

California Department of Water Resources

# Baseline Greenhouse Gas Emissions Inventory

## 1990



This Document accompanies the  
DWR Climate Action Plan Phase I: Greenhouse Gas Emissions Reduction Plan

## Introduction

The California Department of Water Resources (DWR) provides water management and planning services for the State of California. DWR is located within the California Natural Resources Agency. DWR's operations include ownership, operation, and maintenance of the State Water Project (SWP), operations and maintenance of flood protection facilities throughout the Central Valley, administration of several grant programs which dispense state funds to local and regional water authorities, and regulatory authority over dam safety throughout California.

## Inventory Purpose

This baseline greenhouse gas (GHG) emissions inventory has been developed to supplement information provided in DWR's Climate Action Plan Phase I: Greenhouse Gas Emissions Reduction Plan (GGERP) (<http://www.water.ca.gov/climatechange/CAP.cfm>). The GGERP documents DWR's historical, current, and projected future GHG emissions, establishes and articulates GHG emissions reduction goals for 2020 and 2050, and describes the GHG emissions reduction measures that DWR will implement to achieve those goals. In the GGERP, GHG emissions are broken up into four categories: Operation, Construction, Maintenance, and Business Activities. Emissions are broken up in this way because they relate to key distinctions in the way activities are managed within DWR and the ways in which GHG emissions reduction measures can be implemented within DWR's existing organizational structure. This inventory is organized to comply with the **GHG Protocol- Corporate Accounting and Reporting Standard** developed by the World Resources Institute and World Business Council for Sustainable Development. Therefore, this inventory accounts for GHG emissions from DWR activities under the categories of Scope 1, 2, and 3 emissions. The information in this inventory is consistent with the information provided in the GGERP, uses the same base data, and only differs in the ways in which the data are categorized and summed.

## Organizational Boundaries

DWR uses an operational control approach for accounting for its emissions. This approach delineates that all emissions over which DWR has operational control will be accounted for as Scope 1 emissions. DWR does not have many complicated ownership agreements. In fact, its organizational boundaries are generally quite straight forward. DWR has its own maintenance and operations crews for SWP and flood protection infrastructure, and its own fleet of vehicles and equipment. The two exceptions to this are equity shares of electricity generating facilities where DWR has no operational control and lease agreements for DWR office space over which DWR has limited operational control. Under the operational control approach the DWR uses, DWR's equity share of electricity generating facilities is accounted for as Scope 2 emissions. This convention eliminates the complexity of accounting for DWR's share of the facility and instead focuses on the totality of emissions from the facility which are associated with meeting DWR's electricity needs. For leased office space, DWR's convention is to account for all emissions associated with operation of DWR's spaces within these buildings. For DWR's activities, the only emissions from these facilities come from generation of electricity used to operate the buildings (reported under Scope 2) and stationary combustion at facility sites for heating (reported

under Scope 1). The operational control approach is also used to consolidate emissions from different facilities within DWR's inventory.

DWR recognizes that about 1% of annual emissions from its activities come from construction activities where construction contractors are doing work for DWR. While the scale of these emissions is relatively small, and information about actual emissions (historical, current, and future) is difficult to attain and may contain significant uncertainties. DWR has endeavored to quantify these emissions to the greatest extent possible so that it can most fully and accurately quantify the totality of its GHG emissions impact and the potential for future GHG emissions reductions. Therefore, emissions from construction activities undertaken on behalf of DWR by outside contractors are reported as Scope 3 emissions.

## Reporting Period

This baseline emissions inventory covers the period 1988-1992 and is reported as DWR's 1990 baseline. The 1990 baseline year was chosen to be consistent with California state law (AB 32) which mandates statewide GHG emissions reductions down to 1990 levels by 2020. And a gubernatorial executive order which sets GHG emissions reduction goals for the state and state agencies was also based on 1990 as the baseline year. The 1988-1992 time-frame was chosen to capture the average of emissions over a period of years. DWR's emissions, particularly those associated with operation of the SWP, fluctuate significantly on a year to year basis as a result of differences in hydrology (which effects DWR hydropower generation and delivery of water) and other important factors. A five year period was determined to be long enough to capture a range of water year types and provide a reasonably stable metric for measuring long-term changes in GHG emissions. Section V of the GGERP provides a detailed explanation of the factors which effect annual emissions variability and the degree to which emissions have varied in the past.

## Exclusions

For Scope 1, 2, and 3 emissions, DWR has only been able to account for emissions associated with carbon dioxide in its 1990 baseline emissions inventory. Historical data and emissions factors used to calculate historical emissions were not robust enough to capture levels of all six important GHGs. However, using DWR's 2010 and 2011 emissions reports to The Climate Registry (which quantify emissions of all 6 GHGs of concern) and the eGrid2010 database (which provides data for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions) to gauge the scale of this omission, DWR has determined that the error in scope 2 emissions would be around 0.37% and thus would add approximately 10,000 mtCO<sub>2</sub>e to DWR's total emissions. Scope 1 and 3 emissions would be increased by approximately 2.22% or about 875 mtCO<sub>2</sub>e. The combined effect of these two omissions (about 11,000 mtCO<sub>2</sub>e) has an inconsequential effect on DWR's baseline emissions, its establishment of GHG emissions reduction goals, or DWR's future achievement of those goals.

