

APPENDIX A

AIR QUALITY CALCULATIONS

Appendix A Contents:

Urbemis Combined Summer Emissions Report for Shoreline – 5 pages

Urbemis Combined Winter Emissions Report for Shoreline – 2 pages

Urbemis Combined Annual Emissions Report for Shoreline – 2 pages

The assumptions used for the Shoreline phase of the project are the same for the summer, winter and annual reports and are shown in the summer report. Construction- and operation-related emissions are shown in these reports.

Urbemis Combined Summer Emissions Report for Terrace – 5 pages

Urbemis Combined Winter Emissions Report for Terrace – 2 pages

Urbemis Combined Annual Emissions Report for Terrace – 2 pages

The assumptions used for the Terrace phase of the project are the same for the summer, winter and annual reports and are shown in the summer report. Construction- and operation-related emissions are shown in these reports. The operation-related emissions for the Shoreline and Terrace phases are one in the same.

Marine Vessel Calculations – 2 pages

Greenhouse Gas (GHG) Emissions Calculations – 1 page

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Users\Lois\Documents\Lois\Miller Env't Inc\Aramburu\Analysis\Aramburu Island.urb924

Project Name: Aramburu

Project Location: Bay Area Air District

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2010 TOTALS (lbs/day unmitigated)	4.23	34.99	20.71	0.01	111.29	1.82	113.11	23.25	1.67	24.92	3,774.20

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.12	0.02	1.55	0.00	0.01	0.01	2.81

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.21	0.05	0.50	0.00	0.08	0.01	42.99

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.33	0.07	2.05	0.00	0.09	0.02	45.80

Construction Unmitigated Detail Report:

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CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
Time Slice 9/6/2010-10/1/2010 Active Days: 20	4.23	34.99	20.71	0.01	111.29	1.82	113.11	23.25	1.67	24.92	3,774.20
Mass Grading 09/06/2010-10/01/2010	4.23	34.99	20.71	0.01	111.29	1.82	113.11	23.25	1.67	24.92	3,774.20
Mass Grading Dust	0.00	0.00	0.00	0.00	111.24	0.00	111.24	23.23	0.00	23.23	0.00
Mass Grading Off Road Diesel	3.66	26.89	15.86	0.00	0.00	1.52	1.52	0.00	1.40	1.40	2,436.04
Mass Grading On Road Diesel	0.49	7.97	2.54	0.01	0.04	0.29	0.33	0.01	0.27	0.28	1,134.33
Mass Grading Worker Trips	0.08	0.13	2.32	0.00	0.01	0.01	0.02	0.00	0.00	0.01	203.82
Time Slice 10/4/2010-10/29/2010 Active Days: 20	3.05	25.09	13.92	0.00	111.24	1.25	112.50	23.23	1.15	24.39	2,376.51
Fine Grading 10/04/2010-10/29/2010	3.05	25.09	13.92	0.00	111.24	1.25	112.50	23.23	1.15	24.39	2,376.51
Fine Grading Dust	0.00	0.00	0.00	0.00	111.24	0.00	111.24	23.23	0.00	23.23	0.00
Fine Grading Off Road Diesel	3.01	25.01	12.47	0.00	0.00	1.25	1.25	0.00	1.15	1.15	2,249.12
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.05	0.08	1.45	0.00	0.01	0.00	0.01	0.00	0.00	0.00	127.39

Phase Assumptions

Phase: Fine Grading 10/4/2010 - 10/29/2010 - Default Paving Description
 Total Acres Disturbed: 16.14
 Maximum Daily Acreage Disturbed: 4.04
 Fugitive Dust Level of Detail: Low
 Onsite Cut/Fill: 75 cubic yards/day; Offsite Cut/Fill: 140.88 cubic yards/day
 On Road Truck Travel (VMT): 0
 Off-Road Equipment:
 1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

6/5/2010 2:57:25 PM

- 1 Pressure Washers (1 hp) operating at a 0.6 load factor for 8 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day
- 1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Mass Grading 9/6/2010 - 10/1/2010 - Default Fine Site Grading Description

Total Acres Disturbed: 16.14

Maximum Daily Acreage Disturbed: 4.04

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 75 cubic yards/day; Offsite Cut/Fill: 140.88 cubic yards/day

On Road Truck Travel (VMT): 281.75

Off-Road Equipment:

- 2 Dumpers/Tenders (16 hp) operating at a 0.38 load factor for 8 hours per day
- 1 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
- 1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
- 1 Pressure Washers (1 hp) operating at a 0.6 load factor for 8 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day
- 1 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
City park	0.21	0.05	0.50	0.00	0.08	0.01	42.99
TOTALS (lbs/day, unmitigated)	0.21	0.05	0.50	0.00	0.08	0.01	42.99

