Calendar Year 2018
Carbon Footprint Report

IMPROVING THE QUALITY OF THE ENVIRONMENT IN WHICH WE LIVE, ONE PROJECT AT A TIME®

Prepared by

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LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CY	Calendar Year
EA	EA Engineering, Science, and Technology, Inc., PBC
eGrid	Emissions & Generation Resource Integrated Database
EPA	U.S. Environmental Protection Agency
FedEx	Federal Express
FTE	Full-time equivalent
gal	Gallon(s)
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
kg	Kilogram(s)
kW	Kilowatt
kWh	Kilowatt hour(s)
MPG	Mile(s) per gallon
$MTCO_2$	Metric ton(s) carbon dioxide
$MTCO_2e$	Metric ton(s) carbon dioxide equivalent
MWh	Megawatt hour(s)
N_2O	Nitrous oxide
PBC	Public benefit corporation
POV	Privately-owned vehicle
PV	Photovoltaic
REC	Renewable energy certificate
SF	Square foot (feet)
Standards	Greenhouse Gas Protocol Initiative Corporate Standards
SUV	Sport utility vehicle
th	Therm(s)
UPS	United Parcel Service
WARM	Waste Reduction Model
WRI	World Resource Institute

EXECUTIVE SUMMARY

ABOUT EA—EA Engineering, Science, and Technology, Inc., PBC (EA) is a 100 percent (%) Employee Stock Ownership Plan-owned public benefit corporation (PBC) that provides environmental, compliance, natural resources, and infrastructure engineering, technology, and management solutions to a wide range of public and private sector clients. Headquartered in Hunt Valley, Maryland, EA had an average headcount of 498 employees (511 full-time equivalents [FTE][1]) working through a network of 26 commercial offices across the United States, as well as Alaska, Hawaii, and Guam.

This is EA's seventh tabulation of greenhouse gas (GHG) emissions and resulting carbon footprint, first initiated in 2009. The previous tabulation was completed for Calendar Year (CY) 2017. Previous reports, through CY 2016, were prepared biennially to cover two full CYs. This is EA's third annual report and represents EA's Carbon Footprint Report for CY 2018. This report is based on EA's CY 2018 operations and activities.

INVENTORY MANAGEMENT PLAN—This GHG inventory has been prepared in accordance with the GHG Protocol Initiative Corporate Standards (hereafter referred to as the Standards), developed and published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WRI and World Business Council for Sustainable Development 2004). This method is the most widely used international accounting tool for governments and businesses to identify, quantify, and manage GHG emissions.

Additionally, as an aspect of continual improvement to further align with WRI and to ensure consistent analysis of data year to year, EA developed a *Carbon Footprint Inventory Management Plan* (EA 2019) that further documents procedures and controls and identifies data and factors to be used by EA to estimate GHG emissions associated with its business operations. The Inventory Management Plan summarizes EA's operations, details data collected for each GHG scope area, quantifies emissions calculation methods utilized, and outlines data management methods and verification process controls calculations. The Inventory Management Plan is considered an internal "evergreen" document that will be updated annually, or more often as best practices dictate. It will be used to ensure annual GHG accounting and reporting are relevant, complete, consistent, transparent, and accurate.

2018 REPORTING—This report is intended to provide an accurate assessment of EA's practices as a company and the associated carbon footprint. In the interest of achieving this goal, the 2018 Report incorporates data from our Headquarters location as well as office-specific data from the majority of our commercial offices. Prior to 2016 assessments of company-wide emissions were made by extrapolating data from EA's leased Headquarters space across all offices based on their headcount and square footage. This and future carbon footprint reports will continue to build on the practice of collecting and incorporating actual data from other commercial offices, when and where available.

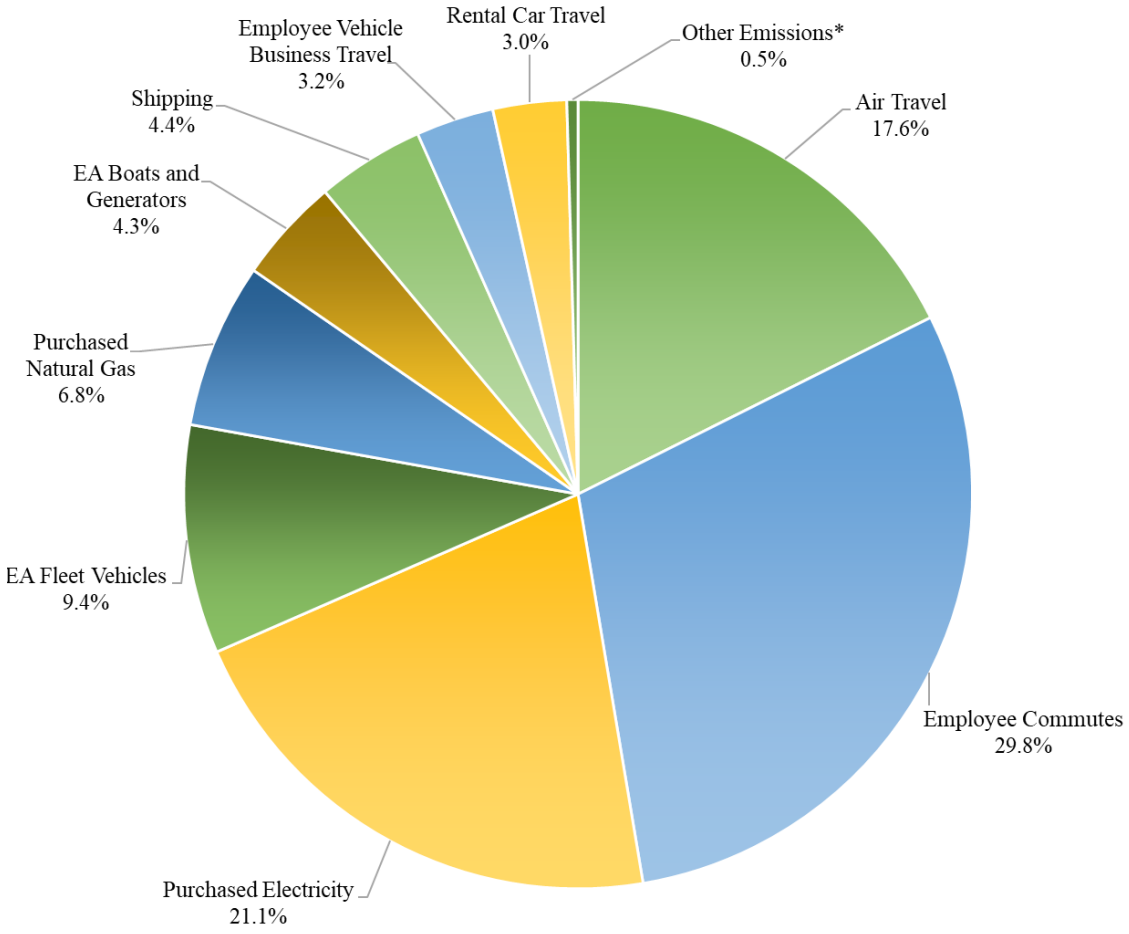
[1] Calculations in this report that rely on personnel totals (e.g., solid waste and wastewater) are completed using a normalized FTE total of 511. Normalized FTE is calculated as EA's total Occupational Safety and Health Administration labor hours reported in 2018 divided by 2080 (the number of hours in a typical full-time year assuming fifty-two 40-hour work weeks) 1,062,015 ÷ 2080 = 511.

