines are regulated by 40 CFR 60, Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines," (Subpart IIII); 40 CFR 60, Subpart JJJJ, "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines" (Subpart JJJJ); and 40 CFR 63 Subpart ZZZZ, "National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" (Subpart ZZZZ). Additionally, DEQ has determined that mercury, POM, arsenic, beryllium, cadmium, chromium, manganese, nickel, ethylene dioxide, PCBs, acetaldehyde, acrolein, dioxins, formaldehyde, and benzene emissions from boilers are regulated by 40 CFR 63 Subpart JJJJJJ, "National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources" (Subpart JJJJJJ).

For applicable non-carcinogenic TAPs, post-project emission rates were calculated and compared to screening ELs to determine whether or not they should be modeled. Emission rates were calculated using the design capacity fuel consumption rates for existing and proposed diesel boilers at the INL (Table 7) and the appropriate emission factors (Table 8) using one of the two formulas:

$$ER\left(\frac{lb}{hr}\right) = \frac{FR\left(\frac{gal}{hr}\right)EF\left(\frac{lb}{1000\ gal}\right)}{1000\left(\frac{gal}{1000\ gal}\right)}$$

$$ER\left(\frac{lb}{hr}\right) = \frac{FR\left(\frac{gal}{hr}\right)EF\left(\frac{lb}{10^{12}Btu}\right)HV\left(\frac{Btu}{gal}\right)}{10^{12}\left(\frac{Btu}{10^{12}Btu}\right)}$$

Where

ER = emission rate

FR = design rated fuel consumption rate

EF = emission factor

HV= heating value of fuel oil (140,000 Btu/gal)

The calculated post-project emission rates shown in Table 8 conservatively assume all boilers operate concurrently at the design capacity and they are less than the respective screening ELs from IDAPA 58.01.01.585 for all non-carcinogenic TAPs.

Table 7. Design capacity fuel consumption rates for diesel boilers.

Facility	Boiler	Rated Capacity (MMBtu/hr)	Design Capacity Fuel Consumption Rate (gal/hr)
CFA	CFA-608	1.5	10.7
CFA	CFA-609-005	2.1	15
INTEC	CPP-606-061	36.4	216
INTEC	CPP-606-062	36.4	216
INTEC	CPP-606-063	36.4	216
INTEC	CPP-606-064	36.4	216
NRF	Boiler No. 1	52.4	470
NRF	Boiler No. 3	52.4	470
NRF	Boiler No. 4 (Proposed)	26.4	209
SMC	TAN-679-067a	25	179.5
SMC	TAN-679-068	25	179.5
		Total	**2397.7**

Table 8. Non-carcinogenic TAP emission factors.

Non-Carcinogenic TAP	Emission Factor[a] (lb/1000 gal)	Emission Factor[b] (lb/10^12 Btu)	Post-Project 24-hour Average Emissions Rate[c] (lb/hr)	Non-Carcinogenic Screening Emission Level (lb/hr)	Emission Rate Exceeds Screening Level? (Yes/No)
1,1,1-Trichloroethane	2.36E-04	—	5.66E-04	1.27E+02	No
Copper	—	6	2.01E-03	6.70E-02	No
Ethyl Benzene	6.36E-05	—	1.52E-04	2.90E+01	No
Naphthalene	1.13E-03	—	2.71E-03	3.33E+00	No
Selenium	—	15	5.04E-03	1.30E-02	No
Toluene	6.20E-03	—	1.49E-02	2.50E+01	No
Xylene	1.09E-04	—	2.61E-04	2.90E+01	No
Zinc	—	4	1.34E-03	6.67E-01	No

a. AP-42: Table 1.3.9. Emission Factors for Speciated Organic Compounds From Fuel Oil Combustion: Oil Fired Boilers

b. AP-42: Table 1.3.10. Emission Factors for Trace Elements from Distillate Fuel Oil Combustion Sources: Oil Fired Boilers

c. Summed over all sources

For applicable carcinogenic TAPs, changes in average annual emission rates were calculated and compared to screening ELs to determine whether or not they should be modeled. In this case, naphthalene is the only carcinogenic TAP that was considered. The pre-project emission rate was calculated using fuel consumption rates based on permitted limits for sources with PTCs, and PTE limits for exempted sources (Table 9) using the following formula:

$$ER\left(\frac{lb}{hr}\right) = \frac{FR\left(\frac{gal}{hr}\right)EF\left(\frac{lb}{1000\ gal}\right)}{1000\left(\frac{gal}{1000\ gal}\right)}$$

Where

ER = emission rate

FR = design rated fuel consumption rate

EF = emission factor

The EF for naphthalene is 1.13E-03 lb/1000 gal from AP-42 (Table 1.3-9 Emission Factors for Speciated Organic Compounds from Fuel Oil Combustion: Oil Fired Boilers).

The post-project emission rate is based on the requested annual Sitewide FEC limit for NO_X of 95 T/yr. The fuel consumption rate was determined using the following formula:

$$FR\left(\frac{gal}{hr}\right) = \frac{FEC_{limit}\ 95\left(\frac{T}{yr}\right)}{EF_{NO_x}\left(\frac{lb}{1000\ gal}\right)}\ 1000\left(\frac{gal}{1000\ gal}\right)\left(\frac{2000\ lb}{T}\right)\left(\frac{yr}{8760\ hr}\right)$$

Using an emission factor for NO_X of 20 lb/1000 gal from AP-42 (Table 1.3-1 Criteria Pollutant Emission Factors for Liquified Petroleum Gas Combustion: External Combustion Sources, Boilers < 100 MMBtu/hr, Distillate Oil) the post project fuel consumption rate is 1084.5 gal/hr. This results in a post-project emission rate that is less than the pre-project emission rate as shown in Table 10 thus the calculated emission rate is less than the EL from IDAPA 58.01.01.586 for all carcinogenic TAPs.

Table 9. Permitted or design capacity fuel consumption rates for permitted diesel boilers.

Facility	Permitted or Design Capacity Fuel Consumption Rate (gal/hr)
INTEC[a]	864.0
SMC[b]	252.6
CFA[c]	25.7
NRF[c]	940.0
Total	**2082.3**

a. T1-2009.0148, INL Title V Operating Permit, 2/6/2013. Calculated from Table 5.1 fuel throughput limit of 20,736 gal/day.

b. T1-2009.0148, INLTitle V Operating Permit, 2/6/2013. Calculated from Table in Section 8.1.1 NO_X limit of 22.1 ton/yr.

c. INL Application for a Synthetic Minor Sitewide Air Quality Permit to Construct, Appendix A, Addendum to Form EU5.

Table 10. Carcinogenic TAPs screening summary.

Carcinogenic TAPs (sum of all emissions)	Pre-Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Post-Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Change in Annual Average Emissions Rates for Units at the Facility (lb/hr)	Carcinogenic Screening Emission Level (lb/hr)	Change Exceeds Screening Level? (Yes/No)
Napthalene	2.35E-03	1.23E-03	-1.13E-03	9.1E-05	No

Based on the results of the above comparisons no TAPs were modeled because the proposed emission rates or emission increases did not exceed screening ELs.

CHECKLIST

_____Explanation/documentation on why modeling was or was not performed for emissions of each TAP identified in the emissions inventory of the permit application are provided in this section.

3.4   Modeling Protocol

A modeling protocol was submitted to DEQ on February 4, 2015 (Sondrup and Verdoorn, 2015). Conditional DEQ protocol approval was provided to INL on April 16, 2015. The protocol approval letter contained six comments listing conditions/concerns with the protocol. These comments were provided to INL prior to the approval letter being issued and INL provided responses to the comments that were included in the approval letter. A copy of the approved protocol letter is provided in Appendix D of the permit application (DOE-ID 2015).

Project modeling and required impact analyses were generally conducted using data and methods described in the protocol and are consistent with the *State of Idaho Guideline for Performing Air Quality Impact Analyses* (DEQ 2013). Any deviations from the protocol to address DEQs comments or otherwise are described in this modeling report.

CHECKLIST

_____If a protocol was submitted to DEQ prior to performing the modeling analyses, the protocol and DEQ's conditional protocol approval notice is included in Attachment ___ of this Modeling Report.

_____Concerns identified by DEQ in the protocol approval notice have been addressed in the analyses performed and in this Modeling Report.

4. MODELED EMISSIONS SOURCES

This section presents the modeled emission rates and release parameters for all sources. All emission sources considered are stack sources and were modeled as point sources using actual stack locations and dimensions. Emission rates, stack flow rates (exit velocities) and stack exit temperatures were based on the design operating capacity (fuel consumption rate) of each source. FEC limits were modeled assuming the FEC component (growth and operational flexibility) for each pollutant is released from each facility one at a time. The FEC component emissions were assumed to be released from an existing boiler stack at each facility, or for facilities without a boiler stack, the emissions were assumed to be released from a generic, conservative stack at a location near an existing non-boiler source. FEC emission rates were calculated based on the requested PTE limit for NO_X adjusted for conservatism. All sources were assumed to operate continuously except for the emergency stationary ICE sources which were operated on a random testing schedule based on their testing frequency and duration. This schedule was determined by DEQ modeling staff and no restrictions were placed on the times or conditions underwhich they could be tested.

A significant impact level analysis was not performed. All CAPs were considered in the cumulative impact analysis and TAPs were not considered because they were screened out using screening ELs. Nevertheless the sections regarding SILs from the template were left in the report.

CHECKLIST
_____The modeling emissions inventory and the emissions inventory presented in other parts of the permit application are consistent, and if they are not identical numbers, it is clearly shown, with calculations submitted, how the modeled value was derived from the value provided in the emissions inventory.

4.1 Criteria Air Pollutants

4.1.1 Modeled Emissions Rates for Significant Impact Level Analyses

This section is omitted because a SIL analysis was not performed. All CAP emissions were modeled for cumulative impacts.

CHECKLIST
_____Calculation of modeled emissions are thoroughly documented in this section, and any unique handling of emissions in the model have been described.

4.1.2 Modeled Emissions Rates for Cumulative Impact Analyses

This section presents the BAE rates first followed by the FEC increase emission rates.

4.1.2.1 Design Capacity Emission Rates for CAP sources

Table 11 lists all existing and proposed sources of CAPs included in the modeling. These are the same sources listed in Table 6 except non-CAP emission sources (CPP-659, CPP-708, OU 7-08, and AMWTF process sources) are excluded, and the ICE sources are listed separately. Only ICE greater than 500 hp are listed and modeled per the modeling protocol (Sondrup and Verdoorn, 2015). Emission rates for these sources are presented in this section for boilers, followed by remediation sources, and ICE. Emission rates for FEC sources (not shown in Table 11) are presented in Section 4.1.2.2.

Table 11. CAP sources included in the modeling.

Facility	Source ID	Description
Boilers		
AMWTP	WMF-676-004A	12.55 MMBtu/hr boiler (propane)
AMWTP	WMF-676-005B	12.55 MMBtu/hr boiler (propane)
AMWTP	WMF-676-006C	12.55 MMBtu/hr boiler (propane)
AMWTP	WMF-676-007	2.0 MMBtu/hr boiler (propane)
CFA	CFA-608	1.5 MMBtu/hr boiler (diesel)
CFA	CFA-609-005	2.1 MMBtu/hr boiler (diesel)
INTEC	CPP-606-001	36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-606-002	36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-606-003	36.4 MMBtu/hr boiler (diesel)
INTEC	CPP-606-004	36.4 MMBtu/hr boiler (diesel)
NRF	Boiler No. 1	52.4 MMBtu/hr boiler (diesel)
NRF	Boiler No. 3	52.4 MMBtu/hr boiler (diesel)
NRF	Boiler No. 4 (Proposed)	26.4 MMBtu/hr boiler (diesel)
SMC	TAN-679-067a	25 MMBtu/hr boiler (diesel)
SMC	TAN-679-068	25 MMBtu/hr boiler (diesel)
Remediation Sources		
RWMC	WMF-1617	Mobile equipment
RWMC	WMF-1621	Mobile equipment, generator, compressor, heater
AMWTP	TSA-RE	Mobile equipment
INTEC	CPP-666	Sodium distillation and treatment process emissions
INTEC	CPP-1696	Integrated Waste Treatment Unit process emissions
Emergency Stationary ICE > 500 hp		
AMWTP	WMF-734	Caterpillar Model 3412, 745 hp
AMWTP	BGEN-812-001	Cummins/Onan Model QSX15-G9, 755 hp
AMWTP	BGEN-812-002	Cummins/Onan Model VTA-28-05, 900 hp
ATR Complex	619-10	Detroit Diesel-Allison Model 71237300, 558 hp
ATR Complex	670-M-42	Enterprise Model, DSQ-38, 2118 hp
ATR Complex	670-M-43	Enterprise, DSQ-38, 2118 hp
ATR Complex	674-M-6	Caterpillar Model 3516, 2132 hp
ATR Complex	786-M-1	Caterpillar Model 3516B TA, 2593 hp
INTEC	GEN-WCS-002	Caterpillar Model 3516 Quad Turbo, 2304 hp
INTEC	GEN-WCS-004	Caterpillar Model 3516 Quad Turbo, 2304 hp
INTEC	GEN-WCS-006	Caterpillar Model 3516 Quad Turbo, 2304 hp
MFC	ANL-785-017	Waukesha Model EM200, 525 hp
MFC	ANL-768-003	Waukesha Model VLRPD, 741 hp
NRF	686-016	Caterpillar Model 3512, 1,445 hp
NRF	686-017	Caterpillar Model 3512, 1,445 hp
NRF	686-018	Caterpillar Model 3512, 1,445 hp
NRF	686-019	Caterpillar Model 3512, 1,445 hp
SMC	TAN 675-010	Caterpillar Model 3408, 598 hp
SMC	TAN 679-012	Caterpillar Model 3412, 890 hp

Table 12 contains the CAP emission rates for boiler sources based on the rated design capacity fuel consumption rates found in Appendix A, Addendum to Form EU5 of the permit application (DOE-ID 2015). The emission rates are presented in Appendix C of the permit application (DOE-ID 2015) and calculated in the Excel spreadsheet "App C - Baseline Actual Emissions.xlsx" in the worksheet "Maximum Hourly Boiler Emissions." They were calculated using the formula:

$$ER\left(\frac{lb}{hr}\right) = \frac{FR\left(\frac{gal}{hr}\right)EF\left(\frac{lb}{1000\ gal}\right)}{1000\left(\frac{gal}{1000\ gal}\right)}$$

Table 13 contains the CAP emission rates for remediation sources based on the rated design capacity for each source. These are found in Appendix A, Addendum to Form EU5 of the permit application (DOE-ID 2015). The emission rates are presented in Appendix C of the permit application (DOE-ID 2015) and calculated in the Excel spreadsheet "App C - Baseline Actual Emissions.xlsx" in the worksheet "Max Hrly Remediation Emissions." The emissions for equipment in WMF-1617 and WMF-1621 were calculated using one of the following two formulae:

$$Equipment\ ER\left(\frac{lb}{hr}\right) = HP(hp)EF\left(\frac{lb}{hp - hr}\right)$$

$$Heater\ ER\left(\frac{lb}{hr}\right) = \frac{HR\left(\frac{MMBtu}{hr}\right)EF\left(\frac{lb}{1000\ gal}\right)10^6\left(\frac{Btu}{MMBtu}\right)}{HV\left(\frac{Btu}{gal}\right)1000\left(\frac{gal}{1000\ gal}\right)}$$

Where

ER = Emission rate

HP = Equipment hp rating

HR = Heater rating (3.879 MMBtu/hr)

EF = emission factor

HV= heating value of fuel oil (140,000 Btu/gal)

Expected emissions from waste treatment operations at CPP-1696, IWTU are based on a conservative waste feed rate of 3.5 gpm and emission factors from "Mass and Energy Balance for Sodium Bearing Waste IWTU – Modified to Support Emissions Permitting" (EDF-6495 2009). Emissions from sodium distillation and treatment at CPP-666 were converted to units of lb/hr from annual estimates in T/yr provided in "Air Permitting Applicability Determination (APAD) for Sodium Distillation and Treatment at CPP-666" (EDF-10422 2015).

