Greenhouse Gas Inventory Management Plan

Truckee Tahoe Airport District

September 2017

Prepared for: Truckee Tahoe Airport District
10356 Truckee Airport Road
Truckee, California 96161

Prepared by: First Environment, Inc.
770 L Street, Suite 950
Sacramento, California 95814

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Revision Page

The TTAD will revise this document as needed to reflect changes in its organizational boundaries, emission sources, data collection approaches, quantification methodologies, and quality assurance procedures; or to improve procedures for the development of the GHG Inventory.

Version Number	Revised By	Revision Date	Description of Revisions
1.0	First Environment	June 2017	Created document.
1.1	First Environment	September 2017	Incorporated v1.0 review comments.

List of Acronyms

ACI - Airports Council International
ACERT - Airport Carbon and Emissions Reporting Tool
AEDT - Federal Aviation Administration Aviation Environmental Design Tool
APU – Auxiliary Power Unit
AR4 - Intergovernmental Panel on Climate Change's Fourth Assessment Report
CH_4 - methane
CO_2 – carbon dioxide
CO_2e - Carbon Dioxide Equivalents
eGRID – US EPA Emissions & Generation Resource Integrated Database
EPA – Environmental Protection Agency
FAA – Federal Aviation Administration
GHG – greenhouse gas
GWP – global warming potential
HFC – hydrofluorocarbon
IMP – Inventory Management Plan
IPCC - Intergovernmental Panel on Climate Change
LTO – landing and take-off
LPG – liquid petroleum gas (propane)
MT – metric tonnes
MSW – municipal solid waste
N_2O – nitrous oxide
PFC - perfluorocarbon
SAR - Intergovernmental Panel on Climate Change's Second Assessment Report
SF_6 – sulfur hexafluoride
TAR - Intergovernmental Panel on Climate Change's Third Assessment Report
TCR – The Climate Registry
TD PUD – Truckee Donner Public Utility District
TTAD – Truckee Tahoe Airport District
UNFCCC – United Nations Framework Convention on Climate Change
WARM - US EPA Waste Reduction Model

1 Greenhouse Gas Inventory

Introduction and Background

This Inventory Management Plan (IMP) provides a framework for the management of greenhouse gas (GHG) accounting within Truckee Tahoe Airport District.

Truckee Tahoe Airport is a regional general aviation airport serving the Town of Truckee, communities along the northern side of Lake Tahoe, and other nearby areas in the central Sierra Nevada mountain range of California.

The airport property occupies approximately 926 acres of land. Additionally, the District has interest in another 1,717 acres that was acquired to help preserve compatible land uses and enable aviation related services in other parts of the district.

A GHG emissions inventory identifies an organization's GHG emission sources and quantifies them according to a set of acknowledged conventions using established estimation methodologies.

This IMP outlines the data, methodologies, and tools required to perform a GHG inventory in an accurate, reliable, and repeatable manner.

GHG Inventory Purpose and Objectives

The District will use the Greenhouse Gas Emissions Inventory to do the following:

1. Demonstrate environmental leadership.
2. Prepare the District for future legislation at the Federal, State, and local level related to GHG and carbon emissions.
3. Look for fuel consumption related efficiencies.
4. Look for ways to mitigate direct and indirect GHG emissions at the Airport.
5. Use data to identify current and future trends and facilitate comparisons with other airport inventories to benchmark progress.
6. Assist the Board and Staff in airport policy and decision making.
7. Complete the first critical step in preparation of an Environmental Sustainability Plan and Environmental Management System.

This IMP directs data collection, data management, emissions quantification and reporting to facilitate consistency, comparability, and transparency.

In summary, TTAD's Inventory Management Plan document has the following purpose:

- to guide TTAD employees and tenants who are responsible for collecting inventory data;
- to allow TTAD to effectively assess its environmental performance with respect to GHG emissions in a credible and open manner;
- to inform TTAD employees, tenants, and other stakeholders on TTAD's GHG inventory.

2 Inventory Approach and Principles

Guidance

TTAD's GHG Inventory was prepared consistent with the The GHG Protocol (2004), an effort of the World Resources Institute and the World Business Council for Sustainable Development (WRI/WBCSD).

TTAD's GHG Inventory is also derived from guidance provided by the ISO 14064 standard, Greenhouse gases – Part 1: Specification for the quantification, monitoring, and reporting of emissions and removals.

Development of TTAD's GHG inventory was also informed by ACRP Report 11 – Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories.

Emission quantification methodologies and emission factors applied in the TTAD GHG inventory and methodologies come from the following sources:

- United States Environmental Protection Agency Center for Corporate Climate Leadership Greenhouse Gas Inventory Guidance for:
    - Direct Emissions from Stationary Combustion Sources,
    - Direct Emissions from Mobile Combustion Sources,
    - Indirect Emissions from Purchased Electricity,
    - Direct Fugitive Emissions from Refrigeration, Air Conditioning, Fire Suppression, and Industrial Gases.
- The Climate Registry General Reporting Protocol.
- Federal Aviation Administration Office of Environment and Energy Aviation Emissions and Air Quality Handbook.
- United States Environmental Protection Agency Center for Corporate Climate Leadership Emission Factors for Greenhouse Gas Inventories.
- The Climate Registry Default Emission Factors.
- Truckee Donner Public Utility District 2012 Greenhouse Gas Emissions Re-Inventory.
- United States Environmental Protection Agency Emissions & Generation Resource Integrated Database (eGRID).
- Federal Aviation Administration Aviation Environmental Design Tool (AEDT).

Inventory Principles

TTAD's GHG Inventory and reporting is based on the principles of relevance, completeness, consistency, transparency, and accuracy. Adherence to these principles is necessary to ensure that inventoried and reported data are free of significant errors and capable of being relied upon by users of this information.

Relevance

Relevance refers to information that is significant and useful for decision making by stakeholders. Relevance has implications on reporting content, as well as timeliness.

Completeness

TTAD's GHG inventory and reporting are complete and therefore include all emissions within TTAD's operational and organizational boundaries that are important and significant to users.

Consistency

TTAD's GHG information is quantified and reported to allow for valid year-to-year comparisons. Changes to the inventory, its approach or methods, or the way in which it is reported are appropriately documented and justified to ensure consistency.

Transparency

TTAD's GHG Inventory Report is intended to provide users with a clear understanding of the contained information through a factual, neutral, and coherent presentation of information. At a minimum, the reported data is supported by the approach and the emissions estimation methodologies used and the identification of any assumptions made. All reported information is based on a clear audit trail.

Accuracy

TTAD's Inventory Report is sufficiently accurate and precise to enable its intended users to make decisions based on the reported information with reasonable confidence. Quality systems and other controls have been implemented to identify and eliminate any systematic and/or random errors. Uncertainties associated with GHG information have been reasonably and appropriately identified and communicated.

3 Inventory Boundaries

Temporal Boundary

The TTAD's GHG inventory takes the calendar year approach to the quantification and reporting of GHG emissions. GHG inventory reports according reflect emissions occurring at TTAD between January 1 and December 31 of a particular calendar year.

At the current time, TTAD has not designated a base year. Designation of a base year provides a benchmark against which subsequent emission years are compared to identify relative changes in GHG emissions or progress towards GHG reduction goals.