In CY 2018, EA generated an estimated total of 4,379.6 metric tons of carbon dioxide equivalents (1,252.4 $MTCO_2e$) from its operations. Approximately 28.6% ($MTCO_2e$) was offset, resulting in net emissions from operations of 3,127.2 $MTCO_2e$. In 2018, emissions associated with EA employee commutes continued to be the largest single source of GHG, contributing 1,303 $MTCO_{2e}$ (29.8%). Purchased electricity generated an estimated 923.7 $MTCO_2e$ (21.1%) while emissions associated with EA's business travel contributed 771.3 $MTCO_{2e}$ (17.6%). EA's top three sources for emissions—Employee Commutes, Purchased Electricity, and Air Travel—have consistently been the top emissions sources since CY 2016.

Normalized by total labor hours worked, EA's 2018 carbon footprint was 6.1 metric tons per FTE—a 15% decrease from 7.2 metric tons per FTE based on 2017 net emissions.

Figure ES-1 (below) and ***Table ES-1*** (page ES-3) summarize the findings of EA's CY 2018 Carbon Footprint Report.

Figure ES-1. Sources of Emissions by Percentage of Total 2018 Carbon Footprint



** "Other Emissions" represents the sum of emissions related to EA's Solid Waste Disposal, Rail Travel, Potable Water, and Wastewater Treatment.*

Table ES-1. Summary of Emissions Contributing to EA's 2018 Carbon Footprint

Emissions Sources	2018 $MTCO_2e$	% of 2018 Total Footprint	2017 $MTCO_2e$
Scope 1: Direct GHG Emissions			
EA Fleet Vehicles	410.5	9.4	422.5
EA Boats and Generators	188.3	4.3	415.7
Natural Gas	296.9	6.8	219.9
Scope 2: Electricity Indirect GHG Emissions			
Purchased Electricity	923.7	21.1	805.9
Scope 3: Other Indirect GHG Emissions			
Employee Commutes	1,303.0	29.8	1,370.5
Air Travel*	771.3	17.6	722.8
Rail Travel*	1.5	0.03	0.61
Rental Car Travel*	132.3	3.0	224.4
Employee Vehicle Business Travel	139.8	3.2	152.5
Solid Waste Disposal	11.9	0.3	13.0
Shipping	193.8	4.4	132.3
Potable Water	2.9	0.07	1.2
Wastewater Treatment	3.7	0.08	1.7
Total Emissions	**4,379.6**	**100.0**	**4,483.0**
Carbon Offsets**			
Single Stream Recycling and Composting Offsets	(133.3)		(91.0)
Air Travel Offsets (Purchased)	(150.0)		(100.0)
Renewable Energy Certificates (Purchased)	(923.7)		(515.3)
Shipping Offsets (Purchased)	(45.4)		(48.1)
Total Reduction	**(1,252.4)**	**(28.6)**	**(754.4)**
NET EMISSIONS**	**3,127.2**		**3,728.6**

* Travel data provided by EA's corporate travel agent, Safe Harbors.

** Offsets such as recycling, composting, and purchased Renewable Energy Certificates result in a decrease in net emissions and are denoted by parentheses. Net emissions represent the sum of EA's Scope 1, 2, and 3 emissions less earned/purchased offsets.

NOTE: All calculations in this report have been rounded to one significant digit unless two significant digits were required to prevent a "0" total from influencing the accuracy of a total (e.g., % of 2018 Total Footprint for Rail Travel) or in cases where an official emissions factor used for calculations includes more than one significant digit (e.g., emissions factors for gasoline consumption).

1. INTRODUCTION

EA Engineering, Science, and Technology, Inc., PBC (EA) is a 100 percent (%) Employee Stock Ownership Plan-owned public benefit corporation (PBC) that provides environmental, compliance, natural resources, and infrastructure engineering, technology, and management solutions to a wide range of public and private sector clients. Headquartered in Hunt Valley, Maryland, EA employs over 500 professionals through a network of offices located across the continental United States, as well as Alaska, Hawaii, and Guam. In 2018, EA maintained 26 commercial offices and an average headcount of 511 full-time equivalent (FTE) employees.

This is EA's seventh tabulation of greenhouse gas (GHG) emissions and resulting carbon footprint, first initiated in 2009. The previous tabulation was completed for Calendar Year (CY) 2017. Previous reports, through CY 2016, were prepared biennially to cover two full CYs. This is EA's third annual report and represents EA's Carbon Footprint Report for CY 2018. This report is based on EA's CY 2018 operations and activities.

This report is intended to provide an accurate assessment of EA's practices as a company and the associated carbon footprint. In the interest of achieving this goal, the 2018 Report incorporates data from our Headquarters location as well as office-specific data from the majority of our commercial offices. Earlier assessments of company-wide emissions were made by extrapolating data from EA's leased Headquarters space across all offices based on their headcount and square footage. This and future carbon footprint reports will continue to build on the practice of collecting and incorporating actual data from other commercial offices, when and where available.

This GHG inventory has been prepared in accordance with the GHG Protocol Initiative Corporate Standards (hereafter referred to as the Standards), developed and published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WRI and World Business Council for Sustainable Development 2004). This method is the most widely used international accounting tool for governments and businesses to identify, quantify, and manage GHG emissions. The Standards require accounting for the six "Kyoto Protocol" GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons, emissions of which are reported in terms of carbon dioxide equivalents (CO_2e). Other gases with global warming potential may be included in such analyses, but are not included herein.

This report accounts primarily for CO_2 emissions. Where GHG calculator tools were used to estimate emissions in the form of CO_2e, other GHGs may be included. Aside from these equivalencies, emission estimates for other GHGs have not been directly calculated for this report. These emissions (typically CH_4 and N_2O from combustion of fuels) are usually several orders of magnitude smaller than CO_2 emissions, as is the case for EA's footprint; as such, it is not currently practicable to calculate carbon equivalents for these other GHGs from all activities. The Standards divide GHG emission sources into three categories: Scope 1, Scope 2, and Scope 3, each of which is detailed in dedicated sections in this report.

2. SCOPE 1: DIRECT GREENHOUSE GAS EMISSIONS

Scope 1 emissions arise from operations and equipment that is owned or directly controlled by an organization, including:

- Generation of electricity, heat, or steam from fuel combustion in stationary emission units
- Physical or chemical processing operations that release GHGs
- Transportation of materials, products, waste, and employees
- Fugitive emissions of GHGs resulting from accidental releases, leaks, or other unintentional releases.

Scope 1 GHG emissions from EA's business operations and activities, summarized in ***Table 2-1***, include emissions from fleet vehicle operations, boat operations, generators used in the field, and emissions associated with natural gas utilized for heating offices.

Table 2-1. Scope 1 Emissions Summary

Source	$MTCO_2e$
EA Fleet Vehicles	410.5[2]
Miscellaneous Engines	188.3[3]
Natural Gas	296.9[4]
Net Scope 1 Emissions	**895.7**
NOTE: $MTCO_{2e}$ = Metric tons carbon dioxide equivalent.	

2.1 FLEET VEHICLES

EA's vehicle fleet includes passenger cars, small trucks/sport utility vehicles (SUVs), and large trucks/SUVs. EA maintained 86 fleet vehicles in CY 2018 (***Table 2-2***), including multiple hybrid and FlexFuel vehicles. Apart from electric power provided for plug-in hybrid vehicles, EA's fleet is powered by gasoline and/or diesel fuel. Two electric charging stations for electric and hybrid technology vehicles are available at EA's Corporate Headquarters in Hunt Valley, Maryland. These charging stations are openly available for public use, not just EA. In 2018, EA also installed two electric charging stations in the 231 Schilling Circle/Ecotoxicology parking lot; these stations are reserved for EA use as they are located behind the lot's security barriers. Associated energy usage for the charging stations is included in monthly electric bills for their respective buildings (i.e., 225 and 231 Schilling Circle).

