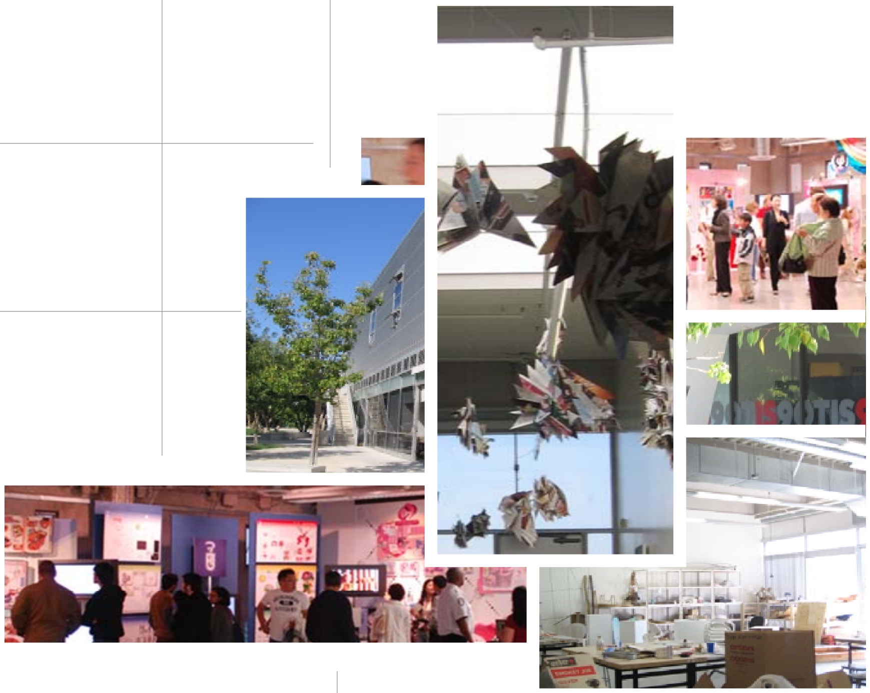
2006 - 2008 Greenhouse Gas Emissions Inventory



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OTIS

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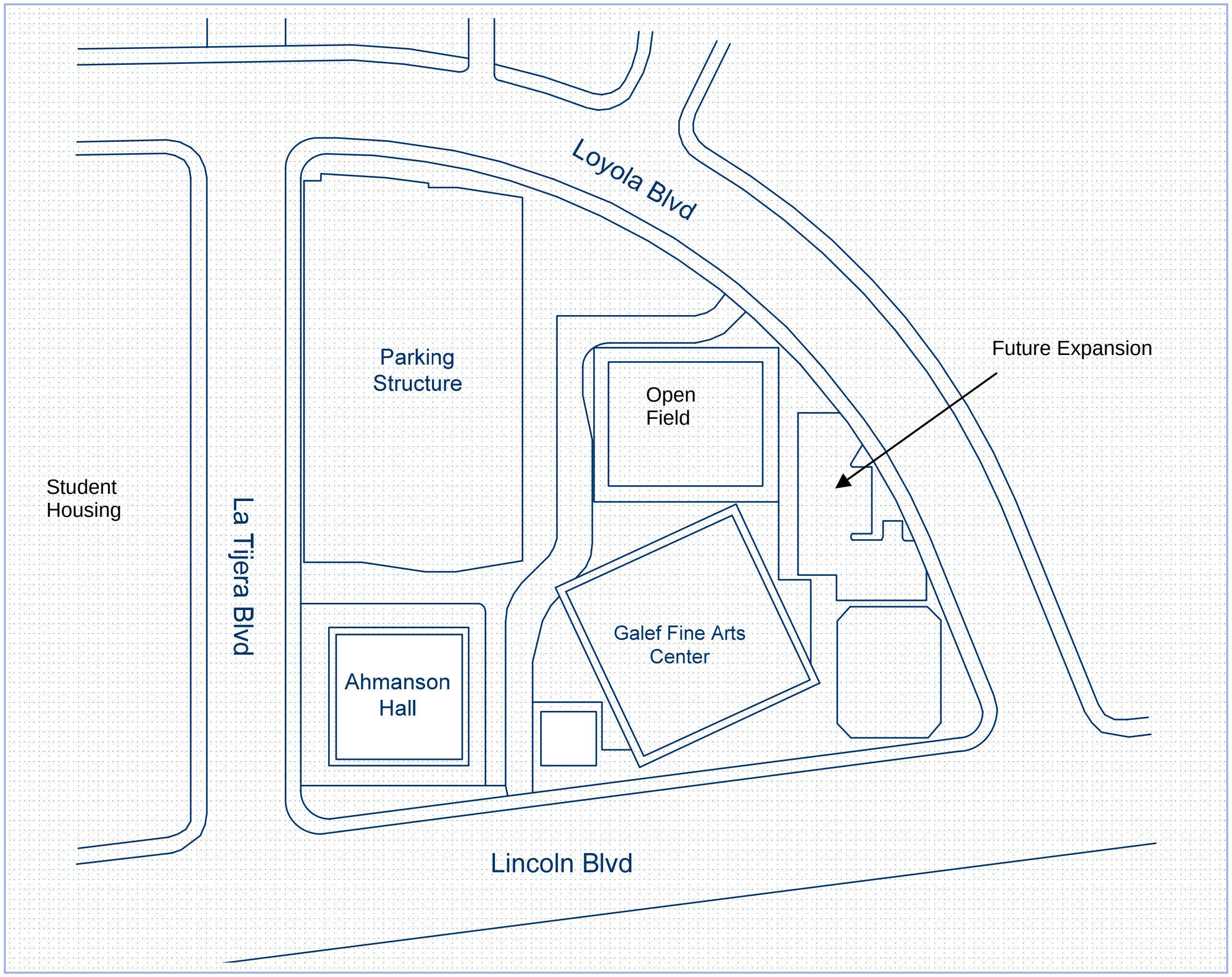


OTIS

1.0 INTRODUCTION

This report summarizes the anthropogenic greenhouse gas (GHG) emissions inventory for Otis College for calendar years 2006, 2007 and 2008. The emissions in this report are presented in both weight of the gases emitted and in Metric Tons Carbon Dioxide Equivalents (MTCDE), according to their Global Warming Potential (GWP) to provide the relative contribution of each gas to climate change. This GHG inventory follows the guidelines of the California Climate Action Registry (CCAR), Intergovernmental Panel on Climate Change (IPCC) and other applicable international and United States protocols. The general purposes of completing this GHG inventory were to:

- Identify and quantify the sources of GHG emissions
- Understand how GHG emissions are generated
- Investigate potential measures to reduce GHG emissions
- Educate students and other members of the Otis College community

1.1 Overview of Otis College

Founded in 1918, Otis College is a Los Angeles based private college specializing in art and design. Otis College offers accredited Bachelor of Fine Art (BFA) degrees in architecture, advertising, digital media, fashion design, graphic design, interactive product design, photography, painting, sculpture, toy design and others. Otis College also issues accredited Masters of Fine Arts (MFA) degrees in fine arts, writing, public practice and graphic design. Continuing education programs include certification programs, as well as personal and professional development courses.

In 1997, Otis College purchased and moved to its present location at The Elaine and Bram Goldsmith Campus, which serves as its main campus and headquarters. The main campus is comprised of The Ahmanson Hall building, which is a seven story, 115,000 square foot building previously constructed and occupied by International Business Machines (IBM) since the 1960s. Ahmanson Hall is principally used for student classrooms, creative studios, computer labs, a central library, building facilities and administrative offices.

In 2001, Otis College completed construction of the Galef Fine Arts Center, which is a two story, 40,000 square foot building that was designed and constructed to satisfy certain green building standards. Inside of the Galef Fine Arts Center is a 3,500 square foot Art Gallery which exhibits artwork from students and other artists. The main campus also includes a two-story parking garage, student rest areas and an open grass field. In addition to the main campus, Otis College leases building space in other locations throughout Los Angeles providing additional student classrooms and studios.

1.2 Project Background

Since 1997, Otis College has implemented various sustainability and green initiatives to address environmental impacts from campus operations, buildings, infrastructure and other related activities. Some of these efforts have included temperature control systems, efficient lighting, green building designs, waste management procedures, recycling programs and general pollution prevention efforts.

To address a general movement in global warming and similar sustainability initiatives across the United States, Otis College formed an internal sustainability committee to review and evaluate GHG similar measures for its organization. As part of this effort, E5, Inc. was retained to conduct this GHG emissions inventory of the Otis College main campus. The goals of the audit were to identify major sources of GHG emissions from the main campus, and establish a baseline of GHG emissions. Furthermore, this audit determined any recommendations concerning possible sustainability improvements or future year emission reductions in the areas of GHG sources.

1.3 Project Working Group

The Project Working Group comprised of staff members from E5 Consulting, and the Otis College Environmental Steering Committee which included members of Otis staff, students and alumni. This Project Working Group identified the project scope, inventory methods and other information required to conduct this GHG inventory and prepare this report.