Greenhouse Gases

TTAD's GHG Inventory evaluated emissions of all six internationally recognized greenhouse gases:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Sulfur hexafluoride (SF_6).

No sources of PFCs or SF_6 were identified within TTAD inventory boundaries.

Organizational Boundaries

Organizational boundaries define the limits of a GHG inventory by identifying the activities that are owned and/or controlled by the entity and determining which activities and emission sources should be included in its GHG inventory.

TTAD's GHG Inventory consolidates GHG emissions according to the operational control approach, where operational control is established for entities, facilities, activities, and sources over which the organizational possesses the authority to implement operating policies, such as financial, environmental, or health and safety directives.

This GHG inventory also identifies emissions that are a consequence of the activities of TTAD but result from facilities, activities, and sources owned by or under the operational control of other entities. For the TTAD GHG inventory, these other entities include airport tenants as well as the operators of aircraft which are served by the airport.

Operational Boundaries

Operational boundaries of a GHG inventory refer to the specific types of emission sources that the TTAD, as defined by the inventory's organizational boundary, possesses and will include in its GHG Inventory. A key distinction in setting operational boundaries is whether GHG emissions sources are categorized as direct emissions or indirect emissions.

- Direct emissions result from emission sources that are owned or operated by the organization.
- Indirect emissions are emissions that are due to an organization's activities but occur from sources owned or controlled by another organization.

The concept of emission "scopes" expands upon the distinction between direct and indirect emissions, splitting indirect emissions into two separate categories: one associated with indirect energy emissions and the other capturing all other types of indirect emissions. In addition, categories of common sources, such as stationary combustion, create a framework for the organization of the inventory. This framework facilitates the identification of appropriate quantification methodologies for emission sources, collection of data, as well as reporting of inventory results.

The general operational boundaries of the TTAD GHG inventory are as follows:

Scope 1: Direct GHG emissions from activities that are owned or controlled by the reporting entity.

TTAD Scope 1 GHG emission categories include the following:

- stationary combustion,
- mobile combustion,
- fugitive emissions.

Scope 2: Indirect GHG emissions from the generation of purchased or acquired energy, such as electricity, which is consumed by the reporting entity.

TTAD Scope 2 GHG emission categories include the following:

- purchased electricity.

Scope 3: All other indirect emissions not covered in Scope 2.

TTAD Scope 3 GHG emission categories include the following:

- Tenant stationary combustion, mobile combustion, fugitive emissions, and consumption of purchased electricity.
- Fugitive emissions resulting from airport waste disposed in third-party landfills.
- Aircraft operations – specifically from the LTO cycle to an altitude of 3,000 feet.

Specific emission sources in the TTAD GHG inventory include the following:

Scope 1 - Direct Emissions

The following sources are identified as Scope 1 sources of GHG emissions:

- Stationary Combustion of Natural Gas in heaters, water heaters and similar units which produce CO_2, CH_4, and N_2O emissions.
- Stationary Combustion of Gasoline in a portable generator and portable wielder which produce CO_2, CH_4, and N_2O emissions.
- Stationary Combustion of Diesel in airfield and maintenance generators which produce CO_2, CH_4, and N_2O emissions.
- Stationary Combustion of Acetylene by welding activities which produce CO_2, CH_4, and N_2O emissions.
- Mobile Combustion of Gasoline by ground support vehicles and other airport vehicles which produce CO_2, CH_4, and N_2O emissions.
- Mobile Combustion of Diesel by ground support vehicles and other airport vehicles which produce CO_2, CH_4, and N_2O emissions.
- Mobile Combustion of Propane by airport forklifts which produce CO_2, CH_4, and N_2O emissions.
- Fugitive Emissions of HFCs from Stationary Air Conditioning and Refrigeration Units releasing R-134a, R-404A, R-410A.
- Fugitive Emissions of HFCs from Mobile Air Conditioning Sources releasing R-134a.
- Fugitive Emissions of CO_2 from Fire Extinguishers.

Scope 2 - Energy Indirect Emissions

The following sources are identified as Scope 2 sources of GHG emissions:

- Consumption of purchased electricity which indirectly result in CO_2, CH_4, and N_2O emissions.

Scope 3 - Other Indirect Emissions

The following sources are identified as Scope 3 sources of GHG emissions:

- Airport Tenant Activities -
    - Stationary Combustion of Natural Gas in heaters, water heaters and similar units which produce CO_2, CH_4, and N_2O emissions.
    - Mobile Combustion of Gasoline by ground support vehicles and other tenant vehicles which produce CO_2, CH_4, and N_2O emissions.
    - Mobile Combustion of Diesel by ground support vehicles and other tenant vehicles which produce CO_2, CH_4, and N_2O emissions.
    - Mobile Combustion of Propane in tenant forklifts which produce CO_2, CH_4, and N_2O emissions.
    - Consumption of purchased electricity which indirect result in CO_2, CH_4, and N_2O emissions.
    - Fugitive Emissions of HFCs from Stationary Air Conditioning and Refrigeration Units releasing R-134a, R-404A, R-410A.
- Airport Waste disposed in Third-Party Landfills which results in CH_4 emissions.
- Emissions from Aircraft Operations at the Airport -
    - LTO Cycle Emissions from Aircraft and Helicopters which produce CO_2, CH_4, and N_2O emissions.
    - Emissions from the Startup of Jet Engines which produce CO_2, CH_4, and N_2O emissions.
    - Emissions from the operation of Auxiliary Power Units (APUs) which produce CO_2, CH_4, and N_2O emissions.

The GHG inventory also calculates GHG emissions resulting from the combustion of aviation fuels sold at the airport as a further indicator of airport's impact on greenhouse gas emissions. These aviation fuels emissions are not aggregated with the Scope 1, 2, or 3 emissions to avoid double counting since some fuel emissions are accounted for relative to aircraft operations.

4 Inventory Data Collection Methodologies

Data Collected for Each Source

Two primary methodologies are utilized to collect data:

- Data is provided by TTAD staff. In some cases when data is not available for a particular source, individuals knowledgeable of the activities will provide an estimate.
- Tenants are distributed customized questionnaires which request various types of data from their activities such as electricity consumption, fuel consumption, air conditioning, and refrigeration systems. An example of a tenant questionnaire is included in Appendix E.

The collection methodology for each source is summarized below.

Scope 1 Emissions

Stationary Combustion

Natural Gas

TTAD staff provides a summation of natural gas usage in therms in airport buildings compiled from Southwest Gas Corporation invoices. Each building in the summary is designated as operated under TTAD control or tenant operated and controlled. Total natural gas usage in airport-controlled buildings is totaled.

A complete list of airport buildings and designation of operational control is provided in Appendix A.

Gasoline

TTAD staff provides a summation of gasoline usage in gallons which was provided to airport operations, including both stationary and mobile equipment. Hourly fuel consumption rates for the gasoline-fueled generators and weekly run-times are used to estimate gasoline consumption by stationary sources.

Generator hourly fuel consumption rates:

Name	Fuel Use	Units	Fuel Type
Welder Portable	1.7	gallons/hour	Gasoline
Portable	0.5	gallons/hour	Gasoline

Weekly run times:

Generators run 0.50 hours per week.