During the reporting period, EA retired a total of 6 fleet vehicles across the company, decreasing our total fleet from 92 to 86 vehicles. A summary of the fleet vehicles and their estimated fuel economy is shown in ***Table 2-2***.

[2] Emissions were approximately 4% lower than in 2017 due to fewer overall miles driven.
[3] Emissions were 55% lower than in 2017 due to conclusion of a project that involved use of EA's largest vessel, the *Marine Vessel Jane. B* (which is >23 feet).
[4] Emissions are approximately 35% higher than in 2017 as a result of determining EA's Albuquerque, New Mexico office is both cooled and heated with natural gas.

Table 2-2. EA's Fleet Vehicles and Average Mileage

Vehicle Type	Average MPG	Number of Vehicles
Passenger Cars	43.1	11
Small Trucks/SUVs	16.4	41
Large Trucks/SUVs	12.2	34
Total		**86**
NOTES: Average miles per gallon (MPG) for Passenger Cars is high due to hybrid and FlexFuel vehicles in the fleet.		

Calculation of GHG emissions from fleet vehicles was based on the total vehicle miles traveled based on EA *Equipment Tracker* information and tracking forms completed by EA employees following project-related travel, and average MPG for each vehicle type. Total gasoline consumption calculation is displayed in ***Table 2-3***.

Table 2-3. Fleet Vehicle Gasoline Consumption Estimations

Vehicle Type	Average MPG	Miles Traveled	Estimated Gasoline Consumption (gal)
Passenger Cars	43.1	100,625.0	2,334.7
Small Trucks/SUVs	16.4	478,037.0	29,148.6
Large Trucks/SUVs	12.2	184,385.1	15,113.5
Total		**763,047.1**	**46,596.8**
NOTE: gal = Gallon.			

A gallon of gasoline is assumed to produce 8.81 kilograms (kg) of CO_2 based on calculated values from 40 Code of Federal Regulations (CFR) 600.113-78, which the U.S. Environmental Protection Agency (EPA) uses to calculate vehicle fuel economy. This number also relies on assumptions consistent with United Nations Intergovernmental Panel on Climate Change (IPCC) guidelines. The total emission calculation is displayed in ***Table 2-4***.

Table 2-4. 2018 Fleet Vehicle Emissions Data

Total Gasoline Consumption (gal)	Emissions Factor (kg CO_2/gal)[5]	Total Emissions (kg CO_2)	Total Emissions ($MTCO_2e$)
46,596.8	8.81	410,517.8	410.5

2.2 MISCELLANEOUS ENGINES

EA owns and operates powered watercraft, including boats powered by inboard, 4-stroke gasoline engines, and by outboard, 2-stroke gasoline engines[6]. EA's watercraft fleet includes multiple powered vessels as well as standalone outboard motors with engine power ranging from 10 to 300 horsepower. EA owns multiple vessels; therefore, utilization exceeds 365 calendar days per year. An average daily use of 8 hours is used for boats; multiplying 8 by the total days utilized yielded total hours used.

[5] 40 Code of Federal Regulations (CFR) 600.113-78; Subchapter Q – Energy Policy, Part 600 – Fuel Economy of Motor Vehicles.

[6] Boat-specific engine type information could not be determined using EA's current tracking system; for the purposes of this report, calculations assumed a mechanically maintained (i.e., in-tune), 4-stroke engine.

To calculate total gallons of fuel used by EA watercraft, a specific fuel consumption of 0.5 pounds/hour per unit of horsepower was used, with a fuel-specific weight of 6.1 pounds/gal. Multiplying specific fuel consumption by horsepower and dividing the product by fuel-specific weight yields gallons of fuel consumed per hour by a boat engine.

A total of 14 EA-owned field generators are also used and are included in this portion of emissions calculation. Gallons of fuel burned per day of generator use (1.97 gal/day) is calculated using manufacturer specifications for fuel consumption at the rated load of the models in EA's generator inventory[7] and is based on 4 hours of generator use per day. Total generator fuel consumption is the product of total EA generator usage days and gallons of fuel burned per day of generator use. This estimate of fuel use was multiplied by the EPA published emissions factor for gasoline combustion, providing the estimated CO_2 emissions.

The total estimates of fuel use by vessels, outboard motors, and generators were multiplied by the EPA published emissions factor for gasoline combustion, providing the estimated CO_2 emissions displayed in ***Table 2-5***. Emissions were 55% lower than in 2017 due to conclusion of a project that involved use of EA's largest vessel, the *Marine Vessel Jane. B*, which is powered by two 225 horsepower outboard motors. The net result was a decrease of 18 days in the vessel's operations from calendar year 2017 to calendar year 2018.

Table 2-5. Emissions Data for Miscellaneous Engines

Total Gasoline Consumption (gal)	Emissions Factor (kg CO_2/gal)[8]	Total Emissions (kg CO_2)	Total Emissions ($MTCO_2e$)
21,180	8.89	188,290.2	188.3

One of the more challenging aspects of calculating carbon emissions from EA fleet vehicles and other engines is the availability of data. The simplest and most accurate approach would be to use records of all fuel purchased for these vehicles and engines, by fuel type, in a calendar year and fuel-specific emission factors. Unfortunately, data come from many different sources (only 70–80% of these data are available through EA purchase records (i.e., fuel vendor accounts) and, in some cases, is too labor intensive to extract. As a result, activity-level data (e.g., mileage and hours of operation) are used with assumed mileage data to estimate emissions. These data are also incomplete because EA's *Equipment Tracker* system is not used at all commercial office locations (i.e., some EA offices utilize paper forms to track mileage and reservations). It should be noted that use of *Equipment Tracker* continues to improve annually; consequently, it is anticipated that the accuracy of emissions calculations will continue to improve as a result.

[7] Generator model specifications were not available for three EA offices (Deerfield, Illinois; Lincoln, Nebraska; and Albuquerque, New Mexico). In these instances, the average fuel consumption per day of use from the remaining EA generator inventory was used.

[8] 40 CFR 600.113-78; Subchapter Q – Energy Policy, Part 600 – Fuel Economy of Motor Vehicles.

2.3 NATURAL GAS

2.3.1 Directly Billed Natural Gas Usage

Natural gas usage by multiple EA offices and warehouse facilities is known via direct utility billing for the buildings. Where EA occupies less than the entire building, actual gas usage was calculated in proportion to the building space occupied by EA. Natural gas usage is reported in therms (th). Emissions are based on the factor 0.0053 $MTCO_{2e}$/th (EPA GHG Equivalencies Calculator [EPA 2017]). A summary of gas usage and GHG emissions from gas and steam is displayed in ***Table 2-6***, sorted by highest total GHG emissions.