2.0 GLOBAL WARMING BASICS

Climate change and global warming are sometimes used interchangeably, however there are slight differences in specific terminology. Climate change refers to “fluctuations in the temperature, precipitation, wind, and other elements of Earth’s climate system.” These fluctuations can be influenced by a variety of natural factors including changes in orbital parameters, volcanic activity, and solar irradiance. Climate change can also be brought about with a change in the composition of the atmosphere. The planet is kept at a hospitable average temperature of 15.5^oC (60^o F) due to the insulating layer of greenhouse gases that encapsulate the surface. These gases absorb some of the sun’s energy and keep the enclosed surface warm. This phenomenon, known as the greenhouse effect, is a necessary component of the many systems needed to support life on Earth. Greenhouse gases may result from biogenic sources, such as natural occurring photosynthesis within plants and trees. In addition, GHG emissions may also result from anthropogenic sources, which are man-made such as fossil fuel consumption, industrial sources and others. The existence of clouds also contributes to the greenhouse effect on Earth.

While climate change is a general term as applied to fluctuations in the Earth’s climate system, “global warming” is a recent phenomenon which attributes the increased or enhanced greenhouse effect from anthropogenic or man-made sources. As generally used today, global warming is typically used in reference to this enhanced greenhouse effect from man-made activities. There are many gases that contribute to the greenhouse effect from biogenic and anthropogenic activities, some directly and others indirectly. Although not commonly known as a greenhouse gas, water vapor is the most significant greenhouse gas in the Earth’s atmosphere contributing approximately 66 to 85% of the greenhouse effect when combined with clouds.[1] The remaining major contributors to the greenhouse effect include carbon dioxide, methane and ozone. Although there are numerous other greenhouse gases, the relative contribution of all other greenhouse gases are small by comparison.

2.1 The Kyoto Protocol

In 1992, the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro, Brazil produced an international environmental treaty intending to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." [2] In 1997, this agreement was adopted for use in Kyoto, Japan requiring collectively GHG emissions to be reduced by 5.2% compared to the year 1990. National limitations range from 8% reductions for the European Union and some others to 7% for the United States, 6% for Japan, and 0% for Russia. The Kyoto Protocol identified six (6) principal greenhouse gases (also known as the Kyoto 6) subject to its requirements:

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

As of 2008, 183 countries have ratified the Kyoto Protocol inspiring voluntary and regulatory efforts worldwide to combat global warming, including carbon cap-and-trade programs involving the major European nations. Although not technically ratified by the United States government, the Kyoto Protocol has resulted in numerous voluntary and mandatory GHG emission reduction programs throughout the United States involving major corporations, organizations, universities, non-profit groups, individual states, regional cooperatives and consumers.

2.2 Biogenic vs. Anthropogenic Sources

The U.S. and all other parties to the Kyoto Framework Convention on Climate Change agreed to develop inventories of greenhouse gas emissions (GHG) for purposes of: 1) developing mitigation strategies, and 2) monitoring the progress of those strategies. The Intergovernmental Panel on Climate Change (IPCC) developed a set of inventory methods to be used as the international standard. One of the elements of the IPCC guidance that deserves special mention is the approach used to address CO2 emissions from biogenic sources. In the earth’s carbon cycle, CO2 is removed from the atmosphere through natural processes such as photosynthesis and converted to carbon. This carbon is stored in items such as wood, paper and grass trimmings and eventually cycles back to the atmosphere as CO2 through degradation processes. The quantity of carbon that these natural processes cycle through the earth’s atmosphere, waters, soils, and biota is much greater than the quantity added by anthropogenic GHG sources.

However, the focus of the Framework Convention on Climate Change is on anthropogenic emissions; those emissions resulting from human activities and subject to human control. It is these emissions that the IPCC determined to have the potential to disrupt the natural balances in carbon’s biogeochemical cycle, and altering the atmosphere’s heat trapping ability. Thus, for processes with CO2 emissions, if (a) the emissions are from biogenic materials, and (b) the materials are grown on a sustainable basis, then those emissions are considered to simply close the loop in the natural carbon cycle. In this case, the CO2 emissions from wood and biomass are not counted. On the other hand, CO2 emissions from burning fossil fuels are counted because these emissions would not enter the cycle were it not for human activity. Likewise, methane (CH4) emissions would not be emitted were it not for the human activity of landfilling the waste, which creates anaerobic conditions (i.e. without oxygen) conducive to methane formation.

[1] "Water vapour: feedback or forcing?", RealClimate (6 Apr 2005)

[2] Kyoto Protocol: Status of Ratification". United Nations Framework Convention on Climate Change (2008-10-16)

2.3 Primary Greenhouse Gases

Carbon Dioxide (CO2) – Carbon is a continually cycling element that moves between the atmosphere, ocean, land biota, marine biota, and mineral reserves. In the atmosphere, carbon exists primarily as carbon dioxide, which is a part of global biogeochemical cycling. About three quarters of anthropogenic CO_2 emissions are from burning fossil fuels, the other quarter from land-use changes, primarily deforestation.

Methane (CH4) – Methane is produced primarily through anaerobic decomposition of organic matter in living systems. It is produced in the stomachs of cows and pigs and from their manure, as well as from rice paddies and landfills. It is also released with the collection, processing, and combustion of fossil fuels.

Nitrous Oxide (N2O) – Nitrous Oxide is also produced with the combustion of fossil fuels, as well as in agriculture and some industrial processes. The high atmospheric lifetime of N2O and its global warming potential makes N2O the second most important greenhouse gas next to CO2.

Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexaflouride (SF6)) – Although much smaller in terms of amounts emitted on an annual basis, these chemicals have significant global warming potentials and very long atmospheric lifetimes. Majority of PFCs emissions are principally produced as dielectric medium in electrical equipment. HFCs were introduced as replacements for ozone-depleting substances, primarily as refrigerants. SF_6 emissions are principally generated from aluminum smelting operations.

2.4 Global Warming Potentials

Each greenhouse gas traps the sun's energy to varying degrees. This is called the chemical's radiative forcing or global warming potential– (GWP). By measuring and describing a greenhouse gas in terms of its global warming potential, its radiative forcing can be converted to a similar unit of carbon dioxide equivalents (CO2e). The radiative forcing of a gas is dependent on how it reacts with long-wave radiation coming from the Earth and how long lived it is. For example, one molecule of SF6 warms the planet to a similar extent as 23,900 molecules of CO2.

The emissions in this report are reported in Metric Tons Carbon Dioxide Equivalents (MTCDE). This value is the product of the weight of the gas in metric tons and the GWP. The GWP unit allows for a quick comparison of different gases relative to the effect they have in the atmosphere. As shown below in Table 1, various greenhouse gases will have different atmospheric lifetimes and global warming potentials relative to carbon dioxide.

Table 1
List of Global Warming Potentials [3]

Gas	Atmospheric Lifetime (Years)	Global Warming Potential (100 Year)
Carbon Dioxide (CO_2)	50-200	1
Methane (CH_4)	9-15	21
Nitrous Oxide (N_2O)	120	310
HFCs	15	> 140
PFCs	> 48	>6,500
Sulfur Hexafluoride (SF_6)	3,200	23,900

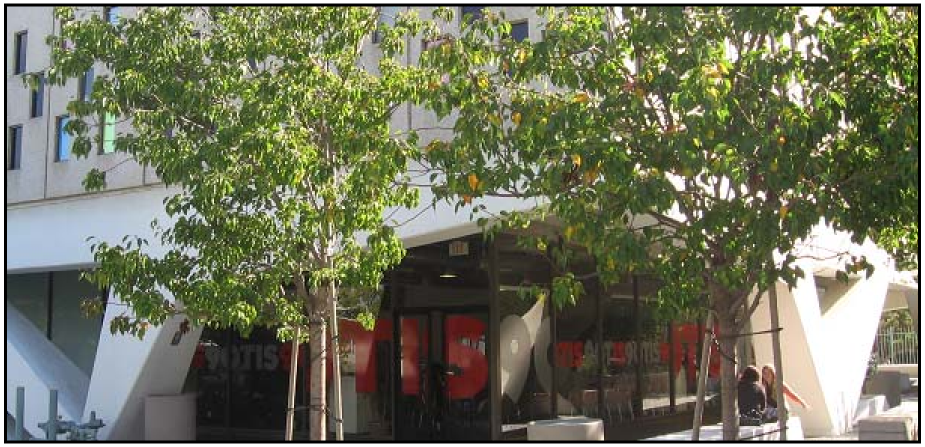
[3] California Climate Action Registry, General Reporting Protocol, Version 3.0

3.0 CONDUCTING AN EMISSIONS INVENTORY

There are numerous emissions sources for a GHG inventory, including, stationary sources, purchased electricity, onsite mobile sources, commuter travel, air travel, events, purchased goods and others. Furthermore, for any specific project or organization, the GHG project scope may involve multiple emission years, locations, operational units and greenhouse gases. The extent that one or more of these factors is applied to a specific GHG inventory will increase or decrease the complexity of its project scope. At a minimum, California requires voluntary inventories include entity-wide GHG emissions for each of the following categories:

- Direct emissions from mobile source combustion
- Direct emissions from stationary combustion
- Indirect emissions from electricity use, imported steam, heating and cooling
- Direct process emissions
- Direct fugitive emissions

For purposes of this GHG inventory, Otis College followed the guidelines of CCAR to inventory GHG emissions from its main campus in Los Angeles, California. Applicable GHG types include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFC) and sulfur hexafluoride (SF_6). In accordance with CCAR guidelines, all GHG emissions from stationary sources, mobile, fugitive and purchased electricity were included.