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2010 Temperature (F): 85 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
City park		0.37	acres	16.14	5.97	44.53
					5.97	44.53

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	53.7	1.3	98.3	0.4
Light Truck < 3750 lbs	12.9	2.3	94.6	3.1
Light Truck 3751-5750 lbs	19.8	0.5	99.5	0.0
Med Truck 5751-8500 lbs	6.6	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.9	0.0	77.8	22.2
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	50.0	50.0
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.4	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.2	68.8	31.2	0.0

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.6	0.0	83.3	16.7

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commuter	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
City park				5.0	2.5	92.5

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Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Users\Lois\Documents\Lois\Miller Env't Inc\Aramburu\Analysis\Aramburu Island.urb924

Project Name: Aramburu

Project Location: Bay Area Air District

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2010 TOTALS (lbs/day unmitigated)	4.23	34.99	20.71	0.01	111.29	1.82	113.11	23.25	1.67	24.92	3,774.20

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.05	0.07	0.55	0.00	0.08	0.01	37.20

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.05	0.07	0.55	0.00	0.08	0.01	37.20

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\Users\Lois\Documents\Lois\Miller Env't Inc\Aramburu\Analysis\Aramburu Island.urb924

Project Name: Aramburu

Project Location: Bay Area Air District

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2010 TOTALS (tons/year unmitigated)	0.07	0.60	0.35	0.00	2.23	0.03	2.26	0.46	0.03	0.49	61.51

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.01	0.00	0.14	0.00	0.00	0.00	0.25

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.03	0.01	0.09	0.00	0.01	0.00	7.49

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.04	0.01	0.23	0.00	0.01	0.00	7.74

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Users\Lois\Documents\Lois\Miller Env't Inc\Aramburu\Analysis\Aramburu Island Opt 1.urb924

Project Name: Aramburu

Project Location: Bay Area Air District

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2011 TOTALS (lbs/day unmitigated)	3.53	25.95	17.65	0.00	158.04	1.46	159.50	33.01	1.34	34.35	2,715.68

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.12	0.02	1.55	0.00	0.01	0.01	2.81

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.20	0.05	0.45	0.00	0.08	0.01	42.96

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.32	0.07	2.00	0.00	0.09	0.02	45.77

Construction Unmitigated Detail Report:

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CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
Time Slice 5/2/2011-6/3/2011 Active Days: 25	3.53	25.95	17.65	0.00	158.04	1.46	159.50	33.01	1.34	34.35	2,715.68
Mass Grading 05/02/2011-06/03/2011	3.53	25.95	17.65	0.00	158.04	1.46	159.50	33.01	1.34	34.35	2,715.68
Mass Grading Dust	0.00	0.00	0.00	0.00	158.03	0.00	158.03	33.00	0.00	33.00	0.00
Mass Grading Off Road Diesel	3.43	25.36	15.36	0.00	0.00	1.43	1.43	0.00	1.32	1.32	2,436.04
Mass Grading On Road Diesel	0.03	0.48	0.15	0.00	0.00	0.02	0.02	0.00	0.02	0.02	75.69
Mass Grading Worker Trips	0.07	0.12	2.14	0.00	0.01	0.01	0.02	0.00	0.00	0.01	203.95
Time Slice 6/6/2011-7/1/2011 Active Days: 20	2.87	23.53	13.31	0.00	158.04	1.18	159.21	33.01	1.08	34.09	2,376.59
Fine Grading 06/06/2011-07/01/2011	2.87	23.53	13.31	0.00	158.04	1.18	159.21	33.01	1.08	34.09	2,376.59
Fine Grading Dust	0.00	0.00	0.00	0.00	158.03	0.00	158.03	33.00	0.00	33.00	0.00
Fine Grading Off Road Diesel	2.83	23.46	11.97	0.00	0.00	1.17	1.17	0.00	1.08	1.08	2,249.12
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.04	0.07	1.34	0.00	0.01	0.00	0.01	0.00	0.00	0.00	127.47

Phase Assumptions

Phase: Fine Grading 6/6/2011 - 7/1/2011 - Default Paving Description

Total Acres Disturbed: 16.14

Maximum Daily Acreage Disturbed: 4.04

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 967.67 cubic yards/day; Offsite Cut/Fill: 7.83 cubic yards/day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

6/5/2010 3:01:41 PM

- 1 Pressure Washers (1 hp) operating at a 0.6 load factor for 8 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day
- 1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Mass Grading 5/2/2011 - 6/3/2011 - Default Fine Site Grading Description

Total Acres Disturbed: 16.14

Maximum Daily Acreage Disturbed: 4.04

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 967.67 cubic yards/day; Offsite Cut/Fill: 7.83 cubic yards/day

On Road Truck Travel (VMT): 18.8

Off-Road Equipment:

- 2 Dumpers/Tenders (16 hp) operating at a 0.38 load factor for 8 hours per day
- 1 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
- 1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
- 1 Pressure Washers (1 hp) operating at a 0.6 load factor for 8 hours per day
- 1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day
- 1 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
- 1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
City park	0.20	0.05	0.45	0.00	0.08	0.01	42.96
TOTALS (lbs/day, unmitigated)	0.20	0.05	0.45	0.00	0.08	0.01	42.96

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2011 Temperature (F): 85 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
City park		0.37	acres	16.14	5.97	44.53
					5.97	44.53

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	53.8	0.9	98.7	0.4
Light Truck < 3750 lbs	12.8	1.6	95.3	3.1
Light Truck 3751-5750 lbs	19.8	0.5	99.5	0.0
Med Truck 5751-8500 lbs	6.6	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.9	0.0	77.8	22.2
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	50.0	50.0
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.4	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.2	62.5	37.5	0.0

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.6	0.0	83.3	16.7

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commuter	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
City park				5.0	2.5	92.5

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Users\Lois\Documents\Lois\Miller Env't Inc\Aramburu\Analysis\Aramburu Island Opt 1.urb924

Project Name: Aramburu

Project Location: Bay Area Air District

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2011 TOTALS (lbs/day unmitigated)	3.53	25.95	17.65	0.00	158.04	1.46	159.50	33.01	1.34	34.35	2,715.68

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.04	0.07	0.49	0.00	0.08	0.01	37.14

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (lbs/day, unmitigated)	0.04	0.07	0.49	0.00	0.08	0.01	37.14

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\Users\Lois\Documents\Lois\Miller Env't Inc\Aramburu\Analysis\Aramburu Island Opt 1.urb924

Project Name: Aramburu

Project Location: Bay Area Air District

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10 Dust</u>	<u>PM10 Exhaust</u>	<u>PM10</u>	<u>PM2.5 Dust</u>	<u>PM2.5 Exhaust</u>	<u>PM2.5</u>	<u>CO2</u>
2011 TOTALS (tons/year unmitigated)	0.07	0.56	0.35	0.00	3.56	0.03	3.59	0.74	0.03	0.77	57.71

AREA SOURCE EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.01	0.00	0.14	0.00	0.00	0.00	0.25

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.03	0.01	0.09	0.00	0.01	0.00	7.49

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	<u>ROG</u>	<u>NOx</u>	<u>CO</u>	<u>SO2</u>	<u>PM10</u>	<u>PM2.5</u>	<u>CO2</u>
TOTALS (tons/year, unmitigated)	0.04	0.01	0.23	0.00	0.01	0.00	7.74

Marine Vessel Calculations

Project Name: Aramburu Island

In general, emissions were estimated using the activity and construction or operational information described in the project description.

Emission factors for marine vessels are expressed in terms of grams of emissions (of a particular pollutant) per kiloWatt-hour and

are based on EPA's Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data formula

KiloWatt-hours are the product of in-use horsepower converted to kiloWatts times hours of use.

Project emissions were then calculated by kiloWatt-hours and then converted from grams to pounds

Emission Factor Formula

$E=a*(FL)^x+b$ FL=fractional load	Pollutant	x	b	a	Source
	PM	1.50	0.26	0.01	U.S. EPA, 2000, pg 5-3
	Nox	1.50	10.45	0.13	
	SO2	na	ns	2.37	
	CO	1.00	0.00	0.84	
	CO2	1.00	648.60	44.10	

Non-Oceangoing Engine	Cruising	Slow Cruising	Maneuvering	Source
Load Factor	0.80	0.40	0.20	U.S. EPA, 2000, pg 5-6

For sulfur	Source
$E=a(\text{Fuel Sulfur Flow})+b$	U.S. EPA, 2000, pg 5-3
Fuel consumption=14.12/load +205.717	U.S. EPA, 2000, pg 5-3
Sulfur % of fuel	0.02 City of Richmond, 2008, pg D-8

Emission Factors (grams/kiloWatt-hour)

Emission Factor	grams/kW-hr		
	Cruising	Slow Cruising	Maneuvering
PM	0.26	0.28	0.32
NOx	10.62	10.95	11.85
SO2	7.95	8.58	9.84
CO	1.05	2.09	4.19
CO2	703.73	758.85	869.10

Construction Activity Assumptions

	Horsepower	Kilowatt	Conversion	Source
Transport Barge Engine Size	460	343.02	1.34	http://www.pushboats-barges.com/2078.html
Ferry Barge Engine Size	230	171.51	1.34	http://www.pushboats-barges.com/2078.html

To calculate maximum emissions per day, assumed construction activity plus one barge trip

Conservative approach assumed transport barge transported from staging area to island