Table 2-6. Emissions Associated with Known Natural Gas Consumption

Building	EA-Occupied Space (SF)	Natural Gas Consumption (th)	Total GHG Emissions ($MTCO_{2e}$)
Albuquerque, New Mexico	8,500	20,635	109.5
Hunt Valley (231 Schilling), Maryland	10,000	5,700	30.2
Hunt Valley (225 Schilling), Maryland	65,400	5,293	28.1
Cockeysville, Maryland (Warehouse)	7,500	4,598	24.4
Lincoln, Nebraska (Office + Warehouse)	10,800	2,620	13.9
Lewisville, Texas	12,800	1,747	9.3
Oswego, New York	2,400	1,143	6.1
Brighton, Michigan	1,900	642	3.4
Sacramento, California	860	233	1.2
Ocean Pines, Maryland	1,560	0.0	0.0
Warner Robins, Georgia	1,500	0.0	0.0
Houston, Texas	1,800	0.0	0.0
Alameda, California	5,100	0.0	0.0
Barrigada, Guam	2,700	0.0	0.0
Honolulu, Hawaii	2,500	0.0	0.0
Seattle, Washington	5,470	0.0	0.0
Total	**140,790**	**42,611**	**226.1**

NOTE: SF = Square foot.

Natural gas usage could not be determined for some EA offices, typically because lease payments include utility charges and property owners were not able to provide separated utility usage data. EA estimated gas usage for these offices by using energy intensity factors based on building size, local climate, and use (U.S. Energy Information Administration 2012). GHG emissions related to natural gas consumption for offices where usage was estimated are displayed in ***Table 2-7***.

Table 2-7. Emissions Associated with Estimated Natural Gas Consumption

Building	EA-Occupied Space (SF)	Energy Intensity Factor (th/SF)	Estimated Natural Gas Consumption (th)	Total GHG Emissions ($MTCO_2e$)
Deerfield, Illinois	10,300	0.30	3,072	16.3
Abingdon, Maryland	6,300	0.34	2,096	11.1
Syracuse, New York	6,300	0.44	2,785	14.8
Warwick, Rhode Island	4,500	0.34	1,527	8.1
Anchorage, Alaska	3,700	0.34	1,283	6.8
Denver, Colorado	3,000	0.29	893	4.7
Fairbanks, Alaska	2,200	0.35	767	4.1
Virginia Beach, Virginia*	2,079	0.54	170	0.9
Newburgh, New York	1,500	0.30	443	2.4
Fayetteville, Arkansas*	1,268	0.49	115	0.6
San Antonio, Texas	240	0.42	100	0.5
Salt Lake City, Utah	310	0.29	90	0.5
Total	**41,697**	**Not applicable**	**13,341**	**70.8**

NOTE: Some offices have multiple facilities with different regional energy intensity factors due to different building uses (warehouse and offices). In those instances, factors shown are weighted averages of all facilities at an office location. Some values are rounded.

* Consumption and Total GHG Emissions for EA's newly opened Fayetteville, Arkansas and Virginia Beach, Virginia offices are based on 2018 occupancy of 2 months (November–December 2018).

A summary of natural gas usage and GHG emissions resulting from natural gas and steam usage is displayed below.

Table 2-8. 2018 Natural Gas Consumption Emissions Summary

Building	Total EA-Occupied Space (SF)	Total Natural Gas Consumption (th)	Total Emissions ($MTCO_2e$)
Buildings with known usage (Table 2-1)	140,790	42,611	226.1
Buildings with estimated usage (Table 2-2)	41,697	13,341	70.8
All EA Buildings	**182,487**	**55,962**	**296.9**

With respect to the emissions data presented in ***Table 2-8***, it should be noted that natural gas consumption totals are similar between offices with known and estimated usage despite the significant difference in total occupied space; this is a result of energy intensity factors used for estimates. Intensity factors provided by the U.S. Energy Information Administration for estimating gas usage are considered conservative compared to actual usage data. As a result, estimated usage calculations appear higher on a square-footage basis compared to buildings with office-specific/known usage data. For future reports, EA will continue to collect more office-specific natural gas consumption data to decrease reliance on conservative intensity factors.

3. SCOPE 2: INDIRECT GREENHOUSE GAS EMISSIONS

Scope 2 GHG emissions arise from electric power generated by third-parties and purchased (consumed) by the organization. Scope 2 emissions can also arise from thermal energy (heating or cooling) generated by third-parties (e.g., steam heating in a multi-use office building) and purchased by the organization. Scope 2 GHG emissions from EA's business operations are limited to emissions from power generating stations supplying electric energy to EA's offices.

3.1 DIRECTLY BILLED POWER UTILITY USAGE

Utility usage for various EA offices and warehouses is known from direct utility billing for the locations. Where EA occupies less than the entire building, actual usage was calculated in direct proportion to the building space occupied by EA. Electricity usage is reported in kilowatt-hours (kWh). GHG emissions for purchased power utility are displayed in ***Table 3-1***.

Table 3-1. Emissions Associated with Known Power and Thermal Energy Consumption

Building	EA-Occupied Space (SF)	Electricity Purchased (kWh)	Subregion Output Emission Rate* ($MTCO_2e/kWh$)	Total Emissions ($MTCO_2e$)
Hunt Valley, Maryland (225 Schilling)	65,400	1,142,850	3.46×10^{-4}	395.1
Hunt Valley, Maryland (231 Schilling)	10,000	184,100	3.46×10^{-4}	63.6
Lewisville, Texas	12,800	136,968	4.60×10^{-4}	63.0[9]
Albuquerque, New Mexico	8,500	101,136	4.76×10^{-4}	48.1
Lincoln, Nebraska	10,800	72,697	5.66×10^{-4}	41.1
Honolulu, Hawaii	2,500	43,494	7.60×10^{-4}	33.1
Barrigada, Guam	2,700	30,118	5.26×10^{-4}	15.8
Seattle, Washington (steam**)	5,470	0	Not applicable	14.0
Abingdon, Maryland	6,300	31,789	3.46×10^{-4}	11.0
Warner Robins, Georgia	1,500	16,727	4.97×10^{-4}	8.3
Brighton, Michigan	1,900	12,638	5.80×10^{-4}	7.3
Warwick, Rhode Island	4,500	27,629	2.56×10^{-4}	7.1
Alameda, California	5,100	26,339	2.40×10^{-4}	6.3
Ocean Pines, Maryland	1,560	16,096	3.46×10^{-4}	5.6
Cockeysville, Maryland (Warehouse)	7,500	13,291	3.46×10^{-4}	4.6
Houston, Texas	1,800	6,245	4.60×10^{-4}	2.9
Sacramento, California	860	7,243	1.18×10^{-4}	0.9
Oswego, New York	2,400	4,943	1.34×10^{-4}	0.7
Total	**151,590**	**1,874,303**	**Not applicable**	**728.5**

* Subregion Output Emission Rates obtained from eGrid2016 summary tables (EPA 2016).

** The Seattle, Washington office utilizes district steam heating; the emissions calculation for steam assumes an industry standard boiler efficiency and that the fuel used to create steam is wood or wood waste (Oregon Department of Environmental Quality 2016).

NOTE: eGrid = Emissions & Generation Resource Integrated Database.

[9] Scope 2 emissions associated with power utilization for the Lewisville, Texas office were previously assumed to be zero based on use of 100% wind generated power. However, in accordance with revised guidance documents, emissions are now based on the EPA Subregion Output Emission Rate due to the lack of publicly available emissions data from the power provider. In the future, if data become available, emissions may be more accurately calculated based on the provider's contractual agreements to purchase and generate wind-generated power.