3.1 GHG Emission Reporting Protocols

This GHG Emissions Inventory followed the protocols used and adopted by lead agencies in California. The California Air Resources Board (CARB) has been tasked with implementation of AB 32 – The Global Warming Solutions Act of 2006, which involves the mandatory regulation and reporting of GHG emission sources within the State of California. AB 32 requires GHG emissions reporting and inventory to conform to protocols developed by the California Climate Action Registry (CCAR). As one of its primary missions, CCAR develops GHG reporting protocols that are consistent with the objectives of the State of California, which includes the General Reporting Protocol (Version 3.0).

CCAR's protocols generally conform with those adopted by other state and global organizations, such as the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). In 1998, the WRI and WBCSD jointly developed the Greenhouse Gas Protocol Initiative (GGPI) to serve as a guiding document for organizations and countries in developing GHG emission inventories consistent with the Kyoto Convention. The California GHG reporting protocols and inventory methods are based largely on the efforts of the GGPI.

World Business Council for Sustainable Development (WBCSD)
The World Business Council for Sustainable Development (WBCSD) is a coalition of 200 international companies united by a shared commitment to sustainable development through economic growth, ecological balance and social progress. It's members are drawn from more than 35 countries and 20 major industrial sectors. The WBCSD's activities reflect a belief that the pursuit of sustainable development is good for business and business is good for sustainable development.

World Resources Institute (WRI)
WRI is an environmental think tank that focuses on ways to improve the Earth and people's lives. It's principal mission is to move human society to live in ways that protect Earth's environment and its capacity to provide for the needs and aspirations of current and future generations. WRI provides-and helps other institutions provide-objective information and practical proposals for policy and institutional change that will foster environmentally sound, socially equitable development.

The California Climate Action Registry

In calendar year 2000, following considerable initiative and input from various stakeholders from the business, government, and environmental communities, the California State Legislature established the California Climate Action Registry. CCAR is a non-profit public/private partnership that serves as a voluntary greenhouse gas registry to protect, encourage, and promote early actions to reduce GHG emissions. CCAR provides leadership on climate change by promulgating credible and consistent GHG reporting standards and tools for organizations to measure, report, verify, and reduce their GHG emissions in California and/or the U.S. To this end, CCAR has developed a state-wide reporting and verification guidance for California, including a General Reporting Protocol and industry-specific reporting protocols.

3.2 GHG Accounting and Reporting Principles

As a general practice, the following principles serve as the basis of reporting and verifying emissions with CCAR, which are also consistent with the WRI/WBCSD GHG Protocol Initiative.

- **Relevance**. Relevant GHG inventories reflect the GHG emissions of the entity and include emissions information produced in accordance with the program rules on defining reporting boundaries and sources.
- **Completeness**. Complete GHG inventories include emissions from all GHG sources and activities within the specified scope of the participant's report. Baseline and annual emissions results include all sources.
- **Consistency.** Consistently developed GHG inventories enable meaningful comparison of emissions performance over time and across similar organizations. Additionally, changes to a participant's emission baselines are verified to ensure appropriate comparisons.
- **Accuracy.** Accurate GHG inventories must be within the materiality threshold of 5% of the verifier's estimate of total emissions.
- **Transparency.** Reporters must make available to their verifiers the necessary information and documentation used to produce the inventory. Additionally, the verification process should be clearly and thoroughly documented to allow the possibility for outside reviews by the State or the California Registry.

3.3 Scope of Inventory

For purposes of this GHG inventory, the following parameters define the scope of the inventory for Otis College. Explanations for the above parameters are provided below.

- Baseline Year - 2008
- Geographic Boundary – California only
- Operational Boundary - The Elaine and Bram Goldsmith Campus
- Applicable Emission Sources - (1) Direct emissions and (2) Indirect emissions from purchases of electricity, steam, heating and/or cooling
- Greenhouse Gases - Carbon dioxide, Methane, Nitrous Oxide, HFCs, PFCs and Sulfur Hexaflouride (SF6)

Geographic Boundaries

An initial step in determining the scope of an inventory is deciding on the geographic boundaries of the GHG inventory. In California, a voluntary reporter may elect to report California-only emissions, or all U.S. GHG emissions, which include California emissions, if any. For purposes of this GHG inventory, only California emission sources are involved, and hence only California emissions are included within this inventory.

Organizational Boundaries

Once the geographic boundaries of the inventory have been identified, the organization is required to identify those sources of significant GHG emissions within the selected geographic boundaries. An organizational boundary generally includes a corporation or other legally constituted body, such as a city or county, a state government agency, a non-profit organization, etc. At a minimum, the organizational boundary must be entity-wide (total) (i.e., the entire organization). However, GHG emissions down to a facility-specific or source-specific level are also allowed.

For those operations and facilities that are wholly-owned, the organizational boundary includes all associated emissions. For those operations or facilities in which there is partial ownership share or working interest, hold an operating license, lease, or otherwise represent joint ventures or partnerships of some kind (both incorporated and unincorporated), GHG emissions may be based on management control or equity share.

For purposes of this GHG inventory, the organizational boundaries will include the Otis College's operations and facilities on The Elaine and Bram Goldsmith Campus. Although Otis College has a few satellite office locations, it is anticipated that over 95% of the GHG emissions will result from Otis College's main campus.

Applicable GHG Emission Sources

The next step in compiling GHG emissions inventory is to identify and divide emission sources into emission source categories. In general, emission sources produce either direct or indirect GHG emissions. Direct emissions are those emissions from sources that are owned or controlled by the organization, such as:

- Mobile combustion sources (i.e. from cars, trucks, rail, air, and other transport) owned or leased by your organization and used for moving raw materials, finished products, supplies, or people;
- Stationary combustion sources used for the production of electricity, steam, or district heating and cooling;
- Direct process emissions that occur during the production of cement, adipic acid, and ammonia, as well as emission from agricultural processes; and
- Direct fugitive sources, for example methane leaks from pipeline systems or leaks of HFCs from air conditioning systems.

Indirect emissions are emissions occur because of an organization's actions, but are produced by sources owned or controlled by another entity, which include:

- Purchased and consumed electricity;
- Purchased and consumed steam, and
- Purchased and consumed district heating or cooling.

Other indirect GHGs may occur from other activities of the organization but do not fall within your organizational boundary. This may include employee commuting and business travel, off-site waste disposal, and other emissions resulting from demand for goods and services each year.

The Baseline Year

Emission baselines are used in a regulatory context to establish a clear threshold for compliance and non-compliance. Setting a baseline also allows an organization to scale structural changes to their organization back to a benchmark emission profile. This aspect of baselines is called "normalization". For example, an acquisition of a new company or facility could dramatically increase emissions relative to previous reporting years. To account for the impact on its emissions profile due to this circumstance, a participant would adjust its baseline to incorporate the additional emissions associated with the structural change in the organization. There are several issues to consider when deciding whether to establish a baseline, including:

- Data certainty – do you have sufficient data to verify your emissions against the requirements in the General Reporting Protocol for the baseline year
- Comparable organizational structure – is the organization sufficiently comparable in its composition and structure to support a meaningful comparison with the baseline year
- Relative emission levels – which year minimizes or maximizes your emissions relative to most recent level

Typically, an emissions baseline should not be adjusted for the organic growth or decline of your organization. Organic growth or decline refers to the increase or decrease in production output, changes in product mix, plant closures, and the opening of new plants that are not the result of changes in the structure of the participant's organization or the result of shifting operations into or out of California.

4.0 INVENTORY FINDINGS

As discussed below, over the past 3 years, Otis College has emitted an average of 1,020 metric-tons CO2e annually. Since 2006, total greenhouse gas emissions have increased by approximately 30%. Carbon dioxide represents over 99% of the greenhouse gas emitted, and approximately 87% of the GHG emissions result from the consumption of purchased electricity. Of the amount of purchased electricity, the Ahmanson Building constitutes approximately 92% of the electricity consumed.

4.1 GHG Emission Sources

GHG emissions from Otis College's main campus that were within the scope of this audit resulted from the following emission sources, as listed below in Table 2:

Table 2
List of GHG Emission Sources

Source Type	Direct Indirect	General Description	GHG Emission
Mobile combustion sources	Direct	Forklifts, utility carts and landscaping	CO2, CH4, N2O
Stationary combustion sources	Direct	Comfort heating, emergency power	CO2, CH4, N2O
Process Emissions	Direct	None	None
Fugitive Sources	Direct	None	None
Electricity Purchases	Indirect	General building power usage	CO2, CH4, N2O
Steam Purchases	Indirect	None	None
Heating or Cooling Purchase	Indirect	None	None

Based on the results of the GHG audit, GHG emissions resulted principally from three principal areas or emission sources:

- Electricity purchases for general electrical power to the Ahmanson Building , Galef Fine Arts Center and related support structures, including, parking lot.
- Stationary source fuel combustion for comfort heating, hot water and emergency power generation
- Propane and gasoline combustion for mobile sources, such as, forklifts, landscaping equipment and utility carts

The above emission sources generate carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). There were no GHG emissions from process emissions, fugitive emissions, and/or steam and heating or cooling purchases. All other potential GHG emission sources were not in the scope of this audit, nor within the defined organizational or geographic boundaries of this audit.