Table 12. Emission rates for INL boiler sources.

Boiler Source	Rated Capacity	Design Capacity Fuel Consumption Rate[a]	SO$_2$ (lbs/hr)	NO$_X$ (lbs/hr)	CO (lbs/hr)	PM 10 + Condensable PM (lbs/hr)
			Emission Factor[b] (lb/1000gal)			
Propane	(MMBtu/hr)	(gal/hr)	1.5[f]	13	7.5	0.7
WMF-676-004A	12.55	138.7	2.08E-01	1.80E+00	1.04E+00	9.71E-02
WMF-676-005B	12.55	138.7	2.08E-01	1.80E+00	1.04E+00	9.71E-02
WMF-676-006C	12.55	138.7	2.08E-01	1.80E+00	1.04E+00	9.71E-02
WMF-676-007	2	22.1	3.32E-02	2.87E-01	1.66E-01	1.55E-02
			Emission Factor[c, d, e] (lb/1000gal)			
#2 Diesel	(MMBtu/hr)	(gal/hr)	0.213[g]	20	5	2.3
CFA-608	1.5	10.7	2.28E-03	2.14E-01	5.35E-02	2.46E-02
CFA-609	2.1	15	3.20E-03	3.00E-01	7.50E-02	3.45E-02
CPP-606-061	36.4	216	4.60E-02	4.32E+00	1.08E+00	4.97E-01
CPP-606-062	36.4	216	4.60E-02	4.32E+00	1.08E+00	4.97E-01
CPP-606-063	36.4	216	4.60E-02	4.32E+00	1.08E+00	4.97E-01
CPP-606-064	36.4	216	4.60E-02	4.32E+00	1.08E+00	4.97E-01
NRF Boiler No. 1	52.4	470	1.00E-01	9.40E+00	2.35E+00	1.08E+00
NRF Boiler No. 3	52.4	470	1.00E-01	9.40E+00	2.35E+00	1.08E+00
NRF Boiler No. 4 (Proposed)	26.4	209	4.45E-02	4.18E+00	1.05E+00	4.81E-01
TAN 679-067a	25	179.5	3.82E-02	3.59E+00	8.98E-01	4.13E-01
TAN 679-068	25	179.5	3.82E-02	3.59E+00	8.98E-01	4.13E-01

a. Idaho National Laboratory Application for a Synthetic Minor Sitewide Air Quality Permit to Construct, Appendix A, Addendum to Form EU5.

b. AP-42: Table 1.5-1 Criteria Pollutant Emission Factors for Liquified Petroleum Gas Combustion: External Combustion Sources – Propane

c. AP-42: Table 1.3-1 Criteria Pollutant Emission Factors for Liquified Petroleum Gas Combustion: External Combustion Sources, Boilers < 100 MMBtu/hr, Distillate oil.

d. AP-42: Sum of Table 1.3-2 Condensable Particulate Matter Emission Factors for Oil Combustion (1.3 lb/1000 gal for No. 2 oil fired) and Table 1.3-6 Cumulative Particle Size Distribution and Size-Specific Emission Factors for Uncontrolled Industrial Boiler firing Distillate Oil (0.25 lb/1000 gal for PM2.5) for a total of 1.55 lb/1000 gal.

e. AP-42: Sum of Table 1.3-2 Condensable Particulate Matter Emission Factors for Oil Combustion.

f. SO$_2$ emission factors for propane boilers based on 15 gr/100 scf, Gas Processors Association Engineering Data Book (Ninth Edition, 1972), Figure 15-50 (GPA Liquefied Petroleum Gas Specifications, rev. 1979).

g. SO$_2$ emission factor for diesel boilers based on fuel oil sulfur content of 15 ppm.

Table 13. Emission rates for INL remediation sources.

Equipment	Rating		SO$_2$	NO$_X$	CO	PM-10
		WMF-1617				
Mobile (Tier I)	330 hp	Emission Factor[a,b] (lbs/hp-hr)	2.05E-03	1.52E-02	6.68E-03	2.20E-03
		Emissions (lb/hr)	6.77E-01	5.02E+00	2.20E+00	7.26E-01
Mobile (Tier II)	230 hp	Emission Factor[a,b] (lbs/hp-hr)	2.05E-03	1.09E-02	8.27E-03	2.20E-03
		Emissions (lb/hr)	4.72E-01	2.51E+00	1.90E+00	5.06E-01
		Facility Emission Total (lb/hr)	**1.15E+00**	**7.52E+00**	**4.11E+00**	**1.23E+00**
		WMF-1621				
Compressor	17 hp	Emission Factor[a,b] (lbs/hp-hr)	2.05E-03	1.24E-02	1.09E-02	1.32E-03
		Emissions (lb/hr)	3.49E-02	2.11E-01	1.85E-01	2.24E-02
Generator	157 hp	Emission Factor[a,b] (lbs/hp-hr)	2.05E-03	6.61E-03	8.27E-03	4.96E-04
		Emissions (lb/hr)	3.22E-01	1.04E+00	1.30E+00	7.79E-02
Mobile (Tier I)	330 hp	Emission Factor[a,c] (lbs/hp-hr)	2.05E-03	1.52E-02	6.68E-03	2.20E-03
		Emissions (lb/hr)	6.77E-01	5.02E+00	2.20E+00	7.26E-01
Mobile (Tier II)	230 hp	Emission Factor[a,c] (lbs/hp-hr)	2.05E-03	1.09E-02	8.27E-03	2.20E-03
		Emissions (lb/hr)	4.72E-01	2.51E+00	1.90E+00	5.06E-01
Space Heater	3.879 MMBtu/hr	Emission Factor[c] (lbs/1000 gal)	1.50E+00	1.30E+00	7.50E+00	2.00E-01
		Emissions (lb/hr)	4.16E-02	3.60E-02	2.08E-01	5.54E-03
		Facility Emission Total (lb/hr)	**1.55E+00**	**8.81E+00**	**5.80E+00**	**1.34E+00**
		TSA-RE				
Mobile	111 hp	Emission Factor[a] (lbs/hp-hr)	2.05E-03	3.10E-02	6.68E-03	2.20E-03
		Emissions (lb/hr)	**2.28E-01**	**3.44E+00**	**7.41E-01**	**2.44E-01**
		CPP-1696, IWTU				
		Emission Factor (lb/gal of waste processed)	1.82E-02	5.90E-02	1.10E-03	7.83E-04
		Emissions (lb/hr)	**3.83E+00**	**1.24E+01**	**2.30E-01**	**1.64E-01**
		CPP-666, Sodium Distillation and Repack				
		Emissions (lb/hr)	**1.20E-02**	**3.42E-07**	**3.84E-03**	**NA**

a. AP-42: Table 3.3-1 Emission Factors for Uncontrolled Gasoline and Diesel Engines: Gasoline And Diesel Industrial Engines, Distillate oil fired
b. 40 CFR 89.112, "Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines," Paragraph 112(a), Table 1.
c. Emission factors obtained from AP-42, Chapter 1, "External Combustion Sources," Section 1.5 "Liquefied Petroleum Gas Combustion (Final Section, July 2008)," Table 1.5.-1 (EPA 2009)

Table 14 contains the CAP emission rates for emergency stationary ICE sources greater than 500 hp, based on the maximum hourly fuel consumption rates. These fuel consumption rates are found in Appendix A, Addendum to Form EU1 of the permit application (DOE-ID 2015). The emission rates are presented in Appendix C of the permit application (DOE-ID 2015) and calculated in the Excel spreadsheet "App C - Baseline Actual Emissions.xlsx" in the worksheet "Hourly Engine Emissions >500 hp." ICE emissions were calculated using the formula:

$$ER\left(\frac{lb}{hr}\right) = FR\left(\frac{gal}{hr}\right)HV\left(\frac{Btu}{gal}\right)EF\left(\frac{lb}{MMBtu}\right)\left(\frac{MMBtu}{10^6 Btu}\right)$$

Where

ER = emission rate

FR = maximum fuel rate

HV = heating value of fuel oil (140,000 Btu/gal)

EF = emission factor

Table 14. Emission rates for INL ICE sources greater than 500 hp.

Source ID	Testing Frequency	Testing Duration (hrs)	Maximum Fuel Rate (gal/hr)	SO_2 (lbs/hr)	NO_X (lbs/hr)	CO (lbs/hr)	PM[a] (lbs/hr)
Emission Factors for ICE ≤ 600 hp (lb/MMBtu)				0.29	4.41	0.95	0.31
ANL-785-017	Quarterly	2.5	28[e]	1.14E+00	1.73E+01	3.72E+00	1.22E+00
TAN 675-010	Monthly	1	15.6	6.33E-01	9.63E+00	2.07E+00	6.77E-01
619-10	Weekly	0.5[c]	26	1.06E+00	1.61E+01	3.46E+00	1.13E+00
	Annually	2	26				
Emission Factors for ICE > 600 hp (lb/MMBtu)				1.52E-03	3.2	0.85	6.97E-02
WMF-734	Monthly	0.25[b]	39.4	8.36E-03	1.77E+01	4.69E+00	3.84E-01
BGEN-812-001	Monthly	0.25[b]	27.1	5.75E-03	1.21E+01	3.22E+00	2.64E-01
BGEN-812-002	Monthly	0.25[b]	44.2	9.37E-03	1.98E+01	5.26E+00	4.31E-01
670-M-42	Monthly	1	44[d]	9.33E-03	1.97E+01	5.24E+00	4.29E-01
	Quarterly	3	44[d]				
670-M-43	Monthly	1	44[d]	9.33E-03	1.97E+01	5.24E+00	4.29E-01
	Quarterly	3	44[d]				
674-M-6	Monthly	1	44[d]	9.33E-03	1.97E+01	5.24E+00	4.29E-01
	Quarterly	3	44[d]				
786-M-1	Quarterly	8	123.1	2.61E-02	5.51E+01	1.46E+01	1.20E+00
GEN-WCS-002	Monthly	1	119.2	2.53E-02	5.34E+01	1.42E+01	1.16E+00
GEN-WCS-004	Monthly	1	119.2	2.53E-02	5.34E+01	1.42E+01	1.16E+00
GEN-WCS-006	Monthly	1	119.2	2.53E-02	5.34E+01	1.42E+01	1.16E+00
ANL-768-003	Quarterly	3.34	32[e]	6.79E-03	1.43E+01	3.81E+00	3.12E-01
686-016	Monthly	1	69.7	1.48E-02	3.12E+01	8.29E+00	6.80E-01
686-017	Monthly	1	69.7	1.48E-02	3.12E+01	8.29E+00	6.80E-01
686-018	Monthly	1	69.7	1.48E-02	3.12E+01	8.29E+00	6.80E-01
686-019	Monthly	1	69.7	1.48E-02	3.12E+01	8.29E+00	6.80E-01
TAN 679-012	Monthly	1	20.4	4.33E-03	9.14E+00	2.43E+00	1.99E-01

a. PM-10, PM-2.5 and condensable PM
b. Tested weekly for 15 minutes. Testing assumed to be monthly for 1 hour for modeling.
c. Testing duration assumed to be 1 hour for modeling.
d. Acutal fuel rate. Units do not have loads connected to them that are capable of using the maximum design fuel rate.
e. Value is estimated

4.1.2.2 Facility Emissions Cap Emission Rates for CAPs

For CAPs, INL is requesting growth and operational flexibility components as defined in IDAPA 58.01.01.176.03.e that will limit its PTE (i.e., allowable actual emissions) to less than 95 T/yr NO_X. The requested PTE limit for NO_X (95 T/yr) results in a net increase of 1.35x over the 70.2 T/yr BAE for NO_X presented in Table 6. The requested PTE for all other CAPs presented in Table 15 were determined by multiplying the BAE from Table 6 by the factor 1.35. The amounts assigned to the Operational Flexibility and Growth components were somewhat arbitrary, but it is assumed that the majority of increase will be attributable to growth.

To be conservative, modeling was performed by assuming the requested PTE limit was 100 T/yr NO_X and the PTEs for other CAPs were adjusted by the same ratio. This increase of 1.42 (=100/70.2) was multiplied by the BAE values to obtain the modeled FEC emission rate for CAPs. The total increase was released from a single point source at each major facility one at a time in separate model runs. Table 15 shows the requested and modeled emission rate increases. The modeled FEC emissions are shown in units of T/yr, lb/hr and g/s assuming continuous operation. Units of g/s were used in the model input files.