As a best practice, it is recommended that TTAD staff maintain field logs that record actual generator run-times.

Diesel

TTAD staff provides a summation of diesel usage in gallons which was provided for airport activities, including both stationary and mobile equipment. TTAD staff also provides hourly fuel consumption rates for the diesel-fuel generators and weekly run-times estimates. These rates and estimates are used to estimate diesel consumption by stationary sources.

Generator hourly fuel consumption rates:

Name	Fuel Use	Units	Fuel Type
Airfield/Terminal Generator	6	gallons/hour	Diesel
Maintenance Generator	3.2	gallons/hour	Diesel

Weekly run times:

Generators run 0.50 hours per week.

As a best practice, it is recommended that TTAD staff maintain field logs that record actual generator run-times.

Acetylene

TTAD staff provides an estimate of acetylene usage in cubic feet.

As a best practice, it is recommended that TTAD track acetylene consumption by retaining fuel purchase records.

Mobile Combustion

Gasoline

TTAD staff provides a summation of gasoline usage in gallons which was provided to airport activities, including both stationary and mobile equipment. Gasoline usage by stationary sources is estimated using generator consumption rates and runtime estimates. This estimate of the stationary usage is subtracted from the total usage. The remaining quantity is assumed to be combusted by mobile sources.

As a best practice, it is recommended that TTAD also record odometer readings or run-hour meter totals for all vehicles at the start and end of each reporting year.

Diesel

TTAD staff provides a summation of diesel usage in gallons which was provided to airport activities, including both stationary and mobile equipment. Diesel usage by stationary sources is estimated using generator consumption rates and runtime estimates. This estimate of the stationary usage is subtracted from the total usage. The remaining quantity is assumed to be combusted by mobile sources.

As a best practice, it is recommended that TTAD also record odometer readings or run-hour meter totals for all vehicles at the start and end of each reporting year.

Propane

TTAD staff provides a summation of propane purchases in gallons, which is assumed to be representative of usage.

As a best practice, it is recommended that TTAD track propane consumption by retaining fuel purchase records.

Fugitive Emissions

Stationary Air Conditioning and Refrigeration Units

TTAD staff provides an inventory of airport air conditioning and refrigeration units identifying refrigerant type and total refrigerant charge in ounces. Unit information is aggregated by equipment types (e.g., domestic refrigeration) and refrigerant types.

TTAD Air Conditioning and Refrigeration Unit Inventory

Equipment	Equipment Type	Refrigerant	Charge (oz)
Admin Building Chiller	Chiller	R-410A	1088
Household Refrigerator (3)	Domestic Refrigeration	R-134A	12.6
Deli Walk-in Cooler	Stand Alone Commercial Application	R-404A	24
Deli Upright Cooler	Stand Alone Commercial Application	R-404A	18

As a best practice, it is recommended that TTAD maintain records of any equipment servicing, including refrigerant replenishment and recharge quantities.

Mobile Air Conditioning Sources

TTAD staff provides an inventory of airport ground services equipment and vehicles identifying which vehicles possess an air conditioning unit. The number of vehicles with air conditioning units is multiplied by an assumed 0.5kg charge of R-134a.

A complete list of vehicles and ground service equipment and air conditioning capacity, refrigerant, and charge quantity is provided in Appendix B.

As a best practice, it is recommended that TTAD maintain records of any equipment servicing, including refrigerant replenishment and recharge quantities.

Fire Extinguishers

TTAD staff provides an inventory of airport fire extinguishers identifying extinguisher type and total charge in pounds. Carbon dioxide extinguisher information is totaled.

List of CO_2 Fire Extinguishers at Truckee Tahoe Airport	
Location	**Quantity (lb)**
Gen. RM	10
Elec. Room	10
Lawn Pole 9	50
Pole 8	50
Flatbed 1	20
Ops truck	10

Scope 2 Emissions

Purchased Electricity

TTAD staff provides a summation of electricity consumption in kilowatt hours in airport buildings compiled from Truckee Donner Public Utility District invoices. Each building in the summary is designated as operated under TTAD control or tenant operated and controlled. Total electricity consumption in airport-controlled buildings is summed.

A complete list airport buildings and designation of operational control is provided in Appendix A.

Scope 3 Emissions

Tenant Activities

Tenant Stationary Combustion of Natural Gas

TTAD staff provides a summation of natural gas usage in therms in airport buildings compiled from Southwest Gas Corporation invoices. Each building in the summary is designated as operated under TTAD control or tenant operated and controlled. Total natural gas usage in tenant-controlled buildings is totaled. In addition, airport tenants possessing natural accounts directly with the gas utility report an estimate of gas usage via the tenant questionnaire and these quantities are aggregated. The gas subtotals from the airport summation and the tenant questionnaires is summed.

Tenant Mobile Combustion of Gasoline

Airport tenants report an estimate of gasoline usage in mobile sources via the tenant questionnaire and these quantities are aggregated.

Tenant Mobile Combustion of Diesel

Airport tenants report an estimate of diesel usage in mobile sources via the tenant questionnaire and these quantities are aggregated.

Tenant Mobile Combustion of Liquid Petroleum Gas (Propane)

Airport tenants report an estimate of liquid petroleum gas usage in mobile sources via the tenant questionnaire and these quantities are aggregated.

Tenant Air Conditioning and Refrigeration Units

Airport tenants report air conditioning units and refrigerators via the tenant questionnaire. Reported unit counts are aggregated by equipment types (e.g., domestic refrigeration) and multiplied by an average refrigerant charge for the types.

Tenant Consumption of Electricity

TTAD staff provides a summation of electricity consumption in airport buildings compiled from utility invoices. Each building in the summary is designated as operated under TTAD control or tenant operated and controlled. Total consumption in tenant-controlled buildings is summed. In addition, airport tenants possessing electricity accounts directly with the power utility report an estimate of gas usage via the tenant questionnaire and these quantities are aggregated. The electricity subtotals from the airport summation and the tenant questionnaires are summed.

<u>Landfilled Waste</u>

TTAD staff provided an estimate of airport waste sent to the landfill of 21 cubic feet per week based on waste receptacle volume and an assumption of full weekly usage of this capacity. This weekly volume of waste was multiplied by 52 weeks to obtain an annual quantity.

Tahoe Truckee Sierra Disposal Waste Bins at Truckee Tahoe Airport
6 cubic yard bin
6 cubic yard bin
3 cubic yard bin
6 cubic yard bin

As a best practice, it is recommended that TTAD maintain waste hauling records and/or billing records from the disposal service to document actual quantities of waste landfilled.

<u>Aircraft Operations</u>

<u>Aircraft LTO Cycle</u>

Total aircraft operations allocated to general aircraft categories is determined from Truckee Tahoe Airport District Operations and Community Comment Report. In addition, TTAD staff provides “Model ReportxxxxKTRK.xlsx” which identifies the number of arrival and departures for a particular aircraft type (e.g., AC109). These aircraft models are sorted according to three aircraft categories: piston, turbo prop, and jet. The aircraft in each category are ranked and model-specific arrival and departure totals are identified for the top 80 percent of the aircraft models. The 20 percent remainder of the operations from each aircraft category are assigned to a representative aircraft for that category (e.g., Cessna Citation 560XL for jets) and assumed to be equally divided between arrivals and departures. These aircraft arrival and departure totals are summarized.