4.2 Emissions by Source Category

Stationary emission sources consist of natural gas consumption for general heating and diesel fuel consumption for emergency generators. Mobile sources consist of combustion of propane and gasoline for forklifts, utility carts and landscaping equipment, which release relatively small amounts of GHG emissions. As shown by Table 3 below, these sources are small in comparison to GHG emissions resulting from purchased electricity.

Table 3
Summary of GHG Emissions Inventory
By Source Category

Source Category	2006 MTCDE	2007 MTCDE	2008 MTCDE
Mobile Sources	1.33	1.33	1.33
Stationary Sources	99.69	130.34	151.54
Purchased Electricity	746.94	889.90	1,038.63
Total	**847.96**	**1,021.57**	**1,191.41**

From 2006 through 2008, GHG emissions from purchased electricity averaged approximately 87% of the campus-wide GHG emission inventory. The relative contribution to the campus-wide GHG inventory from the remaining mobile and stationary sources is approximately 13% during this same timeframe.

4.3 Emissions by Type of Gas

As shown by Table 4 below, of the six greenhouse gases identified in this inventory, carbon dioxide constitutes over 99% (on a carbon equivalent basis) of the inventory from all source categories. Although the other gases have higher global warming potentials that range from 21 times as powerful as CO2 in the case of methane, to 23,900 times as powerful in the case of sulfur hexafluoride, these other gases have little or no impact on the environment from the Otis College operations.

Table 4
Summary of GHG Emissions Inventory
By Type of Gas

Type of GHG Emission	2006 MTCDE	2007 MTCDE	2008 MTCDE
Carbon Dioxide (CO2)	846.46	1,019.76	1,189.43
Methane (CH4)	0.02	0.02	0.02
Nitrous Oxide (N2O)	0.00	0.00	0.00
PFCs	N/A	N/A	N/A
HFCs	N/A	N/A	N/A
Sulfur Hexafluoride (SF6)	N/A	N/A	N/A
Total	**846.48**	**1,019.78**	**1,189.46**

4.4 Direct Emissions

Direct emissions are those emissions from sources that are owned or controlled by the organization, such as, mobile combustion sources, stationary equipment, process emissions and fugitive sources. At its main campus, Otis College has principally offices, classrooms and studios. There are no industrial or commercial operations that produce significant quantities of process or fugitive GHG emissions. Principal direct GHG emissions result from stationary source fuel combustion and mobile source fuel combustion. As shown by Table 5, natural gas combustion for the Ahmanson Building is the largest direct emission source representing over 90% of all direct emissions at Otis College, as of calendar year 2008.

Table 5
Summary of GHG Emissions Inventory
Direct Emissions

Source – Direct Emissions	2006 MTCDE	2007 MTCDE	2008 MTCDE
Stationary Source – Natural Gas Combustion for Ahmanson Building	88.47	120.57	139.54
Stationary Source – Natural Gas Combustion for Galef Fine Arts	10.40	8.95	11.09
Stationary Source – Diesel fuel combustion for emergency generator	0.82	0.82	0.82
Mobile Sources – Forklifts, Utility Carts and Landscaping Equipment	1.33	1.33	1.33
Total	**101.02**	**131.67**	**152.78**

4.5 Indirect Emissions

Indirect emissions are emissions occur because of an organization's actions, but are produced by sources owned or controlled by another entity, which typically include purchased electricity, steam, heating and/or cooling sources. Other indirect emissions may include employee commuting, business travel, off-site waste disposal, campus events or emissions resulting from demand for goods and services. In this audit, GHG emissions only from purchased electricity, steam, heating and/or cooling sources were considered. All other indirect emission sources were not in the scope of this audit.

As shown by Table 6, Otis College's electrical consumption has increased by approximately 30% since 2006. Of this increase, the electricity purchases for the Ahmanson Building constitute over 90% of the usage, and 100% of the increase in electrical consumption since 2006.

Table 6
Summary of Electrical Consumption

Source – Electrical Demand	2006 (kWh)	2007 (kWh)	2008 (kWh)
Purchased Electricity - Ahmanson Building	1,801,280	2,176,880	2,379,440
Purchased Electricity - Galef Fine Arts Center	242,220	257,760	222,600
Total	**2,043,500**	**2,434,640**	**2,602,040**

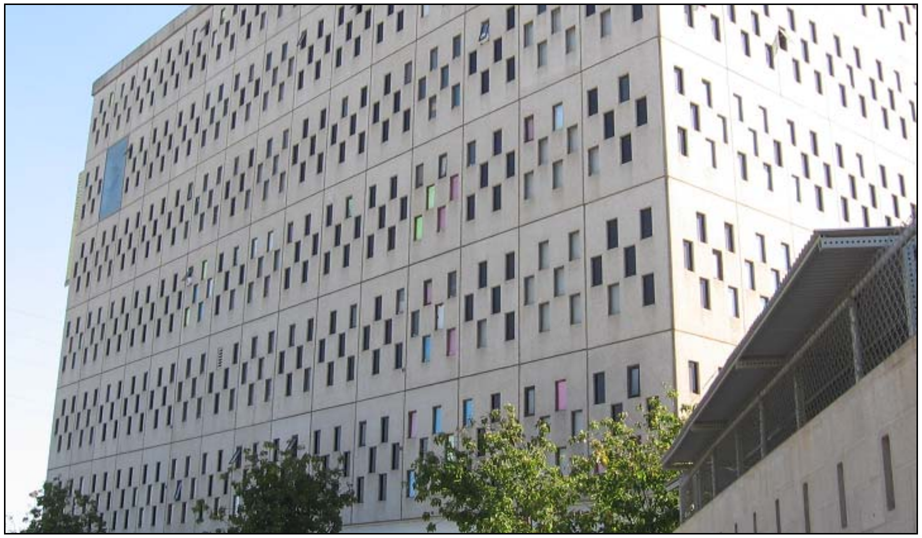
As shown by Table 7 below, GHG emissions have followed in proportion to the electrical consumption from Otis College since 2006. Similarly, GHG emissions from the indirect sources have increased by 30% since 2006, of which over 90% of the GHG emissions result from electrical purchases for the Ahmanson Building.

Table 7
Summary of GHG Emissions Inventory
Indirect Emissions

Source – Indirect Emissions	2006 MTCDE	2007 MTCDE	2008 MTCDE
Purchased Electricity - Ahmanson Building	658.40	795.69	949.78
Purchased Electricity - Galef Fine Arts Center	88.54	94.22	88.85
Total	**746.94**	**889.90**	**1,038.63**

5.0 SUSTAINABILITY MEASURES

As shown by this audit, Otis College utilizes natural gas for comfort heating and hot water. Diesel fuel, propane and gasoline are combusted in emergency power generation equipment, landscaping, forklifts and utility carts. Purchased electricity is used for general building power, lighting, elevators and other infrastructure support. As a percentage of GHG emissions, the combustion of fossil fuels at the main campus is small in comparison to emissions from electrical purchases. Otis College has several sustainability measures and energy efficiency initiatives that help keep GHG emissions steady despite increasing demand. The following discussion highlights current energy initiatives and other potential sustainability measures for the Otis College campus.



5.1 The Ahmanson Building

The Ahmanson Building is over 40 years old, and as such, the general building infrastructure was not designed to satisfy current energy efficiency or other building sustainability standards. The windows are single paned, ceilings are over 10 feet high and there is no insulation for the exterior walls. However, there are several energy efficiency measures that have been implemented for the Ahmanson Building which have considerable positive sustainability impacts:

- Fluorescent lighting fixtures throughout the building
- LED exit signs throughout building
- Occupancy light sensors and timers in student classrooms, bathrooms, studios and computer laboratories
- “Smart Occupancy” light sensors in parking structure provide lower level of light during zero occupancy to full lighting level upon detection of occupant.
- Computer controlled HVAC system for entire building, which closely monitors the temperature floor-by-floor and coordinated with student classroom schedules by Otis facility staff
- Windows and natural lighting throughout the building
- Centrally housed, and independently cooled computer server location in basement of the Ahmanson Building

Generally, the above measures represent standard energy efficiency practices for existing commercial buildings. Additional energy efficiency measures, such as wall insulation or double pane windows, for the Ahmanson Building may be considered although would likely involve considerable capital outlay.

5.2 Galef Fine Arts Center

Galef Fine Arts Center is a 2-story structure which is approximately 7 years old, and originally designed and constructed to conform to certain green building standards. Besides being constructed of recycled materials, several features of the Galef center provide positive sustainability impacts:

- Natural lighting and natural convective cooling design
- No air conditioning system
- LED exit signs throughout building
- Fluorescent lighting fixtures (except for the Art Gallery)
- Automatic lighting sensors and timers (except for the Art Gallery)

- Outside staircase to access 2nd Floor (minimize use of elevator)

The above measures meet or exceed standard sustainability or energy efficiency practices for existing commercial buildings. One additional improvement for the Art Gallery could be automatic motion sensors or timers to minimize use of lights during times of zero occupancy.

