Joint Water Commission Greenhouse Gas Inventory

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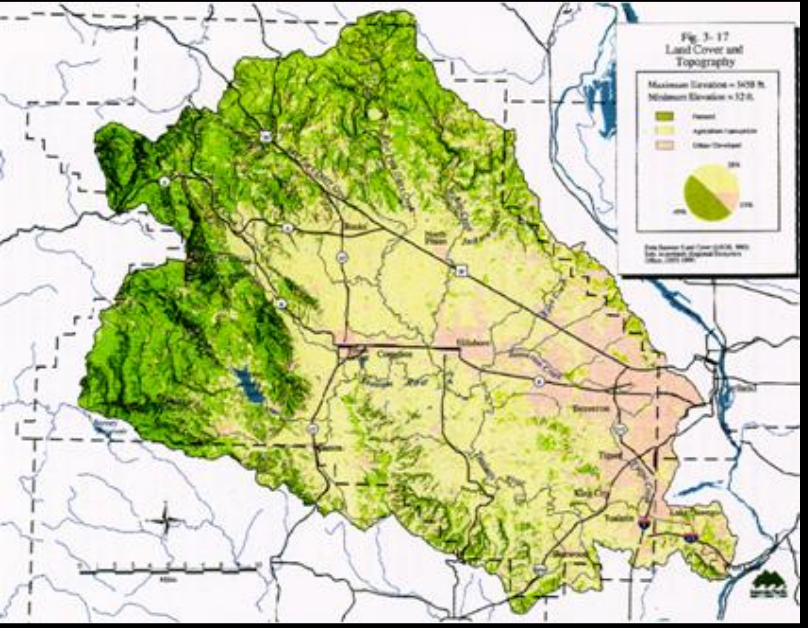
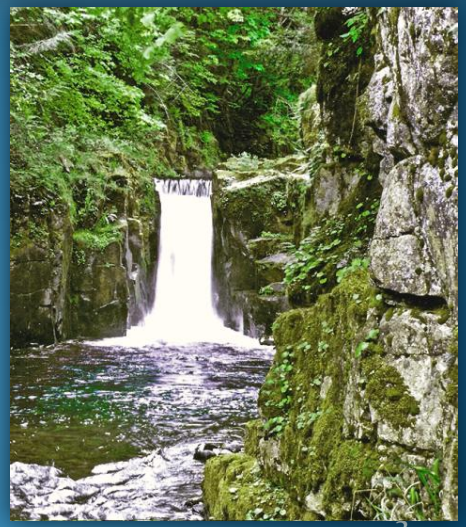
City of Hillsboro, Water Resources Technician

PNWS - AWWA Annual Conference
Boise Center in Boise, ID
May 5, 2011



The Joint Water Commission (JWC)

Cities of Hillsboro, Forest Grove, Beaverton and the Tualatin Valley Water District



JWC System

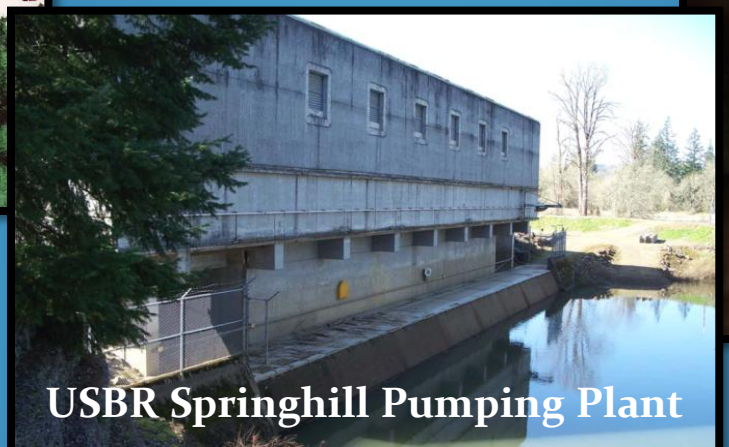
Barney Reservoir

USBR Hagg Lake/ Scoggins Reservoir

Water Treatment Plant

Northside Transmission Line

Fern Hill Reservoirs (40 MG)


USBR Springhill Pumping Plant

Southside Transmission Line

Why Complete a GHG Inventory?

- Track JWC Trends Over Time
- Information Required for Member Agencies Inventories
- Mandatory Reporting in Oregon by Emissions Level
- Gain a Better Understanding of Legislative and Emissions Assumptions that Impact JWC

Good Company's Operation Climate Collaborative Network

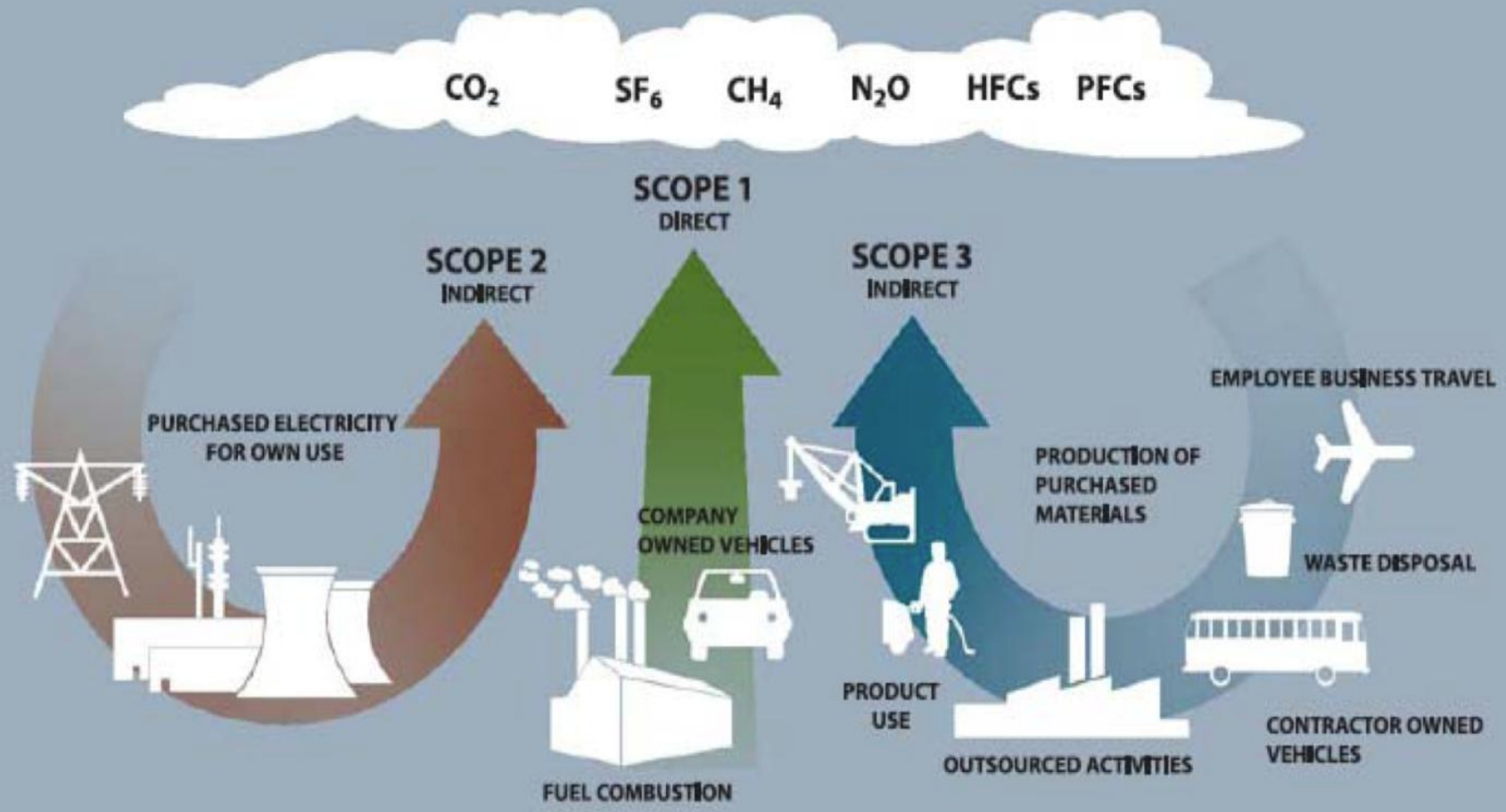
- Good Company is a sustainability consulting firm that provides analysis, strategy and implementation services to help clients meet their triple bottom line

