
To: EPA Region 9
75 Hawthorne St.
San Francisco, CA 94105

From: Stephen Carter, Paradigm Environmental
Eric Wineteer, Paradigm Environmental

Date: 02/16/2021

Re: Dominguez Channel and Los Cerritos Channel CII Metals Load Analysis

The purpose of this memorandum is to summarize the modeling approach for quantifying pollutant loads from commercial, industrial, and institutional (CII) facilities within Dominguez Channel and Los Cerritos Channel watersheds and to report the load reductions necessary to meet applicable water quality objectives for metals. To estimate the pollutant loading from CII facilities in the two watersheds, the most recent version of Watershed Management Modeling System (WMMS 2.0) was used. WMMS 2.0 is a hydrology and water quality model and decision support platform for the Los Angeles County (County) coastal watersheds (LACPW 2020). This memorandum is organized into the following sections:

1. **Model Configuration:** overview of the modeling system, study area, and determination of the critical period of analysis.
2. **Baseline Loads and Water Quality Targets:** modeled loads for both watersheds during a critical period and determination of the load reduction targets to meet applicable waste load allocations (WLAs) associated with Total Maximum Daily Loads (TMDLs).
3. **CII Loads:** estimation of the CII component of the watershed loads during the critical period and comparison of scenarios considering different CII-designated areas based on parcel size thresholds.

1 MODEL CONFIGURATION

The watershed modeling component within WMMS 2.0 is the Loading Simulation Program in C++ (LSPC) model. LSPC provides hourly simulation of stormwater runoff and water quality across the County and was used to simulate the baseline pollutant loads in this CII analysis. The LSPC model was configured using the Dominguez Channel and Los Cerritos subwatersheds from WMMS 2.0. WMMS 2.0 subwatersheds do not cover the area around the Los Angeles Harbor, and therefore, were not explicitly modeled. Instead, subwatersheds from the City of Long Beach Watershed Management Program (WMP) were used to delineate the Harbor area. Additionally, because the most recent version of WMMS 2.0 was used, the loads calculated vary slightly from older versions of WMMS 2.0. Figure 1-1 shows the WMMS 2.0 model subwatersheds and the Harbor subwatersheds that comprise the two watersheds in the CII analysis. Dominguez non-harbor watersheds cover 70,250 acres of land, Dominguez harbor watersheds cover 6,414 acres, and Los Cerritos watersheds cover 24,007 acres. Pollutant loads from these subwatersheds were estimated using the annual unit-area loads from adjacent WMMS 2.0 subwatersheds containing similar land use and rainfall characteristics.