5.3 Purchased Electricity

Otis College purchases its electricity from the Los Angeles Department of Water Power (LADWP). As an indirect source, the purchase of electricity produces a GHG emission from the upstream combustion of fossil fuels (such as natural gas, coal or other) to drive electrical generators at the LADWP power plants or other plants depending upon the mix of generation sources that are available or used to create the electricity. As of 2006, the LADWP held approximately 7,000 MW in total generation capacity, of which roughly 70% resulted from fossil fuel sources, 21% large hydropower and 3% renewable power (such as solar, wind, biomass and geothermal).[4] LADWP is committed to increasing retail sales of renewable energy to its customers through an aggressive Renewable Portfolio Standard (RPS) that calls for meeting an accelerated goal of 20% by 2010.[5] Given the aggressive stance of the LADWP to increase the use of renewable power in its energy generation mix over time, there will generally be lower GHG emissions per megawatt supplied in the future years. Consequently, as the LADWP continues this effort to increase its renewable supply, Otis College will indirectly receive future GHG emission reductions by virtue of these efforts. However, if this GHG inventory audit continues to conform with California Climate Registry Protocols, the onsite emissions inventory for Otis College can not claim specific emission reductions or use a lower GHG emission factor than that specified by existing state protocols.

5.4 LADWP Green Power Program

As part of the LADWP jurisdiction, Otis College may participate in its Green Power Purchase (GPP) program. Green power is electricity produced in an environmentally friendly manner, such as, sun, wind, and water, which are pollution free and do not generate any GHG emissions. Renewable electricity technologies are among the cleanest and have the least impact on the environment. The Green Power Purchase program is intended to help encourage and finance the development of renewable power for the Los Angeles area. The LADWP uses its GPP program to help subsidize and facilitate compliance with applicable renewable portfolio standards and renewable goals. As a consequence, although a participant in the GPP can not take credit of the GHG emission offsets, the GPP provides a mechanism for a business or residential customer to help develop renewable power without making investments into own solar panels, wind turbines or other on-site renewable source. Commercial customers of LADWP can designate up to 100% of an electricity bill to green resources, with a minimum of 500 KWh for general services customers or 1,000 kWh for large general service customers. For the GPP, green power is charged an extra cost of 3 cents per kWh, which typically is applied only to that portion of the electrical usage that has been allocated to green resources.

[4] LADWP Financial Statements, June 2006

[5] LADWP Renewable Portfolio Goals

5.5 Green Tags

Renewable Energy Certificates (RECs), also known as Green Tags, Renewable Energy Credits, or Tradable Renewable Certificates (TRCs), are tradable environmental commodities in the United States which represent proof that 1,000 kWh (or 1 MWh) of electricity was generated from an eligible renewable energy resource, such as a wind farm, solar project, geothermal site, etc. Unlike the LADWP Green Power Program or other utility green purchase programs, the purchaser of a Green Tag can claim the environmental benefits associated with the renewable power (such as GHG reduction).

For example, while traditional carbon emissions trading programs promote low-carbon technologies by increasing the cost of emitting carbon, RECs incentivize carbon-neutral renewable energy by providing a production subsidy to electricity generated from renewable sources. It is important to note that the energy associated with a REC is sold separately and is used by another party. Consequently, the buyer of the REC gets the certificate only (not the electricity), however, the buyer can claim the environmental reductions or benefits associated with that green power. Renewable energy produced by a green energy provider (such as a wind farm) is fed into the electrical grid, and the accompanying REC is certified and then sold to businesses, consumers or organizations that are seeking to claim the environmental attribute.

For Otis College, the purchase of 2,602 Green Tags (or 2,602 MWh) would represent the entire year worth of purchased electricity for all of 2008. Although there is no formal mechanism to recognize the GHG emission offsets for this purchase, Otis College can claim the associated environmental benefits as an organization and ongoing sustainability initiatives.

5.6 Carbon Credits

Carbon credits are emission reductions of greenhouse gases (in terms of carbon dioxide equivalents) that have been achieved through air pollution controls, low-carbon technologies, energy efficiency, carbon sequestration or other GHG reduction measures. As similar to Green Tags or RECs, the carbon credit is a tradable environmental commodity. One (1) carbon credit represents proof that one (1) metric ton of equivalent carbon dioxide emissions was prevented or removed prior to entering the atmosphere. Depending upon the region or jurisdiction, carbon credits can be generated from a variety of sources and reduction projects, such as, landfills, livestock, forestry and cement plants. Carbon credits are typically only issued or generated by a climate registry or regulatory body with established protocols and verification procedures to demonstrate the emission reduction are real.

As with RECs, carbon credits can be bought and sold to comply with regulatory requirements. In voluntary markets, carbon credits can also be used as part of an organization's sustainability programs to partially offset its carbon footprint or become carbon neutral. In the case of Otis College, carbon credits may be purchased (and retired) to wholly or partially offset its 1,191 metric tons of CO2e emissions for calendar year 2008. Alternatively, if Otis College establishes an annual target or goal of its GHG emissions, carbon credits may be used to offset any increases above its baseline. For example, if 2008 emission levels were used as a baseline for future emission inventories, the purchase and retirement of carbon credits could be used to offset any increases above 1,191 metric tons, which in effect would zero out the excess carbon emission from Otis College in future years.

5.7 Renewable Energy Projects

Otis College may investigate the implementation of viable on-campus renewable energy projects using solar, hydrogen, CNG fleet or other similar renewable technologies or projects. An on-campus renewable project would have the benefit of providing renewable energy directly for campus power requirements, offsetting the use of grid-based electrical demand and/or otherwise reducing GHG emissions from stationary or mobile sources. As a consequence, grid-based electricity usage would decrease and hence associated GHG emissions from purchased electricity would be reduced. These projects typically require large upfront capital outlays with extended periods of investment return. Before any specific on-campus project is considered, a feasibility study is recommended to evaluate appropriate technologies, environmental benefits, logistics, capital requirements, operating costs, investment payback and numerous other success factors.

5.8 Student Housing and Commuting

Since 2006, Otis College has the following estimated number of students attending the main campus, including, regular full time and continuing education students, as shown below in Table 8. Student population (full time and continuing education) has grown by approximately 15% since 2006. As an out-of-scope indirect source of GHG emissions, student housing and commuter miles were not included in this GHG audit. However, it is possible for future inventory audits to evaluate this emission source. The following provides a rough calculation of commuter miles from the Otis student population offering a reference point for possible future study.

Table 8
Student Population

Students	2006	2007	2008
Full Time (Bachelors and Masters)	1,125	1,177	1,206
Continuing Education	2,254	2,555	2,550
Summer Art Programs	122	134	139

It is estimated that roughly 10% of the full time student population live across the street in apartments (not owned by Otis College), and hence walk to and from school. The remaining 90% of full time students live in nearby cities and neighborhoods, and drive personal vehicles to school. Assuming the typical full time student attends classes roughly 3 days per week (1 roundtrip per day), that equates to approximately 6,500 vehicle trips per week (to and from school). If the average student drives 5 miles to and from Otis, this equates to roughly 32,500 commuter miles per week for the full time student population.

For the continuing education students, it is estimated each attends 1 class per week with an average commute of 10 miles. This equates to approximately 25,000 commuter miles per week for the continuing education students. Combining full time and continuing education students, this equates to roughly 57,500 commuter miles per week for the Otis College main campus. Otis College does not own or sponsor any specific modes of mass transit or public transportation for its students, and hence no mileage credits or commuter mile reductions can be claimed.

Although it is unlikely that Otis College can require specific modes of transportation from its students, it is possible for certain sustainable student transportation initiatives and programs to be developed, which encourage or facilitate less carbon-intensive transportation. Some of these initiatives may involve purchase and operation of mass transit vehicles for students (such as hydrogen or CNG transit vehicles), bus pass reimbursement programs, car pooling, incentives or other sustainability measures. In the event student and/or other commuter miles are included in future inventory audits, a detailed survey of students and other participants would be necessary to more accurately measure vehicle trips and associated GHG emissions.

5.9 University Fleet

As mentioned above, Otis College does not own or operate any specific mass transit or other fleets. However, if Otis College elects to purchase and/or operate any specific mass transit vehicles as part of ongoing GHG sustainability efforts, the associated GHG emissions would need to be included as a direct mobile emission source taking into account # of vehicles, weekly trips, fuel consumption and annual ridership. Based on this data, appropriate GHG reductions or credit may also be taken from use of such equipment against commuter-related emissions.

5.10 Solid Waste Disposal

As an out-of-scope indirect emission source, GHG emissions associated with solid waste landfill disposal was not included in this inventory audit. In landfills, methane and carbon dioxide are produced from the anaerobic decomposition of organic solid waste materials. Landfill gases (mostly methane) can be captured and incinerated with emission recovery systems, and in some cases, electricity can be generated. Since 1997, Otis College has contracted with Athens Services to manage the solid waste disposal from its main campus which is land filled. GHG emissions from solid waste disposal may include uncaptured landfill gas, combustion of captured landfill gas and truck transportation of the solid waste. At Otis College, solid waste pick ups occur approximately 6 times per week. Each pick up includes 3 trash bins with 3 yards of capacity for each bin, which equates to roughly 54 yards of solid waste disposed each week. In the event future inventory audits include the associated GHG emissions related to solid waste disposal, any GHG emission reduction measures would likely be limited to solid waste pollution prevention practices and initiatives.