3.1.1 Solar Array at 225 Schilling Circle

EA's Headquarters building at 225 Schilling Circle (Hunt Valley, Maryland) has a photovoltaic (PV) array installed on the roof. This array is rated at 25.08-kilowatt (kW) direct current and 20.94-kW alternating current. Energy generated by the array is fed directly into the building electrical distribution system; therefore, its output displaces energy that would otherwise be purchased from the local utility (Baltimore Gas and Electric). The rooftop PV array typically generates approximately 25 MWh of energy annually, which is roughly 1% of total building electricity use and offsets. This renewable energy benefit is noted here, but is not included in the Scope 2 emissions calculation.

3.2 ESTIMATED ELECTRICITY USAGE

Electricity usage data were not available for some EA offices, typically because lease payments include utility charges and/or property owners do not provide separate utility usage data for these buildings. In such instances, EA estimated electricity usage by using regional energy intensity factors based on building size, local climate, and use (U.S. Energy Information Administration 2012). GHG emissions related to electricity consumption for offices where usage was estimated are summarized in ***Table 3-2***.

Table 3-2. Emissions Associated with Estimated Power Consumption

Building	EA-Occupied Space (SF)	Energy Intensity (kWh/SF)	Estimated Electricity Usage (kWh)	Subregion Output Emission Rate[1] ($MTCO_2e/kWh$)	Total Emissions ($MTCO_2e$)
Deerfield, Illinois	10,300	14.0	144,340	5.68×10^{-4}	81.9
Syracuse, New York	6,300	13.0	82,210	1.34×10^{-4}	11.0
Seattle, Washington	5,470*	16.5	90,340	2.97×10^{-4}	26.9
Anchorage, Alaska	3,700	14.0	52,580	4.89×10^{-4}	25.7
Denver, Colorado	3,000	13.3	40,450	6.25×10^{-4}	25.3
Fairbanks, Alaska	2,200	13.8	30,420	4.89×10^{-4}	14.9
Virginia Beach, Virginia**	2,079	15.7	3,455	3.82×10^{-4}	2.0
Newburgh, New York	1,500	14.1	20,740	1.34×10^{-4}	2.8
Fayetteville, Arkansas**	1,268	17.7	3,731	3.76×10^{-4}	1.4
San Antonio, Texas	240	16.8	4,010	4.60×10^{-4}	1.9
Salt Lake City, Utah	310	14.8	4,570	2.97×10^{-4}	1.4
Total	**30,897**	**Not applicable**	**476,846**	**Not applicable**	**195.2**

1. Subregion Output Emission Rates obtained from eGrid2016 summary tables (EPA 2016).

NOTE: Some offices have multiple facilities with different regional energy intensity factors due to different building uses (warehouse and offices). The factor is a weighted average of all facilities at an office location. Some values are rounded.

* To prevent double counting of the square footage of the Seattle, Washington office, the total occupied space has not been incorporated in the Total for this table as it was previously included in Table 3-1, which calculated known emissions associated with the office's steam usage.

** Electricity consumed and Total GHG Emissions for newly opened Fayetteville, Arkansas and Virginia Beach, Virginia offices are based on 2018 occupancy of 2 months (November–December 2018).

Subregion Output Emissions Rates used in **Table 3-1** and **Table 3-2** vary significantly between EA offices as a result of the subregion in which they are located. The EPA eGRID rates are derived based on the type of electricity predominantly utilized within the region. For example, offices located in regions such as the Midwestern United States, where electricity is predominantly coal-derived, correspond to a higher subregion output emissions rate as a result of fossil fuel emissions; whereas, offices in the Northeastern United States correspond to lower subregion output emissions rates as a result of electricity being purchased from a higher percentage of cleaner sources, such as nuclear and/or hydroelectric plants.

3.3 RENEWABLE ENERGY CERTIFICATES

A renewable energy certificate (REC) is a tradable asset that represents the environmental attributes of 1 megawatt hour (MWh) of renewable electricity. RECs are sold separately from actual power generated to consumers who want to "green" their existing power sources by contributing to the use of renewable energy sources.

In 2018, EA initiated a Leased Energy Working Group charged with evaluating EA's Scope 2 GHG emissions. The Working Group evaluated 10[10] EA offices where EA directly pays for utilities and, therefore, has direct control over energy purchases. Analyzing green energy alternatives for those 10 office locations, the Working Group recommended options to reduce EA's Scope 2 emissions impacts through the purchase of additional RECs and completed a cost/benefit analysis related to future purchases of renewable energy at office locations where markets are available.

Following presentation of the Leased Energy Working Group's findings in late 2018, EA's PBC Committee approved an increase in RECs purchased for 2018 in order to offset 100% of EA's Scope 2 emissions, and approved the commitment to offset 100% of future Scope 2 emissions through REC purchases. For comparison, EA's prior REC purchases offset approximately 64% of EA's Scope 2 emissions. A summary of electricity usage, RECs purchased, and the resulting net GHG emissions is shown in ***Table 3-3***.

Table 3-3. Scope 2 Emissions Summary

Building	Total EA-Occupied Space (SF)	Total Electricity Consumption (kWh)	Total Emissions ($MTCO_2e$)
Buildings with known usage (Table 3-1)	151,590	1,874,303	728.5
Buildings with estimated usage (Table 3-2)	30,897	**476,846**	195.2
Totals for Scope 2	**182,487**	**2,351,149**	**923.7**
Purchased RECs		**2,351.1 MWh**	**(923.7)***
Net Scope 2 Emissions			**0.0**
NOTE: Square footage for EA's Seattle office is included in both Tables 3-1 and 3-2 due to having known and unknown sources of Scope 2 emissions (i.e., known steam usage and estimated electricity usage). Total square footage presented here considers the Seattle office only one time.			

[10] EA offices evaluated: Abingdon, Hunt Valley (Warehouse and 231 Schilling), and Ocean Pines, Maryland; Warwick, Rhode Island; Lincoln, Nebraska; Warner Robins, Georgia; Brighton, Michigan; and Dallas and Houston, Texas.

Building	Total EA-Occupied Space (SF)	Total Electricity Consumption (kWh)	Total Emissions ($MTCO_2e$)
Based on total billed and estimated usage, and estimated emissions based on regional eGrid2016 factors, EA's aggregate Scope 2 emission rate is approximately 0.393 $MTCO_2e$/MWh. A total of 2,352 RECs were purchased to fully offset Scope 2 emissions.			

* In accordance with allowable industry practice, EA held 1,000 MWh of RECs in 2018 (remaining from a 2016 purchase), and the balance of 1,352 MWh were purchased in calendar year 2019. Purchasing RECs a calendar year in arrears allowed for finalization of 2018 emissions calculations ensuring purchase of an adequate number of RECs to cover 100% of the reporting year's emissions. Moving forward, EA intends to proactively purchase RECs for 2019, 2020, and 2021 at current market value using 2018 emissions data with an assumed 5% increase in headcount per year to cover increased emissions resulting for company growth. A copy of EA's total 2018 REC certificate is included in ***Appendix A***.

4. SCOPE 3: OTHER INDIRECT GREENHOUSE GAS EMISSIONS

Scope 3 GHG emissions (summarized below in ***Table 4-1***) arise from indirect sources related to activities supporting the organization, including:

- Extraction and production of purchased materials and fuels
- Transportation by common carriers of materials, fuels, personnel, and products
- Employee commuting
- Employee-owned vehicle travel for business
- Emissions from recycling and solid waste disposal
- Emissions from potable water supply and wastewater treatment
- Emissions from freight shipments.

Scope 3 GHG sources arise from EA's business operations, and include emissions from:

- Employee commutes to and from EA commercial office locations and employee business travel using personal vehicles

- Emissions from recycling and disposal of solid wastes generated at EA offices and other work locations

- Emissions from potable water consumption and wastewater treatment

- Emissions arising from shipment of samples, work products, and other materials to and from EA offices and to client/project sites.