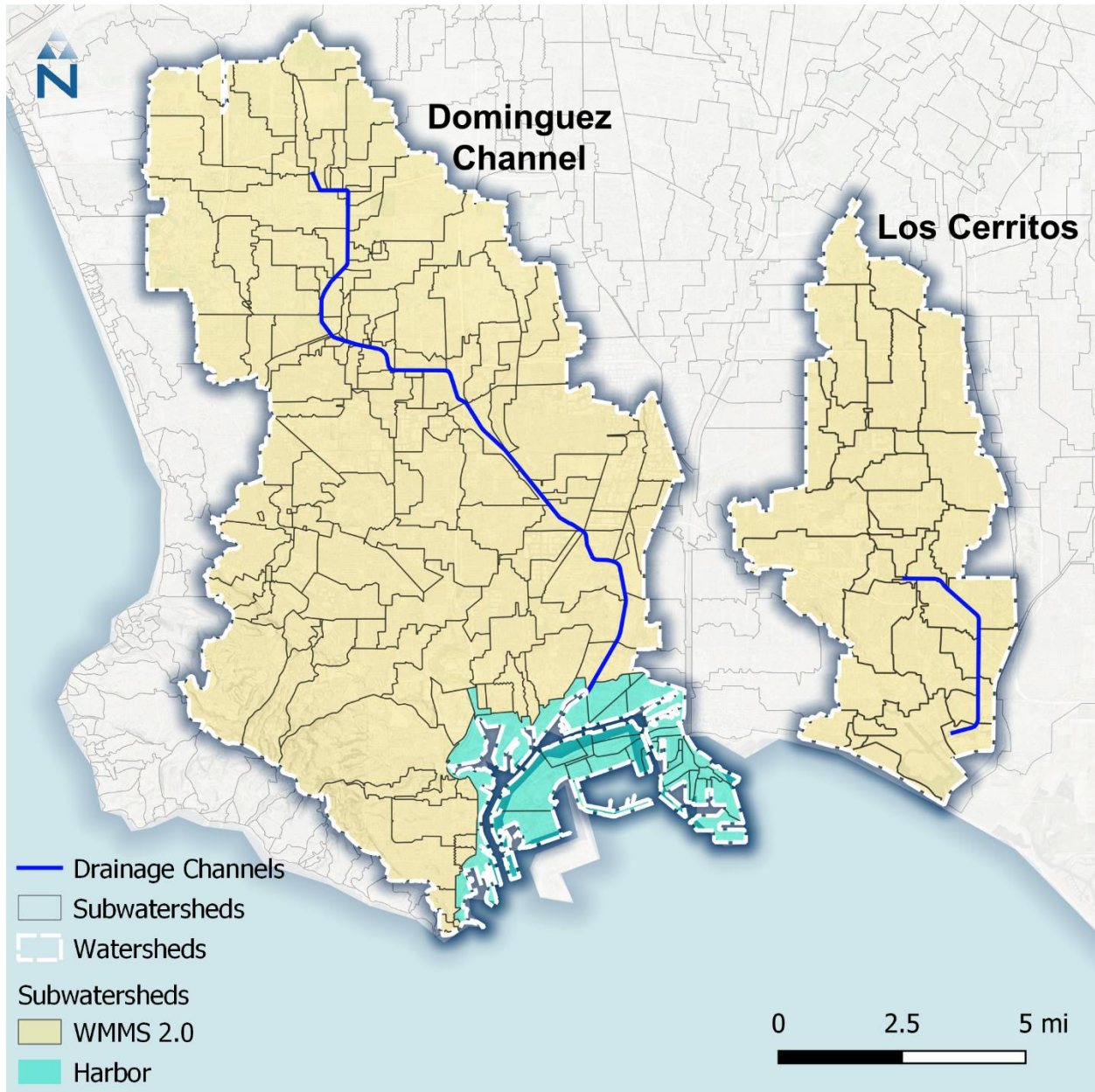


Figure 1-1. WMMS 2.0 model subwatersheds and the Harbor area subwatersheds within the Dominguez Channel and Los Cerritos watersheds.

Runoff and pollutant loads in the LSPC model were driven by the WMMS 2.0 hydrologic response units (HRUs). HRUs represent discrete combinations of land characteristics (e.g., land use/cover, geology, slope) that dictate the quantity and quality of runoff in each model subwatershed. A summary of the HRU distributions by land use in the Dominguez Channel and Los Cerritos watersheds are depicted in Figure 1-2. Because the Harbor area was not included in the WMMS 2.0 HRU coverage, HRU representation in this area was approximated by proximal and similar subwatersheds. This process is described in detail in Section 2.