5.11 Electronic Wastes

Electronic waste (or “e-waste") is a waste type consisting of any broken or unwanted electrical or electronic device, such as computers, printers, mobile phones, monitors, circuit boards, televisions and similar equipment. In general, there is little concern over GHG emissions resulting from the management or disposal of e-wastes. However, e-wastes have raised concerns considering that many components of such equipment are considered toxic and are not biodegradable (primarily metals). As a consequence, e-wastes are not handled as normal solid wastes, since they are not allowed to be disposed into normal landfills. Otis College has an aggressive policy of recycling its e-waste products, which consists primarily of used computer equipment and fluorescent lights. On an annual basis, the IT department will offer to sell any used computer equipment to staff and students prior to disposal, which further extends the useful life of the computer equipment. Any unsold equipment is then properly disposed through an e-waste hauling company, such as Eco International. When burned out, used fluorescent lights are generally returned to Home Depot or given to an e-waste company which are then properly disposed. Since there is little GHG emission concerns and given Otis College’s aggressive recycling and disposal policy for e-wastes, no further recommendations or GHG emission reduction measures are provided.

5.12 Refrigeration

Hydrofluorocarbons (HFCs) are used primarily as alternatives to ozone-depleting substances, such as Chlorofluorocarbons (CFCs) that are being phased out under the terms of the Montreal Protocol and Clean Air Act Amendments of 1990. These substances (CFCs and HFCs), are both used in refrigeration and air conditioning. Leakage from such refrigeration systems is common across a wide range of entities. HFCs are the primary GHG of concern for refrigeration systems, particularly for motor vehicle air conditioners. Today, HFC-134a is the standard refrigerant for mobile air conditioning systems. In most cases, GHG emissions from refrigeration tend to be negligible in comparison to other GHG emission sources. Since CFCs are monitored and are being phased out by the Montreal Protocol they are not included in GHG inventory programs resulting from the Kyoto Protocol. As shown by Table 9 below, usage of the following HFCs are reportable GHGs in California:

Table 9
List of Reportable HFCs

HFC – 23	HFC – 143a	HFC – 227ea
HFC – 152a	HFC – 125	HFC – 32
HFC – 236fa	HFC – 4310mee	HFC – 134a

Otis College uses HCFC-22 in its chiller, which currently is not reportable under CCAR requirements. Even assuming this were GHG emissions, the total annual emissions would be well less than 1% of the annual inventory. Consequently, refrigerants are not a significant source of GHG emissions at Otis College. No further recommendations or GHG emission reduction measures are provided.

5.13 Green Building Standards

Many new building constructions conform to certain green building standards and requirements, either voluntarily or through local building codes. Programs such as U.S. Green Building Counsel's Leadership in Energy and Environmental Design (LEEDS) Green Building Rating System or EPA's Energy Star Buildings Program provide standards through which developers and owners can evaluate their own buildings. LEEDS certification is a nationally accepted benchmark for design, construction, and operation of high performance green buildings. Participation in the Energy Star Buildings Program entails a partnership with EPA to continually track or measure energy performance, implement energy saving measures in accordance to Energy Star guidelines, educate staff and surrounding communities about importance of energy efficiency, and highlight the college's achievements with recognition offered through Energy Star. Otis College may consider pursuing one or more of these recognized green building standards for its main campus. In the case of Ahmanson Building, it is unlikely this building could meet these green building standards without additional capital expenditures and improvements. Given the recent construction of Galef Fine Arts Center, this building may have already been constructed to meet LEEDS or other green building standards.

6.0 CONCLUSIONS

◊ **Otis College is Making Progress.** Prior to this audit, Otis College had already instituted several sustainability or other green initiatives that have reduced the carbon footprint in campus operations, such as, green building designs, temperature control systems, efficient lighting systems, coordinated scheduling and other initiatives. Through its Environmental Steering Committee, additional green or sustainability efforts can be explored for implementation, as well as part of future GHG inventory audits to encourage or facilitate emission reductions from student and/or facility activities.

◊ **GHG Emissions Remain Relatively Low.** For 2008, it is estimated that Otis College will emit 1,191 metric-tons CO2e, which equates to roughly 1 annual metric-ton CO2e per full time student. If continuing education students are also included, this equates to approximately 0.3 annual metric tons CO2e per student. Note that this amount does not include any emissions from commuter miles, waste or other indirect emissions (other than purchased electricity and natural gas). In general, these GHG emissions are relatively low as compared to other organizations. For reference, Table 10 below compares the Otis College emissions to other organization types.

Table 10
GHG Emissions Comparison

Reference	Annual CO2e (MTCDE)	Population	GHG Ratio (tons/person)
Average U.S. Household [6]	12.38	2	6.2
Major Corporation [7]	5,000,000	75,000	66.7
State University Campus [8]	61,343	4,463	13.7
Otis College	**1,191**	**1,206**	**1.0**

When measured on a per full time student basis, the carbon footprint of Otis College is substantially smaller than the average U.S. household, a sample major corporation and a sample state university campus.

[6] U.S. EPA Greenhouse Gas Emissions Calculator (excluding transportation and solid waste related emissions)

[7] U.S. EPA Climate Leaders, 3M Corporation (2008)

[8] University of New Hampshire, 1990 – 2003 GHG Emissions Inventory, 2003 student enrollment (excluding transportation and solid waste related emissions)

◊ **Purchased Electricity Remains #1 GHG Emission Source.** Energy consumption from purchased electricity for the Ahmanson Building and Galef Fine Arts Center constitutes over 87% of the GHG emissions for the Otis College main campus. Of this amount, purchased electricity for the Ahmanson Building constitutes roughly 80% of the total GHG emission inventory in 2008. The second largest source of GHG emissions is natural gas consumption for comfort heating and hot water, which comprised approximately 12% of the GHG emission inventory in 2008. It is expected that purchased electricity will remain the #1 GHG emission source for the future, however, Otis does plan on expanding its main campus in the near future by taking over the existing Bank of America building located adjacent to the existing property. It is likely GHG emissions from purchased electricity will increase after this future expansion.

◊ **Energy and GHG Emissions Outpace Student Growth.** Energy consumption and greenhouse gas emissions have increased since 2006 by approximately 30% while student population has increased by approximately 15% over this same time. This growth in GHG emissions can be attributed primarily to the increase in purchased electricity for the Ahmanson Building which has also grown by 30% since 2006, and constitutes roughly 80% of the campus-wide GHG emissions inventory. The excess growth from purchased electricity relative to student population growth can not be fully explained. Possible theories include changes in building operations, fluctuations in class schedules, additional student usage of computer equipment or other changes in student habits, equipment or campus operations since 2006, which resulted in additional electrical demand.

◊ **Mobile and Stationary Source Emissions are Insignificant.** Mobile and stationary source emissions from Otis College are very low (less than 1%) relative to purchased electricity. Unless Otis College elects to purchase or operate its own fleet for student mass transit or other purposes, it is expected that these source emissions will remain very low, and no further emission reductions or recommendations are required.

7.0 RECOMMENDATIONS

◊ **Maintain current sustainability commitments.** Otis College should maintain its commitment toward general sustainability programs, energy efficiency and other similar initiatives, in particular additional efforts toward reducing electrical demand and other energy consumption. To this end, the maximum use of fluorescent lights, automatic sensors and/or automatic timers in all buildings and rooms would provide additional reductions in electrical consumption.

◊ **Set future GHG emission goals.** Otis College may consider setting future GHG emission reduction targets or other organization goals as part of conducting its annual GHG emission inventory, so that future sustainability initiatives can be evaluated. Example emission goals may include an annual mass GHG emission cap (based on 2008 or other calendar year) or ratio of 1 metric ton CO2e per full-time student could be appropriate goals to ensure Otis College maintains its commitment to sustainability.

◊ **Consider expanding annual GHG inventory.** Possible expansions of this annual GHG emissions inventory may include student commuter miles, faculty transportation and waste disposal. If Otis College elected to expand this GHG emissions inventory, the organizational goals discussed above should reflect these potential new emissions.

◊ **Evaluate green power purchase or renewable power.** Since purchased electricity will likely remain the #1 source GHG emissions for the immediate future on the main campus, Otis College should evaluate potential benefits of green power for its campus. For example, Otis College may evaluate on-campus solar project, participation in the LADWP Green Power Purchase program and/or acquisition of Renewable Energy Credits.

◊ **Consider implementation of carbon credits.** Otis College may consider the use of carbon credits to partially or wholly offset future year emission increases, or become totally "carbon neutral". There are also potential nationally recognition standards and certifications that Otis College can pursue as a "carbon neutral" campus.

◊ **Participate in California Climate Action Registry**. Although not required, Otis College may consider voluntarily joining the California Climate Action Registry (CCAR) for purposes of registering its greenhouse gas inventories on an annual basis. There are membership fees and conditions of participation, including the public disclosure of its GHG inventory, which should be evaluated to determine consistency with Otis College's objectives.

◊ **Incorporate transportation sustainability measures.** As discussed in this report, Otis College may consider transportation related sustainability measures for students and faculty, including mass transit system, car pooling, incentive programs and other similar measures.