Table 15. Requested and modeled FEC component emission rates

Emissions Component	SO_2	NO_X	CO	PM
Sitewide BAE values (T/yr)	12.5	70.2	13.1	4.0
- Operational Flexibility component (T/yr)	1.7	9.8	1.8	0.7
- Growth component (T/yr)	2.7	15.0	2.8	0.9
Requested FEC/PTE limit based on 95 T/yr NO_X (T/yr)	16.9	95.0	17.6	5.6
Modeled FEC/PTE limit based on 100 T/yr NO_X (T/yr)	17.8	100.0	18.6	5.7
Modeled emission rate increase assigned to each facility (T/yr)[a]	5.3	29.8	5.6	1.7
Modeled emission rate increase assigned to each facility (lb/hr)	1.2	6.8	1.3	0.4
Modeled emission rate increase assigned to each facility (g/s)	0.153	0.858	0.160	0.049

a. Difference between modeled FEC/PTE limits (based on 100 T/yr NO_X) and Sitewide BAE values.

4.1.2.3 Modeled Emission Rates for all CAP Sources

Table 16 lists all the modeled CAP sources and their respective emission rates in lb/hr and g/s. Emission rates in g/s are presented because those units are used in the model input files. Since AERMOD limits source names to 8 characters and no dashes, the AERMOD SourceID is also listed for convenience. As explained previously, boiler and remediation sources are assumed to run continuously, FEC sources are assumed to run continuously but emissions are only released from one facility at a time. This is done by making separate computer runs for each facility. Emissions from ICE sources are released according to a random run schedule that is consistent with the testing frequency and durations listed in Table 14.

Table 16. Emission rates for modeled INL CAP sources.

Source Name	AERMOD SourceID	SO_2 (lbs/hr)	NO_X (lbs/hr)	CO (lbs/hr)	PM (lbs/hr)	SO_2 (g/s)	NO_X (g/s)	CO (g/s)	PM (g/s)
WMF-676-004A	AMWBOIA	2.08E-01	1.80E+00	1.04E+00	9.71E-02	2.62E-02	2.27E-01	1.31E-01	1.22E-02
WMF-676-005B	AMWBOIB	2.08E-01	1.80E+00	1.04E+00	9.71E-02	2.62E-02	2.27E-01	1.31E-01	1.22E-02
WMF-676-006C	AMWBOIC	2.08E-01	1.80E+00	1.04E+00	9.71E-02	2.62E-02	2.27E-01	1.31E-01	1.22E-02
WMF-676-007	AMWBOI2	3.32E-02	2.87E-01	1.66E-01	1.55E-02	4.18E-03	3.62E-02	2.09E-02	1.95E-03
TSA-RE	AMWTSARE	2.28E-01	3.44E+00	7.41E-01	2.44E-01	2.87E-02	4.34E-01	9.34E-02	3.08E-02
CFA-608	CFBOI608	2.28E-03	2.14E-01	5.35E-02	2.46E-02	2.87E-04	2.70E-02	6.74E-03	3.10E-03
CFA-609-005	CFBOI609	3.20E-03	3.00E-01	7.50E-02	3.45E-02	4.03E-04	3.78E-02	9.45E-03	4.35E-03
CPP-606-001	INTBOI1	4.60E-02	4.32E+00	1.08E+00	4.97E-01	5.80E-03	5.44E-01	1.36E-01	6.26E-02
CPP-606-002	INTBOI2	4.60E-02	4.32E+00	1.08E+00	4.97E-01	5.80E-03	5.44E-01	1.36E-01	6.26E-02

Table 16. (continued).

Source Name	AERMOD SourceID	SO_2 (lbs/hr)	NO_X (lbs/hr)	CO (lbs/hr)	PM (lbs/hr)	SO_2 (g/s)	NO_X (g/s)	CO (g/s)	PM (g/s)
CPP-606-003	INTBOI3	4.60E-02	4.32E+00	1.08E+00	4.97E-01	5.80E-03	5.44E-01	1.36E-01	6.26E-02
CPP-606-004	INTBOI4	4.60E-02	4.32E+00	1.08E+00	4.97E-01	5.80E-03	5.44E-01	1.36E-01	6.26E-02
CPP-1696 IWTU	IWTUTMT	3.83E+00	1.24E+01	2.30E-01	1.64E-01	4.82E-01	1.56E+00	2.90E-02	2.07E-02
CPP-666	CPP666	1.20E-02	3.42E-07	3.84E-03	0.00E+00	1.51E-03	4.32E-08	4.83E-04	0.00E+00
Boiler No. 1	NRFBOI1	1.00E-01	9.40E+00	2.35E+00	1.08E+00	1.26E-02	1.18E+00	2.96E-01	1.36E-01
Boiler No. 3	NRFBOI3	1.00E-01	9.40E+00	2.35E+00	1.08E+00	1.26E-02	1.18E+00	2.96E-01	1.36E-01
Proposed Boiler	NRFBOIP	4.45E-02	4.18E+00	1.05E+00	4.81E-01	5.61E-03	5.27E-01	1.32E-01	6.06E-02
WMF-1617	WMF1617	1.15E+00	7.52E+00	4.11E+00	1.23E+00	1.45E-01	9.48E-01	5.17E-01	1.55E-01
WMF-1621	WMF1621	1.55E+00	8.81E+00	5.80E+00	1.34E+00	1.95E-01	1.11E+00	7.31E-01	1.69E-01
TAN-679-067a	SMCBOI67	3.82E-02	3.59E+00	8.98E-01	4.13E-01	4.82E-03	4.52E-01	1.13E-01	5.20E-02
TAN-679-068	SMCBOI68	3.82E-02	3.59E+00	8.98E-01	4.13E-01	4.82E-03	4.52E-01	1.13E-01	5.20E-02
AMWTP FEC Src	AMWFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
ATR FEC Src	ATRFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
CFA FEC	CFAFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
INTEC FEC Src	INTFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
MFC FEC Src	MFCFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
NRF FEC Src	NRFFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
SMC FEC Src	SMCFEC	1.21E+00	6.81E+00	1.27E+00	3.86E-01	1.53E-01	8.58E-01	1.60E-01	4.87E-02
WMF-734	WMF734	8.36E-03	1.77E+01	4.69E+00	3.84E-01	1.05E-03	2.22E+00	5.91E-01	4.84E-02
BGEN-812-001	812001	5.75E-03	1.21E+01	3.22E+00	2.64E-01	7.24E-04	1.53E+00	4.06E-01	3.33E-02
BGEN-812-002	812002	9.37E-03	1.98E+01	5.26E+00	4.31E-01	1.18E-03	2.50E+00	6.63E-01	5.43E-02
619-10	61910	1.06E+00	1.61E+01	3.46E+00	1.13E+00	1.33E-01	2.02E+00	4.36E-01	1.42E-01
670-M-42	670M42	9.33E-03	1.97E+01	5.24E+00	4.29E-01	1.18E-03	2.48E+00	6.60E-01	5.41E-02
670-M-43	670M43	9.33E-03	1.97E+01	5.24E+00	4.29E-01	1.18E-03	2.48E+00	6.60E-01	5.41E-02
674-M-6	674M6	9.33E-03	1.97E+01	5.24E+00	4.29E-01	1.18E-03	2.48E+00	6.60E-01	5.41E-02
786-M-1	786M1	2.61E-02	5.51E+01	1.46E+01	1.20E+00	3.29E-03	6.95E+00	1.85E+00	1.51E-01
GEN-WCS-002	WCS002	2.53E-02	5.34E+01	1.42E+01	1.16E+00	3.19E-03	6.73E+00	1.79E+00	1.47E-01
GEN-WCS-004	WCS004	2.53E-02	5.34E+01	1.42E+01	1.16E+00	3.19E-03	6.73E+00	1.79E+00	1.47E-01
GEN-WCS-006	WCS006	2.53E-02	5.34E+01	1.42E+01	1.16E+00	3.19E-03	6.73E+00	1.79E+00	1.47E-01
ANL-785-017	785017	1.14E+00	1.73E+01	3.72E+00	1.22E+00	1.43E-01	2.18E+00	4.69E-01	1.53E-01
ANL-768-003	768003	6.79E-03	1.43E+01	3.81E+00	3.12E-01	8.55E-04	1.81E+00	4.80E-01	3.93E-02
686-016	686016	1.48E-02	3.12E+01	8.29E+00	6.80E-01	1.86E-03	3.93E+00	1.05E+00	8.57E-02
686-017	686017	1.48E-02	3.12E+01	8.29E+00	6.80E-01	1.86E-03	3.93E+00	1.05E+00	8.57E-02
686-018	686018	1.48E-02	3.12E+01	8.29E+00	6.80E-01	1.86E-03	3.93E+00	1.05E+00	8.57E-02
686-019	686019	1.48E-02	3.12E+01	8.29E+00	6.80E-01	1.86E-03	3.93E+00	1.05E+00	8.57E-02
TAN 675-010	675010	6.33E-01	9.63E+00	2.07E+00	6.77E-01	7.98E-02	1.21E+00	2.61E-01	8.53E-02
TAN 679-012	679012	4.33E-03	9.14E+00	2.43E+00	1.99E-01	5.45E-04	1.15E+00	3.06E-01	2.51E-02

CHECKLIST

_____ Emissions rates in (g/s) in Table 16 are identical to those in the model input files for the cumulative NAAQS impact analyses.

_____ Calculation of modeled emissions are thoroughly documented in this section, and any unique handling of emissions in the model have been described.

4.1.3   NO$_2$/NO$_X$ Ratio for NO$_X$ Chemistry Modeling

NO$_X$ chemistry was not considered in the modeling. The NO$_2$ concentrations reported are the NO$_X$ concentrations based on NO$_X$ emissions and assuming 100% conversion to NO$_2$ (i.e., no credit taken for reduction or conversion to NO$_2$).

4.1.4   Special Methods for Modeling Criterial Pollutant Emissions.

For modeling, all CAP sources were assumed to operate continuously except for emergency stationary ICE which were operated on a random schedule based on their testing frequency and duration. External files containing the run schedule and emission rates for each CAP were generated by DEQ modeling staff and provided in a zip file (hrly_emits_tojeff.inl.zip). No restrictions were placed on the times or conditions underwhich the ICE could be tested. Emission rates that had changed since the time the files were provided by DEQ were replaced in the external files.

For 1-hr NO$_X$ modeling, emergency stationary ICE sources were not included according to guidance in *State of Idaho Guideline for Performing Air Quality Impact Analyses* (DEQ 2013). This was done by setting the emission rates to zero and making separate computer runs.

4.2   Toxic Air Pollutants

TAPs were not modeled based on the evaluation presented in Section 3.3 that determined uncontrolled emissions for regulated TAPS were less than the ELs in IDAPA 58.01.01.585 and less than the EL increments in IDAPA 58.01.01.586. Therefore, no compliance demonstration is required.

4.3   Emissions Release Parameters

Table 17 contains the location (coordinates) and release parameters for all sources modeled. Since the protocol was approved, stack information and coordinates for some sources has changed. In addition, none of the sources are combined as described in the protocol. All of the sources are stacks and modeled as individual point sources.

The FEC component emissions were assumed to be released from an existing boiler stack at each facility. For facilities without a boiler stack, the emissions were assumed to be released from a generic, conservative stack at a location near an existing non-boiler source. For the FEC sources listed in Table 17, they were assigned the same location and parameters as an existing boiler at facitlities where there are boilers (AMWTP, CFA, INTEC, NRF and SMC). For facilties where there is not a boiler, generic conservative stack parameters were assigned based on an evaluation of actual stack parameters. The source location was assigned near a non-boiler source so existing building wake effect files could be used. FEC releases were assumed to be from a stack since any future emission sources constructed at the INL are likely to be a boiler or a process unit like the IWTU and would certainly require a stack of some kind.

Table 18 lists the minimum, maximum and average stack parameters included in the baseline emissions for the 46 stack sources included in the modeling. The last row contains the proposed parameters for modeling the FEC component for facilities where it was not assigned to an existing boiler source. The proposed stack height of 5 m is less than one-half the average stack height of all stacks considered. The proposed exit velocity is 5 times less than the average velocity, and the assumed release temperature of 366 K (200 F) is nearly one-half the average exit temperature and relatively cool for any type of combustion source.

Table 17. Modeled source locations and release parameters.

AERMOD SourceID	UTM Easting (m)	UTM Northing (m)	Source Elevation (m)	Stack Height[a] (m)	Stack Exit Temperature[a] (K)	Stack Exit Velocity[a] (m/sec)	Stack Diameter[a] (m)	Stack Orientation (H/V)	Raincap (Y/N)
AMWBOIA	335280	4817969	1530	15.40	450	9.39	0.56	V	N
AMWBOIB	335280	4817969	1530	15.40	450	9.39	0.56	V	N
AMWBOIC	335280	4817969	1530	15.40	450	9.39	0.56	V	N
AMWBOI2	335268	4817975	1530	11.20	491	4.87[b]	0.36	V	Y
AMWTSARE	335076	4818097	1530	18.30	294	11.7	1.5	V	N
CFBOI608	342456	4821112	1506	10.52	436	6.94[b]	0.305	V	Y
CFBOI609	342471	4821114	1506	7.90	436	6.94[b]	0.254	V	Y
INTBOI1	343727	4826295	1499	15.40	464	23.1	0.62	V	N
INTBOI2	343737	4826295	1499	15.40	464	23.1	0.62	V	N
INTBOI3	343748	4826295	1499	15.40	464	23.1	0.62	V	N
INTBOI4	343756	4826295	1499	15.40	464	23.1	0.62	V	N
IWTUTMT	344111	4826077	1498	36.60	398	18	1.52	V	N
CPP666	343721	4826050	1499	48.80	297	10.8	1.65	V	N
NRFBOI1	345440	4834677	1479	9.14	533	8.58	1.07	V	N
NRFBOI3	345440	4834688	1479	9.14	533	8.58	1.07	V	N
NRFBOIP	345427	4834681	1479	6.81	509	20[b]	0.61	V	Y
WMF1617	335042	4818501	1526	7.62	298	17.7	1.21	V	N
WMF1621	334341	4818445	1531	8.38	298	15.5[b]	0.76[c]	H	N
SMCBOI67	360896	4857581	1460	16.20	422	8.93[b]	0.61	V	Y
SMCBOI68	360894	4857577	1460	16.20	422	8.93[b]	0.61	V	Y
AMWFEC	335280	4817969	1530	15.40	450	9.39	0.56	V	N
ATRFEC	341579	4828097	1501	5.00	366	5	0.305	V	N
CFAFEC	342456	4821112	1506	10.52	436	6.94[b]	0.305	V	Y
INTFEC	343727	4826295	1499	15.40	464	23.1	0.62	V	N
MFCFEC	366235	4828352	1562	5.00	366	5	0.305	V	N
NRFFEC	345440	4834677	1479	9.14	533	8.58	1.07	V	N
SMCFEC	360894	4857577	1460	16.20	422	8.93[b]	0.61	V	Y
WMF734	335209	4817972	1530	3.51	877	62	0.203	V	Flapper
812001	335300	4817993	1530	3.66	739	47.6	0.19	V	Flapper
812002	335301	4817964	1530	3.58	775	1.50	2.01	V	N
61910	341600	4828095	1501	6.40	716	61.7	0.19	V	Flapper
670M42	341324	4828032	1502	9.14	647	25.3	0.439	V	N
670M43	341319	4828032	1502	9.14	647	25.3	0.439	V	N
674M6	341321	4828039	1502	3.35	763	68.4[b]	0.34[c]	H	N
786M1	341683	4828099	1501	4.11	704	1.24	2.63	V	N
WCS002	343985	4826058	1500	4.88	778	52	0.406	V	N
WCS004	343979	4826058	1500	4.88	778	52	0.406	V	N
WCS006	343973	4826058	1500	4.88	778	52	0.406	V	N
785017	366301	4828336	1562	9.14	811	27.9	0.254	V	Flapper
768003	366241	4828182	1562	12.20	811	22.6[b]	0.305	V	Y

Table 17. (continued).