## Emissions Summary

Total Emissions: CDWR Aggregated Facilities								
Does the Entity Control the Facilities emissions?				Yes				
Organizational Boundary:		Operational Control						
Consolidation Method:		Operational Control						
							<b>Percent of Total Emissions</b>	
<b>Direct Emissions - Scope 1</b>		<b>CO2e</b>	<b>CO2</b>	<b>CH4</b>	<b>N2O</b>	<b>HFC(CO2e)</b>	<b>SF6</b>	
Stationary Combustion		719.00	719.00	0	0	0	0	
Mobile Combustion		10,486.42	10,486.42	0	0	0	0	
Process		0	0	0	0	0	0	
Fugitive		0	0	0	0	0	0	
<b>Total Direct Emissions</b>		<b>11,205.42</b>	<b>11,205.42</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.41%</b>
<b>Indirect Emissions - Scope 2</b>		<b>CO2e</b>	<b>CO2</b>	<b>CH4</b>	<b>N2O</b>	<b>HFC(CO2e)</b>	<b>SF6</b>	
Purchased Electricity		2,706,925.60	2,706,925.60	0	0	0	0	
Purchased Heating		0	0	0	0	0	0	
Purchased Cooling		0	0	0	0	0	0	
Purchased Steam		0	0	0	0	0	0	
<b>Total Indirect Emissions</b>		<b>2,706,925.60</b>	<b>2,706,925.60</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>98.57%</b>
<b>Optional Emissions</b>		<b>CO2e</b>	<b>CO2</b>	<b>CH4</b>	<b>N2O</b>	<b>HFC(CO2e)</b>	<b>SF6</b>	
Scope 3 (Consturction Contractors)		28,200.00	28,200.00	0	0	0	0	
<b>Total Optional Emissions</b>		<b>28,200.00</b>	<b>28,200.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.03%</b>
<b>Biogenic Emissions/Sequestration</b>		<b>CO2e</b>	<b>CO2</b>	<b>CH4</b>	<b>N2O</b>	<b>HFC(CO2e)</b>	<b>SF6</b>	
None		0	0	0	0	0	0	
<b>Total Scope 1,2, and 3 Emissions</b>		<b>2,746,331.02</b>	<b>2,746,331.02</b>					

## Scope 1 Emissions Explanations

Direct Emissions constituted approximately 0.4% of DWR's total emissions in 1990. DWR did not start tracking GHG emissions until 2007, therefore determination of the level of Scope 1 emissions in 1990 required estimation techniques and assumptions. To establish these values DWR took the average emissions from its Scope 1 emissions from its 2007, 2008, and 2009 verified California Climate Action Registry emissions reports and averaged them. DWR's core activities between 1990 and 2007 have not substantially changed, nor have the major facilities which it manages and maintains. DWR has added a handful of new facilities and office buildings and has updated or replaced most of its equipment since 1990. However, with no other available information, DWR has made the assumption that any increase in emissions driven by the expansion of DWR activities has likely been offset by improvements in the efficiency of mobile equipment and stationary emissions sources. Thus, DWR has concluded that average emissions 2007-2009 constitute a reasonable estimate of Scope 1 emissions in 1990. Further, given their minor contribution to DWR total emissions even a large percentage error in this source of emissions would not have consequential impacts on DWR's emissions reduction goals or emissions reduction measures.

## Scope 2 Emissions Explanations

DWR did not begin calculating, monitoring, and reporting GHG emissions from its operations until 2007. Thus, GHG emissions data for years prior to 2007 was developed retrospectively base on available information about energy purchases, sales, and generation and emissions factors.

DWR uses a portfolio of energy resources to meet the electricity needs of SWP facilities. The composition of the SWP Power Portfolio (SWPPP) varies throughout the year and from year to year, but SWPPP's electricity sources can generally be categorized as one of the following:

- Generation from large hydroelectric generation facilities either owned by DWR or provided to DWR by contract;
- Generation from other renewable generation facilities, including small hydroelectric, owned by DWR or provided to DWR by contract;
- Generation from thermal generation facilities, such as Reid Gardner, a coal fired generation facility, and other combined cycle gas fired power plants that are owned by DWR or provided to DWR by contract;
- Energy purchased by DWR from unspecified sources through contract –as part of an energy exchange agreement, or as part of a bilateral contract for energy; or
- Energy purchased by DWR from the forward or real-time California Independent System Operator (CAISO) markets.

Each energy resource within the portfolio has an emissions rate associated with it. Table 1 below shows resources used in the SWPPP between 1988-1992 and their associated emissions rates.