◊ **Expand on-campus GHG education and awareness.** On-going educational or awareness campaign may be implemented to introduce faculty and students to GHG emissions. As part of a general campaign, the following elements should be considered: (1) Publication of this GHG emissions inventory report on the Otis College website or other area for review by students and faculty; (2) Signage in the computer labs, offices and classrooms reminding students, faculty and others to turn off computers and lights; (3) Climate change suggestion box to solicit ideas from students and others on ways to further reduce the campus carbon footprint.

APPENDIX A

GHG EMISSIONS – CALENDAR YEAR 2008

Indirect - Electricity Use (9025 Lincoln, Galef Fine Arts Center)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	6.98	0.00	0.00	6.99
February	7.94	0.00	0.00	7.95
March	8.42	0.00	0.00	8.43
April	8.80	0.00	0.00	8.81
May	8.51	0.00	0.00	8.53
June	6.74	0.00	0.00	6.75
July	5.98	0.00	0.00	5.99
August	6.65	0.00	0.00	6.66
September	7.17	0.00	0.00	7.18
October	7.17	0.00	0.00	7.18
November	7.17	0.00	0.00	7.18
December	7.17	0.00	0.00	7.18
			Total (tons/year)	**88.85**

Indirect - Electricity Use (9045 Lincoln, Ahmanson Hall)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	66.58	0.00	0.00	66.68
February	81.44	0.00	0.00	81.56
March	81.60	0.00	0.00	81.72
April	82.86	0.00	0.00	82.98
May	74.29	0.00	0.00	74.40
June	73.02	0.00	0.00	73.13
July	70.31	0.00	0.00	70.41
August	71.12	0.00	0.00	71.23
September	86.79	0.00	0.00	86.92
October	86.79	0.00	0.00	86.92
November	86.79	0.00	0.00	86.92
December	86.79	0.00	0.00	86.92
			Total (tons/year)	**949.78**

APPENDIX A

GHG EMISSIONS – CALENDAR YEAR 2008

Direct - Stationary Combustion (9025 Lincoln, Galef Fine Arts Center Gas Use)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	4.02	0.00	0.00	4.03
February	3.20	0.00	0.00	3.21
March	2.24	0.00	0.00	2.25
April	0.42	0.00	0.00	0.42
May	0.54	0.00	0.00	0.54
June	0.01	0.00	0.00	0.01
July	0.33	0.00	0.00	0.33
August	0.00	0.00	0.00	0.00
September	0.00	0.00	0.00	0.00
October	0.00	0.00	0.00	0.00
November	0.16	0.00	0.00	0.16
December	0.13	0.00	0.00	0.13
			Total (tons/year)	**11.09**

Direct - Stationary Combustion (9045 Lincoln, Ahmanson Hall Gas Use)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	20.16	0.00	0.00	20.22
February	29.59	0.00	0.00	29.68
March	25.25	0.00	0.00	25.32
April	19.82	0.00	0.00	19.88
May	14.75	0.00	0.00	14.79
June	6.48	0.00	0.00	6.50
July	0.89	0.00	0.00	0.89
August	0.42	0.00	0.00	0.43
September	0.33	0.00	0.00	0.34
October	0.79	0.00	0.00	0.79
November	5.13	0.00	0.00	5.14
December	15.52	0.00	0.00	15.57
			Total (tons/year)	**139.54**

Direct - Stationary Combustion (Emergency Generator)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.07	0.00	0.00	0.07
February	0.07	0.00	0.00	0.07
March	0.07	0.00	0.00	0.07
April	0.07	0.00	0.00	0.07
May	0.07	0.00	0.00	0.07
June	0.07	0.00	0.00	0.07
July	0.07	0.00	0.00	0.07
August	0.07	0.00	0.00	0.07
September	0.07	0.00	0.00	0.07
October	0.07	0.00	0.00	0.07
November	0.07	0.00	0.00	0.07
December	0.07	0.00	0.00	0.07
			Total (tons/year)	**0.82**

APPENDIX A

GHG EMISSIONS – CALENDAR YEAR 2008

Direct - Mobile Combustion (Forklift)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.02	0.00	0.00	0.02
February	0.02	0.00	0.00	0.02
March	0.02	0.00	0.00	0.02
April	0.02	0.00	0.00	0.02
May	0.02	0.00	0.00	0.02
June	0.02	0.00	0.00	0.02
July	0.02	0.00	0.00	0.02
August	0.02	0.00	0.00	0.02
September	0.02	0.00	0.00	0.02
October	0.02	0.00	0.00	0.02
November	0.02	0.00	0.00	0.02
December	0.02	0.00	0.00	0.02
			Total (tons/year)	**0.22**

Direct - Mobile Combustion (Scissor Lift)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.02	0.00	0.00	0.02
February	0.02	0.00	0.00	0.02
March	0.02	0.00	0.00	0.02
April	0.02	0.00	0.00	0.02
May	0.02	0.00	0.00	0.02
June	0.02	0.00	0.00	0.02
July	0.02	0.00	0.00	0.02
August	0.02	0.00	0.00	0.02
September	0.02	0.00	0.00	0.02
October	0.02	0.00	0.00	0.02
November	0.02	0.00	0.00	0.02
December	0.02	0.00	0.00	0.02
			Total (tons/year)	**0.22**

Direct - Mobile Combustion (Golf Cart)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.04	0.00	0.00	0.04
February	0.04	0.00	0.00	0.04
March	0.04	0.00	0.00	0.04
April	0.04	0.00	0.00	0.04
May	0.04	0.00	0.00	0.04
June	0.04	0.00	0.00	0.04
July	0.04	0.00	0.00	0.04
August	0.04	0.00	0.00	0.04
September	0.04	0.00	0.00	0.04
October	0.04	0.00	0.00	0.04
November	0.04	0.00	0.00	0.04
December	0.04	0.00	0.00	0.04
			Total (tons/year)	**0.44**

Direct - Mobile Combustion (Landscaping Equipment)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.04	0.00	0.00	0.04
February	0.04	0.00	0.00	0.04
March	0.04	0.00	0.00	0.04
April	0.04	0.00	0.00	0.04
May	0.04	0.00	0.00	0.04
June	0.04	0.00	0.00	0.04
July	0.04	0.00	0.00	0.04
August	0.04	0.00	0.00	0.04
September	0.04	0.00	0.00	0.04
October	0.04	0.00	0.00	0.04
November	0.04	0.00	0.00	0.04
December	0.04	0.00	0.00	0.04
			Total (tons/year)	**0.44**

APPENDIX B

GHG EMISSIONS – CALENDAR YEAR 2007

Indirect - Electricity Use (9025 Lincoln, Galef Fine Arts Center)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	5.39	0.00	0.00	5.40
February	8.41	0.00	0.00	8.42
March	8.36	0.00	0.00	8.38
April	8.58	0.00	0.00	8.60
May	9.72	0.00	0.00	9.74
June	6.74	0.00	0.00	6.75
July	7.23	0.00	0.00	7.24
August	7.31	0.00	0.00	7.32
September	7.09	0.00	0.00	7.11
October	9.59	0.00	0.00	9.61
November	9.24	0.00	0.00	9.25
December	6.39	0.00	0.00	6.40
			Total (tons/year)	**94.22**

Indirect - Electricity Use (9045 Lincoln, Ahmanson Hall)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	40.95	0.00	0.00	41.01
February	62.80	0.00	0.00	62.90
March	66.79	0.00	0.00	66.90
April	70.38	0.00	0.00	70.49
May	67.29	0.00	0.00	67.40
June	58.51	0.00	0.00	58.60
July	57.56	0.00	0.00	57.65
August	65.21	0.00	0.00	65.31
September	75.86	0.00	0.00	75.98
October	84.43	0.00	0.00	84.57
November	73.26	0.00	0.00	73.38
December	71.38	0.00	0.00	71.50
			Total (tons/year)	**795.69**

APPENDIX B

GHG EMISSIONS – CALENDAR YEAR 2007

Direct - Stationary Combustion (9025 Lincoln, Galef Fine Arts Center Gas Use)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.51	0.00	0.00	0.52
February	4.13	0.00	0.00	4.14
March	1.48	0.00	0.00	1.48
April	0.79	0.00	0.00	0.79
May	0.97	0.00	0.00	0.97
June	0.66	0.00	0.00	0.66
July	0.08	0.00	0.00	0.08
August	0.00	0.00	0.00	0.00
September	0.00	0.00	0.00	0.00
October	0.00	0.00	0.00	0.00
November	0.16	0.00	0.00	0.16
December	0.13	0.00	0.00	0.13
			Total (tons/year)	**8.95**

Direct - Stationary Combustion (9045 Lincoln, Ahmanson Hall Gas Use)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	6.66	0.00	0.00	6.68
February	26.37	0.00	0.00	26.44
March	19.46	0.00	0.00	19.51
April	19.08	0.00	0.00	19.13
May	17.28	0.00	0.00	17.33
June	6.18	0.00	0.00	6.19
July	0.31	0.00	0.00	0.31
August	0.00	0.00	0.00	0.00
September	0.00	0.00	0.00	0.00
October	4.25	0.00	0.00	4.26
November	5.13	0.00	0.00	5.14
December	15.52	0.00	0.00	15.57
			Total (tons/year)	**120.57**