Table 4-1. Scope 3 Emissions Summary

Carbon Source	$MTCO_2e$
Employee Commutes	1,303.0
Employee Vehicle Business Travel	139.8
Air Travel	771.3
Wastewater Treatment	3.7
Potable Water	2.9
Solid Waste Disposal	11.9
Shipping	193.8
Rental Car Travel	132.3
Rail Travel	1.5
Total Scope 3 Emissions	**2,560.2**
Carbon Emissions Offsets	
Shipping Offsets*	(45.4)
Air Travel Offsets**	(150.0)
Recycling and Composting Offsets**	(133.3)
Net Scope 3 Emissions	**2,231.5**

* Shipping offsets are a result of EA's paid partnership with United Parcel Service's (UPS's) carbon neutral program.
** Air Travel offsets are purchased through TerraPass.
*** Recycling and Composting offsets are a result of operational activities to improve EA's solid waste diversion in offices nationwide.

NOTE: Offset documentation is provided in ***Appendix A***.

4.1 EMPLOYEE COMMUTING

Data used to determine emissions produced from employee commutes to each EA workplace were compiled using a voluntary employee survey. A survey of commuting habits in 2018 was sent out to all EA employees in early 2019, and 276 employee responses were received—a 55% overall response rate, similar to response rates for previous years' commuter surveys.

Survey questions addressed modes and details of commuting (including type, fuel, mileage, and frequency of use of conventional and hybrid electric privately-owned vehicles [POVs]), as well as frequency of use of other modes such as mass transit (e.g., train, bus, etc.), or carpooling; bicycle and pedestrian modes; and telecommuting. Emissions calculations were based on these sampling data extrapolated to the company's average headcount of 511 FTE employees. Emission factors from the most recent EPA Emissions Factor GHG Inventory protocol were used. ***Table 4-2*** summarizes the findings.

Table 4-2. Emissions Attributed to Employee Commutes

Fuel Type	Emissions Factor (kg CO_2/Unit)	Unit
Gasoline	8.81	Gallon
Diesel	10.2	Gallon
Bus	0.06	Passenger-mile
Intercity Rail*	0.14	Passenger-mile
Commuter Rail**	0.17	Passenger-mile
Transit Rail***	0.12	Passenger-mile
Average Commuter Emissions per Employee	**Normalized FTE Headcount**	**Total Emissions ($MTCO_2e$)**
2.55	511	1,303

* Defined as long-distance rail between major cities (i.e., Amtrak).
** Defined as rail service between a central city and adjacent suburbs (also called regional rail or suburban rail).
*** Rail service typically within an urban center, such as subways, elevated railways, metropolitan railways (metro), streetcars, trolley cars, etc.

It is interesting to note that based on 2018 commuting habits reported as part of the survey, the amount of emissions from gasoline-powered cars was reduced by nearly 10%, and there was a significant increase in utilization of public transit (associated emissions by bus increased by 62% and emissions by intercity rail increased by 33%).

4.2 EMPLOYEE BUSINESS TRAVEL

4.2.1 Employee Business Travel Utilizing Personal Vehicles

EA employees logged 442,859 vehicle miles for business travel utilizing personal vehicles in 2018. The average self-reported personal vehicle MPG value (27.9) from EA's employee commuter survey was used to calculate total GHG emissions from business travel in employees' privately-owned vehicles. The total gasoline consumption calculation related to the use of POVs to complete business-related travel is displayed in ***Table 4-3***.

Table 4-3. Gasoline Consumption for Business Travel Utilizing Privately-Owned Vehicles

Average Self-Reported MPG	Miles Traveled	Total Gasoline Consumption (gal)
27.9	442,859	15,873.1

As in Section 2.1 (Fleet Vehicles), the combustion of a gallon of gasoline is assumed to produce 8.8 kg of CO_2. The total emission calculation is displayed in ***Table 4-4***.

Table 4-4. Emissions Attributed to Privately-Owned Vehicle Use During Business Travel

Total Gasoline Consumption (gal)	Emissions Factor (kg CO_2/gal)	Total Emissions (kg CO_2)	Total Emissions ($MTCO_2e$)
15,873.1	8.81	139,842.0	139.8

4.2.2 Employee Business Travel by Air, Rental Car, and Rail

In 2018, data provided by Safe Harbors, EA's corporate travel agent, were used to calculate GHG emissions from business travel by air, rail, and rental car. Emissions attributed to air and rental car travel decreased compared to 2017 values, while rail travel-related emissions remained unchanged.

4.2.2.1 Air Travel

Net air travel emissions calculations based on total emissions and offsets are broken out in ***Tables 4-5, 4-6, and 4-7***. In 2018, EA purchased 100 metric tons of verified CO_2 offsets through TerraPass (TerraPass 2012) to reduce the net impact of employee air travel.

Table 4-5. Emissions Attributed to Business Travel – Airlines

Airlines	Miles Traveled	Total Emissions ($MTCO_2e$)
Short Haul	626,919	416.9
Medium Haul	2,149,989	315.8
Long Haul	775,773	38.6
Total	**3,552,681**	**771.3**
Definition		**Distance (miles)**
Short Haul		<281
Mid Haul		281-994
Long Haul		>994

Table 4.6. TerraPass Offsets and Net Emissions Attributed to Air Travel

Source	Total Emissions ($MTCO_2e$)
Air Travel Emissions	771.3
TerraPass Offsets	(150.0)
Net Air Travel Emissions	**621.3**

All TerraPass carbon offsets have been verified by independent third parties using the Verified Carbon Standard and the Climate Action Reserve; the TerraPass project portfolio includes farm power (e.g., capture of emissions from animal waste), landfill gas capture, abandoned coal mine methane capture, wind energy, and *BEF* (formerly Bonneville Environmental Foundation) Water Restoration Certificate® projects.

4.2.2.2 Rental Car and Ride Share Utilization

With respect to the decrease in rental car miles traveled, EA attributes this change to increased use of ride share options (e.g., Lyft and Uber) in lieu of rental cars. In early 2019, EA updated expense report tracking to include an expense code specifically for ride share, cab, and shuttle use to allow EA to better track costs for ride share use versus rental car costs. Future reporting will include estimated emissions based on ride share, cab/taxi, and airport shuttle utilization by employees based on expense report tracking. However, expense costs do not translate to miles traveled as a result of varying pricing between providers and cost of trips taken during peak versus non-peak hours (i.e., surge pricing). As a result, EA will estimate mileage (and associated emissions) following completion of an audit of a minimum of 5% of these expenses going forward.

Further, in April 2018, the ride share service Lyft announced plans to offset all rides globally as part of a commitment to full company carbon neutrality. Their commitment also includes 100% renewable energy purchases to offset every Lyft office space, driver hub, and electric vehicle mile on their platform. In support of Lyft's carbon neutrality commitment, EA will encourage employees to utilize Lyft for ride share services, where feasible, in order to offset carbon emissions associated with these services.