- JWC began GHG Inventory Process in March 2010, Completed in August 2010
  - Good Company gave 7 webinars to teach the process and methods

- Calculated and Classified GHG emissions for 2007-2009

GHG Emissions Accounting 101

1 MT CO2e = consuming 112 gallons of gasoline



Emission Sources

- Fleet: Gasoline, Diesel, Biodiesel, Ethanol, CNG
- Stationary Fuels: Diesel, Oil, Gas
- Refrigerants
- Electricity and Steam
- Solid Waste
- Employee Commute
- Business Travel
- Goods & Services

Emission Calculations

- Use emission factors to translate activities and purchases into equivalent carbon dioxide emissions

- Collect data on JWC's purchases
- Emissions factors available from widely available, high consensus public information
  - EPA (eGRID, WARM model), Carnegie Mellon University, Portland General Electric, Bureau of Labor Statistics, and more
- Input data into Good Company Carbon Calculator

Scope 1- Methods

- Includes direct emissions from
  - Vehicles
  - Onsite Fuel Combustion (i.e. generators)
  - Refrigerants
- Easiest to calculate and JWC's smallest category
  - Only 11 Fleet Vehicles
  - 1 generator
  - Minimal AC usage

Scope 1- Methods

G3C Map (click here)

Transportation Emissions

Worksheet

Results by Scope Category

	Owned Vehicles - Gasoline				Results
Inventory Year / Facilities Description	Owned Gasoline quantity	Unit of Measure (please select)	Average Fuel Efficiency miles per gallon (MPG)	Emissions MT CO_2e	Owned Fleet Emissions (Scope 1) MT CO_2e
Fern Hill Water Treatment	911	gallons	16.8	8.2	11.5
2007				**8.2**	**11.5**
Fern Hill Water Treatment	810	gallons	16.8	7.3	9.4
2008				**7.3**	**9.4**
Fern Hill Water Treatment	752	gallons	16.8	6.8	11.0
2009				**6.8**	**11.0**
Cumulative Totals:				**22.2**	**32.0**

12 MT CO2e = total energy use of **1** home for 1 year

Scope 2- Methods

- Indirect emissions from Purchased Electricity
- Easy to calculate and very large emission value
  - JWC uses 23 million kWh of electricity/year
  - Only 1 electric provider
  - JWC has 5 accounts

Scope 2- Emissions Factor

- Electricity is traded on the minute-by-minute basis from large geographic areas making it difficult to determine the ‘correct’ emissions factor.
- Available emissions factors
  - Portland General Electric
  - Northwest Power Pool (7 western states)
  - National Average

Scope 2- Emissions Factor

eGRIDweb Home Data GHG Emission Factors Reports Notes Help

Reset Select Data View Data Export Data

Electric Generating Company (EGC) Owner-based Level Data

Company: **Portland General Electric Co**

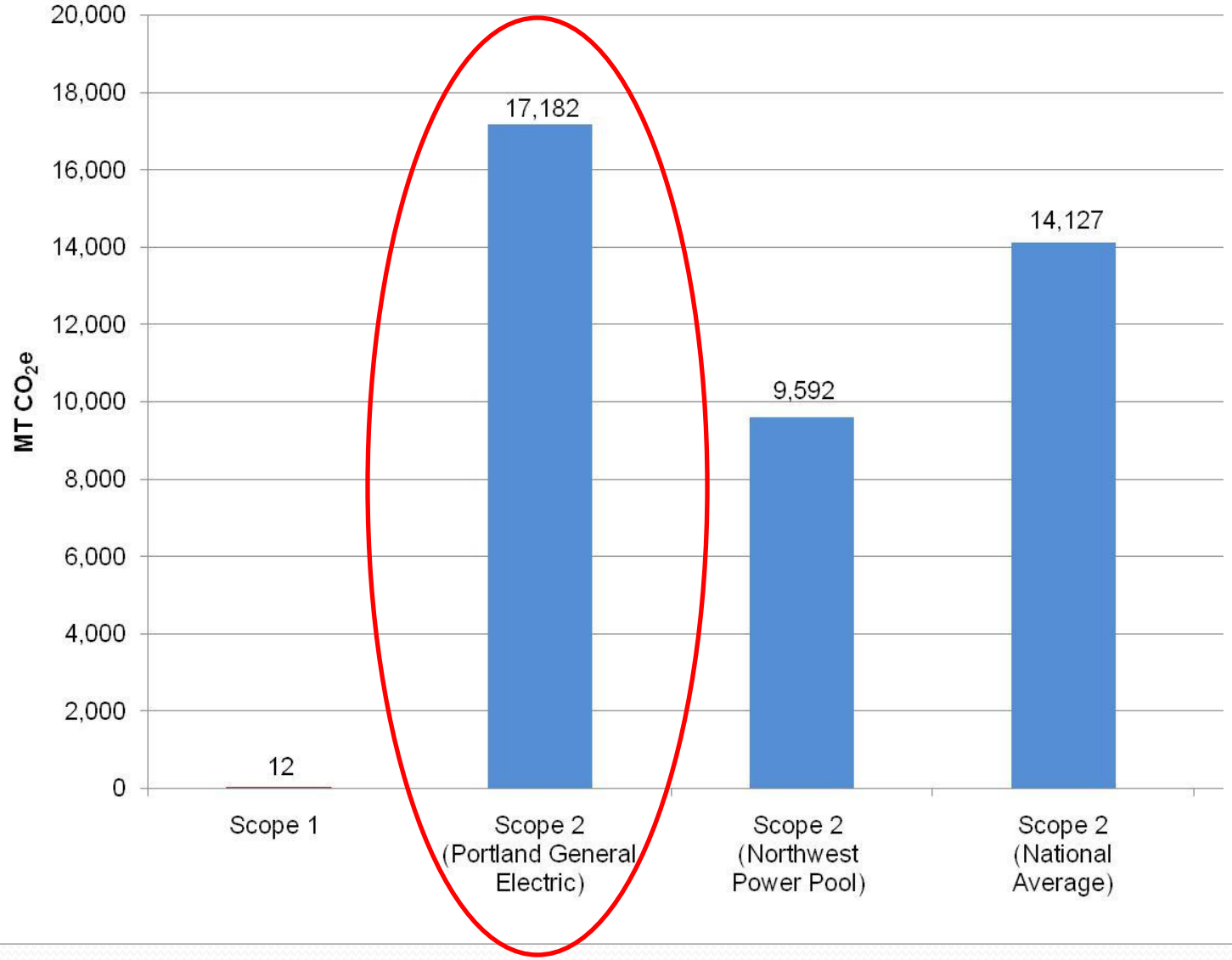
Parent Company:
Capacity (MW): 2,090.2
Net Generation (MWh): 8,117,698.2
Heat Input (MMBtu): 69,007,382.3

Data Year: 2005
Location (Operator)-based
Owner-based

Emissions Profile | Generation Resource Mix

Pollutant	Emissions	Units	Output Emission Rates	Units	Input Emission Rates	Units
Annual CO_2	6,563,651.4000	tons	1,617.1200	lb/MWh	190.2300	lb/MMBtu
Annual SO_2	11,756.0500	tons	2.8964	lb/MWh	0.3407	lb/MMBtu
Annual NO_x	11,985.5000	tons	2.9529	lb/MWh	0.3474	lb/MMBtu
Ozone Season NO_x	5,240.8900	tons	3.2676	lb/MWh	0.3633	lb/MMBtu
Annual Hg	267.4600	lbs	0.0329	lb/GWh	0.0039	lb/BBtu
Annual CH_4	162,839.6000	lbs	20.0600	lb/GWh	N/A	
Annual N_2O	201,677.8000	lbs	24.8400	lb/GWh	N/A	

Scope 2 Emissions (2007)



Equal to total energy use of **1,460** homes for 1 year

Scope 3

- Indirect emission source
- Often not required or completed during emissions analysis
- Important to give sense of scale of total operations

Scope 3- Emission Sources

- Commute
- Business Travel (not done in company vehicles)
- Solid Waste
- Goods & Services
  - Construction & Facilities Maintenance
  - Treatment Chemicals
  - Professional Services
  - Equipment & Vehicles
  - Administrative & Office Supplies

Scope 3- Methods

- Commute and Business Travel
  - Calculated the same way as Scope 1
  - Data from Employee Reimbursement receipts

- 43 MT CO2e average emissions = energy use at 3.7 homes for 1 year
- That's larger than the Scope 1 emissions!