TTAD "Representative" Aircraft

Aircraft Category	Representative Aircraft
Piston Single	Cessna Skylane C182
Glider Tow Plane	Cessna Skylane C182
Piston Twin	Cessna 421
Turbo Prop	Pilatus PC12
Jet	Cessna Citation 560XL

Helicopter LTO Cycle

Total helicopter operations are determined from Truckee Tahoe Airport District Operations and Community Comment Report. The operations are divided by two to identify helicopter LTOs.

TTAD "Representative" Helicopter

Helicopter	Eurocopter A-star AS50

Jet Engine Startup

Total turbo prop, jet, and helicopter operations are determined from Truckee Tahoe Airport District Operations and Community Comment Report. These turbo prop, jet, and helicopter operations are divided by two to identify departure operations that would begin with a jet engine startup.

- Jet aircraft are assumed to have twin jet engines.
- Helicopters are assumed to have single jet engines.
- Seventy percent of turbo prop aircraft are assumed to have single jet engines and the remaining 30 percent are assumed to have twin jet engines.

Turbo prop, jet, and helicopter departure quantities are aggregated according to single engine aircraft and twin engine aircraft.

APU Emissions

Total operations for jets larger than 20,000 pounds are identified from Truckee Tahoe Airport District Operations and Community Comment Report. Sixty percent of these jet operations are assumed to have operated an APU.

Aviation Fuel Sales Emissions

TTAD staff provides 100LL aviation gasoline and Jet A fuel sales total in gallons as determined from the fuel dispensing system metering.

The Jet A fuel sales totals from the fuel dispensing system include an immaterial quantity of Prist fuel system icing inhibitor, but fuel quantities are not adjusted to account for this additive since the volume is immaterial.

5 Emissions Quantification Methodologies

GHG emissions are calculated using methodologies from:

- United States Environmental Protection Agency Center for Corporate Climate Leadership Greenhouse Gas Inventory Guidance for:
    - Direct Emissions from Stationary Combustion Sources;
    - Direct Emissions from Mobile Combustion Sources;
    - Indirect Emissions from Purchased Electricity;
    - Direct Fugitive Emissions from Refrigeration, Air Conditioning, Fire Suppression, and Industrial Gases.
- The Climate Registry General Reporting Protocol.
- Federal Aviation Administration Office of Environment and Energy Aviation Emissions and Air Quality Handbook.

In addition, GHG emissions are calculated using emission factors sourced from:

- United States Environmental Protection Agency Center for Corporate Climate Leadership Emission Factors for Greenhouse Gas Inventories.
- The Climate Registry Default Emission Factors.
- Truckee Donner Public Utility District 2012 Greenhouse Gas Emissions Re-Inventory.
- United States Environmental Protection Agency Emissions & Generation Resource Integrated Database (eGRID).
- Federal Aviation Administration Aviation Environmental Design Tool (AEDT).

The quantification methodology for each source is summarized in the following paragraphs.

Scope 1 Emissions

Stationary Combustion

Natural gas

Emissions are calculated by multiplying the mmBtu heat content of the total natural gas usage in airport-controlled buildings by the following natural gas emission factors for CO_2, CH_4, and N_2O sourced from the US EPA emission factors for GHG inventories:

	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu
Natural Gas	53.06	1.00	0.10

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Gasoline

Emissions are calculated by multiplying the total gallons of estimated gasoline usage by the stationary sources by the following gasoline emission factors for CO_2, CH_4 and N_2O sourced from the US EPA emission factors for GHG inventories:

	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Motor Gasoline	8.78	0.38	0.08

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that were converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Diesel

Emissions are calculated by multiplying the total gallons of estimated diesel usage by stationary sources by the following diesel emission factors for CO_2, CH_4, and N_2O sourced from the US EPA emission factors for GHG inventories:

	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Distillate Fuel Oil No. 2	10.21	0.41	0.08

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that were converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Acetylene

Emissions are calculated by multiplying the total cubic feet of estimated acetylene usage by the following CO_2 emission factor source from the TCR's GRP:

	kg CO_2 per standard cubic foot
Acetylene	0.11

The results of these calculations are converted to pounds of CO_2, emissions, which are converted to metric tonnes of CO_2 emissions.

Mobile Combustion

Gasoline

Emissions are calculated by multiplying the total gallons of estimated gasoline usage by mobile sources by the following gasoline emission factors for CO_2, CH_4, and N_2O sourced from the US EPA emission factors for GHG inventories:

	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Motor Gasoline	8.78	0.50	0.22

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Diesel

Emissions are calculated by multiplying the total gallons of estimated diesel usage by mobile sources by the following diesel emission factors for CO_2, CH_4, and N_2O sourced from the US EPA emission factors for GHG inventories:

	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Diesel Fuel	10.21	0.57	0.26

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Propane

Emissions are calculated by multiplying the total gallons of estimated propane usage by mobile sources by the following liquid petroleum gas (LPG) emission factors for CO_2, CH4, and N_2O sourced from the US EPA emission factors for GHG inventories, since propane emission factors for mobile sources were not available.

	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Liquefied Petroleum Gases (LPG)	5.68	0.50	0.22

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Fugitive Emissions

Refrigerants, Stationary Sources

Emissions are calculated by multiplying the total refrigerant charge in pounds for an equipment type (e.g., domestic refrigeration) by the following equipment-specific "operating emission factor" reflecting a percent annual leakage of the equipment charge, sourced from TCR's default emission factors:

	Operating Emission Factor
Type of Equipment	**% of capacity**
Domestic Refrigeration	0.5%
Stand-Alone Commercial Applications	15%
Chillers	15%
Commercial A/C	10%

The results of these calculations are pounds of the specific refrigerant (e.g., R-134a) emissions that are converted to metric tonnes of the refrigerant emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Refrigerants, Mobile Sources

Emissions are calculated by multiplying the total estimated R-134a refrigerant charge in pounds for mobile air conditioning by the following "operating emission factor" for mobile air conditioning systems, reflecting a percent annual leakage of the equipment charge, sourced from TCR's default emission factors:

	Operating Emission Factor
Type of Equipment	**% of capacity**
Mobile Air Conditioning	20%

The results of these calculations are converted to pounds of R-134a emissions that are converted to metric tonnes of the R-134a emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

CO_2 Fire Extinguishers

Emissions are calculated by multiplying the total CO_2 fire extinguisher capacity in pounds by an "operating emission factor" for portable fire suppression equipment, reflecting a percent annual leakage of the equipment, sourced from US EPA's guidance for direct fugitive emissions:

	% of total capacity
Portable equipment	3.5%

The result of this calculation is pounds of CO_2 emissions, which is converted to metric tonnes CO_2e.