Table 4-7. Emissions Attributed to Business Travel – Rental Cars

Miles Traveled	Average MPG	Gas Used (gal)	Emissions Factor (kg CO_2/gal)	Total Emissions (kg CO_2)	Total Emissions ($MTCO_2e$)
312,285	20.8	15,013.7	8.81	132,270.7	132.3

4.2.2.3 Rail Travel

Table 4-8. Emissions Attributed to Business Travel – Railways

Miles Traveled	Total Emissions ($MTCO_2e$)
30,542	1.5

4.3 RESOURCE CONSUMPTION, RECYCLING, AND DISPOSAL

EA's carbon emissions (as CO_2e) arising from recycling and disposal of solid waste were calculated using EPA's Waste Reduction Model (WARM) Version 14 (EPA 2012). The emission factors in the WARM model represent the life cycle emissions of various materials, and capture the upstream emissions associated with the raw material extraction, manufacturing processes, and transportation involved in producing the material, in addition to those for recycling and/or disposing of the material.

All EA offices have recycling programs in place. Estimates of the amounts of trash and recycling generated by EA personnel (***Table 4-9***) were calculated based on the generation rates for the Hunt Valley offices at 225/231 Schilling Circle and based on actual data from 5 of EA's commercial offices: Warner Robins, Georgia; Alameda and Sacramento, California; Honolulu, Hawaii; and Barrigada, Guam.

The amounts of recyclables and trash generated by the Hunt Valley offices were calculated using information provided by Waste Management, Inc., through the property manager Merritt Properties, LLC. The amounts of trash and recycling generated by the other offices were extrapolated using information provided from EA employees based in those offices. Estimates of compost generated by EA employees for the offices with established composting programs were also calculated using employee reporting.

Additionally, to meet company sustainability goals, paper purchased and used in each office meets one of the three following sustainable standards: Forest Stewardship Council-certified, Sustainable Forestry Initiative-certified, or at least 30% post-consumer recycled content.

Table 4-9. Waste Generation and Diversion Data

Waste Category	Amount (short tons)
Trash	62.9
Recycling	46.9*
Compost	4.2*
Total	**114.0**
* Total waste generation increased by 3.3% over 2017, but waste diversion increased by 30% over 2017 due to increases in both recycling and composting. Waste diversion is calculated as (46.9 + 4.2)/114) × 100 = 44.8%.	

WARM provides estimates in metric tons of CO_2e for GHG emissions resulting from disposal of materials. For EA's calculations (***Table 4-10***), it was assumed that all trash is equivalent to "Mixed Municipal Solid Waste" and that all single stream recycling is equivalent to "Mixed Recyclables." Additionally, paper recycled by the Hunt Valley offices was assumed to be equivalent to the category "Mixed Paper (primarily from offices)." Compost generated by the Hunt Valley, Maryland; Alameda, California; and Seattle, Washington offices was assumed to be equivalent to the category "Food Waste."[11] Finally, across all EA offices, 25% of trash was incinerated and 75% of trash was landfilled based on assumptions in line with national averages for landfill gas capture and destruction rates.

Table 4-10. Emissions and Offsets Related to Recycling and Solid Waste Disposal

Category	Treatment	Location	Quantity (short tons)	Total Emissions ($MTCO_2e$)
Trash	Landfilled	All offices	47.8	11.9
Trash	Combusted	All offices	15.1	
Mixed Recyclables	Recycled	All offices	46.9	(132.6)
Compost	Composted	Hunt Valley and Alameda	4.2	(0.7)
		Total	**114.0**	**(121.4)**
* Total waste generation increased by 3.3% over 2017; however, due to a 30% increase in waste diversion over 2017, GHG offsets for solid waste management increased by 34.8%.				

Note that the annual waste disposal summary for Hunt Valley, provided by waste management company RoadRunner, is not based on actual weights. The Hunt Valley complex is provided with two, 8-cubic yard containers—one for municipal solid waste and the other for mixed-stream recycling. At an assumed density of 78 pounds per cubic yard, the municipal solid waste

[11] "Food Waste" category indicates products comprised of approximately 9% beef, 11% poultry, 13% grains, 49% produce, and 18% dairy. The "Food Waste" category was selected to be representative of EA's company-wide compost content.

container is assumed to hold 624 pounds each time it is emptied. At an assumed density of 5 pounds per cubic yard, the mixed recyclables container is assumed to hold 40 pounds each time it is emptied. Both containers are being emptied three times per week.

4.3.1 Composting Programs

EA implemented a kitchen waste reduction and composting program in the Hunt Valley office in 2016. In 2018, the Hunt Valley Composting Program diverted 6,931 pounds of biodegradable material such as food waste, paper products, and compostable kitchen products.

EA's Alameda and Seattle offices also participate in composting programs. In Alameda, compost is collected weekly by Alameda County Industries using 96-gal buckets. The EPA density factor of 1 cubic yard equaling 463 pounds of compost was used to factor Alameda's annual compost contribution. In Seattle, composting of food waste and some related items are required by City of Seattle regulations. However, there are no data available on the amounts of compostable materials collected at the Seattle office as part of City composting requirements. Additionally, EA's Warwick, Rhode Island and Deerfield, Illinois offices maintain compost take-home programs run by employees. Scraps are collected weekly or bi-weekly and taken-home for personal use in gardening and agricultural spaces. Total weights for these compost contributions are not tracked and are, therefore, not included in composting totals in ***Table 4-10***.

4.3.2 Additional Solid Waste Diversion Initiatives

EA's Information Technology Department in Hunt Valley fosters environmentally responsible recycling of electronic devices and equipment by holding an annual eWaste collection event and inviting employees to bring in personal eWaste for recycling through EA's corporate eWaste vendor. The first annual eWaste event was conducted during 2016 as an Earth Day activity; its success led to EA establishing an annual Spring eWaste event open to employees in all EA Maryland offices (Hunt Valley, Abingdon, and Ocean Pines). In addition, the Information Technology Department accepts eWaste from employees at other times of the year and stores the material for later transfer to our supplier of recycling services.

In 2018, EA recycled 31 computers, 6 printers/scanners/fax machines, and multiple cords, switches, routers, and other miscellaneous eWaste through its selected service provider (EZPC Recycle LLC). These totals reflect a combination of EA's corporate eWaste (i.e., company-owned materials that have reached end-of-life status and require replacement/upgrade) and personal eWaste from employees collected during the annual eWaste recycling event.

EPA's WARM Model does not currently support eWaste diversion calculations and EA does not currently estimate the reduction in GHGs associated with recycling eWaste.

4.4 POTABLE WATER SUPPLY AND WASTEWATER TREATMENT

Potable water and wastewater discharge emissions are associated with the use of energy required to pump and treat the water. These services are energy intensive and account for 5% of energy use in the United States (Griffiths-Sattenspield and Wilson 2009). The largest use of energy for potable water utilities is pumping water, while a combination of pumping and treating by aeration comprises the majority of energy use for wastewater treatment plants. The emissions factors used herein capture emissions generated from treating and delivering potable water, and emissions generated from pumping and treating wastewater.

In addition to GHGs generated by energy use at wastewater treatment plants, wastewater may also generate GHGs in the form of CH_4, N_2O, and CO_2 during the course of its transport and treatment. The amount of GHGs produced from wastewater varies considerably with the type of treatment utilized. Aerobic treatment processes that are well managed generally produce little or no CH_4, while anaerobic systems may produce a significant amount of CH_4. The net impact of these emissions may also be reduced if the CH_4 is recovered for energy. Nutrient removal systems may generate minor amounts of N_2O. CO_2 emissions are generally omitted from inventories as they are considered to be of biogenic origin, and thus part of the natural carbon cycle (IPCC 2006). The size of the wastewater treatment plant also plays a significant role in the quantity of emissions, with smaller plants typically having a higher energy intensity (e.g., a wastewater treatment plant with an average daily flow of 3 million gal per day has an energy intensity of 3,000 kWh/million gal whereas a wastewater treatment plant with an average daily flow of 200 million gal per day has an energy intensity of 1,600 kWh/million gal). It is equally important to note that each of these regions of the country obtains their energy from different sources; therefore, emissions of CO_2e per kWh may vary from a region powered by coal to a region powered by hydroelectric power. Thus, EA must also take this into consideration when calculating CO_2e emissions from each EA office.