**Table 1. Emissions rates for typical SWPPP electricity generating sources.**

Generation Resource	GHG Emissions Rate	Emissions Factor Reference
Large Hydroelectric Generation	0 mtCO <sub>2</sub> e/MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions
Small hydroelectric and other renewable	0 mtCO <sub>2</sub> e/MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions
Reid Gardner Unit #4	1.116 mtCO <sub>2</sub> e/MWh	11 year average of emissions rates as reported in eGrid plant data
Purchases, Sales, and Exchanges of electricity from unspecified sources	1988: 0.5555 mtCO <sub>2</sub> e/MWh 1989: 0.5555 mtCO <sub>2</sub> e/MWh 1990: 0.5237 mtCO <sub>2</sub> e/MWh 1991: 0.5195 mtCO <sub>2</sub> e/MWh 1992: 0.5160 mtCO <sub>2</sub> e/MWh	California Air Resources Board (CARB) Supplied Factors for Unspecified power 1990-2007. Years 1990, 1991, 1992 use the actual emissions rate for the year as specified by CARB, years 1988 and 1989 use the factor calculated by extrapolating the trendline for all years 1990-2007.

During the period 1988-1992, the energy system in California required that a wholesale energy user had to purchase and schedule an appropriate amount of electricity generating resources to meet its needs on a daily and weekly basis. Under this system, DWR often purchased significant amounts of energy resources which it ended up not needing and subsequently selling off. In addition, DWR in an effort to provide grid stabilization and grid balancing services to California, operates its facilities to generate the maximum amount of power during peak demand periods and to operate its pumps (which demand large amounts of energy) when electricity demands on the system are lowest. This means that much of DWR's hydroelectric generation is not temporally coincident with DWR's electricity demand. Because of these two factors, it is difficult to reconcile exactly which electricity sources were used to meet DWR's electricity load. (Between 1988-1992 DWR's total resource portfolio exceeded its total load by an average of 3,500 gigawatt-hours/year.) Thus, DWR has devised a methodology where by each resource in DWR's portfolio contributes to DWR's emissions according to the emissions factor associated with the resource and its *pro rata* share DWR's actual net load. More explanation of this issue is available in Section V of the GGERP.

In order to calculate the total emissions from DWR operations, the individual emissions rates for each resource and the amount of energy from each resource are used to calculate a weighted average emissions rate for the entire portfolio. Total emissions from operation of the SWP are calculated by multiplying the portfolio emissions factor by the net energy consumed by DWR to operate the SWP pumps. The entire process is depicted in Figure 1.

SWP electricity generation and use data were developed using the following process:

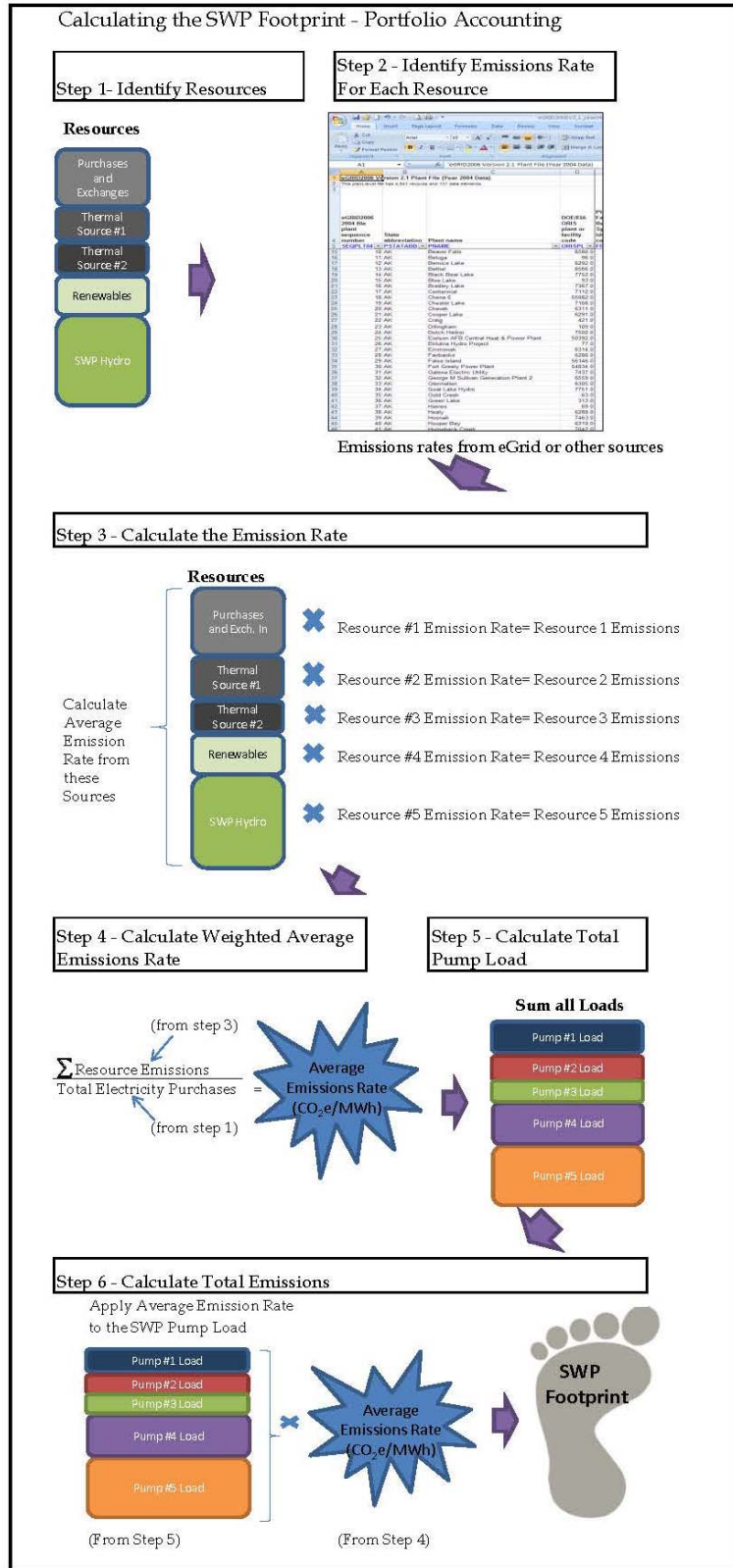


Figure 1. Calculation of SWP Footprint-Portfolio Accounting

1. Historical electricity use and generation data was extracted from DWR archives. This data has also been publically reported in annual issues of Bulletin-132: Management of the California State Water Project.

<http://www.water.ca.gov/swpao/bulletin.cfm>

2. Electricity resources (which include: purchased electricity, electricity generated at DWR facilities, and all electricity exchanges) were then differentiated by source.

3. Each source was given an emissions rate factor. Where detailed information was known about a source, historical data was used to generate the factor, as in the case of the Reid Gartner Power Plant resources. For most other sources, where detailed information was not available, the default emissions rate associated with unspecified electricity resources was applied. This rate was acquired from the California Air Resources Board (Hunsaker, 2012)

4. The weighted average portfolio emissions rate is then calculated by dividing the sum of all emissions from all resources by the total amount of resources in the portfolio.

5. The total SWP load is calculated by summing the amount of electricity consumed during the year at each SWP facility.

6. The weighted average portfolio emissions rate is then multiplied by the SWP total load to calculate total emissions.

Scope 2 emissions associated with retail



electricity purchases at DWR facilities have been developed consistent with DWR's methodology for Scope 1 emissions.

### Scope 3 Emissions Explanation

Historical construction emissions are the most difficult type of emissions for DWR to estimate. These emissions are generated by DWR's many contractors and change continuously depending on the number and types of projects being built and the numbers and types of equipment being used. Further because this equipment is owned and operated by DWR's contractors, DWR does not have fuel consumption data for specific equipment or projects. The only available data for constructing historical estimates of construction emissions that DWR has is a database of past contracts. This database contains information about the name, location, cost, start date, finish data, and total construction duration of each contract that DWR has let. In addition to this database, DWR has detailed construction reports including inspection reports, daily equipment logs, and other information about the day-to-day operations of individual projects.

DWR has used these two data sources to construct its estimates of historical construction emissions. The steps DWR followed to develop the estimates are described below.

1. The 450 contracts listed in the database between 1990 and 2009 were reviewed and categorized by project type. From this analysis DWR developed the following list of project types and the descriptions of each of the project types.

1.	<b>Building</b>	Includes a wide range of building construction, repair, and retro-fit activities that would involve minimal heavy equipment.
2.	<b>Earthwork</b>	Projects that involve predominantly heavy equipment.
3.	<b>Furnish and Install</b>	Projects that do not include any equipment besides limited use of cranes or small equipment to place and install products. Emissions from these projects predominantly come from transportation.
4.	<b>Maintenance 1</b>	Includes a wide range of maintenance activities such as painting, sealing, cleaning, and cathodic protection that require limited use of smaller heavy duty equipment or other high emissions machinery.
5.	<b>Maintenance 2</b>	Includes a wide range of maintenance activities such as pump and motor rebuilding that do not require the use of high emissions equipment.
6.	<b>Maintenance 3</b>	Includes a wide range of maintenance activities such as dredging and sediment removal that typically require the use of heavy equipment.
7.	<b>Other</b>	Includes a wide range of other miscellaneous projects that would not require the use of high emissions equipment or machinery.
8.	<b>Pipeline</b>	Projects that involve significant amounts of earthwork, but also involve large amounts of time constructing and placing piping or other linear construction materials.
9.	<b>Pumping Plant</b>	Projects that involve some earthwork, but also involve large amounts of time constructing structures and other appurtenances.



<b>10.</b>	<b>Roads</b>	All road and bridge projects.
<b>11.</b>	<b>Storage Basin</b>	Projects that involve large amounts of earthwork, paving, and dewatering typically involving the use of very large equipment.

Each of the 450 entries in the database conformed to the definition of one of these project types.

2. From analysis of the database with the project type characterizations DWR staff determined that detailed analysis of the emissions from a sample set of projects would be developed in order to start to estimate the scale of emissions from DWR construction activities.
3. Four representative projects were chosen. These projects were chosen because they represented very typical types of DWR construction projects, were representative in terms of size, location, materials and equipment used, and had detailed and complete sets of daily contractor logs that could be used to estimate the numbers and types of equipment in use each day.
4. For each project, information from daily contractor logs was reviewed. These logs provided information on the number and type of equipment that was operating on site and for how many days that equipment operated. This information was used with information from the California Air Resources Board's Offroad2007 database of construction equipment fuel consumption to generate estimates of total fuel consumption on each project. Total fuel consumption was converted to mtCO<sub>2</sub>e by multiplying by the emissions factor for diesel fuel (0.0104mtCO<sub>2</sub>e/gal) provided by the World Resources Institute and World Business Council for Sustainable Development in the GHG Protocol mobile emissions tool. The four projects and some of their key characteristics are shown in the table below.