Scope 3- Solid Waste

- Find quantity of waste generated
- Emission factors from EPA WARM
  - Mostly use Mixed Municipal Solid Waste
- Landfill does Methane Flaring
  - Other options: no methane management, capture methane and generate electricity, incineration
- Recycled/composted material not included

- Largest component was sludge disposal to landfill
- 207 MT CO2e average emissions = energy use at 17.6 homes for 1 year

Scope 3- Emission Sources

- Commute
- Business Travel (not done in company vehicles)
- Solid Waste
- Goods & Services
  - Construction & Facilities Maintenance
  - Treatment Chemicals
  - Professional Services
  - Equipment & Vehicles
  - Administrative & Office Supplies

Scope 3- Goods & Services

Utilized the Economic Input-Output Life-Cycle Analysis (EIO-LCA)

- Includes all emissions from extraction of raw materials to final product point of sale

- Based on expenditures
- Static database from 2002
- Doesn't evaluate emissions factors for recycled products

EIO-LCA Example

Carnegie Mellon

Green Design INSTITUTE

Sector #325181: Alkalies and chlorine manufacturing
Economic Activity: $1 Million Dollars
Displaying: Greenhouse Gases
Number of Sectors: Top 10

Change Inputs (Click here to view greenhouse gases, air pollutants, etc...)

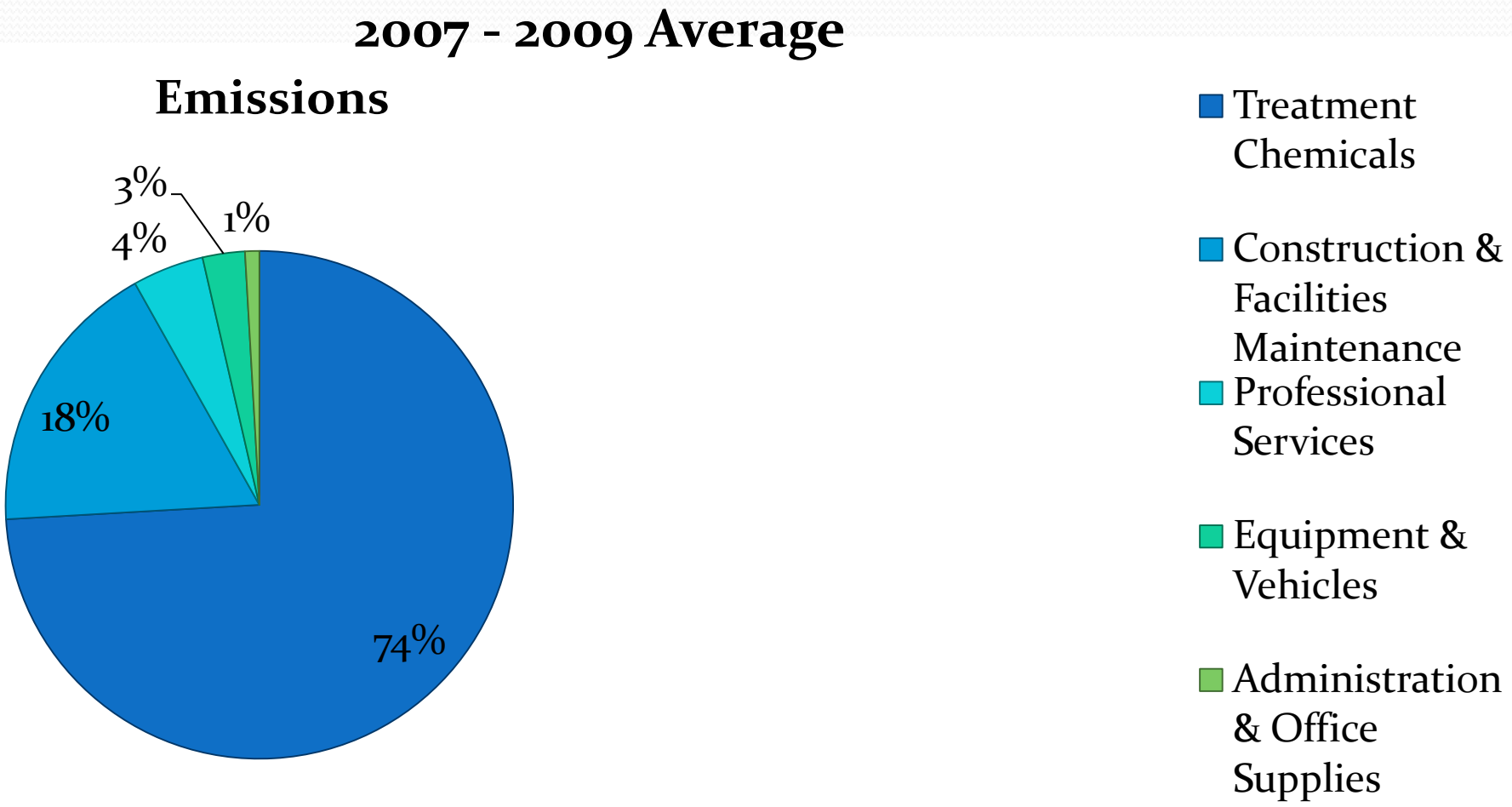
Documentation:
The environmental, energy, and other data used and their sources.
Frequently asked questions about EIO-LCA.

This sector list was contributed by Green Design Institute.

	Sector	Total t CO2e	CO2 Fossil t CO2e	CO2 Process t CO2e	CH4 t CO2e	N2O t CO2e	HFC/PFCs t CO2e
	Total for all sectors	*3500*	*3180*	*72.5*	*177.*	*46.0*	*27.0*
325181	Alkalies and chlorine manufacturing	1390	1390	0	0	0	0
221100	Power generation and supply	1050	1030	0	2.84	6.42	6.65
325190	Other basic organic chemical manufacturing	212.0	190	0	0	21.8	0
211000	Oil and gas extraction	176.0	49.5	32.2	94.1	0	0
212390	Other nonmetallic mineral mining	156.0	156.0	0	0	0	0
324110	Petroleum refineries	101.0	101.0	0	0.313	0	0
325211	Plastics material and resin manufacturing	69.8	69.8	0	0	0	0
212100	Coal mining	37.1	4.19	0	33.0	0	0
486000	Pipeline transportation	35.4	16.2	0.044	19.2	0	0
325110	Petrochemical manufacturing	27.9	23.4	3.23	1.33	0	0