Scope 2 Emissions

<u>Purchased Electricity</u>

"Market-based electricity emissions" are calculated by multiplying the megawatt hours of total consumption in airport-controlled buildings by the following electricity emission factors for CO_2, CH_4 and N_2O sourced from the Truckee Donner PUD 2012 GHG Re-Inventory:

	lb CO_2 per MWh	lb CH_4 per GWh	lb N_2O per GWh
Electricity - TDPUD	606.8	9.55	7.02

The results of these calculations are pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

An alternate calculation is performed to quantify "location-based electricity emissions" by multiplying the megawatt hours of total consumption in airport-controlled buildings by electricity emission factors for CO_2, CH_4, and N_2O sourced from eGRID:

	lb CO_2 per MWh	lb CH_4 per GWh	lb N_2O per GWh
Electricity – NWPP subregion	907.0	97.8	14.2

The results of these calculations are pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Scope 3 Emissions

<u>Tenant Activities</u>

<u>Tenant Stationary Combustion of Natural Gas</u>

Emissions are calculated for total tenant natural gas usage using the same methodology as identified above for Scope 1 stationary combustion of natural gas.

Tenant Mobile Combustion of Gasoline

Emissions are calculated for total tenant gasoline usage using the same methodology as identified above for Scope 1 mobile combustion of gasoline.

Tenant Mobile Combustion of Diesel

Emissions are calculated for total tenant diesel usage using the same methodology as identified above for Scope 1 mobile combustion of diesel.

Tenant Mobile Combustion of Liquefied Petroleum Gas (Propane)

Emissions are calculated for total tenant LPG usage using the same methodology as identified above for Scope 1 mobile combustion of propane.

Tenant Air Conditioning and Refrigeration Units

Emissions are calculated for tenant air conditioning and refrigeration units using the same methodology as identified above for Scope 1 refrigerants, stationary sources.

Tenant Consumption of Electricity

Emissions are calculated for total tenant electricity consumption using the same methodologies as identified above for Scope 2 purchased electricity.

Landfilled Waste

The estimate of annual cubic yards of airport waste is converted to short tons of waste landfilled assuming that it was a residential/institutional/commercial mixed solid waste (MSW) stream and using the following conservative waste density (i.e., volume to weight conversion factor) sourced from the US EPA Office of Resource Conservation and Recovery:

Waste Density	300	lb MSW per cubic yard MSW

The mixed MSW weight quantity is entered into the US EPA Waste Reduction Model which calculates an emissions output in units of metric tonnes CO_2e, though calculated using IPCC GWPs from the fourth assessment report (AR4). For consistency, the output is converted to metric tonnes of CH_4 emissions using the AR4 GWP for CH_4, which is the primary GHG released from landfills. This value is then multiplied by IPCC SAR CH_4 GWP to identify total emissions in units of metric tonnes CO_2e.

Aircraft Operations

Aircraft LTO Cycle

The number of aircraft-specific arrivals and departures are multiplied by aircraft-specific fuel burn quantities for landing and takeoff cycle modes (e.g., taxi-out, takeoff, climbout, etc.), which are modeled for Truckee Tahoe Airport conditions to an altitude of 3,000 feet using the FAA AEDT, to estimate total aviation gasoline or jet fuel combusted for piston, turbo prop, and jet aircraft categories. The AEDT LTO cycle fuel burn value modeling approach is described in Appendix C.

A list of aircraft modeled in AEDT is identified in Appendix D.

The aircraft category fuel totals are multiplied by the following LTO-specific avgas and Jet A fuel emission factors for CO_2, CH_4, and N_2O sourced from the FAA Aviation Emissions and Air Quality Handbook:

	lb CO_2 per gallon	**lb CH_4 per gallon**	**lb N_2O per gallon**
Avgas - LTO	18.342	0.0155	0.000243
Jet A - LTO	21.098	0.0	0.000683

The results of these calculations are pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Helicopter LTO Cycle

Total helicopter LTOs are multiplied by the following fuel usage per LTO value for the Eurocopter AS350 sourced from the Airports Council International (ACI) Airport Carbon and Emissions Reporting Tool (ACERT) to identify total jet fuel combusted for helicopter LTO:

Aircraft Type	No./Eng	Typical Engine	Data	Fuel Burn
Eurocopter AS350	1H	Arriel 1D1	LSZH-H650	35 kg/LTO

The helicopter Jet A total is multiplied by the following LTO-specific Jet A emission factors for CO_2, CH_4, and N_2O sourced from the FAA Aviation Emissions and Air Quality Handbook.

	lb CO_2 per gallon	lb CH_4 per gallon	lb N_2O per gallon
Jet A - LTO	21.098	0.0	0.000683

The results of these calculations are pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Jet Engine Startup

Consistent with the following jet engine startup fuel usage methodology from the FAA Aviation Emissions and Air Quality Handbook, single jet engine aircraft and twin engine aircraft departure totals are multiplied by an engine-specific "idle" fuel flow rate for the Pratt & Whitney JT15D-5, as an overall representative jet engine, sourced from ICAO Aircraft Engine Exhaust Emissions Databank, v23, adjusted to a 42-second startup period, to identify total jet fuel combusted for jet engine startups.

FAA Engine Startup Fuel Usage Equation

Fuel Usage = [(Fuel Flow Rate x 2 seconds x Number of Engines s x 1 hour / 3600 seconds / 6.84 pounds per gallon) + (Fuel Flow Rate x 40 seconds x Number of Engines s x 1 hour / 3600 seconds / 6.84 pounds per gallon)] x Number of Operations

Cessna Citation 560XL		
Pratt & Whitney JT15D-5, -5A, -5b		
Fuel flow rate	0.0296	kg/sec

The jet engine startup Jet A fuel total is multiplied by the following "startup mode"-specific Jet A emission factors for CO_2, CH_4, and N_2O sourced from the FAA Aviation Emissions and Air Quality Handbook.

	lb CO_2 per gallon	lb CH_4 per gallon	lb N_2O per gallon
Jet A - startup mode	21.098	0.000595	0.000683

The results of these calculations is pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

APU Emissions

Consistent with the following APU fuel usage methodology from the FAA Aviation Emissions and Air Quality Handbook, the estimated APU operations total is multiplied by an APU-specific fuel flow rate for APU GTCP-36-100, as an overall representative APU, sourced from FAA AEDT. The APU usage period is assumed to be 15 minutes. The calculation identifies total jet fuel combusted for APU operations.

FAA APU Fuel Usage Equation

Fuel Usage = Fuel Flow Rate x Operating Time x Number of Operations x 1 hour / 60 minutes / 6.84 pounds per gallon

APU GTCP-36-100		
Fuel flow rate	146	lb/hour

The APU operation Jet A fuel total is multiplied by the following “startup mode”-specific Jet A emission factors for CO_2, CH_4, and N_2O sourced from the FAA Aviation Emissions and Air Quality Handbook.

	lb CO_2 per gallon	**lb CH_4 per gallon**	**lb N_2O per gallon**
Jet A - startup mode	21.098	0.000595	0.000683

The results of these calculations are pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Aviation Fuel Sales Emissions

The 100LL and Jet A fuel sales total in gallons are multiplied by the following aviation gasoline and kerosene-type jet fuel emission factors for CO_2, CH_4, and N_2O sourced from the US EPA emission factors for GHG inventories.

	kg CO_2 per gallon	**g CH_4 per gallon**	**g N_2O per gallon**
Aviation Gasoline	8.31	7.06	0.11
Kerosene-Type Jet Fuel	9.75	0.00	0.30

The results of these calculations are converted to pounds of CO_2, CH_4, and N_2O emissions that are converted to metric tonnes of CO_2, CH_4, and N_2O emissions, and then multiplied by IPCC SAR GWPs to identify total emissions in units of metric tonnes CO_2e.