AERMOD SourceID	UTM Easting (m)	UTM Northing (m)	Source Elevation (m)	Stack Height[a] (m)	Stack Exit Temperature[a] (K)	Stack Exit Velocity[a] (m/sec)	Stack Diameter[a] (m)	Stack Orientation (H/V)	Raincap (Y/N)
686016	345273	4834554	1479	7.32	749	55.1[b]	0.305[c]	H	N
686017	345257	4834554	1479	7.32	749	55.1[b]	0.305[c]	H	N
686018	345257	4834552	1479	7.62	749	55.1[b]	0.305[c]	H	N
686019	345273	4834552	1479	7.62	749	55.1[b]	0.305[c]	H	N
675010	361018	4857558	1460	4.88	794	109[b]	0.152[c]	H	N
679012	360901	4857565	1460	3.96	789	55.9[b]	0.254[c]	H	N

a. References for stack parameters (location, dimensions, exit velocity, temperature) for ICE and boiler sources is provided in Appendix A of the permit application, Addendum for Form EU1-Emssion Units Industrial IC Engine Information, and Addendum for Form EU5-Industrial Boiler Information. References for remediation source parameters are provided with the application.
b. Exit velocity for horizontal stacks or stacks with raincaps set to 0.001 m/s in AERMOD per DEQ modeling guidelines (DEQ 2013).
c. Diameter for horizontal stacks set to 0.001 m in AERMOD to prevent stack tip downwash effects per DEQ modeling guidelines (DEQ 2013).

Table 18. Statistical parameters for all modeled stacks.

Stack Statistical Value	Stack Height (m)	Stack Diameter (m)	Exit Temperature (K)	Exit Velocity (m/s)
Minimum Value	3.4	0.15	294	1.24
Average Value	11.1	0.65	589	29.6
Maximum Value	48.8	2.63	877	109.0
Parameters Assigned to FEC Sources	5.0	0.305	366	5.0

CHECKLIST

_____Thorough justification/documentation of release parameters for all modeled sources is provided in this section.

_____The specific methods used to determine/calculate given release parameters is described in this section.

_____The release orientation of all point source stacks (horizontal, rain-capped, or uninterrupted vertical release) has been verified and is documented in this section.

5.   MODELING METHODOLOGY

5.1   Model Selection

Dispersion modeling was performed with the EPA-approved AERMOD dispersion modeling system (Version 14134) (EPA 2004a). The version of AERMOD used (Version 14134) is more recent than the version specified in the approved Modeling Protocol (Version 12060). AERMOD was run with regulatory default options and five year of meteorological data processed with the AERMET (Version 14134) meteorological data preprocessor for AERMOD (EPA 2004b). Stack heights for actual stacks modeled are less than heights defined by good engineering practice. Building wake effect parameters for actual stacks were determined with the EPA Building Profile Input Program with Plume Rise Enhancement (BPIP-PRIME) (EPA 2004c), Version 04274, designed for use with the AERMOD model. BPIP-PRIME was run under the BEEST for Windows platform (BEE-Line Software, Version 9.95).

In addition to the models, a PERL script (aermodpp.pl) was used to post-process the pollutant concentration output files generated by AERMOD using the PLOTFILE command. The script extracts concentrations for each averaging period and writes the results to a text file that was imported into a spreadsheet. This script is included as Appendix A but will also be provided with all electronic files.

CHECKLIST

_____The current versions of all models and associated programs were used in analyses, or alternate versions were specifically approved by DEQ.

_____Any non-default model options used were approved by DEQ in advance.

5.2   Meteorological Data

Surface and upper air AERMET (Version 06341) meteorological data files for the Idaho Falls area were provided by the DEQ for years 2000 through 2004 (Geomatrix 2008). These data incorporate (1) surface data from the Idaho Falls airport, (2) upper-air data from Boise International Airport, and (3) onsite data from the National Oceanic and Atmospheric Administration (NOAA) 15-m tower located along the Idaho Falls greenbelt in downtown Idaho Falls. DEQ provided not only the AERMET-generated AERMOD meteorological files, but the raw meteorological data and AERMET input files for processing the data. Since the meteorological data from the onsite Idaho Falls station is not representative of INL facilities, meteorological data from the Grid 3 tower at the INL Site was substituted for the Idaho Falls onsite data for use in the AERMOD modeling. The Grid 3 tower is part of the INL Mesonet network (see http://www.noaa.inel.gov/capabilities/mesonet/mesonet.htm) and is the most centrally located tower amongst INL Site facilities. It is located north of INTEC (43.6049ºN, 112.9067ºW) near the Experimental Field Station shown in Figure 1. Additionally, the surface data from the Idaho Falls Airport provided in the Geomatrix files was in the CD144 format, and is not compatible with the newer versions of AERMET. For this reason, data for the Idaho Falls Airport in a format compatible with recent versions of AERMET were obtained and used in the AERMET processing as described below.

The 5-years of meteorological data (2000 to 2004) from the Grid 3 tower was provided by R. Eckman of the Idaho Falls' NOAA office in five files (GRI2000.MET, GRI2001.MET, GRI2002.MET, GRI2003.MET and GRI2004.MET). The Grid 3 tower data included delta temperature (C), precipitation amount (cm), insolation (total amount of solar radiation energy received per unit area measured in watts/m^2), pressure (millibars x 10), measurement height (m), wind speed (m/s), wind direction (degrees), temperature (C), and standard deviation of the horizontal wind angle. These data were converted to the AERMET units and wind speed measured at the 15-m height was extrapolated to 10-m by NOAA and read into AERMET (Version 14134) in the following format.

```
READ 1 OSYR OSMO OSDY OSHR DT01 PAMT INSO PRES

READ 2 HT01 WS01 WD01 TT01 SA01

FORMAT 1 (4(I2,1X),F5.1,1X,F4.1,1X,F5.0,1X,F6.0)

FORMAT 2 (12X,F5.0,1X,F5.1,1X,F4.0,1X,F5.1,1X,F5.1)
```

The AERMET variables are defined as follows: OSYR=year, OSMO=month, OSDY=day, OSHR=hour, DT01=delta temperature, PAMT=precipitation, INSO=solar insolation, PRES=pressure, HT01=height, WS01=wind speed, WD01=wind direction, TT01=temperature, SA01=standard deviation of wind direction.

The overall data completeness of the Grid 3 tower data for the period modeled was 98.5% and is summarized in Table 19.

Table 19. Meteorological data completeness report for the Grid 3 tower for years 2000-2004.

Year	Number of Missing Hours						
	10-m Wind[a]	2-m Temp[b]	15-m Temp[b]	2-m RH	Solar Radiation	Baro Pressure	Rain
2000	74	204	117	1,074	78	0	119
2001	106	119	89	145	10	0	25
2002	145	193	66	207	2	0	16
2003	104	212	212	252	19	18	0
2004	82	250	320	250	5	1	12
Totals (2000-2004)	511	978	804	1,928	114	19	172
Data Completeness Summary							
Total hours in dataset	43,848						
Total measurement hours	306,936						
Total missing measurement hours	4,526						
Percent % complete	98.53%						

a.   Includes wind direction, wind speed, and standard deviation of wind direction.
b.   The 2-m and 15-m temperatures are used to determine delta temperature

The surface data from the Idaho Falls Airport was obtained from the National Climatic Data Center (http://www1.ncdc.noaa.gov/pub/data/noaa/) in TD-3503 (ISH) format, which is read directly by AERMET. Upper air data from the Boise International Airport in the FSL format were provided in the DEQ data set and were used without modification. The surface, onsite, and upper air data files were processed with AERMET (Version 14134) to provide a 5-year surface data file (grd35yr.sfc) and upper air date file (grd35yr.pfl) for running AERMOD.

AERMET processing used the same parameter values that were used in the DEQ processing. These parameters include the threshold wind speed (0.447 m/s) and the range of acceptable values for onsite data. These ranges are given below, followed by the designation for missing data (999, -9999, and 99999).

```
RANGE WS 0 <= 50 99999        wind speed range (m/s)

RANGE WD 0 <= 360 99999       wind direction range (degrees)

RANGE TT -30 < 49 99999       temperature range (C)

RANGE DT01 -2 < 5 99999       delta temperature range (C)

RANGE SA 0 <= 90 99999        standard deviation wind angle(degrees)

RANGE INSO -1 < 1250 99999    solar radiation (W/m²)

RANGE RH 0 <= 100 999         relative humidity (percent)

RANGE PRES 8500 < 10999 -9999 pressure (mB)
```

CHECKLIST

_____Meteorological data files are provided with the permit application.

_____If meteorological data used for modeling were not provided by DEQ, then a detailed discussion of the data is provided along with documentation of the processing steps.

5.3   Effects of Terrain

Terrain data in AERMOD are processed using the AERMAP pre-processor. The processed data consists of terrain elevation and hill heights for each defined receptor. These data were generated by DEQ modeling staff using AERMAP (Version 11103) and provided to INL in the file *AERMAP723.rcf* for the 1,352 receptor locations (see Section 5.7). Receptor locations are defined in UTM coordinates (Zone 12) based on datum NAD 83. The terrain data was extracted from 1 arc-second seamless National Elevation Database files covering the area between -112.005 and -113.644 degrees longitude and 42.967 and 44.287 degrees north latitude. All coordinates and elevations are in meters. The provided file *AERMAP723.rcf* is a text file written in AERMOD format and was used in each AERMOD input file.

Land surface data (e.g., roughness height, albedo, and terrain) were processed for the Grid 3 station using the AERSURFACE utility (Version 13016) (EPA 2013) and National Land Cover Data file, idaho_NLCD92.tif. The National Land Cover Data are derived from the early to mid-1990s Landsat Thematic Mapper satellite data and have a 21-class land-cover classification scheme applied consistently over the United States. The spatial resolution of the data is 30 m and mapped in the Albers Conic Equal Area projection, NAD 83. The National Land Cover Data are provided on a state-by-state basis in the website http://www.webgis.com/nlcd92.html. The input parameters for AERSURFACE are presented in Table 20.

Table 20. AERSURFACE input parameters.

Parameter	Value	Units and comments
Coordinate type	Latitude-Longitude	Decimal degrees (43.6049ºN, 112.9067ºW)
Datum	NAD 83	NA
Study radius	1.0	kilometers
Vary by sector (Yes/No)	Yes	NA
Number of sectors	12	Twelve, 30-degree sectors
Temporal resolution	Seasonal	NA
Continuous snow cover	Yes	During winter months
Airport	No	NA
Surface moisture	Average	NA

CHECKLIST

_____The datum of terrain data, building corner locations, emissions sources, and the ambient air boundary are specified and are consistent such that the modeled plot plan accurately represents the facility and surroundings.

5.4   Facility Layout

Figures 4 through 10 show the locations of each of the sources listed in Table 17.

Figure 4. Sources locations at the RWMC and AMWTP facilities.

Figure 5. Source locations at the ATR Complex.