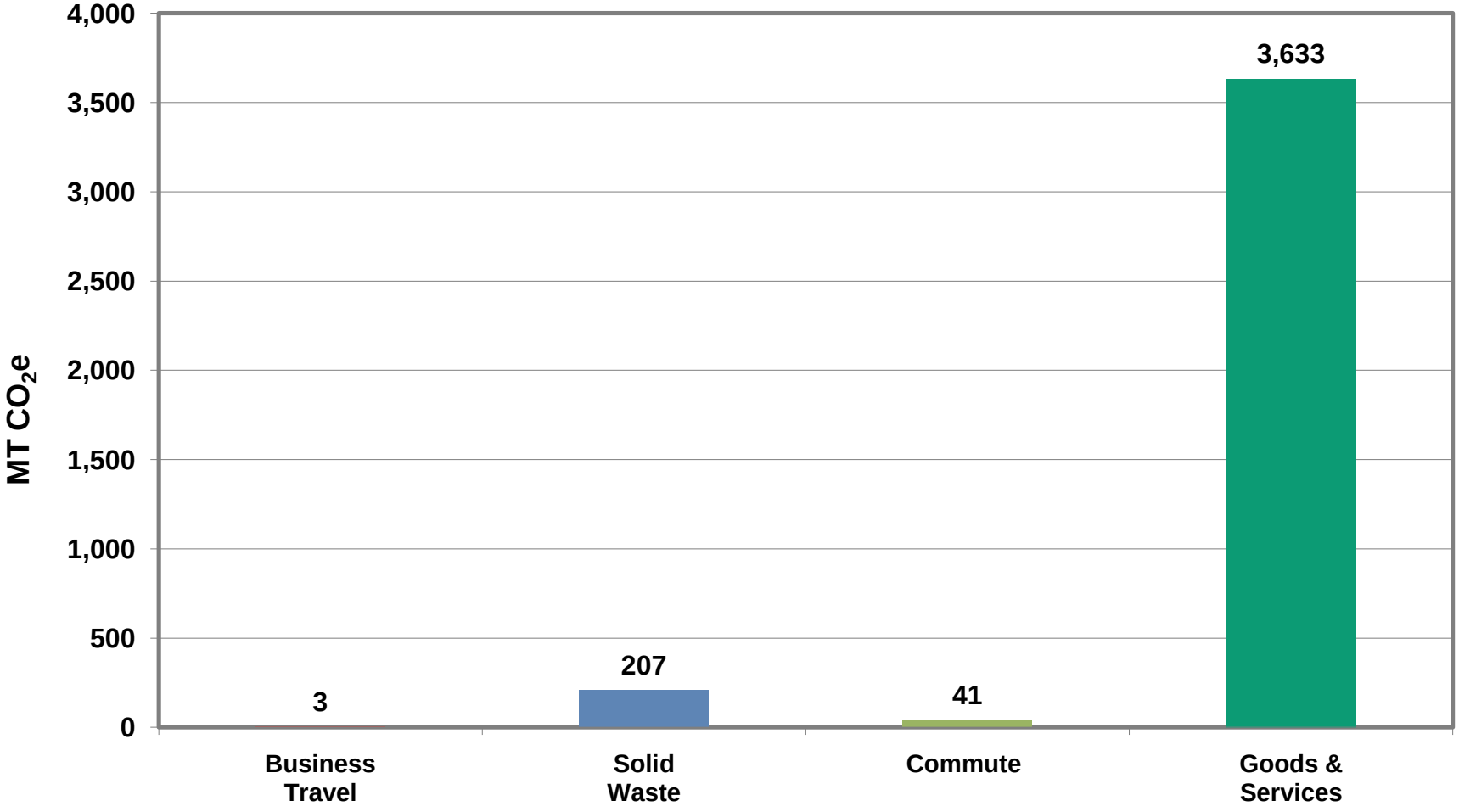
Download View Graph

Scope 3- Goods & Services

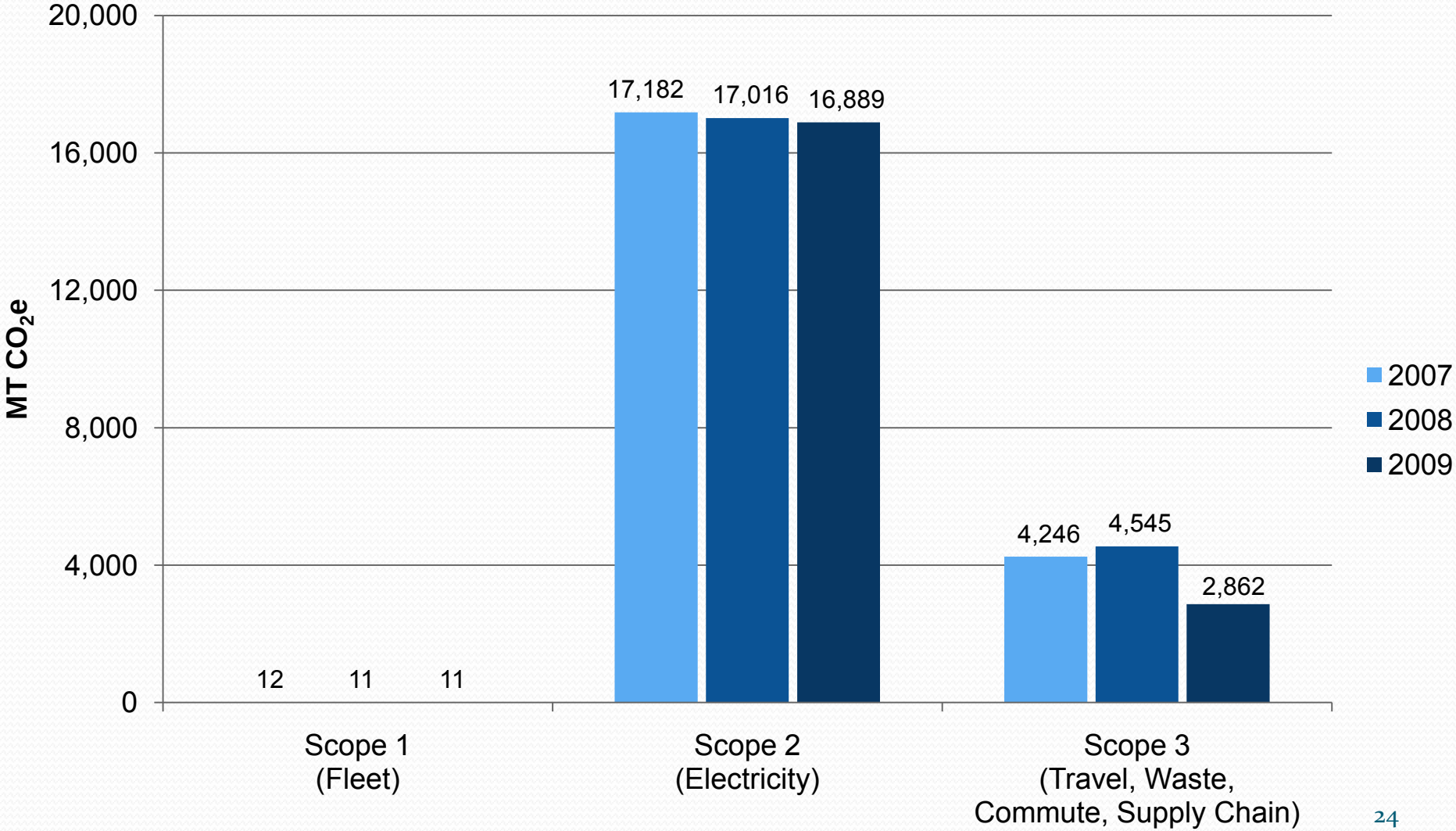


Scope 3- Average Results

3,884 MT CO2e = energy use at 330 homes for 1 year



JWC Results 2007-2009



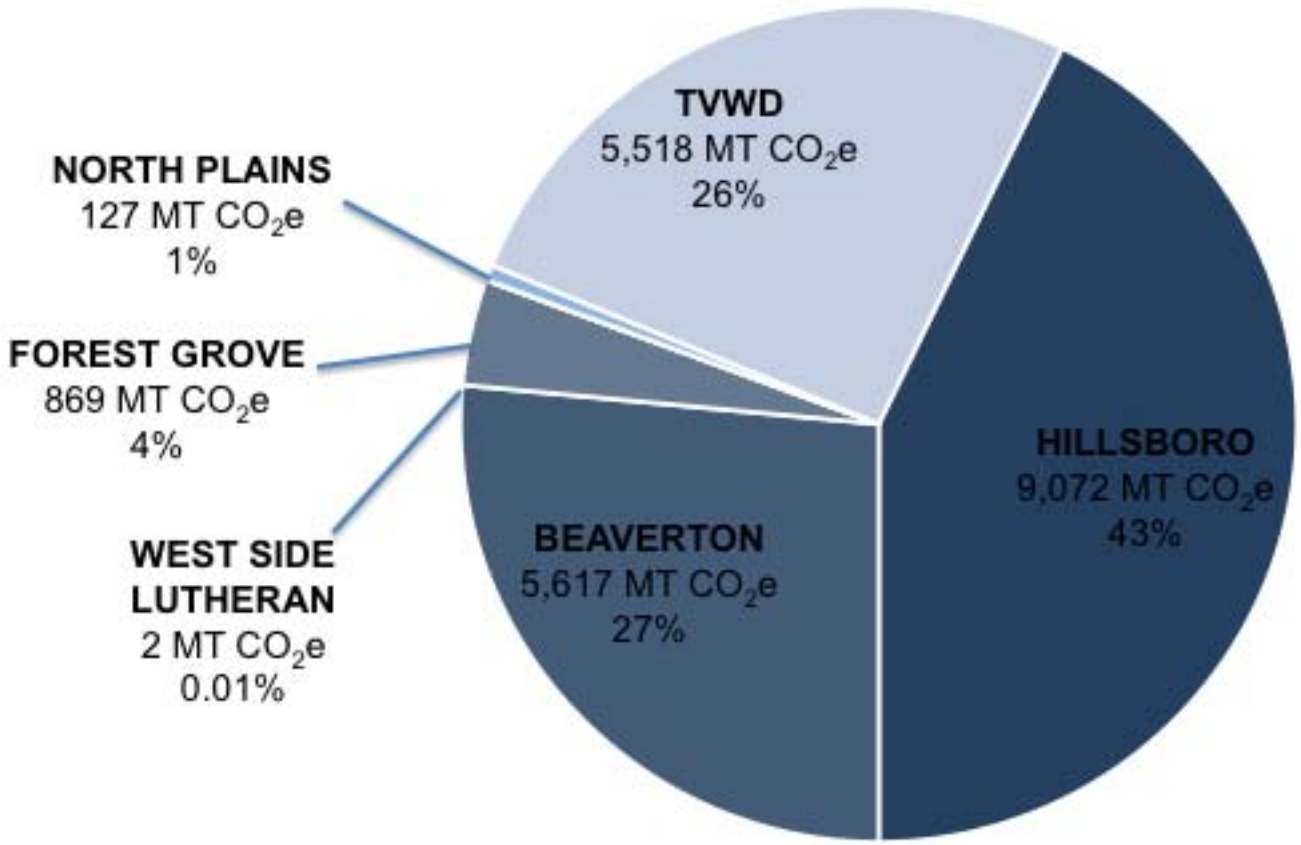
JWC Results 2007-2009

- 20,931 MT CO2e emitted on average
- Equal to energy use at 1,778 homes for 1 year
- Need to plant 536,692 seedlings and survive for 10 years to be carbon neutral for one year