Global Warming Potentials

The Global Warming Potentials, identified in the Second Assessment Report of the Intergovernmental Panel on Climate Change, are used to convert the GHG emissions associated with Airport activities into carbon dioxide equivalents (CO_2e).

The Global Warming Potentials applied to the TTAD GHG inventory are the following:

Name	Chemical Formula	SAR GWP Value
Carbon Dioxide	CO_2	1
Methane	CH_4	21
Nitrous oxide	N_2O	310
Hydrofluorocarbons (HFCs), HFC blends and refrigerant blends		
R-410A		1725
R-134A		1300
R-404A		3260

6 GHG Inventory Roles & Responsibilities

Inventory Activity	Responsibility
Data collection – Natural Gas	TTAD Staff
Data collection - Electricity	TTAD Staff
Data collection – Gasoline, diesel and propane	TTAD Staff
Data collection – Refrigerants and fire suppression	TTAD Staff
Data collection – Waste	TTAD Staff
Data collection – Aviation fuel sales	TTAD Staff
Data collection – Aircraft operations	TTAD Staff
Data collection – Tenant activities	TTAD Tenants
Quantifying GHG Emissions	TTAD Consultant
QA/QC of GHG calculations	TTAD Consultant
Preparing GHG Inventory Report	TTAD Consultant
Internal QA/QC of GHG Inventory Report	TTAD Staff and TTAD Consultant
Approval of final GHG Inventory Report	TTAD Board of Directors
Updating Inventory Management Plan	TTAD Staff and TTAD Consultant

7 Data Management

Data Collection Process

The TTAD General Manager will supervise the annual collection of data by the Director of Operations & Maintenance, Director of Finance & Administration, and other senior staff.

Section 4 lists how TTAD will collect each data element.

Data Collection Process – Quality Assurance

The TTAD General Manager will review collected data for quality assurance. As necessary, the TTAD Consultant will also perform QA/QC of data collected.

For more information on inventory quality assurance, see Section 9.

8 Inventory Management

Control of Records

Records associated with the GHG inventory will be managed consistent with current Finance record-keeping practices.

9 Quality Control

Internal Quality Control

GHG Inventory quality refers to the general accuracy and consistency between an organization's actual GHG emissions and quantified GHG emissions. The difference between actual and quantified GHG emissions results from uncertainty introduced by activities such as data collection, data management, calculations, and reporting. Inventory quality is impacted as data progresses from individual sources to the final report.

A GHG Inventory is a data product upon which a variety of stakeholders may make decisions and take actions. Overall GHG emissions quality affects the confidence that these stakeholders have in the final inventory. Issues of quality and confidence have increased significance when the decisions or actions are related to issues of regulatory compliance or financial management, such as emission trading.

Regardless of the end use of the inventory data, all GHG data management systems must employ mechanisms to improve the quality of the collected and reported data. Inventory quality activities generally include use of best practice processes, emissions calculations and factors, and implementation of reviews and accuracy checks on activity data.

TTAD takes many steps to ensure inventory quality at points throughout the data collection, documentation, calculation, and roll-up processes. These checks begin at the source of emissions and follow the data to its final aggregated form.

Specific actions regarding TTAD's inventory quality are applied to the following major components of its GHG management system:

- inventory process and systems,
- methods,
- data, and
- documentation.

Inventory Processes and Systems

Inventory processes and systems refer to the approach and structure implemented to prepare a quality inventory. TTAD personnel are also a key component of the GHG Inventory process and system.

The TTAD GHG Inventory process is based upon recognized best practices including the GHG Protocol. TTAD recognizes that these reference documents compile the insights of a broad group of industry, environmental, and government experts and have adhered to the guidance provided to implement quality-based inventory process and systems. Key to the inventory process and systems are the identification of the inventory principles (e.g., relevance, completeness, consistency, transparency, accuracy), which provide direction to all aspects of the effort.

Methods

Inventory methods include all the technical aspects of conducting the GHG Inventory. The methods used in TTAD GHG Inventory have been carefully chosen and effectively implemented to ensure quality results and consistency with recognized best practices in GHG accounting.

TTAD will continue to assess both the GHG Inventory methods used, as well as new and improved methods identified, and adopt when appropriate to ensure that its GHG Inventory employs methods that support high inventory quality.

Data

Throughout the GHG Inventory process, management systems and methods create an environment that supports data quality. To ensure this, the GHG Inventory process includes data quality management.

TTAD quantification methodologies use submitted activity data to estimate emissions for particular sources. Data collection processes and procedures are designed to maximize clarity and understanding of expectations and minimize errors in these efforts.

The following checks are performed on the GHG inventory emission calculations:

- confirm correct summation of activity data;
- confirm that emissions quantification followed correct methodology;
- confirm consistency of conversion factors against source references;
- confirm consistency of emission factors against source references;
- confirm that all quantification formulas are applying correct data values;
- confirm that application of GWPs was correct.

Documentation

Inventory documentation is critical to inventory quality in terms of execution and assessment. Clear documentation of the system, processes, and methods ensure that the inventory is performed to support quality. Documentation, including records and work product, from the performance of inventory tasks allows for the review, confirmation, clarification, and verification that these tasks meet quality expectations.

TTAD GHG Inventory documentation includes this GHG Inventory Management Plan, which provides an overview of the approach and the process. Additional documentation, including emissions factor sources, activity data sources, and assumptions made, is included in the GHG Inventory Tool.

TTAD maintains records of its primary and secondary inventory data including, but not limited to, invoices, fuel inventory, and usage records. It also maintains clear records of calculations and assumptions used in the generation of data and supporting text. This documentation is necessary to explain changes over time and forms part of the audit trail necessary for potential third-party verification.

External Quality Control

The TTAD GHG Inventory is not currently subject to third-party verification.

Management Review

The TTAD Board of Directors is responsible for the final review and approval of the GHG inventory.

IMP Update Procedure

This inventory management plan is a living document that will drive continuous improvement in the accuracy and efficiency of the TTAD GHG emissions inventory. The TTAD General Manager is responsible for working with relevant staff to update the IMP after the completion of each GHG inventory performed. Potential updates to the IMP include:

- updated data management procedures;
- updated data requirements and collection tools;
- updated emission quantification methodologies or emission factors; and
- updated auditing and verification procedures.