<b>Project Name</b>	<b>Year</b>	<b>Project Type</b>	<b>Cost</b>	<b>Duration (Weeks)</b>	<b>Total Equip. Hours</b>	<b>Emissions (mtCO<sub>2</sub>e)</b>
Tehachapi East Afterbay (Partial)	2004	Storage Basin	\$18,751,333	58	62,400	9,200
Discharge Line & Brushy Creek Pipeline No. 3- South Bay Aqueduct Enlargement	2006	Pipeline	\$24,719,000	70	12,250	1,750
Levee Erosion Repair Sacramento River – (several sections)	2006	Earthwork	\$39,496,000	76	17,800	6,500
Seal and Pave Roads	1999	Roads	\$1,400,000	13	3,000	500

5. DWR staff including construction engineers, estimators, and planning engineers decided that of the characteristics listed in the database, project duration had the greatest correlation with emissions. Cost was ruled out as having a high correlation with emissions because project costs are often skewed by expensive materials or craftsman. Duration of a project, on the other

hand, is directly linked to the length of time equipment is operated and therefore directly linked to emissions.

6. Using the four project emissions estimates emissions intensity factors in mtCO<sub>2</sub>e/week of construction were developed for the 11 project types. These factors are based on the limited information available, assumptions, judgment, and extrapolation. The table below shows the specific emission intensity factor assigned to each project type as well as a simple sensitivity analysis of the factor.

<b>PROJECT TYPE</b>	<b>Emission Factor</b> (Tons/wk of construction)	<b>Factor Sensitivity</b> (% change per 10 ton change in factor)
Building	10	4%
Earthwork	86	5%
Furnish and Install	20*	10%
Maintenance 1	1	1.40%
Maintenance 2	1	1%
Maintenance 3	90	1%
Other	1	3%
Pipeline	25	3.50%
Pumping Plant	20	1.70%
Road	38	1.80%
Storage Basin	159	0.80%

\*Emissions from Furnish and Install contracts are not likely to be highly correlated to project duration. Instead all furnish and install contracts have been assessed an emission factor of 20 tons regardless of cost or duration. This factor represents the emissions from two semi-trucks traveling 3,000 miles each round trip to deliver products.

7. Each of these factors was then applied to each of the projects in the database by multiplying it by the duration of the project.
8. Although many projects lasted more than one calendar year, all emissions from a project were applied to the year in which the project started.
9. Emissions were then totaled for each year.
10. Projects were then removed from the list that were considered emergency actions because these actions can be very large and happen periodically but not regularly. One very large construction project was also excluded from the calculations because it was a significant outlier and was not consistent with typical yearly construction operations. These two exclusions were made to ensure that the construction emissions information represented the

general level of construction activity taking place over the period 1990-2009 and would not be artificially inflated by extraordinary events and activities.

11. A five year running average of emissions was then used to characterize annual emissions trends between 1990 and 2010. The five year average is used to smooth out annual fluctuations and buffer errors in the estimates.

## **Baseline Emissions Recalculation Policy**

This baseline emissions inventory, describing emissions from 1988-1992 was developed during 2010-2011. It accounts for baseline emissions from DWR facilities and activities across all of its programs and projects. DWR intends for this baseline to stand as the benchmark of its historical emissions even as facilities are added in the future. DWR will not recalculate this baseline to adjust for new electricity loads, such as those caused by construction of new facilities. Nor will DWR adjust this baseline to adjust for long-term changes in water delivery which could have significant effects on future emissions. DWR will only consider adjusting this baseline in situations where:

- new information highlights an error in the existing baseline
- fundamental changes are made to the electricity system or the electricity system accounting practices that would shift future emissions to a degree that they are incongruent with historical emissions
- changes to DWR's structure, mission, mandate, or authority which fundamentally shift future emissions to a degree that they are incongruent with historical emissions

## References

Hunsaker, Larry (California Air Resources Board). 2012. Personal email communication February 2, 2012.

## Appendix A. Scope 1 Emissions

Direct Emissions - Scope 1			CO2e	CO2	CH4	N2O	HFC(CO2e)	SF6
Stationary Combustion			719.00	719.00	0	0	0	0
Mobile Combustion (including de minimus and business travel)			10,486.42	10,486.42	0	0	0	0
Process			0	0	0	0	0	0
Fugitive			0	0	0	0	0	0
<b>Total Direct Emissions</b>			<b>11,205.42</b>	<b>11,205.42</b>	-	-	-	-