- If a 'carbon tax' was implemented, JWC could pay $313,000 more each year

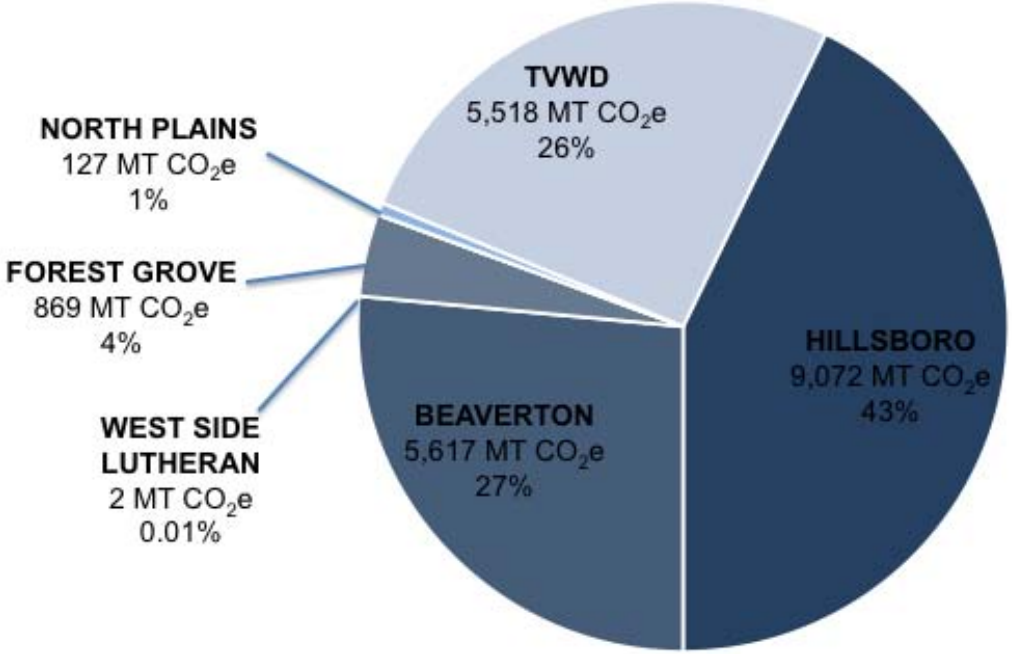
Are the JWC results common?

- Not many WTPs have completed a carbon footprint
- Low vehicle emissions (Scope 1) compared to most Public Works agencies.
- Very high electricity use
- High Scope 3 for the dollars spent

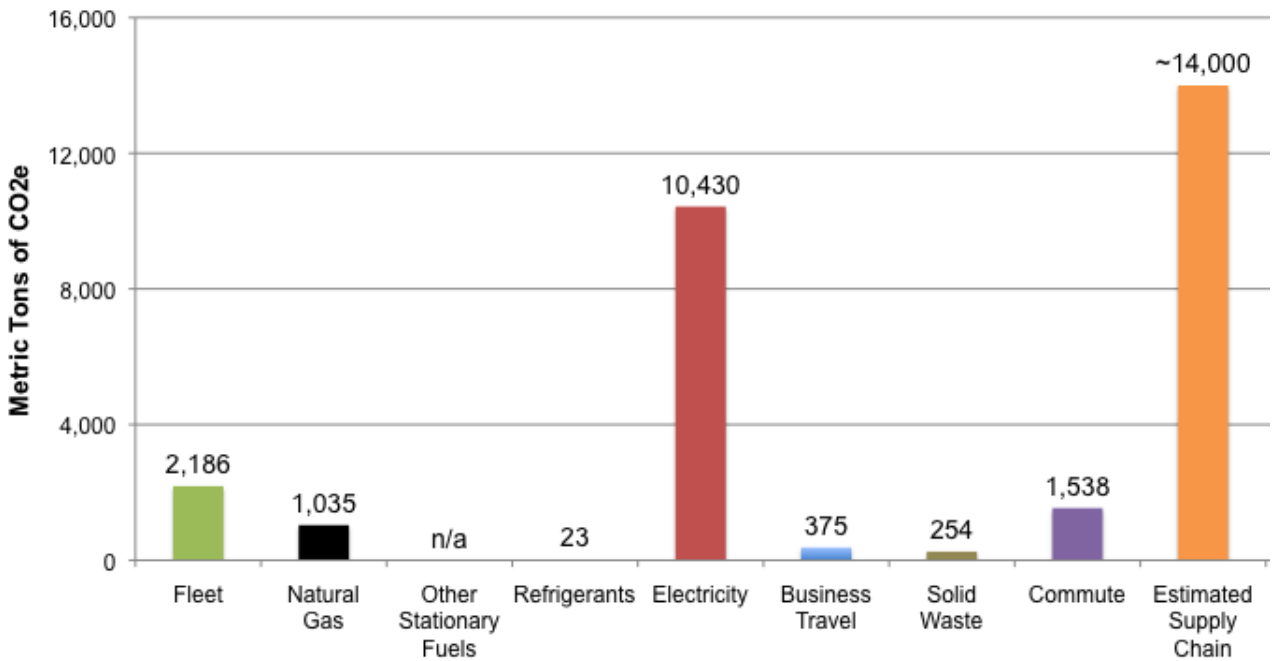
JWC Emissions by Partner Based on Annual Water Purchases