10 References

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Truckee Donner Public Utility District
2012 Greenhouse Gas Emissions Re-Inventory
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United States Environmental Protection Agency
Center for Corporate Climate Leadership
Greenhouse Gas Inventory Guidance
Direct Emissions from Stationary Combustion Sources
January 2016

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January 2016

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Center for Corporate Climate Leadership
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Indirect Emissions from Purchased Electricity
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United States Environmental Protection Agency
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Emission Factors for Greenhouse Gas Inventories
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United States Environmental Protection Agency
Emissions & Generation Resource Integrated Database (eGRID)
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World Resources Institute
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March 2004

Appendix A. TTAD Facility List and Operational Control Designation

Facility	Operational Control
Soar Truckee	Tenant
Hangar A/B	Tenant
Hangars C/D	Tenant
Hangars E/F	Tenant
Hangars G/H	Tenant
Phoenix Hangar	Tenant
Runway Intersection	TTAD
EAA	Tenant
EAA Mnt Side	TTAD
Apron Lights	TTAD
Hangar 1	Tenant
Hangar 2	TTAD
Fuel Island	TTAD
Vault (Air Field)	TTAD
Admin Building	TTAD
Hangar J	Tenant
Hangar K	Tenant
Garage	TTAD
Mnt. Building	TTAD
Warehouse A	Tenant
Warehouse B	Tenant
Warehouse C	Tenant
Warehouse D WRA	Tenant
Warehouse House	TTAD
Warehouse Suite E	TTAD
Fuel Farm	TTAD
Hwy 267 Sign	TTAD
Alder Hill Beacon	TTAD
Long Term Pkg Lot	TTAD
M-1 End Pocket	TTAD
M-18 End Pocket	TTAD
L Row House Panel	Tenant
M-11	TTAD
Careflight	Tenant

Appendix B. TTAD Vehicles and Ground Service Equipment and Air Conditioning Capacity

Vehicle Make	Vehicle Model	Fuel Type	On/Off Road	Model Year	Has A/C?	Assumed Refrigerant	Assumed Charge (kg)
Zero Radius Mower - Evolution		Gas?					
Subaru	Forester	Gasoline	On-Road	2014	Y	R-134A	0.5
Ford	F-150 (Ops)	Gasoline	On-Road	2014	Y	R-134A	0.5
Ford	F-350 (FB1)	Gasoline	On-Road	2013	Y	R-134A	0.5
Chevy	2500 (FB2)	Gasoline	On-Road	2003	Y	R-134A	0.5
GMC	3500 FB	Gasoline	On-Road	2000	Y	R-134A	0.5
GMC	Savana Van	Gasoline	On-Road	2002	Y	R-134A	0.5
Ford	F-150	Gasoline	On-Road	2010	Y	R-134A	0.5
International	7300	Diesel	Off-Road	2016	Y	R-134A	0.5
International	Jet Refueler	Diesel	Off-Road	2002	Y	R-134A	0.5
International	100LL Refueler	Diesel	Off-Road	2004	Y	R-134A	0.5
FordF-700	Jet Refueler	Gasoline	Off-Road	1986	N		
Ford F-350	100LL Refueler	Gasoline	Off-Road		N		
Int. MB Plow Turck	7600	Diesel	Off-Road	2015	Y	R-134A	0.5
Cat Loader	950 B	Diesel	Off-Road	1985	N		
Cat Loader	950 F	Diesel	Off-Road	1996	Y	R-134A	0.5
Cat Grader	143H	Diesel	Off-Road	1996	Y	R-134A	0.5
Cat Backhoe	IT 416C	Diesel	Off-Road	1997	Y	R-134A	0.5
Oshkosh Plow Turck	"P" Series	Diesel	Off-Road	1990	N		
Oshkosh Blower Tractor	"H" Series	Diesel	Off-Road	1993	N		
Oshkosh Blower Drive	"H" Series	Diesel	Off-Road	1993	N		
Larue Snowblower Dr.	T85	Diesel	Off-Road	2011	Y	R-134A	0.5
Larue Snowblower Dr.	T85	Diesel	Off-Road	2011	N		

Vehicle Make	Vehicle Model	Fuel Type	On/Off Road	Model Year	Has A/C?	Assumed Refrigerant	Assumed Charge (kg)
Cat Loader	950 M	Diesel	Off-Road	2015	Y	R-134A	0.5
New Holland	TV 6070	Diesel	Off-Road	2009	Y	R-134A	0.5
JetGo GPU	550Mti	Diesel	Off-Road	2012	N		
Toyota Forklift	L-5FGC25	Propane	Off-Road	1990	N		
Haulmark Trailer	TST6X12DS2		Off-Road	2013	N		
Workhorse Water Tr.	525 Gal.		Off-Road	2008	N		
Graco Paint Striper	LineLazer II	Gasoline	Off-Road	2001	N		
Lektro Tug	AP 8800 SDA	Electric	Off-Road	2002	N		
Lektro Tug	P8360	Electric	Off-Road	2015	N		
Craftco Crack Sealer	Supershot 125	Diesel	Off-Road	2004	N		
Tiger Flail Mower	TRF-96C		Off-Road	2004	N		
F.O.D. Boss	Boss-8		Off-Road	2005	N		
Western Plow #1	Pro-Plow		Off-Road	1997	N		
Western Plow #2	Pro-Plow		Off-Road	2004	N		
Sweepster Lighted X #1	LX D04	Diesel	Off-Road	1994	N		
Sweepster Lighted X #2	LX D04	Diesel	Off-Road	1994	N		
Kawasaki 1	Mule 550	Gasoline	Off-Road	2002	N		
Kawasaki 2	Mule 550	Gasoline	Off-Road	2002	N		
JLG Hilift	600AJ	Gas/Propane	Off-Road	2007	N		
Lincoln Welder	Ranger 9	Diesel	Off-Road	2000	N		
Vac Unit	Command Pro14	Diesel	Off-Road		N		
Honda Snowblower 1	HS 928	Diesel	Off-Road	2004	N		
Honda Snowblower 2	HS 928	Diesel	Off-Road	2009	N		
Honda Snowblower 3	HS 928	Diesel	Off-Road	2012	N		
Golf Cart 5		Electric	Off-Road		N		
Golf Cart 33		Electric	Off-Road		N		

Vehicle Make	Vehicle Model	Fuel Type	On/Off Road	Model Year	Has A/C?	Assumed Refrigerant	Assumed Charge (kg)
Golf Cart 42		Electric	Off-Road		N		
Honda Generator	EM 5000 SX	Diesel	Off-Road		N		

Appendix C. AEDT LTO Cycle Fuel Burn Value Modeling

1 Selected Airport -

1.1 Selected default Truckee-Tahoe Airport Layout from AEDT database.

2 Created Operations: Aircraft -

2.1 Selected Truckee Tahoe Airport (KTRK).

2.2 Selected aircraft based on ICAO code. If multiple matching aircraft were identified, selected first aircraft identified without modifications (e.g., alternative engine, etc.).

2.3 No gates available for KTRK.

2.4 No ground support equipment selected.

2.5 Operation time identified as 12/31/2015 9:00 a.m. for all operations.

2.6 Selected flight profile. If multiple profiles were identified, selected “Standard” or else first listed.

2.7 Selected track as KTRK Runway “28.”

3 Created Operations: Annualization -

3.1 Added all aircraft to operations group (e.g., Pistons, etc.).

3.2 Added to operations group to Root.

3.3 Set Processing Options. Used default settings. This includes a mixing height of 3,000 ft.

4 Calculated Metrics -

4.1 Selected “Emissions” Metric.

4.2 No Receptor Sets selected.

4.3 Selected Root Annualization.

4.4 Specified Result Storage Option as “Segment.” Identified Analysis Year as “2015”. Did <u>not</u> select “Calculate Startup Emissions.”