Figure 6. Source locations at CFA.
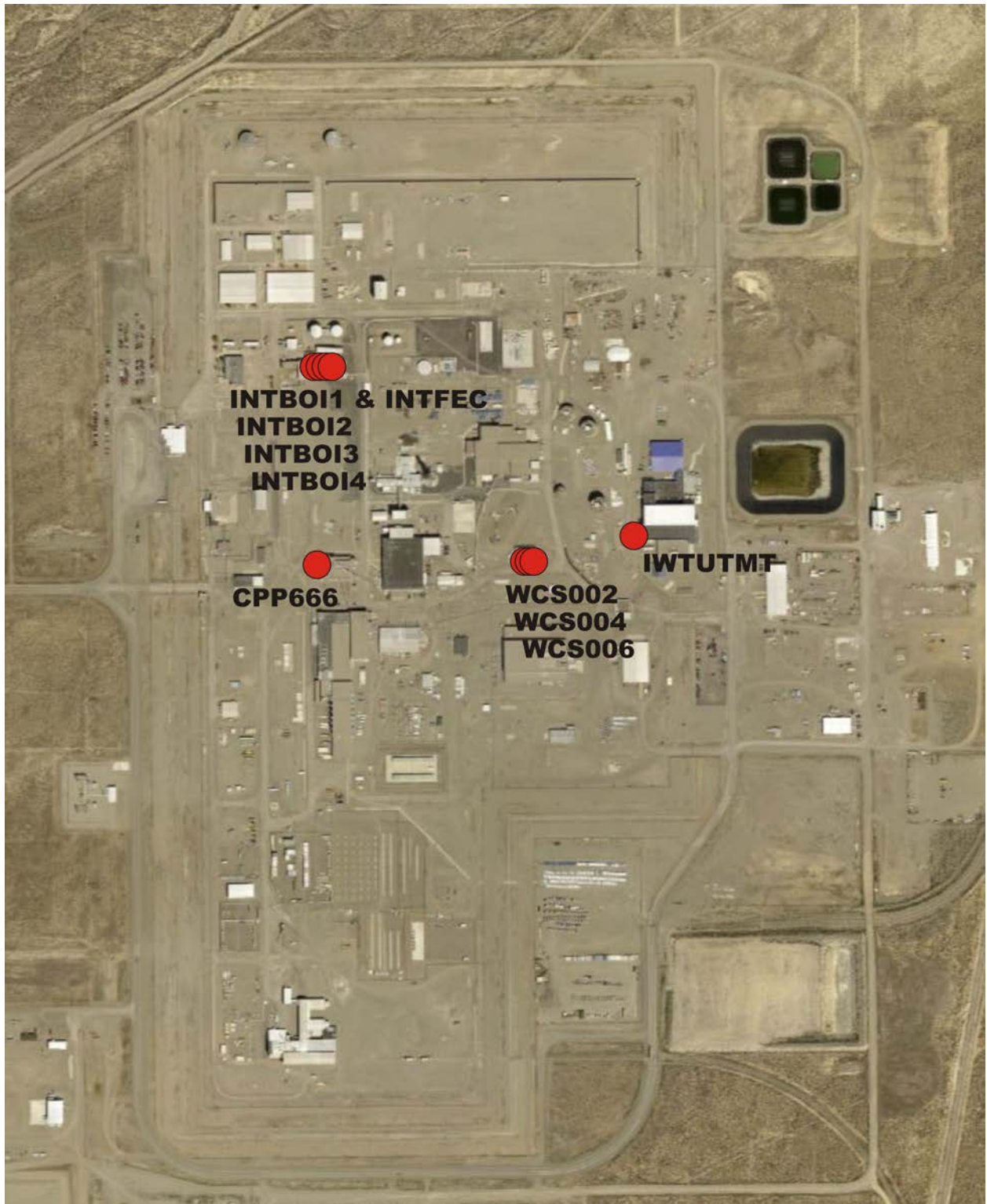
Figure 7. Source locations at the INTEC facility.
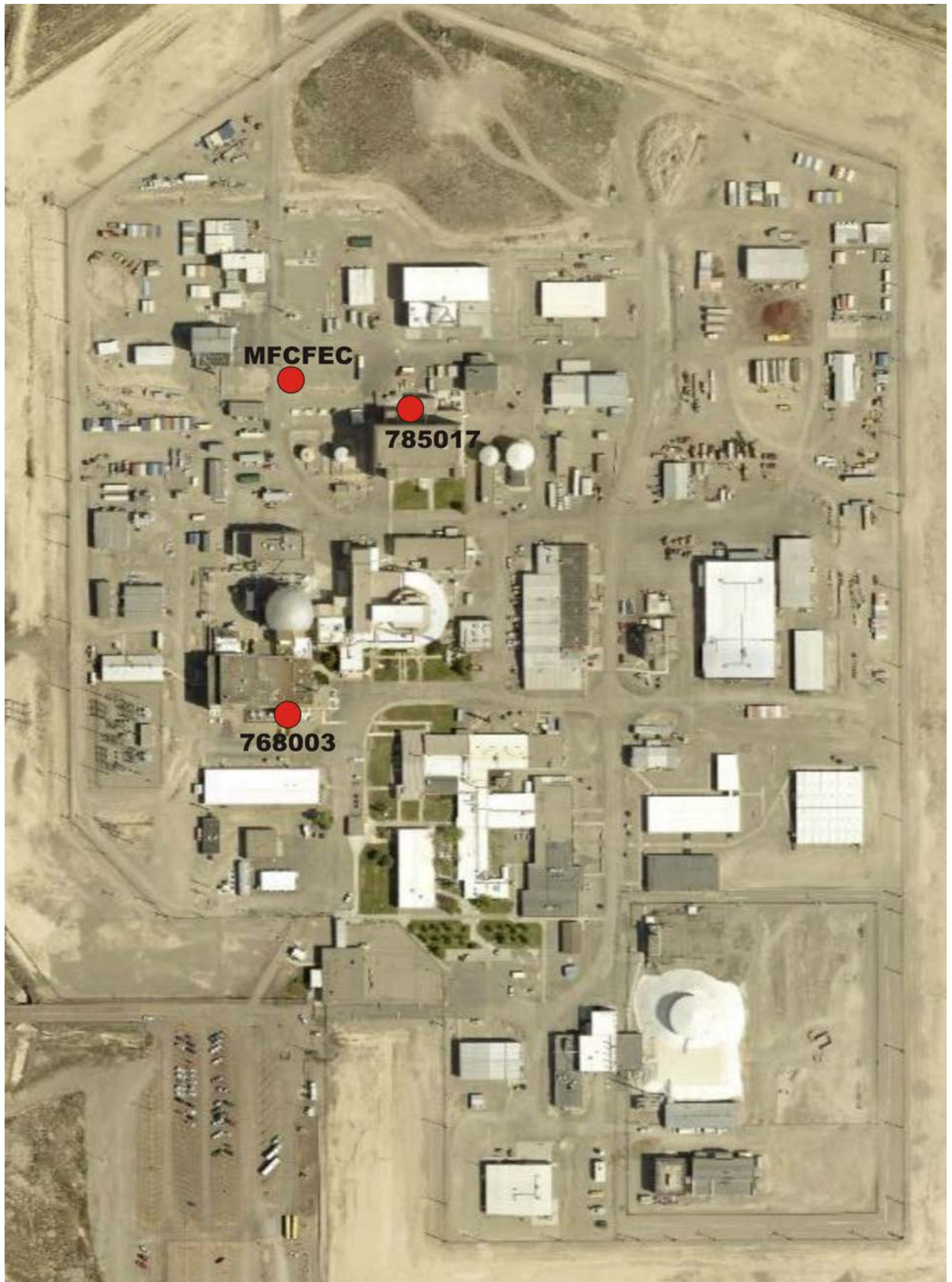
Figure 8. Source locations at MFC.

Figure 9. Source locations at the NRF.

Figure 10. Source locations at the SMC facility.

CHECKLIST

_____The facility layout plot plan is provided in this section that clearly and accurately depicts buildings, emissions points, and the ambient air boundary.

_____This section of the Modeling Report has thoroughly described how locations of emissions sources, building corners, and the ambient air boundary were determined, specifying the datum used.

5.5   Building Wake Effects

Stack heights for actual stacks modeled are less than heights defined by good engineering practice. Therefore, building wake effect parameters for modeled stacks were determined using the EPA Building Profile Input Program with Plume Rise Enhancement (BPIP-PRIME) (EPA 2004c), Version 04274, designed for use with the AERMOD model. BPIP-PRIME was run under the BEEST for Windows platform (BEE-Line Software, Version 9.95).

Wake effects parameters were obtained by importing facility maps with building/structure/tank outlines into the BEEST program. The facility maps were generated using the INL iMAP application (https://maps.inl.gov). iMAP is a web-based GIS (geographic information system) application that provides access to map layers and other information about INL. Figure 11 shows the facility map for the AMWTP facility with building outlines from iMAP. Maps for each facility or a portion of a facility were imported into BEEST and positioned (georeferenced) using UTM coordinates. Building, tank and other structure outlines were created within BEEST.

Building heights were determined using the measuring tools and the Pictometry® feature in iMAP. Pictometry® is a patented aerial image capture process that produces imagery showing the fronts and sides of buildings and locations on the ground. This method was determined to be accurate to within a foot by measuring stacks and comparing to known stack heights. All structures close enough to produce an area of wake effect were included for each stack considered. According to the BPIP user guide (EPA 2004c); structures produce at area of wake effect that extends to a distance of 5L where L is the lesser of the building height or projected building width. For this analysis, all structures within 5L were included.

Figures 12 through 24 shows 3D wireframe building and tank images from the BEEST software for each stack source modeled. These images are created from stack and building locations and dimensions entered for calculating building wake effects. Stack sources are shown in red and labeled. Facility maps with building outlines are shown in the corner of each image. For multi-tiered structures, the tiers were included or the entire building height was assumed to be equal to the height of the tallest tier. This was very conservative for some buildings.

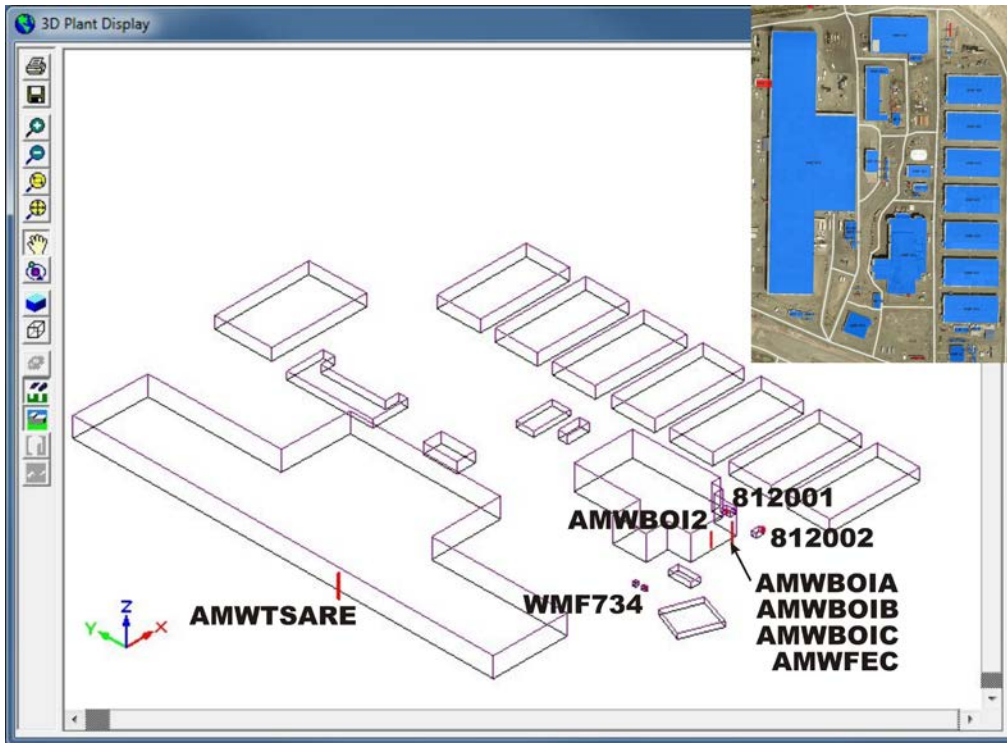Figure 11. Facility map of AMWTP with buildings highlighted.

Figure 12. Wireframe image of buildings at AMWTP for calculating wake effects for boiler sources AMWBOIA, AMWBOIB, AMWBOIC, AMWBOI2; remediation source AMWTSARE; ICE sources WMF734, 812001, 812002 and FEC source AMWFEC. Facility plot map shown in upper right corner.
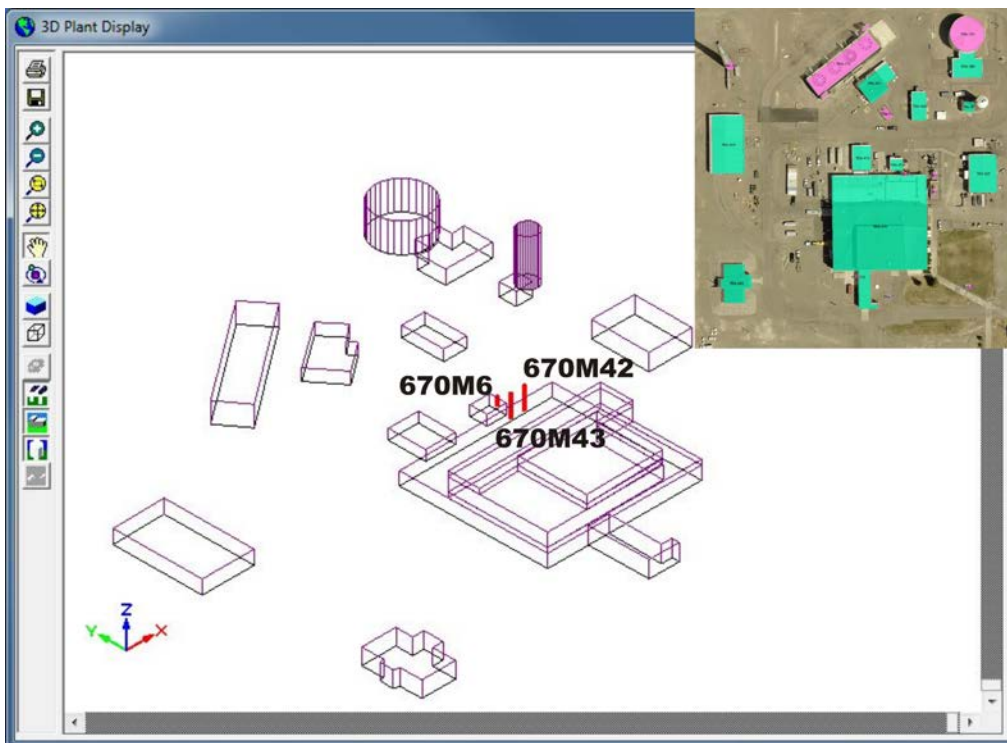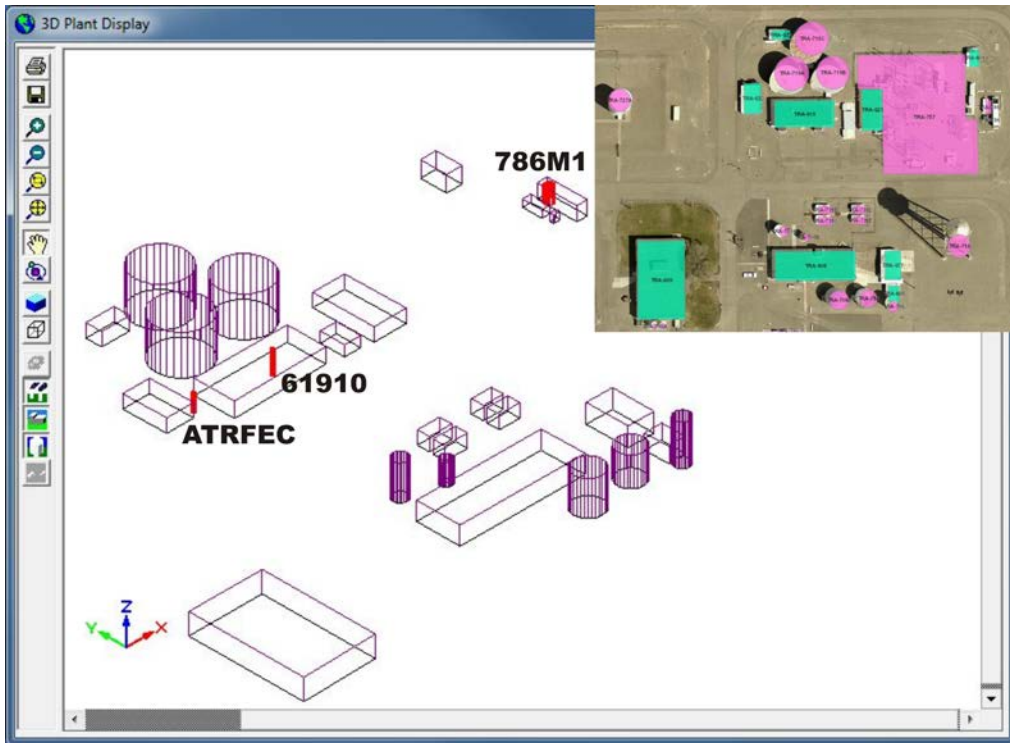

Figure 13. Wireframe image of buildings and tanks at the ATR Complex for calculating wake effects for ICE sources 670M6, 670M42 and 670M43. Facility plot map shown in upper right corner.