JWC 2009 GHG Emissions



Hillsboro 2009 GHG Emissions



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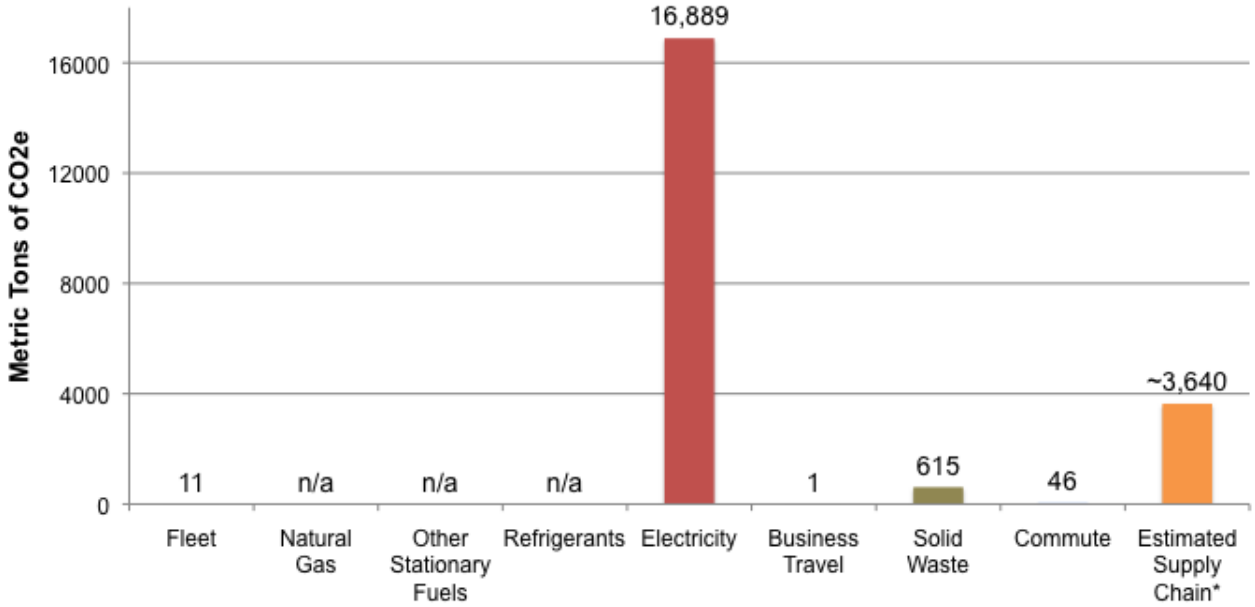

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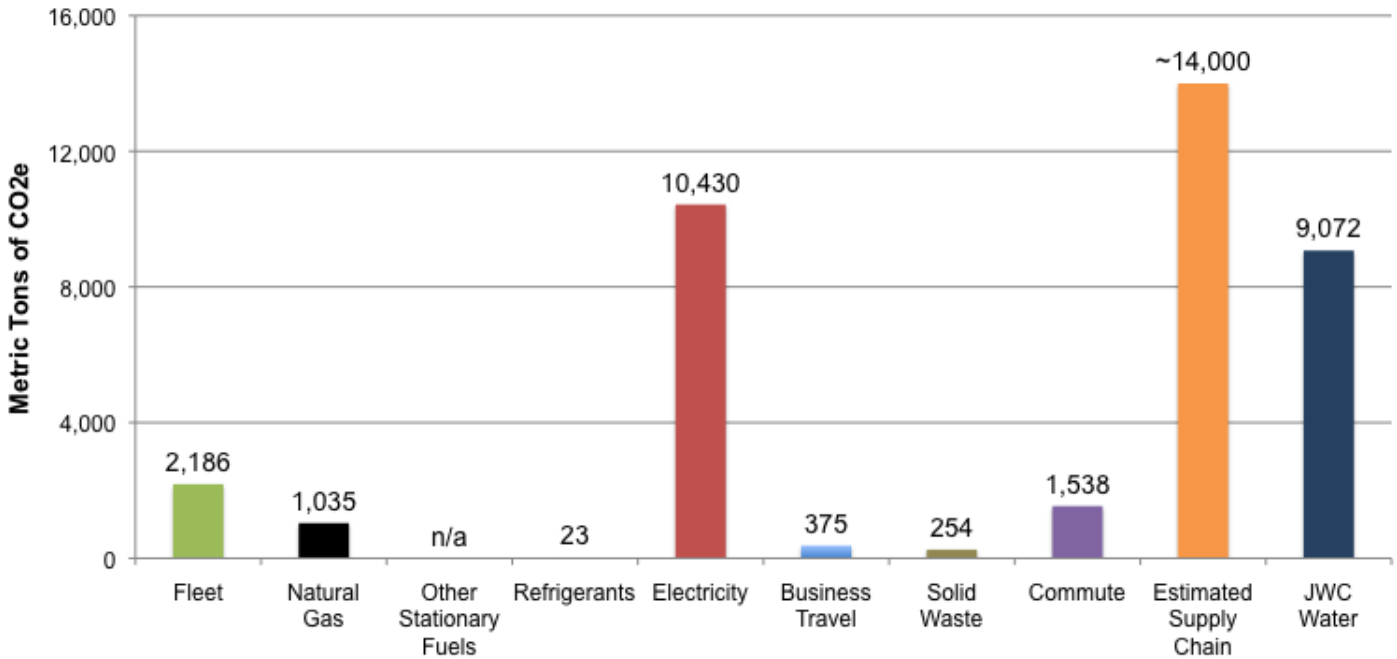


Context – Portland Metro Community

JWC emissions comprise 0.07% of the Metro total

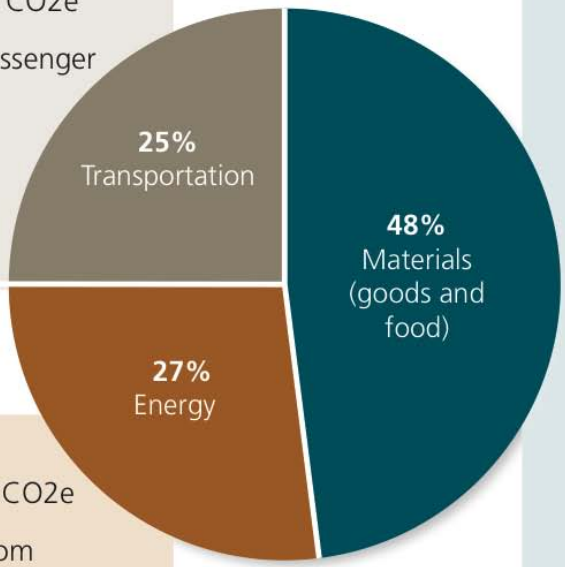
Metro Area Greenhouse Gas Emissions

31 Million Metric Tons Carbon Dioxide Equivalent (MMT CO2e)

Transportation

Estimated emissions: 7.8 MMT CO2e

- Vehicle miles traveled by passenger vehicles and light trucks
- Operation of public transportation system (TriMet)