4.5 Run Metric Calculation.

5 Generated Emissions and Fuel Report -

5.1 Operations Group: Selected Aircraft Operations Group (e.g., Pistons).

5.2 Grouped by: Operations Mode and Detail.

5.3 Units: Pounds.

5.4 Run Report.

5.5 Export to Excel spreadsheet.

Appendix D. AEDT Operations Aircraft

All Aircraft - Representative Scenario

User ID	Airframe	Engine
1	Cessna 182	IO360
2	Cessna 421 Golden Eagle	TIO540
3	Pilatus PC-12	PT67B
4	Cessna 560 Citation XLS	BIZMEDIUMJET_F

Piston Aircraft – 80/20 Scenario

User ID	Airframe	Engine
1	Cessna 172 Skyhawk	IO360
2	Cessna 182	IO360
3	Cirrus SR22	TIO540
4	Cessna 210 Centurion	TIO540
5	Raytheon Beech Bonanza 36	TIO540
6	Cessna 206	IO360
7	Mooney M20-K	TSIO36
8	Raytheon Beech Bonanza 36	TIO540
9	Piper PA-28 Cherokee Series	O320
10	Cessna 421 Golden Eagle	TIO540
11	Raytheon Beech Baron 58	TIO540
12	Piper PA-32 Cherokee Six	TIO540
13	Piper PA-28 Cherokee Series	O320
14	Cessna 414	TIO540
15	Cessna 310	TIO540
16	Cessna 172 Skyhawk	IO360
17	Piper PA-32 Cherokee Six	TIO540
18	Cessna 182	IO360
19	Mooney M20-K	TSIO36
20	Cirrus SR20	IO360
21	Cessna 340	TIO540

Turbo Prop Aircraft – 80/20 Scenario

User ID	Airframe	Engine
1	Pilatus PC-12	PT67B
2	Raytheon Super King Air 300	PT660A
3	Raytheon Super King Air 200	PT6A40
4	EADS Socata TBM-700	PT6A60
5	Raytheon Super King Air 300	PT660A

Jet Aircraft – 80/20 Scenario

User ID	Airframe	Engine
1	Embraer 500	BIZLIGHTJET_F
2	Cessna 560 Citation XLS	BIZMEDIUMJET_F
3	Cessna 525 CitationJet	BIZLIGHTJET_F
4	Embraer 505	BIZLIGHTJET_F
5	Cessna 550 Citation II	1PW036
6	Cessna 525 CitationJet	1PW035
7	Bombardier Challenger 300	8HN001
8	Cessna 750 Citation X	6AL021
9	Cessna 560 Citation V	1PW037
10	Raytheon Hawker 800	1AS002
11	Gulfstream G400	6RR042
12	Raytheon Beechjet 400	1PW035
13	Cessna 525 CitationJet	1PW035
14	Cessna 680 Citation Sovereign	7PW080
15	Bombardier Challenger 600	5GE084
16	CESSNA CITATION 510	BIZLIGHTJET_F

Appendix E. TTAD Tenant Questionnaire Example

To better understand the impact of its operations on the environment, prepare for potential future legislation, and demonstrate environmental leadership, Truckee Tahoe Airport is conducting a Greenhouse Gas Emissions Inventory. As a valued partner in our mission, we invite you to participate in this study by completing this questionnaire which includes requests for information and data relevant to airport emissions quantification.
All information you provide will be kept completely confidential.
Thank you very much for your help in this important project!

General Instructions:
Please complete and return to:
Lauren Tapia, District Clerk
530 587 4119 ext. 107
lauren.tapia@truckeetahoeairport.

This questionnaire can be completed online by clicking on and typing in each question's form fields, or printed and marked with pen.

Please enter data for the period from **JANUARY 1 - DECEMBER 31, 2015**.

If you have any questions, please feel free to contact:
Kevin Smith, General Manager
530 587 4119 ext. 105
ksmith@fly2trk.com

Or contact the Airport's consultant for this project:
Jay Wintergreen
First Environment, Inc.
(916) 492-6080
jtw@firstenvironment.com

TRUCKEE TAHOE AIRPORT DISTRICT TENANT

Completed By:

Email address:

Phone number:

ELECTRICITY

Instructions: Please complete the table below. If you do not pay an electric bill, please check the box below the table.

Provider and Account #	2015 Electricity Quantity	Electricity Units (e.g., kWh or MWh)

☐ My electricity consumption is covered under my lease with Truckee Tahoe Airport. I do not receive a separate utility bill.

Relative to electricity consumption, do you purchase "green power" or buy renewable energy certificates (RECs)?

☐ Yes, I purchase green power or buy RECs.

NATURAL GAS

Instructions: Please complete the table below. If you do not pay a natural gas bill, please check the box below the table.

Provider and Account #	2015 Natural Gas Quantity	Natural Gas Units (e.g., therms, ccf, Btu, etc.)

☐ My natural gas consumption is covered under my lease with Truckee Tahoe Airport. I do not receive a separate utility bill.

GENERATORS

Instructions: If you have any generators for backup or portable power, please enter them in the following table. If the equipment is not equipped with either a meter or a fuel gauge, please enter an estimate based on operation of the generator and make a check mark in the column labeled "Estimate" so that we know the figure is an estimate.

Manufacturer and Model Number	Output Size (kW)	Fuel Type (e.g., diesel or gas)	2015 Fuel Consumption and units (e.g., gallons) or Run time and units (e.g., hours)	Estimate
				☐
				☐
				☐

GROUND SUPPORT EQUIPMENT (GSE)

Instructions: Please enter the requested information in the table below for all GSE in use during 2015. If you do not have actual fuel consumption data, please enter an estimate and make a check mark in the column labeled "Est." so that we know the figure is an estimate.

Equipment Type (e.g., aircraft tractor, baggage tractor)	Equipment Manufacturer	Model	Fuel Type (e.g., diesel, gas, etc.)	2015 Fuel Consumption and units (e.g., gallons) or Run time and units (e.g., hours)	Est.
					☐
					☐
					☐

OTHER MOBILE SOURCES

Instructions: Please enter information in the table below for any other mobile sources that are not captured above. If you do not have actual fuel consumption data, please enter an estimate and make a check mark in the column labeled "Est." so that we know the figure is an estimate.

Equipment Type (e.g., light duty truck)	Manufacturer	Model	Fuel Type	2015 Fuel Consumption & fuel units	Est.
					☐
					☐
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REFRIGERANTS – HVAC & Air Conditioner Systems

Instructions: Please complete the table below. Include units such as kitchen refrigerators and freezers, central A/C units, window units, or portable A/C units.

Equipment Type	Number of Units	Refrigerant Type (if known)	Total Refrigerant Quantity per Unit (if known)
Refrigerators			
Air Conditioners			
Other			

Is there any other equipment *that you operate* that burns fuel?

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Do you maintain any fuel storage tanks at your operations? Please describe the fuel type and tank capacity and 2015 starting and ending volumes, if applicable.

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Other Comments:

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