Facility Specific Data from CCAR Reports 2007-2009										
Facility	Mobile Combustion and De Minimus					Stationary Combustion				
	2007	2008	2009	Total	Average	2007	2008	2009	Total	Average
<b>DWR Business Facilities</b>	2,805.87	2,956.94	1,183.44	6,946.25	2,315.42	102.93	105.14	74.98	283.05	94.35
CERS	7.88	6.39		14.27	4.76				-	-
DES BDO	17.21	8.70		25.91	8.64				-	-
DES New Bridge Marina	-			-	-				-	-
DES				-	-	3.92	3.07	3.18	10.17	3.39
DES-Anx				-	-				-	-
DFM Eureka Flood Center	-			-	-				-	-
DFM Levee Repair HQ	-			-	-				-	-
DFM Limar Realty Corp #10	-			-	-				-	-
DFM Sac HQ				-	-				-	-
DFM	95.71	123.88		219.59	73.20	57.45	49.80		107.25	35.75
DMS	6.22	9.89		16.11	5.37	23.82	24.50		48.32	16.11
DSOD	50.42	53.58		104.00	34.67				-	-
DTS		0.50		0.50	0.17				-	-
DTS- Clayton Hill				-	-				-	-
DMS Facilities Management Office		1.02		1.02	0.34				-	-
DMS Materials Warehouse/Training Center				-	-			8.89	8.89	2.96
DMS Mobile Equipment Office	17.39	4.78		22.17	7.39		11.00		11.00	3.67
DMS Printing Production Services				-	-			16.21	16.21	5.40
DMS Warehouse 7th Street				-	-				-	-
DMS Warehouse Market St.				-	-			13.90	13.90	4.63
DOE	283.70	353.77		637.47	212.49				-	-
DOE Environmental Services	182.40	156.51		338.91	112.97				-	-
DOE Land and Right of Way	46.83	55.88		102.71	34.24				-	-
DWR Business Travel		487.02	1,170.57	1,657.59	552.53				-	-

DWR Executive	2.17	1.15		3.32	1.11				-	-
DWR Fleet	1,553.63	1,103.11	12.87	2,669.61	889.87				-	-
DWR JOC				-	-				-	-
DWR metered facilities				-	-				-	-
DWR Resources Building	12.72	0.51		13.23	4.41				-	-
SWR Water Resources Control Board Building				-	-				-	-
DPLA Northern District				-	-				-	-
IRWM Lancaster HQ				-	-	2.77	2.47	2.95	8.19	2.73
IRWM North Central Region	126.38	132.12		258.50	86.17			5.30	5.30	1.77
IRWM Northern Offices				-	-	14.97	14.30	12.11	41.38	13.79
IRWM Northern Region	225.96	224.95		450.91	150.30			1.84	1.84	0.61
IRWM South Central Office		2.30		2.30	0.77				-	-
IRWM South Central Region				-	-			10.60	10.60	3.53
IRWM Sourthern Region	50.13	75.50		125.63	41.88				-	-
IRWM South Central Region	127.12	155.38		282.50	94.17				-	-
<b>DFM Maintenance Yards</b>	1,760.11	1,273.40	1,106.47	4,139.98	1,379.99	31.96	12.00	101.76	145.72	48.57
DFM Sac Maint. Yard/Bryte Lab	596.28	442.73	245.90	1,284.91	428.30	14.88	12.00	75.92	102.80	34.27
DFM Sutter Maint. Yard	1,163.83	830.67	860.57	2,855.07	951.69	17.08		25.84	42.92	14.31
<b>SWP Field Divisions</b>	9,048.64	5,529.61	5,794.77	20,373.02	6,791.01	548.73	539.19	640.32	1,728.24	576.08
SWP DFD Area control Center				-	-				-	-
SWP DFD Clifton Court				-	-				-	-
SWP DFD Sherman Island				-	-				-	-
SWP O&M Testing and Analysis Office				-	-				-	-
SWP OFD Area Control Center				-	-				-	-
SWP O&M Testing and Analysis Office	40.27	58.92		99.19	33.06				-	-
SWP Delta Field Division	1,515.26	970.55	958.28	3,444.09	1,148.03	182.00	197.25	234.82	614.07	204.69
SWP Oroville Field Division	1,035.81	815.58	361.10	2,212.49	737.50	112.99	141.44	106.77	361.20	120.40
SWP SJ Field Division	1,372.46	1,682.83	660.70	3,715.99	1,238.66	16.79	163.24	214.52	394.55	131.52
SWP SL Field Division	1,731.64	1,004.61	1,052.24	3,788.49	1,262.83	8.16		4.38	12.54	4.18
SWP SFD Area Control Center				-	-				-	-
SWP SFD Castaic				-	-	31.02	35.05	27.31	93.38	31.13
SWP SFD Vista del Lago				-	-	2.43	2.21	13.84	18.48	6.16
SWP SFD Cedar Springs				-	-				-	-
SWP SFD Check 66				-	-				-	-
SWP SFD Devil Canyon				-	-				-	-
SWP SFD EBX				-	-				-	-
SWP SFD Pyramid Lake				-	-				-	-

SWP SFD Quail Lake				-	-				-	-
SWP SFD Silverwood Lake				-	-				-	-
SWP SFD Warehouse				-	-				-	-
SWP SJFD Area Control Center				-	-	131.02			131.02	43.67
SWP SLFD Area Control Center				-	-				-	-
SWP SLFD Romero Overlook				-	-				-	-
SWP Southern Field Division	3,341.11	986.32	2,762.45	7,089.88	2,363.29	64.32		38.68	103.00	34.33
SWP Southern Field Division Warehouse	12.09	10.80		22.89	7.63				-	-
<b>Totals</b>	<b>16,420.49</b>	<b>12,716.89</b>	<b>9,268.12</b>	<b>31,459.25</b>	<b>10,486.42</b>	<b>683.62</b>	<b>656.33</b>	<b>817.06</b>	<b>2,157.01</b>	<b>719.00</b>