Energy

Estimated emissions: 8.2 MMT CO2e

- Natural gas consumption from residents and businesses
- Fossil fuel consumption from utilities' imported electricity

Materials (goods and food)

Emissions related to the production, manufacture and disposal of materials, goods and food

Estimated emissions 14.9 MMT CO2e

- Manufacture of products and food (from inside and outside the region) consumed by metro residents and businesses
- Freight movement of materials, goods and food (heavy truck, rail, air)
- Waste management and recycling system (collection, landfills)

Climate Action Opportunities

- No Mandatory Reporting Requirements
- JWC Emissions – Source of Shared Emissions
- Investigate Opportunities for Energy Savings and Grants:
  - Solar Array at JWC WTP
  - Micro-Hydroelectric Generation
  - Efficiency in Energy and Chemical use

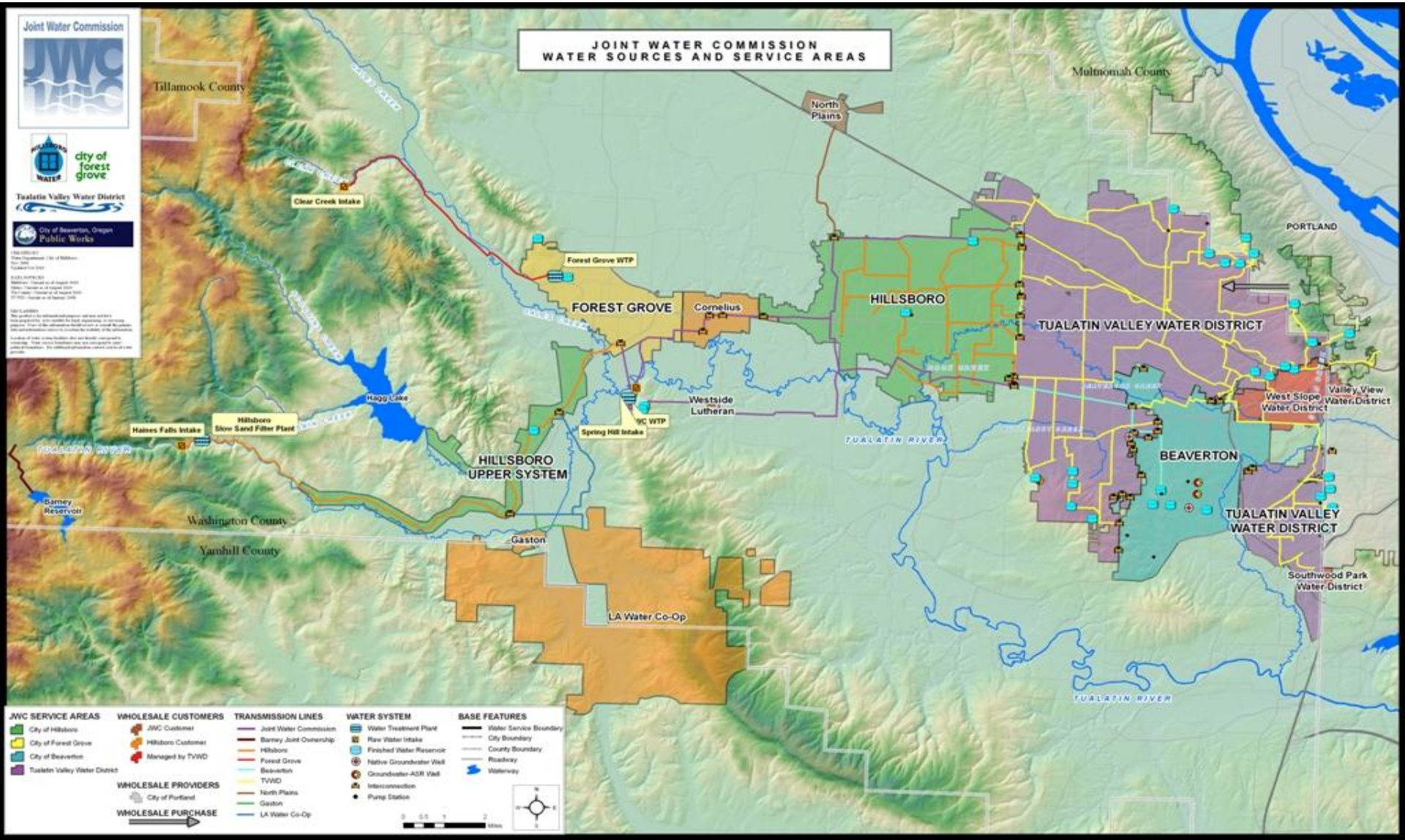
Biggest Potential Climate Change Impact to JWC – Water Availability

Acknowledgements

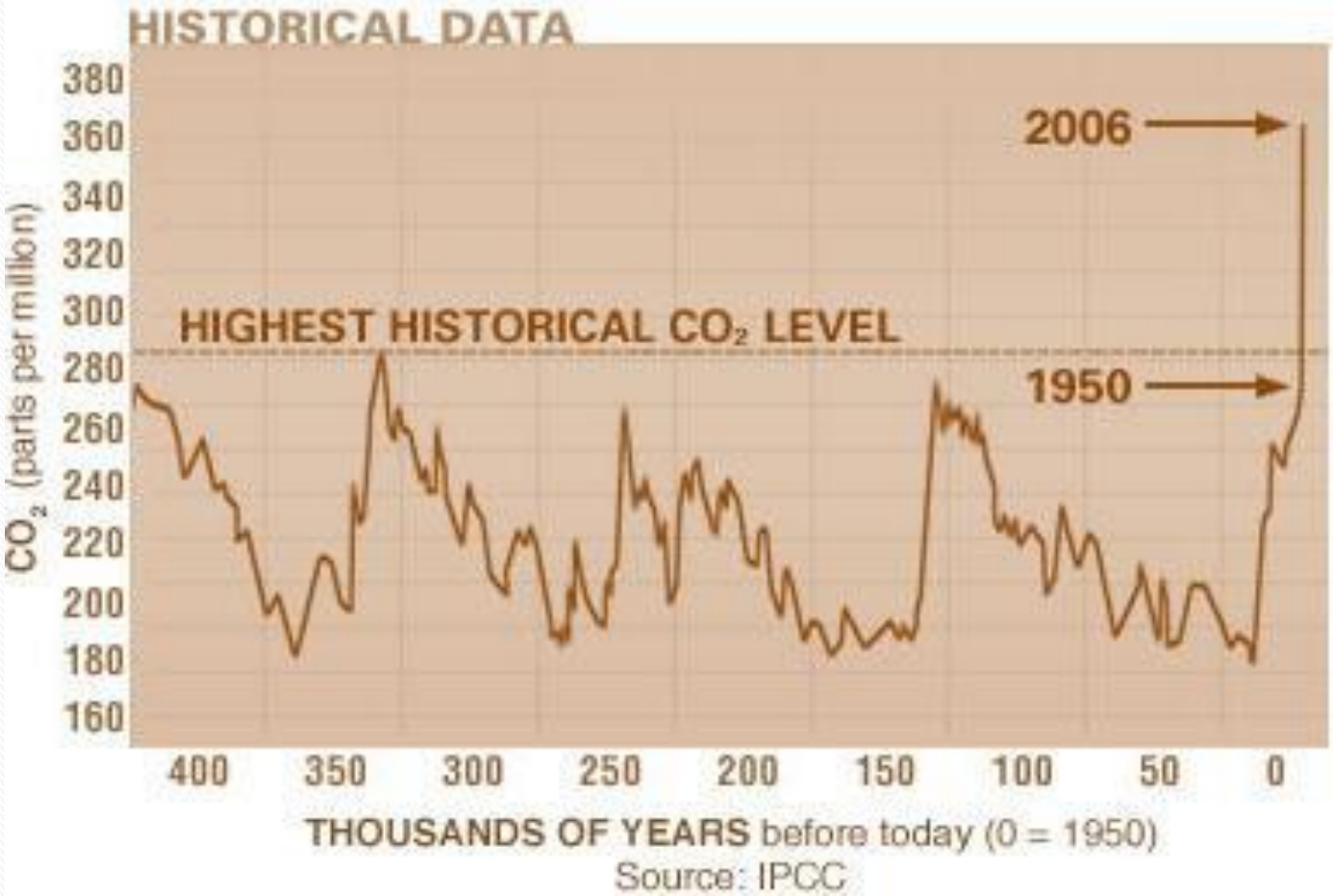
- Josh Skov (Principal) and Kelly Hoell (Associate) from Good Company
- Brian Lovelin (Hillsboro – Water Department Staff)
- Several Hillsboro and JWC Staff
- JWC's Vendors