Figure 14. Wireframe image of buildings and tanks at the ATR Complex for calculating wake effects for ICE sources 61910, 786M1 and FEC source ATRFEC. Facility plot map shown in upper right corner.
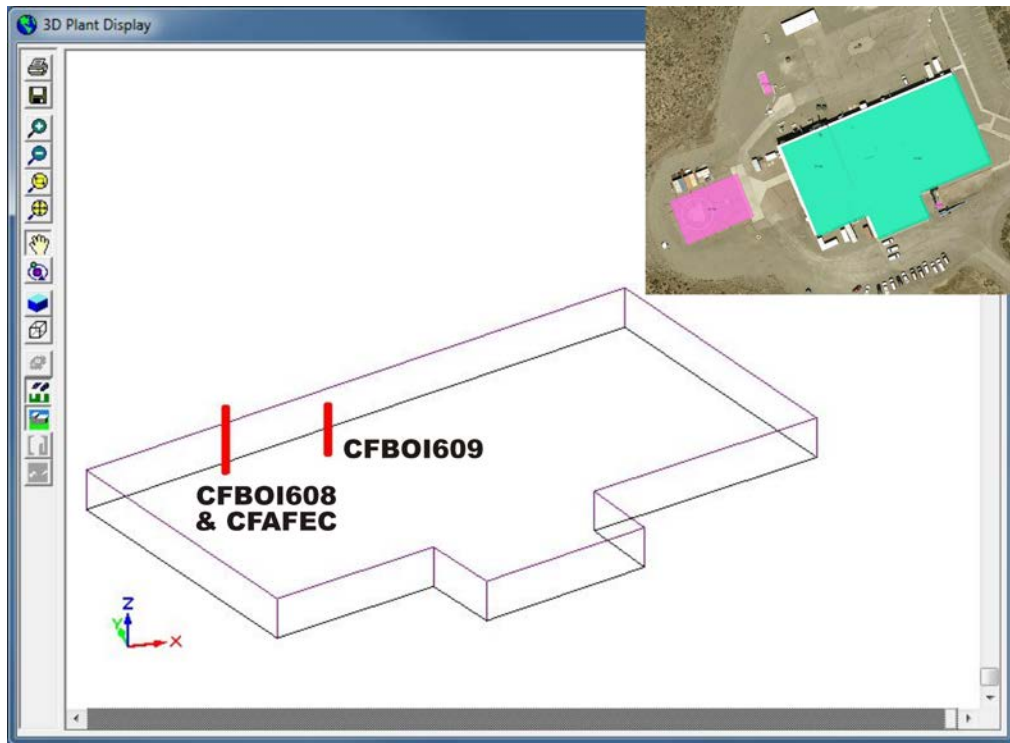
Figure 15. Wireframe image of buildings at CFA for calculating wake effects for boiler sources CFBOI608, CFBOI609 and FEC source CFAFEC. Facility plot map shown in upper right corner.
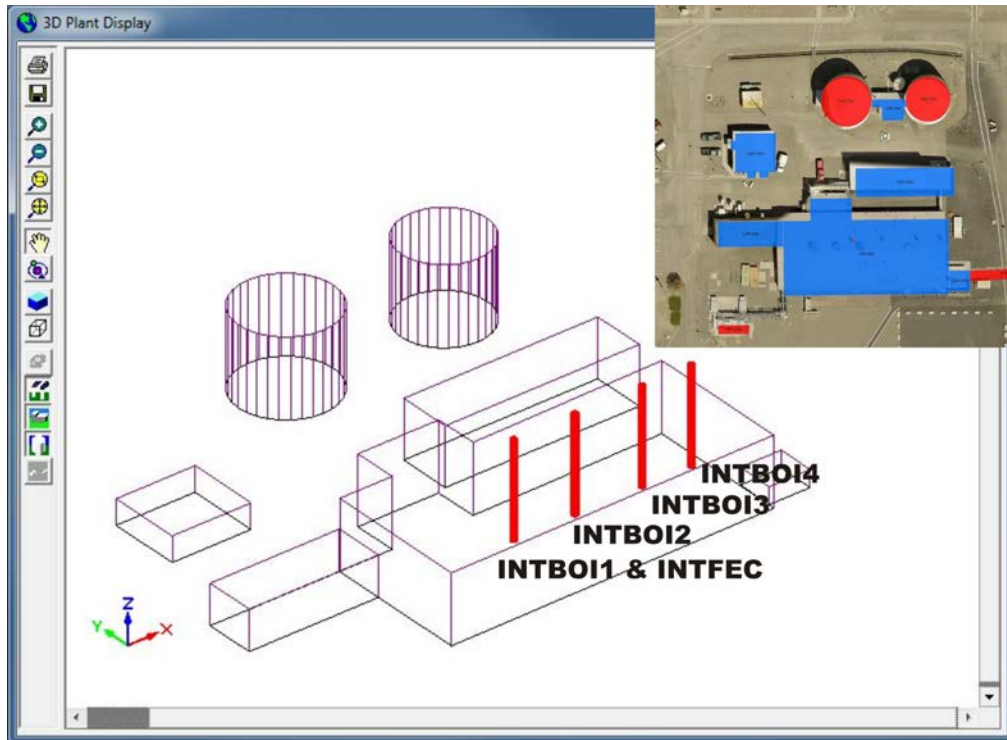
Figure 16. Wireframe image of buildings and tanks at INTEC for calculating wake effects for boiler sources INTBOI1, INTBOI2, INTBOI3, INTBOI4 and FEC source INTFEC. Facility plot map shown in upper right corner.
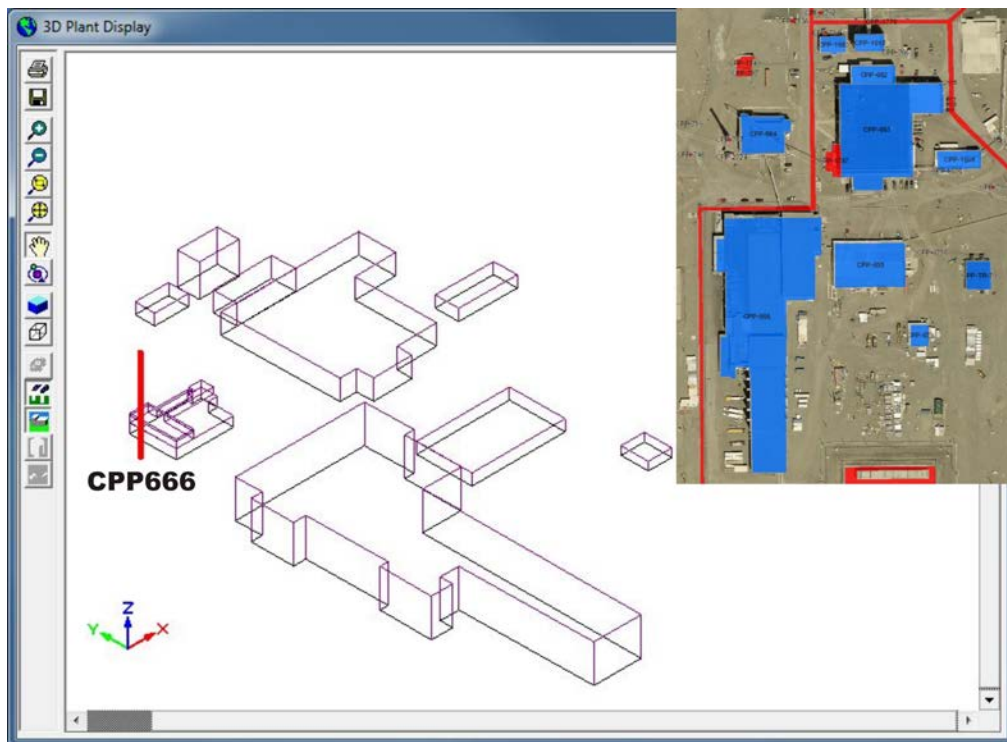
Figure 17. Wireframe image of buildings at INTEC for calculating wake effects for remediation source CPP666. Facility plot map shown in upper right corner.
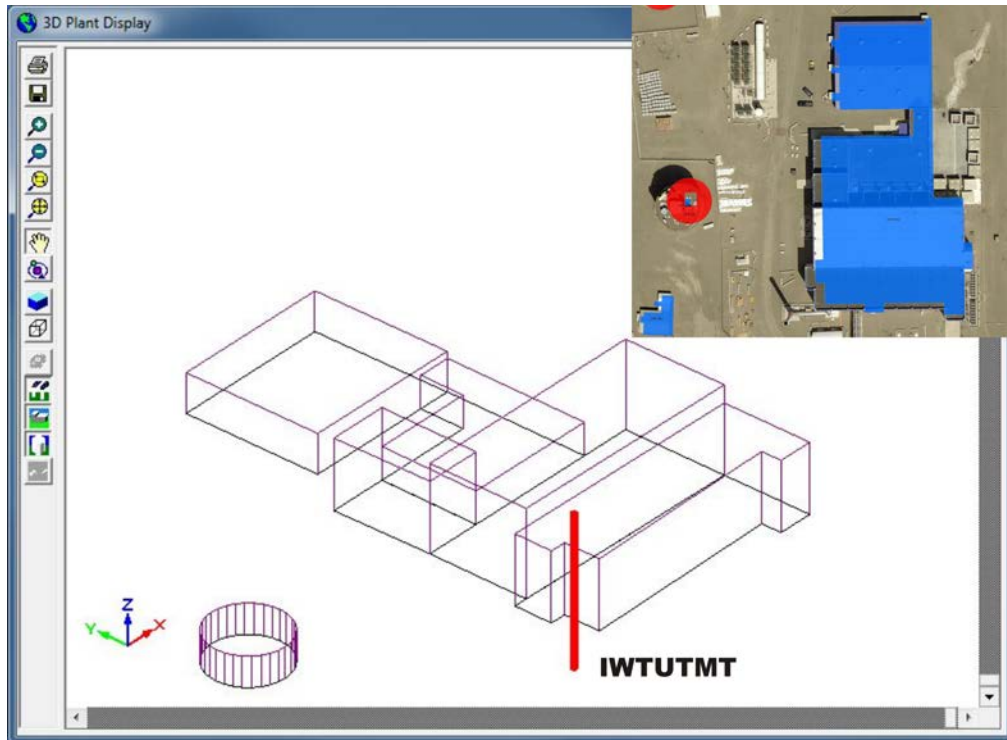
Figure 18. Wireframe image of buildings and tanks at INTEC for calculating wake effects for remediation source IWTUTMT. Facility plot map shown in upper right corner..
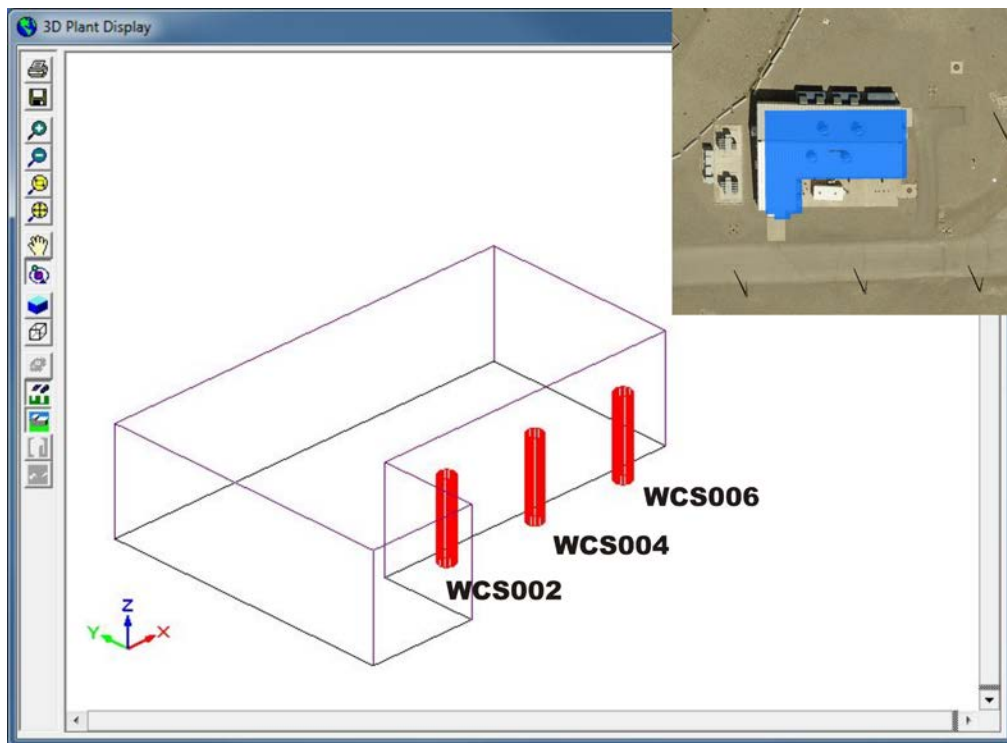