4.4.1 EA Water Consumption and Wastewater Generation

The amount of potable water consumed, and wastewater discharged by EA, were calculated with usage statistics from water bills for EA's Abingdon and Hunt Valley, Maryland; Alameda and Sacramento, California; Albuquerque, New Mexico; Denver, Colorado; Barrigada, Guam; Honolulu, Hawaii; Syracuse and Newburgh, New York; Salt Lake City, Utah; and Seattle, Washington offices as show in ***Tables 4-11, 4-12, and 4-13***. Water usage at all other offices was estimated assuming usage of 15 gal per person per day. For each of these offices, the overall usage reported in these bills for the building was adjusted to account for the fact that EA does not occupy the entirety of these buildings.

Table 4-11. Emissions Associated with Potable Water Consumed and Wastewater Discharged – Hunt Valley, Maryland

Water Type	Amount (gal)	Total Emissions ($MTCO_2e$)
Potable Water	475,625	0.2
Wastewater	475,625	0.5
Total Potable Water and Wastewater		**0.7**

Table 4-12. Emissions Associated with Potable Water Consumed and Wastewater Discharged – All Other EA Offices

Water Type	Amount (gal)	Total Emissions ($MTCO_2e$)
Potable Water	4,605,703	2.7
Wastewater	4,605,703	3.2
Total Potable Water and Wastewater		**5.9**

Table 4-13. Emissions Associated with All Potable Water Consumed and Wastewater Discharged across EA

Water Type	Amount (gal)	Total Emissions ($MTCO_2e$)
Potable Water	5,081,328	2.9
Wastewater	5,081,328	3.7
Total Potable Water and Wastewater		**6.6**

4.5 SHIPPING

EA ships project/client deliverables and other freight using both United Parcel Service (UPS) and Federal Express (FedEx). In January 2017, EA became an official partner in the UPS carbon neutral program, which provides mandatory tracking of carbon emissions for UPS shipments and ensures all EA shipments are carbon neutral.

FedEx purchases offsets directly, rather than allowing customers to opt-in to carbon neutral shipping. Upon request, FedEx provides estimates for both estimated total emissions as well as offsets for a given account and date range. Shipments for 2018 are summarized in Table 4-14.

Table 4-14. Company-Wide Shipping Emissions and Offsets

Carrier	Total Shipped Weight (pounds)	Carbon Neutral Shipments	% Carbon Neutral	Total $MTCO_2$	Offset $MTCO_2e$	Net $MTCO_2e$
UPS	118,974	4,191	100%	42.7	(42.7)	0.0
FedEx	139,800	Not applicable	Not applicable	151.1	(2.7)*	148.4
Total Shipping Offsets and Emissions				**193.8**	**(45.4)**	**148.4**

* Based on Total Calculated Emissions Offset data provide by FedEx. Note that FedEx purchases offsets designed to equal 100% of CO_2 equivalent associated with FedEx envelop shipping.

NOTE: $MTCO_2$ = Metric tons carbon dioxide.

5. SUMMARY

5.1 TOTAL CARBON FOOTPRINT

In CY 2018, EA generated an estimated total of 4,379.6 $MTCO_2e$ from its operations and activities. Approximately 28.6% (1,252.4 $MTCO_2e$) was offset, resulting in net emissions from operations of 3,127.2 $MTCO_2e$. In 2018, emissions associated with EA employee commutes continued to be the largest single source of GHG, contributing 1,303 $MTCO_{2e}$ (29.8%). Purchased electricity generated an estimated 923.7 $MTCO_2e$ (21.1%) while emissions associated with EA's business travel contributed 771.3 $MTCO_{2e}$ (17.6%). ***Table 5-1*** displays the total 2018 estimated carbon footprint and a comparison to 2017 data.

Table 5-1. Summary of Emissions Contributing to EA's 2018 Carbon Footprint

Emissions Sources	2018 $MTCO_2e$	% of 2018 Total Footprint	2017 $MTCO_2e$
Scope 1: Direct GHG Emissions			
EA Fleet Vehicles	410.5	9.4	422.5
EA Boats and Generators	188.3	4.3	415.7
Natural Gas	296.9	6.8	219.9
Scope 2: Electricity Indirect GHG Emissions			
Purchased Electricity	923.7	21.1	805.9
Scope 3: Other Indirect GHG Emissions			
Employee Commutes	1,303.0	29.8	1,370.5
Air Travel*	771.3	17.6	722.8
Rail Travel*	1.5	0.03	0.61
Rental Car Travel*	132.3	3.0	224.4
Employee Vehicle Business Travel	139.8	3.2	152.5
Solid Waste Disposal	11.9	0.3	13.0
Shipping	193.8	4.4	132.3
Potable Water	2.9	0.07	1.2
Wastewater Treatment	3.7	0.08	1.7
Total Emissions	**4,379.6**	**100.0**	**4,483.0**
Carbon Offsets**			
Single Stream Recycling and Composting Offsets	(133.3)		(91.0)
Air Travel Offsets (Purchased)	(150.0)		(100.0)
Renewable Energy Certificates (Purchased)	(923.7)		(515.3)
Shipping Offsets (Purchased)	(45.4)		(48.1)
Total Reduction	**(1,252.4)**	**(28.6)**	**(754.4)**
NET EMISSIONS**	**3,127.2**		**3,728.6**

* Travel data provided by EA's corporate travel agent, Safe Harbors.
** Offsets such as recycling, composting, and purchased Renewable Energy Certificates result in a decrease in net emissions and are denoted by parentheses. Net emissions represent the sum of EA's Scope 1, 2, and 3 emissions less earned/purchased offsets.

Normalized by total labor hours worked, EA's 2018 carbon footprint was 6.1 metric tons per full-time equivalent (FTE)—a 15% decrease from 7.2 metric tons per FTE based on 2017 net emissions. This decrease is largely attributable to increases in purchased offsets and improved data gathering techniques, as discussed throughout this report. Future reports will further analyze normalized results to establish potential trends resulting from EA operations and activities impacting emissions (e.g., total hours worked, implementation of additional composting programs, etc.).

6. REFERENCES

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APPENDIX A: OFFSET CERTIFICATES

This certifies that in 2018:

EA Engineering, Science, and Technology, Inc., PBC

Agreed to cover:

2,352,000 kWh

of traditional electricity consumption with renewable sources in the form of CSG CleanBuild™ Renewable Energy Certificates (RECs).

Green-e Energy CERTIFIED

carbon SOLUTIONS GROUP™

Your purchase of renewable certificates supports renewable energy production. You will continue to receive a separate electricity bill from your utility. For every unit of renewable electricity generated, an equivalent amount of renewable certificates are produced. This purchase builds a market for renewable electricity, but does not directly offset carbon dioxide emissions

This certificate of sustainability is proudly presented to

EA Engineering, Science, and Technology, Inc., PBC

150.000 mT of carbon offsets from the
Business Carbon Offset Package

terrapass
RESTORE THE BALANCE

James Pickren, President, terrapass

December 12, 2018
Date

90878-8120
Certificate Number