Direct - Stationary Combustion (Emergency Generator)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.07	0.00	0.00	0.07
February	0.07	0.00	0.00	0.07
March	0.07	0.00	0.00	0.07
April	0.07	0.00	0.00	0.07
May	0.07	0.00	0.00	0.07
June	0.07	0.00	0.00	0.07
July	0.07	0.00	0.00	0.07
August	0.07	0.00	0.00	0.07
September	0.07	0.00	0.00	0.07
October	0.07	0.00	0.00	0.07
November	0.07	0.00	0.00	0.07
December	0.07	0.00	0.00	0.07
			Total (tons/year)	**0.82**

APPENDIX B

GHG EMISSIONS – CALENDAR YEAR 2007

Direct - Mobile Combustion (Forklift)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.02	0.00	0.00	0.02
February	0.02	0.00	0.00	0.02
March	0.02	0.00	0.00	0.02
April	0.02	0.00	0.00	0.02
May	0.02	0.00	0.00	0.02
June	0.02	0.00	0.00	0.02
July	0.02	0.00	0.00	0.02
August	0.02	0.00	0.00	0.02
September	0.02	0.00	0.00	0.02
October	0.02	0.00	0.00	0.02
November	0.02	0.00	0.00	0.02
December	0.02	0.00	0.00	0.02
			Total (tons/year)	**0.22**

Direct - Mobile Combustion (Scissor Lift)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.02	0.00	0.00	0.02
February	0.02	0.00	0.00	0.02
March	0.02	0.00	0.00	0.02
April	0.02	0.00	0.00	0.02
May	0.02	0.00	0.00	0.02
June	0.02	0.00	0.00	0.02
July	0.02	0.00	0.00	0.02
August	0.02	0.00	0.00	0.02
September	0.02	0.00	0.00	0.02
October	0.02	0.00	0.00	0.02
November	0.02	0.00	0.00	0.02
December	0.02	0.00	0.00	0.02
			Total (tons/year)	**0.22**

Direct - Mobile Combustion (Golf Cart)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.04	0.00	0.00	0.04
February	0.04	0.00	0.00	0.04
March	0.04	0.00	0.00	0.04
April	0.04	0.00	0.00	0.04
May	0.04	0.00	0.00	0.04
June	0.04	0.00	0.00	0.04
July	0.04	0.00	0.00	0.04
August	0.04	0.00	0.00	0.04
September	0.04	0.00	0.00	0.04
October	0.04	0.00	0.00	0.04
November	0.04	0.00	0.00	0.04
December	0.04	0.00	0.00	0.04
			Total (tons/year)	**0.44**

Direct - Mobile Combustion (Landscaping Equipment)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.04	0.00	0.00	0.04
February	0.04	0.00	0.00	0.04
March	0.04	0.00	0.00	0.04
April	0.04	0.00	0.00	0.04
May	0.04	0.00	0.00	0.04
June	0.04	0.00	0.00	0.04
July	0.04	0.00	0.00	0.04
August	0.04	0.00	0.00	0.04
September	0.04	0.00	0.00	0.04
October	0.04	0.00	0.00	0.04
November	0.04	0.00	0.00	0.04
December	0.04	0.00	0.00	0.04
			Total (tons/year)	**0.44**

APPENDIX C

GHG EMISSIONS – CALENDAR YEAR 2006

Indirect - Electricity Use (9025 Lincoln, Galef Fine Arts Center)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	6.83	0.00	0.00	6.84
February	6.83	0.00	0.00	6.84
March	6.83	0.00	0.00	6.84
April	6.83	0.00	0.00	6.84
May	6.83	0.00	0.00	6.84
June	6.83	0.00	0.00	6.84
July	6.46	0.00	0.00	6.47
August	5.21	0.00	0.00	5.22
September	8.01	0.00	0.00	8.03
October	9.24	0.00	0.00	9.25
November	9.24	0.00	0.00	9.25
December	9.24	0.00	0.00	9.25
			Total (tons/year)	**88.54**

Indirect - Electricity Use (9045 Lincoln, Ahmanson Hall)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	50.88	0.00	0.00	50.96
February	50.88	0.00	0.00	50.96
March	50.88	0.00	0.00	50.96
April	50.88	0.00	0.00	50.96
May	50.88	0.00	0.00	50.96
June	50.88	0.00	0.00	50.96
July	56.16	0.00	0.00	56.25
August	43.73	0.00	0.00	43.80
September	63.13	0.00	0.00	63.23
October	69.41	0.00	0.00	69.52
November	60.17	0.00	0.00	60.27
December	59.47	0.00	0.00	59.56
			Total (tons/year)	**658.40**

APPENDIX C

GHG EMISSIONS – CALENDAR YEAR 2006

Direct - Stationary Combustion (9025 Lincoln, Galef Fine Arts Center Gas Use)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.51	0.00	0.00	0.52
February	4.13	0.00	0.00	4.14
March	1.48	0.00	0.00	1.48
April	0.79	0.00	0.00	0.79
May	0.99	0.00	0.00	1.00
June	0.27	0.00	0.00	0.27
July	0.30	0.00	0.00	0.30
August	0.28	0.00	0.00	0.28
September	0.44	0.00	0.00	0.44
October	0.29	0.00	0.00	0.29
November	0.27	0.00	0.00	0.27
December	0.63	0.00	0.00	0.63
			Total (tons/year)	**10.40**

Direct - Stationary Combustion (9045 Lincoln, Ahmanson Hall Gas Use)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	6.66	0.00	0.00	6.68
February	26.37	0.00	0.00	26.44
March	19.46	0.00	0.00	19.51
April	19.08	0.00	0.00	19.13
May	9.92	0.00	0.00	9.95
June	0.46	0.00	0.00	0.46
July	0.26	0.00	0.00	0.26
August	0.26	0.00	0.00	0.26
September	0.15	0.00	0.00	0.15
October	0.21	0.00	0.00	0.21
November	1.00	0.00	0.00	1.01
December	4.39	0.00	0.00	4.40
			Total (tons/year)	**88.47**

Direct - Stationary Combustion (Emergency Generator)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.07	0.00	0.00	0.07
February	0.07	0.00	0.00	0.07
March	0.07	0.00	0.00	0.07
April	0.07	0.00	0.00	0.07
May	0.07	0.00	0.00	0.07
June	0.07	0.00	0.00	0.07
July	0.07	0.00	0.00	0.07
August	0.07	0.00	0.00	0.07
September	0.07	0.00	0.00	0.07
October	0.07	0.00	0.00	0.07
November	0.07	0.00	0.00	0.07
December	0.07	0.00	0.00	0.07
			Total (tons/year)	**0.82**

APPENDIX C

GHG EMISSIONS – CALENDAR YEAR 2006

Direct - Mobile Combustion (Forklift)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.02	0.00	0.00	0.02
February	0.02	0.00	0.00	0.02
March	0.02	0.00	0.00	0.02
April	0.02	0.00	0.00	0.02
May	0.02	0.00	0.00	0.02
June	0.02	0.00	0.00	0.02
July	0.02	0.00	0.00	0.02
August	0.02	0.00	0.00	0.02
September	0.02	0.00	0.00	0.02
October	0.02	0.00	0.00	0.02
November	0.02	0.00	0.00	0.02
December	0.02	0.00	0.00	0.02
			Total (tons/year)	**0.22**

Direct - Mobile Combustion (Scissor Lift)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.02	0.00	0.00	0.02
February	0.02	0.00	0.00	0.02
March	0.02	0.00	0.00	0.02
April	0.02	0.00	0.00	0.02
May	0.02	0.00	0.00	0.02
June	0.02	0.00	0.00	0.02
July	0.02	0.00	0.00	0.02
August	0.02	0.00	0.00	0.02
September	0.02	0.00	0.00	0.02
October	0.02	0.00	0.00	0.02
November	0.02	0.00	0.00	0.02
December	0.02	0.00	0.00	0.02
			Total (tons/year)	**0.22**

Direct - Mobile Combustion (Golf Cart)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.04	0.00	0.00	0.04
February	0.04	0.00	0.00	0.04
March	0.04	0.00	0.00	0.04
April	0.04	0.00	0.00	0.04
May	0.04	0.00	0.00	0.04
June	0.04	0.00	0.00	0.04
July	0.04	0.00	0.00	0.04
August	0.04	0.00	0.00	0.04
September	0.04	0.00	0.00	0.04
October	0.04	0.00	0.00	0.04
November	0.04	0.00	0.00	0.04
December	0.04	0.00	0.00	0.04
			Total (tons/year)	**0.44**

Direct - Mobile Combustion (Landscaping Equipment)

Month	Emissions (tons/month)			Total Emissions (tons/month)
	CO_2	CH_4	N_2O	
January	0.04	0.00	0.00	0.04
February	0.04	0.00	0.00	0.04
March	0.04	0.00	0.00	0.04
April	0.04	0.00	0.00	0.04
May	0.04	0.00	0.00	0.04
June	0.04	0.00	0.00	0.04
July	0.04	0.00	0.00	0.04
August	0.04	0.00	0.00	0.04
September	0.04	0.00	0.00	0.04
October	0.04	0.00	0.00	0.04
November	0.04	0.00	0.00	0.04
December	0.04	0.00	0.00	0.04
			Total (tons/year)	**0.44**