- Need More Info?
  - Kristel Fesler at KristelF@ci.hillsboro.or.us

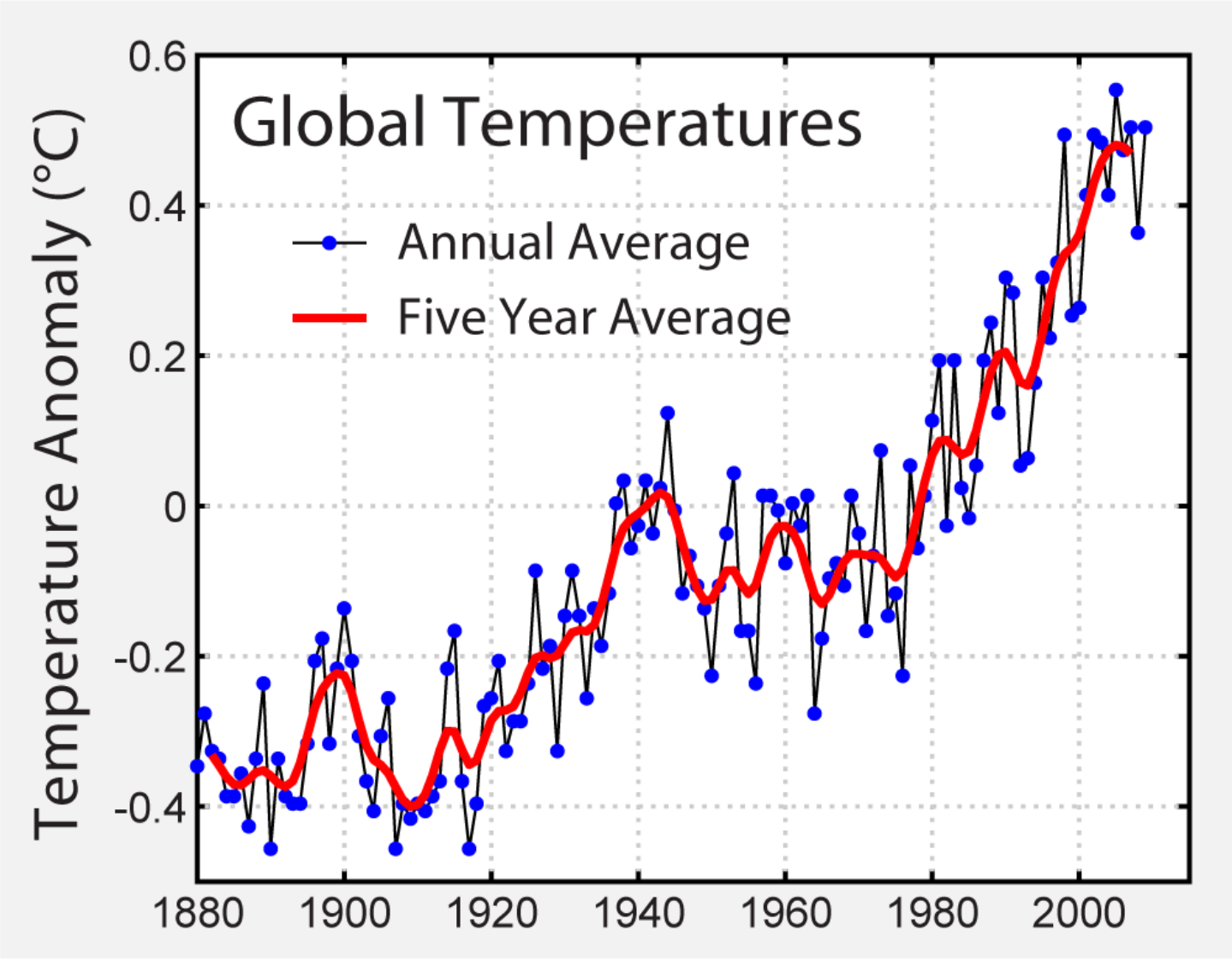
Joint Water Commission



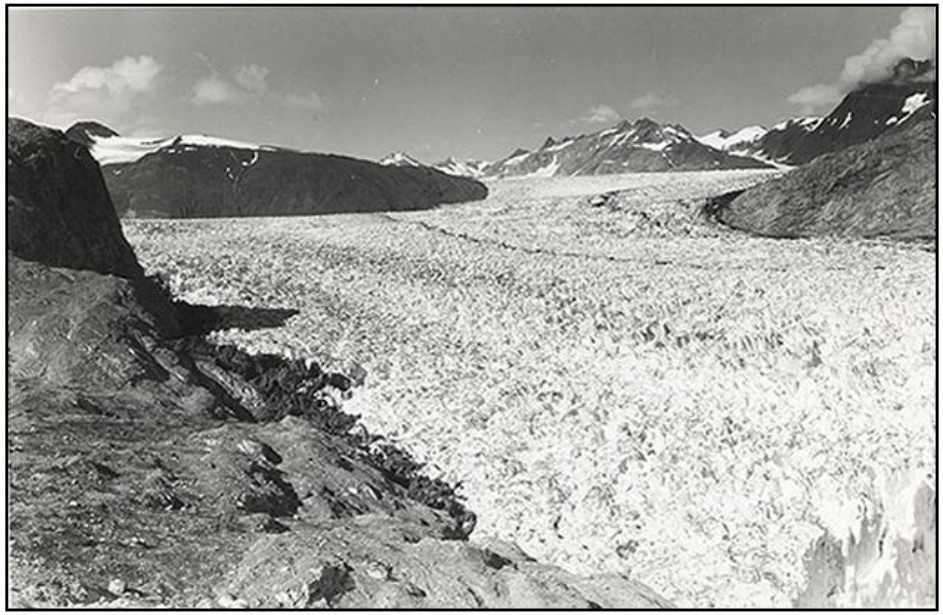
Background – CO2 Emissions



Global Temperature Increases



Recession of the Muir Glacier



Aug, 13, 1941

Aug, 31, 2004

Image Credit: *National Snow and Ice Data Center, W. O. Field, B. F. Molnia*
http://nsidc.org/data/glacier_photo/special_high_res.html

Tualatin Basin Climate Change Study UW – Dr. Palmer, et al.

- Climate Impact Investigation Using 6 Global Circulation Models (GCM)
- Estimated Average Monthly Temps to Increase by as much as 2° F by 2040 and as much as 4° F by 2080
- By 2040, Watershed's Annual Run-off will be less than the Historic Average
- Summer Stream-flows Estimated to Decrease Between 10 and 20%
- PWB's Study Indicated 4 to 5% Increase in Demands Associated with Temperature Increases

Current Projects and Next Steps

- Focus Attention on Climate Impacts to Water Availability in Region and Basin
- Oregon Climate Leadership Initiative
- Oregon Climate Change Research Institute
- Oregon Universities Involved in National Grant Programs and Research
- Investigate Water Demand Increases Through Regional Studies and Historic Relationships
- WMCP Drought and Curtailment Planning