Maximum trips per day (Equipment transportation)				Hours per Day	Hours per Day	Hours per Day
	Miles	MPH	Quantity	Cruising	Slow Cruising	Maneuvering
Transport Barge Engine Size	2.00	6	1	0	0.7	0.1
Ferry Barge Engine Size (Staging area to deep water)	1.50	6	1	0	0.0	0.0
Ferry Barge Engine Size (deep water to island)	0.50	6	1	0	0.0	0.0

Construction Emissions (pounds/day)

Emissions	Cruising	pounds/day Slow Cruising	Maneuvering	Total	pounds/gram Conversion
PM	0.00	0.14	0.02	0.16	0.002
NOx	0.00	5.51	0.75	6.25	
SO2	0.00	4.32	0.62	4.94	
CO	0.00	1.05	0.26	1.32	
CO2	0.00	381.78	54.66	436.43	

Round Trips per Year

Equipment	Shoreline	Terrace	Total
Equipment	12.00	12.00	24.00
Materials	2.00	1.00	3.00
Total			27.00

Construction Emissions (tons/year)

Emissions	Cruising	tons/year Slow Cruising	Maneuvering	Total	ton-day/pound-year Conversion
CO2	0.00	0.001	0.000	0.016	730,000

Operational Activity Assumptions

Motor Boat Engine Size	Horsepower	Kilowatt	Conversion
	20	14.91	1.34

Motor Boat Operations	Quantity	Round Trips per Day (1x/2 months)	Hours per Day Cruising	Hours per Day Slow Cruising	Hours per Day Maneuvering
	1	1	1	1	1

Operational Emissions (pounds/day)

Emissions	Cruising	pounds/day Slow Cruising	Maneuvering	Total	pounds/gram Conversion
PM	0.01	0.01	0.01	0.03	0.002
NOx	0.35	0.36	0.39	1.10	
SO2	0.26	0.28	0.32	0.87	
CO	0.03	0.07	0.14	0.24	
CO2	23.09	24.90	28.52	76.50	

Operational Emissions (tons/year)

Emissions	Cruising	tons/year Slow Cruising	Maneuvering	Total	ton-day/pound-year Conversion
CO2	0.00019	0.00020	0.00023	0.00063	730,000

Sources

City of Richmond, Honda Port of Entry Environmental Impact Report, Volume I and Volume II-Technical Appendices, 2008.
 U.S. Environmental Protection Agency, Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data, February 2000.

Greenhouse Gas (GHG) Emissions Calculations

Project Name: Aramburu Island

Greenhouse Gas (GHG) Emissions from Area Sources and Vehicles

	Scenario 1		
	Annual Emissions		
	pounds (lbs.)	Tons	Metric Tons
URBEMIS2007 Area Emissions	0	0	0
URBEMIS2007 Vehicle Emissions	15,481	7.74	7.02
Total Emissions (area sources + vehicles)	15,481	8	7

Indirect Greenhouse Gas (GHG) Emissions from Project use of Electricity (Power Plant Emissions)

Estimated Project Annual Electrical Use: 0 kWh (kilowatt hours)/year
0 mWh (megawatt hours)/year

Indirect GHG gases	Emission Factor lb/mWh	Annual		CO2 Equivalent Factor	Annual
		Project Electricity mWh	GHGs metric tons		CO2 Equivalent Emissions (metric tons)
Carbon Dioxide (CO2)	521	0	0	1	0
Nitrous Oxide (N2O)	0.0037	0	0.0	296	0
Methane (CH4)	0.0067	0	0.0	23	0
Total Indirect GHG Emissions from Project Electricity Use=					0

Total Annual Greenhouse Gas (GHG) Emission from Project Operations -- All Sources (CO2 equivalent Metric Tons)

Area Sources	0	0.0%
Vehicles	7.02	100.0%
Electrical Use	0	0.0%
Total=	7.02	100.0%

Notes and References:

Total Emissions from Indirect Electricity Use
Formula and Emission Factor from The California Climate Action Registry Report Protocol
Reporting Entity-wide Greenhouse Gas Emissions 2008
Pg. 33 (CCARRP) gives Equations

Pg. 36 (CCARRP - April 2008 update) gives CO2 output emission rate (lbs/mWh)
878.71 (lbs/mWh)

Pg. 36 (CCARRP) gives CO2 equivalency factors

Pg. 36 (CCARRP) gives Methane and Nitrous Oxide electricity emission factors (lbs/mWh)
Methane - 0.0067 (lbs/mWh)
Nitrous Oxide - 0.0037 (lbs/mWh)

PG&E Carbon Footprint Calculator gives CO2 output emission rate (lbs/kWh)
PG&E 2010 estimate 0.521 lbs/kWh

lbs/metric ton = 2204.62

Percentage of 25,000 0.02809%
Percentage of 169 Million 0.00000416%

Maximum Year	Tons from URBEMIS	Metric Tons
Construction CO2	119.236	108