Figure 19. Wireframe image of buildings at INTEC for calculating wake effects for ICE sources WCS002, WCS004 and WCS006. Facility plot map shown in upper right corner.
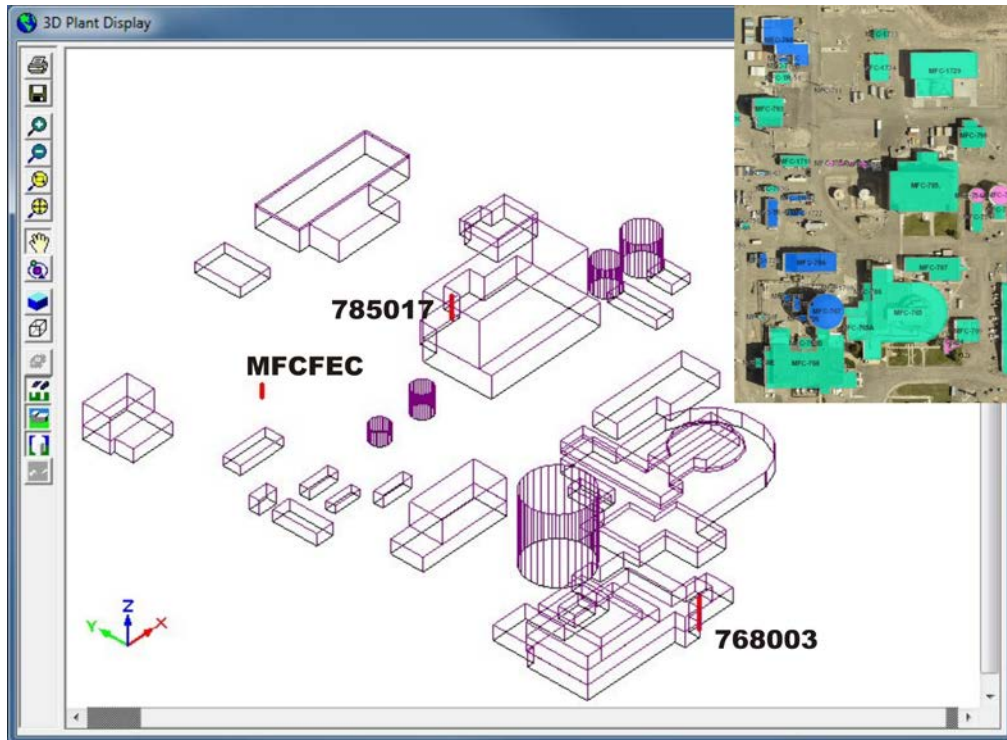
Figure 20. Wireframe image of buildings and tanks at MFC for calculating wake effects for ICE sources 785017, 768003 and FEC source MFCFEC. Facility plot map shown in upper right corner.
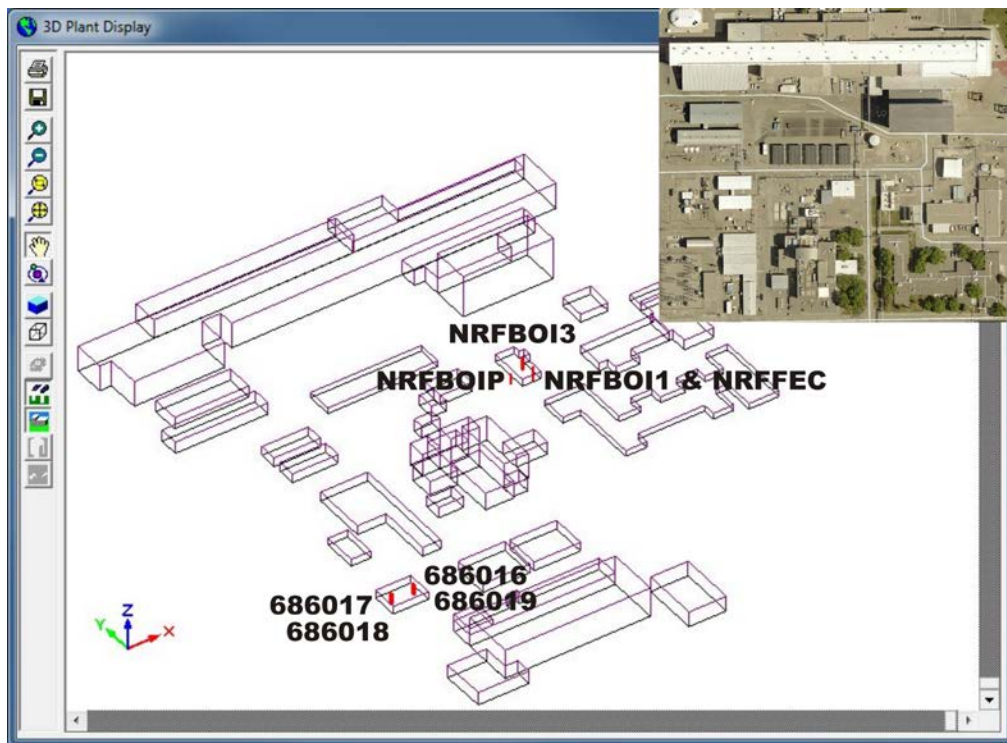

Figure 21. Wireframe image of buildings at NRF for calculating wake effects for boiler sources NRFBOI1, NRFBOI3, NRFBOIP, ICE sources 686016, 686017, 686018, 686019 and FEC source NRFFEC. Facility plot map shown in upper right corner.
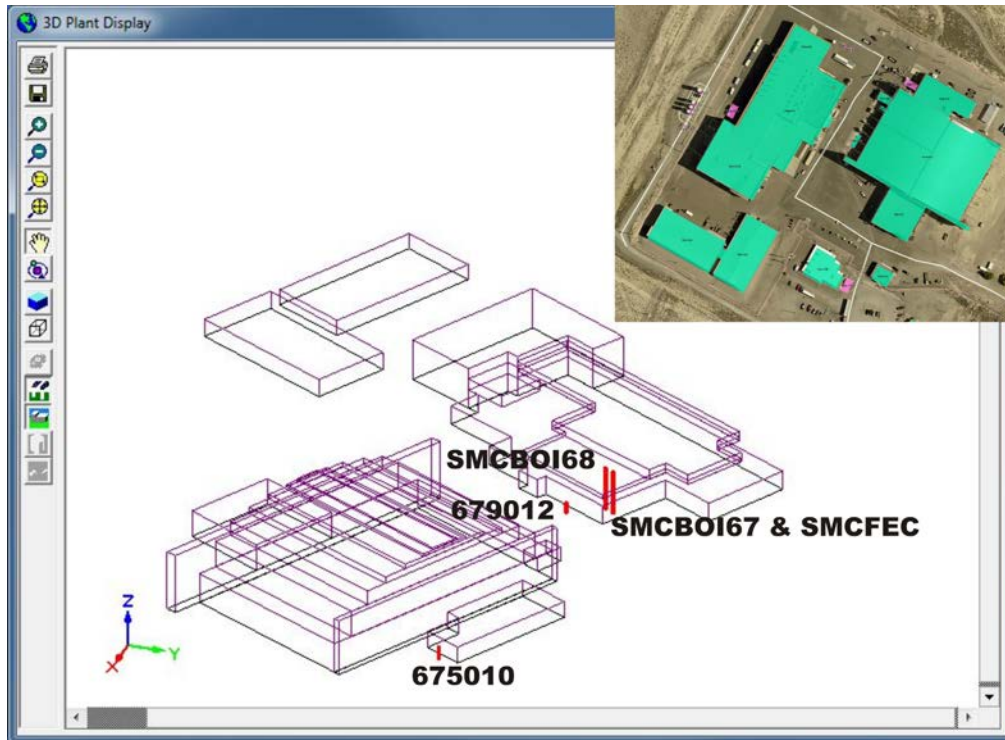
Figure 22. Wireframe image of buildings at SMC for calculating wake effects for boiler sources SMCBOI67, SMCBOI68, ICE sources 675010, 679012 and FEC source SMCFEC. Facility plot map shown in upper right corner.
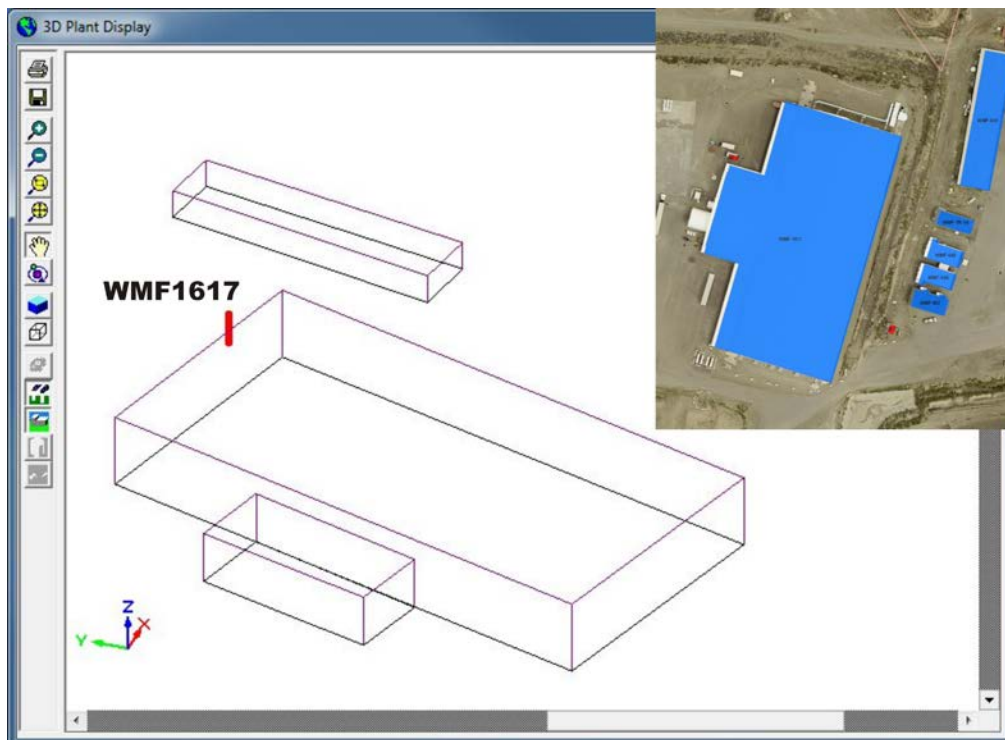

Figure 23. Wireframe image of buildings at RWMC for calculating wake effects for remediation source WMF1617. Facility plot map shown in upper right corner.
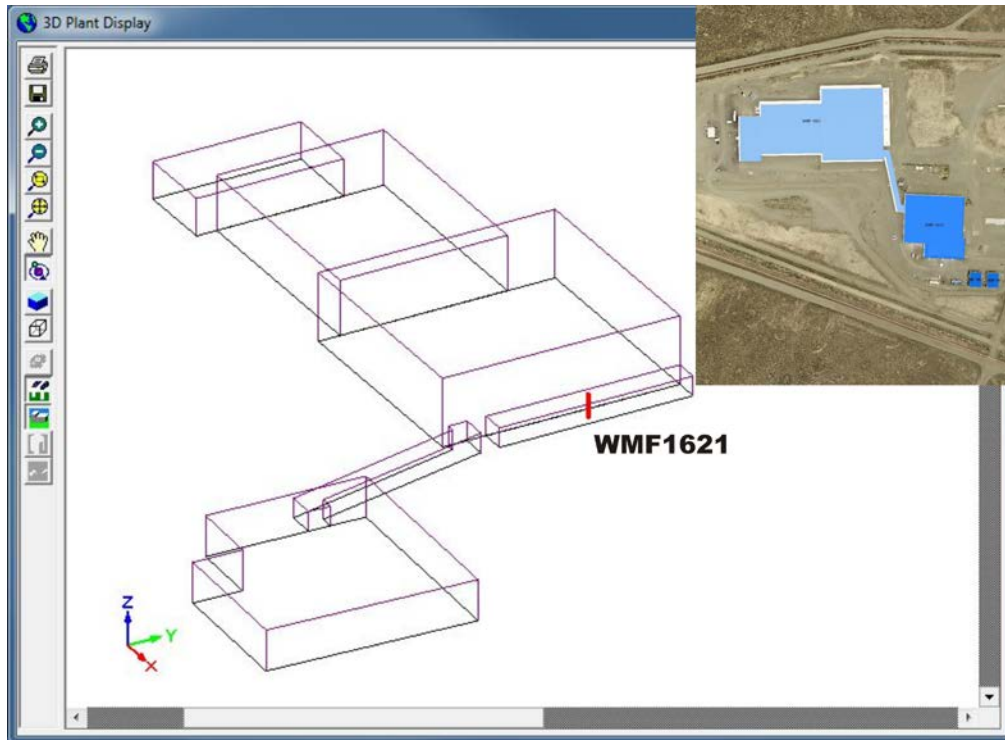
Figure 24. Wireframe image of buildings at RWMC for calculating wake effects for remediation source WMF1621. Facility plot map shown in upper right corner.

5.6 Ambient Air Boundary

As described in Section 2, DOE controls all activities within the INL Site boundary. The Site has no permanent residents and ingress and egress of Site personnel and visiting personnel are strictly controlled. No casual visits are permitted, except for persons driving through INL on one of five public highways (20, 22, 26, 28 and 33) and visitors to EBR-I, a national historic monument, which is open during the summer months. Security forces may interrupt traffic on INL roads or public roads that transverse INL during emergencies and other times to support operations of the laboratory.

For the purposes of this assessment, ambient air on the INL Site is defined by areas occupied by the public highways, short roads up to the entry gates at each facility, and the area around EBR-I. Ambient air off the INL Site is any area outside the INL boundary.

CHECKLIST
_____If any of the following apply, the effect on areas excluded from ambient air is thoroughly described in this section: a river/stream bisecting the facility; the facility is on leased property or is leasing property to another entity; the facility is not completely fenced; there are right-of-way areas on the facility; the nature of business is such that the general public have access to part or all of the facility.

_____This section thoroughly describes how the facility can legally preclude public access (and practically preclude access) to areas excluded from ambient air in the modeling analyses.

5.7   Receptor Network

Receptor locations defined in UTM coordinates based on datum NAD 83, were provided by DEQ modeling staff in the file *AERMAP723.rcf*. This is a text file written in AERMOD format and was used directly in each AERMOD input file. The 1,352 receptor locations shown in Figure 25 are spaced approximately every 500 meters around the INL boundary and along highways that transect the INL. Finer spacing (~100 meters) was used near facilities where concentrations may be higher (i.e. along Highway 20/26 between AMWTP and CFA, from Highway 20 to the MFC guard gate, and along Highway 33 near the entrance to SMC. Finer spacing was also used in gridded areas around EBR-I (~40 m) and Atomic City (~200 meters). All receptors were considered for each pollutant and averaging period for determining maximum impacts.