## Appendix B. Scope 2 Emissions

Indirect Emissions - Scope 2	CO2e	CO2	CH4	N2O	HFC(CO2e)	SF6
Purchased Electricity (SWP)	2,692,435.00	2,692,435.00	0	0	0	0
Purchases Electricity (Retail Purchases)	14,490.60	14,490.60	0	0	0	0
Purchased Heating	0	0	0	0	0	0
Purchased Cooling	0	0	0	0	0	0
Purchased Steam	0	0	0	0	0	0
<b>Total Indirect Emissions</b>	<b>2,706,925.60</b>	<b>2,706,925.60</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

State Water Project Energy Generation and Use						
	1988	1989	1990	1991	1992	Average
<b>Power Resources (GWh)</b>						
SWP Hydro	3,202	3849	3,917	2,119	2,099	
SWP Renewables	362	326	307	168	201	
Reid Gardner Unit 4	1,632	1,687	1,447	1,324	1,069	
Purchases and Exchanges	4,391	4,934	6,208	4,339	4,780	
<b>Total Resources</b>	<b>9,587</b>	<b>10,796</b>	<b>11,880</b>	<b>7,950</b>	<b>8,150</b>	
<b>Emissions (mtCO<sub>2</sub>e)</b>						
Large Hydro (0 mtCO <sub>2</sub> e/GWh)	-	-	-	-	-	
SWP Renewables (0 mtCO <sub>2</sub> e/GWh)	-	-	-	-	-	
Reid Gardner Unit 4 (1116 mtCO <sub>2</sub> e/GWh)	1,821,312	1,882,692	1,615,031	1,477,171	1,193,037	
Purchases and Exchanges (varies mtCO <sub>2</sub> e - unspecified)	2,439,411	2,741,073	3,251,138	2,254,336	2,466,371	
<b>Total Emissions</b>	<b>4,260,723</b>	<b>4,623,765</b>	<b>4,866,168</b>	<b>3,731,507</b>	<b>3,659,408</b>	
<b>Portfolio Emissions Rate</b>	<b>444</b>	<b>428</b>	<b>410</b>	<b>469</b>	<b>449</b>	
<b>Net SWP Load</b>	<b>6,052</b>	<b>7,577</b>	<b>8,389</b>	<b>4,628</b>	<b>4,273</b>	
<b>Total DWR Emissions (Net SWP Load * Portfolio Emissions Rate)</b>	<b>2,689,673</b>	<b>3,245,116</b>	<b>3,436,218</b>	<b>2,172,342</b>	<b>1,918,826</b>	<b>2,692,435</b>

Facility Specific Data from CCAR Reports 2007-2009					
Purchased Electricity					
Facility	2007	2008	2009	Total	Average
<b>DWR Business Facilities</b>	<b>1,198.39</b>	<b>1,842.33</b>	<b>33,143.02</b>	<b>36,183.74</b>	<b>12,061.25</b>
CERS				-	-
DES BDO				-	-
DES New Bridge Marina	3.70	3.70	5.01	12.41	4.14

DES	9.76	212.16	227.10	449.02	149.67
DES-Anx	19.39	19.39	21.35	60.13	20.04
DFM Eureka Flood Center	1.95	1.95	1.32	5.22	1.74
DFM Levee Repair HQ	5.31	5.31		10.62	3.54
DFM Limar Realty Corp #10	36.33	36.33	40.02	112.68	37.56
DFM Sac HQ	73.12	73.12	80.53	226.77	75.59
DFM	107.59	274.20	159.46	541.25	180.42
DMS	20.09	41.36	14.36	75.81	25.27
DSOD	50.05	50.05	55.12	155.22	51.74
DTS			322.55	322.55	107.52
DTS- Clayton Hill	8.08	12.60		20.68	6.89
DMS Facilities Management Office				-	-
DMS Materials Warehouse/Training Center	10.47	11.85		22.32	7.44
DMS Mobile Equipment Office				-	-
DMS Printing Production Services	51.09	51.09	24.97	127.15	42.38
DMS Warehouse 7th Street	19.41	19.41		38.82	12.94
DMS Warehouse Market St.	9.11	15.74		24.85	8.28
DOE				-	-
DOE Environmental Services		98.85	112.59	211.44	70.48
DOE Land and Right of Way				-	-
DWR Business Travel				-	-
DWR Executive				-	-
DWR Fleet				-	-
DWR JOC	534.80	534.80	610.64	1,680.24	560.08
DWR metered facilities	26.33			26.33	8.78
DWR Resources Building			21,957.87	21,957.87	7,319.29
SWR Water Resources Control Board Building			7,848.02	7,848.02	2,616.01
DPLA Northern District	7.73			7.73	2.58
IRWM Lancaster HQ	17.12		19.94	37.06	12.35
IRWM North Central Region		98.85	115.62	214.47	71.49
IRWM Northern Offices	37.46	26.92	22.55	86.93	28.98
IRWM Northern Region		73.74	596.68	670.42	223.47
IRWM South Central Office	51.03	71.80		122.83	40.94
IRWM South Central Region	9.16	19.80	821.11	850.07	283.36
IRWM Sourthern Region	89.31	89.31	86.21	264.83	88.28
IRWM South Central Region				-	-
<b>DFM Maintenance Yards</b>	<b>116.29</b>	<b>180.94</b>	<b>184.86</b>	<b>482.09</b>	<b>160.70</b>
DFM Sac Maint. Yard/Bryte Lab	110.20	169.30	162.94	442.44	147.48
DFM Sutter Maint. Yard	6.09	11.64	21.92	39.65	13.22
<b>SWP Field Divisions</b>	<b>1,337.62</b>	<b>2,007.44</b>	<b>3,460.90</b>	<b>6,805.96</b>	<b>2,268.65</b>
SWP DFD Area control Center	45.71	383.32	466.02	895.05	298.35
SWP DFD Clifton Court	4.56	6.16	5.78	16.50	5.50
SWP DFD Sherman Island	0.45	0.78	0.70	1.93	0.64
SWP O&M Testing and Analysis Office	16.42	16.42		32.84	10.95

SWP OFD Area Control Center	2.30	3.54	4.18	10.02	3.34
SWP O&M Testing and Analysis Office			18.08	18.08	6.03
SWP Delta Field Division	49.12	83.48	90.61	223.21	74.40
SWP Oroville Field Division	786.15	1,060.95	1,094.61	2,941.71	980.57
SWP SJ Field Division	158.95	226.83	247.64	633.42	211.14
SWP SL Field Division	98.35	118.28	83.09	299.72	99.91
SWP SFD Area Control Center	0.57	14.20	25.92	40.69	13.56
SWP SFD Castaic			305.15	305.15	101.72
SWP SFD Vista del Lago			172.10	172.10	57.37
SWP SFD Cedar Springs			54.86	54.86	18.29
SWP SFD Check 66			23.24	23.24	7.75
SWP SFD Devil Canyon			17.47	17.47	5.82
SWP SFD EBX			23.86	23.86	7.95
SWP SFD Pyramid Lake			54.42	54.42	18.14
SWP SFD Quail Lake			49.82	49.82	16.61
SWP SFD Silverwood Lake			20.70	20.70	6.90
SWP SFD Warehouse	0.21			0.21	0.07
SWP SJFD Area Control Center				-	-
SWP SLFD Area Control Center				-	-
SWP SLFD Romero Overlook	18.58	29.44	28.43	76.45	25.48
SWP Southern Field Division	156.25	64.04	664.76	885.05	295.02
SWP Southern Field Division Warehouse			9.46	9.46	3.15
<b>Totals</b>	<b>3,226,249.51</b>	<b>2,400,210.56</b>	<b>2,237,913.64</b>		<b>14,490.60</b>

## Appendix C. Scope 3 Emissions

Optional Emissions	CO2e	CO2	CH4	N2O	HFC(CO2e)	SF6
Scope 3 (Consturction Contractors)	28,200.00	28,200.00	0	0	0	0
<b>Total Optional Emissions</b>	<b>28,200.00</b>	<b>28,200.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Year	Total Emissions	Projects/ Year	Ave Emissions per project	5 year running ave	Trendline Emissions
1990	29,822	42	710		28,200
1991	23,089	31	745		28,000
1992	34,816	30	1161	26,941	27,700
1993	14,506	31	816	25,714	27,500
1994	32,473	29	1308	28,245	27,200
1995	23,683	26	1605	27,195	26,900
1996	35,743	27	1324	29,219	26,700
1997	29,571	24	1232	30,003	26,400
1998	24,626	25	985	28,701	26,200
1999	36,392	24	1516	26,738	25,900
2000	17,175	17	1010	23,512	25,600
2001	25,925	18	1440	23,218	25,400
2002	13,442	14	960	21,095	25,100
2003	23,155	7	3308	22,333	24,900
2004	25,777	15	1718	24,980	24,600
2005	23,368	14	1669	25,340	24,400
2006	39,159	27	1450	25,543	24,100
2007	15,239	21	726		23,800
2008	24,170	17	1422		23,600
Total	492,133	439	1199		
Average	25,902	23	1,321		

<b>Project Type</b>	<b>Num</b>	<b>as % of projects</b>	<b>Emissions</b>	<b>as % of Emissions</b>
<b>Building</b>	54	13%	27,516	5%
<b>Earthwork</b>	104	24%	300,285	51%
<b>Furnish and Install</b>	77	18%	3,489	1%
<b>Maintenance 1</b>	28	7%	1,025	0%
<b>Maintenance 2</b>	17	4%	823	0%
<b>Maintenance 3</b>	23	5%	53,370	9%
<b>Other</b>	21	5%	1,962	0%
<b>Pipeline</b>	48	11%	61,950	10%
<b>Pumping Plant</b>	15	4%	28,503	5%
<b>Road</b>	41	10%	44,118	7%
<b>Storage Basin</b>	11	3%	67,371	11%
<b>Total</b>	428		590,411	