CHECKLIST

_____This section of the Modeling Report provides justification that receptor spacing used in the air impact analyses was adequate to reasonably resolve the maximum modeled concentrations to the point that NAAQS or TAP compliance is assured.
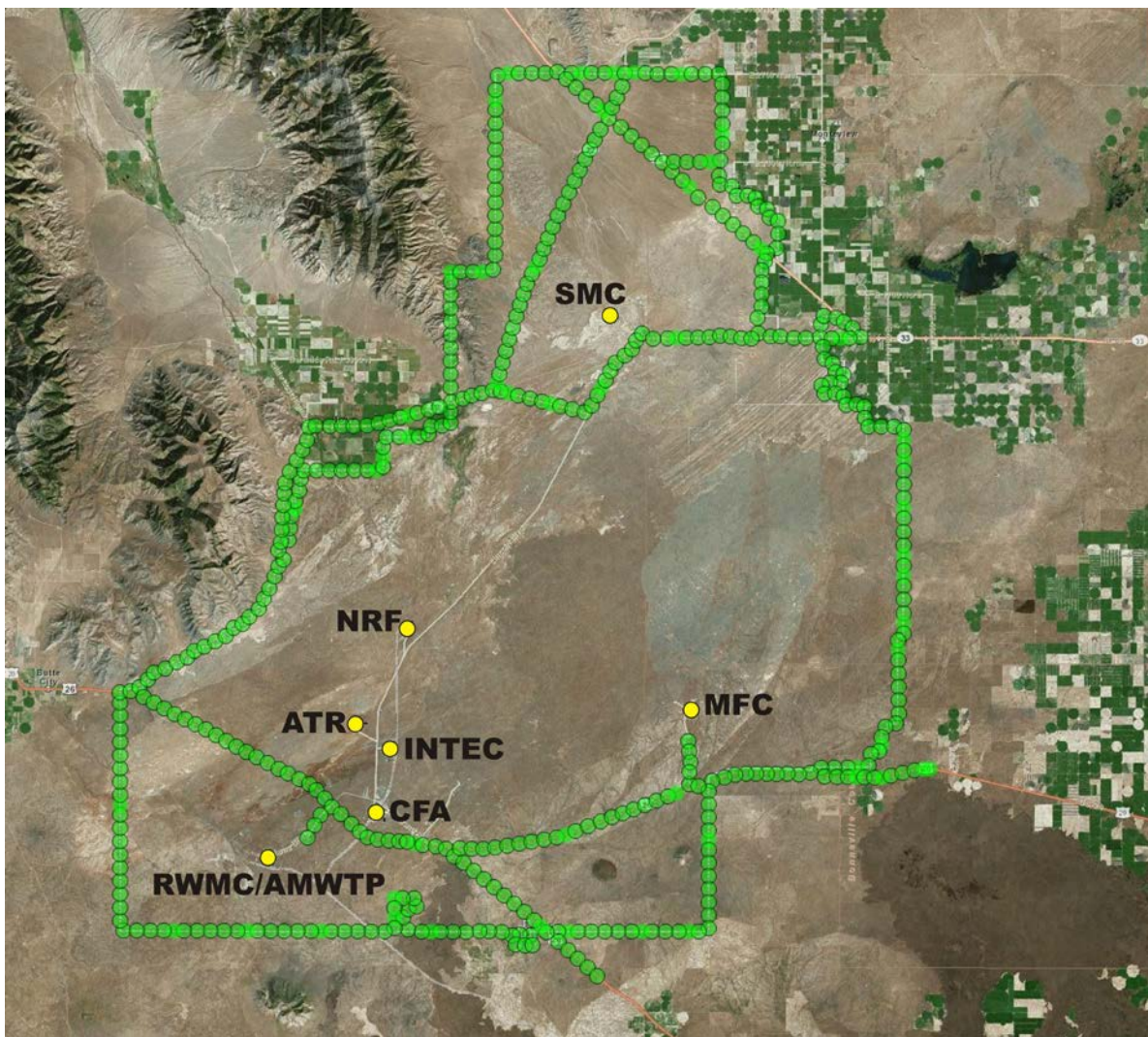

Figure 25. Receptor locations (green circles) for INL AERMOD modeling. Most circles indicate two locations.

5.8   Background Concentrations

Background concentrations for CAPs were obtained using the Washington State University's Laboratory for Atmospheric Research North West Airquest web-based retrieval tool (http://lar.wsu.edu/nw-airquest/lookup.html). Table 21 shows the minimum, maximum, average and standard deviation for background concentrations of CAPs from all 1,352 receptor locations. For the cumulative impact analysis, average background concentrations were added to the modeled concentrations and compared to the NAAQS. For the comparison to the PM-10 24-hr standard, the larger 24-hr values was used and not the 24-hr (no extremes).

Table 21. CAP background concentrations (µg/m³) summary.

Pollutant	Averaging Time	Minimum Concentration[a]	Maximum Concentration[a]	Average Concentration[a]	Standard Deviation[a]
NO_2	1 hr	4.0	16.2	7.3	2.4
	Annual	0.38	2.3	0.83	0.32
SO_2	1 hr	3.1	6.0	4.1	0.65
	3 hr	3.7	6.6	4.6	0.70
	24 hr	1.3	2.9	1.8	0.40
	Annual	0.26	0.52	0.33	0.11
CO	1 hr	1696	2553	2076	199
	8 hr	669	956	797	65
$PM_{2.5}$	24 hr	6.6	13	8.2	1.6
	Annual	2.5	4.9	3.2	0.55
PM_{10}	24 hr	42	80	59	6.8
	24 hr (no extremes)[b]	26	52	36	5.7

a.   Website tool provides NO_2, SO_2 and CO concentrations in ppb. Conversion to µg/m³ was performed assuming an ideal gas with a molar volume of 22.4 L/mol.
b.   The "no extremes" value is a more reasonable estimate of the PM_{10} "design value" and is less dependent upon extreme events. It is determined by the 4th highest daily mean concentration over a 3 year period.

CHECKLIST
_____Background concentrations have been thoroughly documented and justified for all criteria pollutants where a cumulative NAAQS impact analysis was performed.

5.9 NO_X Chemistry

As discussed in Section 4.1.3, NO_X chemistry was not considered in the modeling. The results conservatively assume 100% of the NO_X concentrations convert to NO_2 and no credit was taken for reduction or conversion to NO_2.

CHECKLIST
_____If OLM or PVMRM was used to address NO_X chemistry, reasons for selecting one algorithm over the other are provided in this section.

6. RESULTS AND DISCUSSION

6.1 Criteria Air Pollutant Cumulative NAAQS Impact

Table 22 presents the maximum modeled concentrations based on design capacity emissions, and the maximum modeled concentrations based on design capacity plus FEC (growth and flexibility) component emissions. For each pollutant and averaging period, the maximum modeled concentration based on design capacity plus FEC emissions was added to average background concentration to estimate the total ambient impact which was compared to the NAAQS.

The modeling results show all predicted CAP impacts are less than the applicable standards and will not cause a NAAQS violation. Even if maximum background concentrations (see Table 21) are added to the maximum modeled concentrations, the results would still be less than the standards. The highest pollutant concentration (as a percent of the NAAQS) is the 1-hr NO_2 (88% of the standard). The next highest are the 24-hr PM concentrations (34% and 42% for $PM_{2.5}$ and PM_{10} respectively). But for PM, the maximum impact was dominated by the background concentrations and not the INL contribution.

The impact of adding the FEC component was dependent upon the facility from which it was released. Releasing it at ATR, INTEC, and NRF had very little to no impact because these facilities are located several km from the nearest receptors. The impact was most notable when it was released at AMWTP, CFA, MFC and SMC which are closer to potential receptors. The highest concentrations are a result of releasing the FEC component source at CFA. This likely occurred at CFA because the FEC component was added to the boiler CFA-608 which is the closest source location to receptors (< 1.3 km from Highway 20/26).

There are multiple conservatisms considered in the CAP analysis that help build confidence that the standards will not be exceeded. These include:

- The maximum 1st highest values were presented for all CAPs except for the 1-hr SO_2 and NO_2 which used the 4th and 8th highest values respectively.

- NO_X chemistry was not considered in the modeling. The model results assume 100% of the NO_X concentrations convert to NO_2.

- Many of the FEC sources were assigned to an existing boiler stack which lessens potential dispersion by collocating it with an existing source.

- FEC sources not assigned to an existing boiler were assigned a conservative stack height, exit velocitiy and exit temperature.

- The emission rate for $PM_{2.5}$ and PM_{10} was assumed to be total PM plus condensable PM.

- Deposition was not considered for PM emissions.

- The modeled FEC component for CAPs was 100 tons/yr but only 95 tons/yr is requested.

- Tiers of some multi-tiered buildings were not explicity included and the entire building height was assumed equal to the tallest tier of the building.

- All receptor locations were considered for determination of ambient impacts for all averaging periods. This is extremely conservative for annual averaging periods.

CHECKLIST
_____Model input and output files for the cumulative NAAQS impact analyses are provided with the permit application.

_____If there were modeled NAAQS violations, all violations were analyzed and clearly show that the project did not significantly contribute to those modeled violations.

Table 22. Cumulative NAAQS impact analyses results.

Criteria Pollutant	Averaging Period[a]	Maximum Modeled Concentration Based on Design Capacity (μg/m³)	Maximum Modeled Concentration Based on Design Capacity + FEC Component (μg/m³)	Facility Where Adding FEC Component Resulted in Maximum Concentration	Average Background Concentration (μg/m³)	Total Ambient Impact (μg/m³)	NAAQS (μg/m³)	Total Impact as a Percent of NAAQS
SO_2	1-hr (4th highest value)	21.8	30.1	CFA	4.1	34.2	196	17%
	3-hr	14.6	21.3	CFA	4.6	25.9	1300	2%
	24-hr	3.99	6.59	CFA	1.8	8.39	365	2%
	Annual	0.17	0.37	CFA	0.32	0.69	80	1%
NO_2[b]	1-hr (8th highest value)[c]	101	158	CFA	7.2	165	188	88%
	Annual	1.28	2.45	CFA	0.83	3.28	100	3%
CO	1-hr	132	132	NA[e]	2076	2208	40000	6%
	8-hr	35.3	35.9	AMWTP	797	833	10000	8%
$PM_{2.5}$[d]	24-hr	3.48	3.58	AMWTP	8.2	11.8	35	34%
	Annual	0.16	0.176	CFA	3.2	3.38	12	28%
PM_{10}[d]	24-hr	3.48	3.58	AMWTP	59.0[f]	62.6	150	42%

a. Unless otherwise indicated, all values are the maximum 1st highest values. SO_2 and NO_2 1-hr values are the exceptions.
b. No credit taken for reduction or conversion of NO_X to NO_2.
c. 1-hr NO_2 results do not include emergency stationary ICE according to DEQ (2013).
d. $PM_{2.5}$ and PM_{10} modeled as total particulate matter and includes condensable PM.
e. Adding FEC component emission to each facility did not increase maximum concentration above those determined without it.
f. The background PM_{10} concentration includes extreme values although the "no extremes" value is a more reasonable estimate of the PM_{10} "design value" (see Table 21).

6.2   Toxic Air Pollutant Impact

TAPs were not modeled based on the evaluation presented in Section 3.3 that determined uncontrolled emissions for regulated TAPS were less than the ELs in IDAPA 58.01.01.585 for non-carcinogens and less than the EL increments in IDAPA 58.01.01.586 for carcinogens. Therefore, no compliance demonstration was performed and concentrations are expected to be less than applicable standards for all TAPs.

7.   QUALITY ASSURANCE/CONTROL

The air dispersion analyses documented in this report were prepared and peer-reviewed by qualified air quality professionals experienced in modeling. The modeling and required impact analyses are consistent with protocols and methodologies from the *State of Idaho Guideline for Performing Air Quality Impact Analyses* (DEQ 2013).

All computer code modeling and spreadsheet calculations for this report were performed on a Dell® Precision Workstation T5400 computer (Intel® Xeon® CPU X5450 @ 3 GHz) running Microsoft® Windows® XP Professional Version 2002 SP3. All electronic files including computer code input, output, executable files, and spreadsheet files will be provided to DEQ with the permit application (DOE-ID 2015).

8.   REFERENCES

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Appendix A
Perl Script for Postprocessing AERMOD Results

Appendix A
Perl Script for Postprocessing AERMOD Results

This appendix contains the listing of the Perl script that is used to post-process the pollutant concentration output files generated by AERMOD using the PLOTFILE command. The script extracts concentrations for each averaging period and writes the results to a text file that is imported into a spreadsheet.

```perl
# Aermodpp.pl
# Units of source : g/s
# Units of conc: ug/m**3

    if($ARGV[0] eq "?")
    {
      print "USAGE: Aermodpp.pl [data file] [source name] [pollutant name] NOTE: Default units are g/s for source and
ug/m3 for conc\n";
      print "If units are not default, then change $cf variable \n";
    }


# Convert from lbs/hr to g/s: 1 lb/hr=0.126 g/s
# convert from ug/m3 to g/m3: 10^6 ug per g
# cf = 1/0.126 x 10^-6 = 7.9367e-6
#       $cf=1.0e-6;   # conversion from ug/m**3 to g/m**3
#       $cf = 7.9365E-6;
# Set conversion to 1.0 so the Chi/Q values are ug/m^3 per g/s
      $cf=1.0;


      $filein=$ARGV[0];
#        $fileout=$ARGV[1];
      $fileout="output.txt";
      $srcname=$ARGV[1];
      $pollutant=$ARGV[2];
# check to see if $fileout is present
      $flag=0; # if this flag is 0, then do not print header
      open AEROUT,"<$fileout" or $flag=1;
      close (AEROUT);

      open (AERIN, "<$filein") || die "$filein could not be found";
      open (AEROUT, ">>$fileout");   # open file for append
      if($flag==1)
      {
        print AEROUT "RecID,          ChiQ,          AvgTime,      ChiQID,    PollutantType \n";
      }
      while ($line = <AERIN>)
      {

        if ($line=~/FOR A TOTAL OF/)
        {
          @field = split /[ \t]+/, $line;
          $n=$field[5];
          print "Number of receptors $field[5] \n";
          for $i (1..3)                    # skip three lines
          {
            $line=<AERIN>;
          }

          for $i (1..$n)
          {
            $line=<AERIN>;
            $line =~ s/^[ ]+//; # delete initial spaces
            chomp ($line); # remove carrige return
            @field = split /[ \t]+/, $line;
            $ChiQ=$field[2]*$cf;
            printf AEROUT " %4d,    %11.4e, %12s, %12s, %12s \n",$i,$ChiQ,$field[6],$srcname,$pollutant;

          }
        }
      }
      close (AERIN);
  close (AEROUT);
```