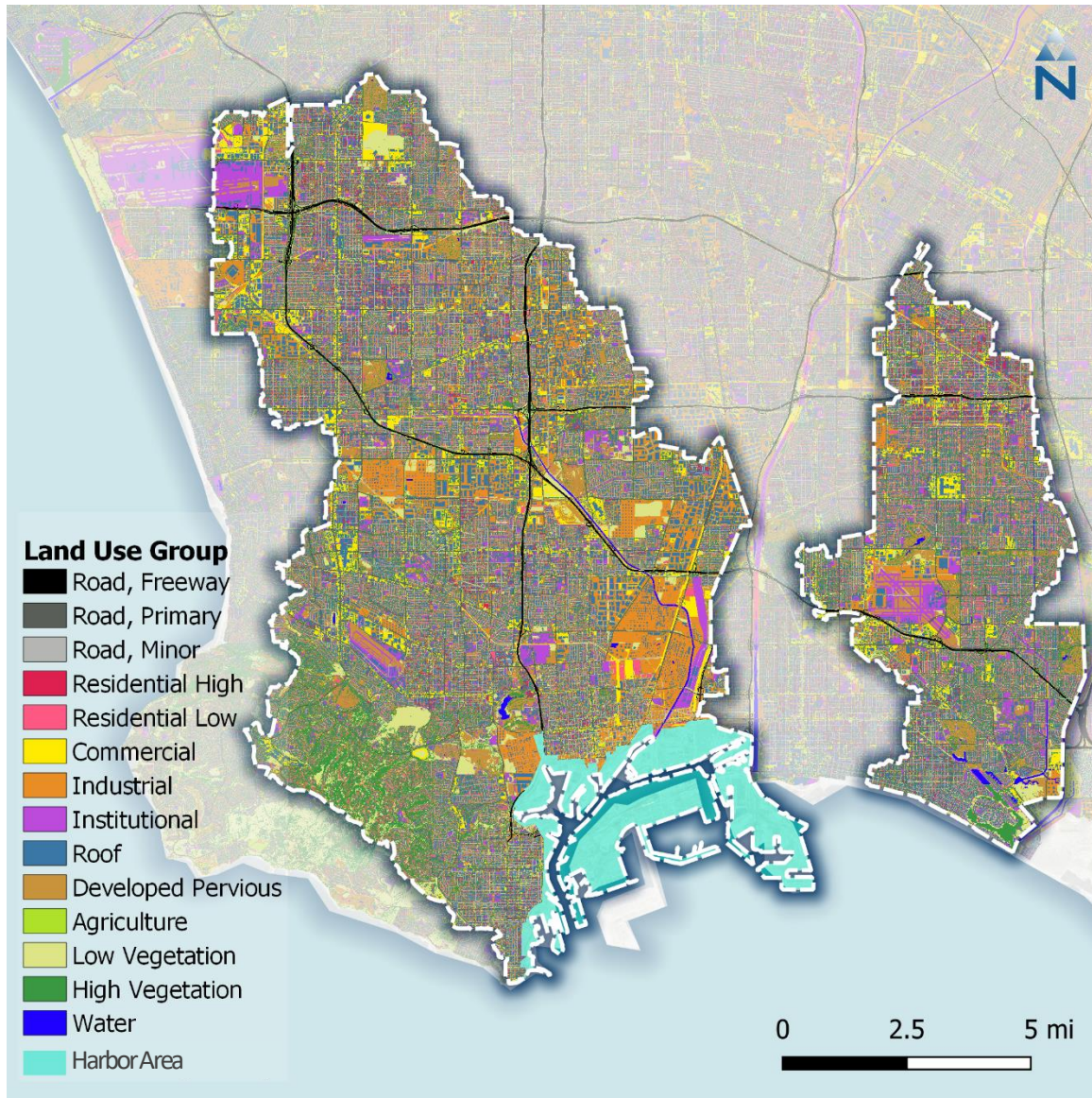


Figure 1-2. Land use breakdown for the Dominguez Channel and Los Cerritos watersheds.

The period of analysis was determined by the 90th percentile critical year, which is consistent with methods provided in the Los Angeles Regional Water Quality Control Board Reasonable Assurance Analysis (RAA) Guidelines (LARWQCB 2014) and used in the RAA for the Los Cerritos Channel Watershed Management Program (LCCWG 2015). The critical year was determined by evaluating the 90th percentile of average 24-hour rainfall intensity (average rainfall per wet day) in the 28-year historical daily rainfall timeseries from WMMS 2.0. This historical rainfall timeseries covers water year (WY) 1991 through 2018. The 90th percentile values for the 28-year period were 0.64 inches per wet day in the Dominguez Channel watershed and 0.65 inches per wet day in the Los Cerritos watershed. Per the RAA Guidelines, these values were compared to the most recent 10 years of data – WY 2009 through 2018. WY 2010 was selected as the critical water year because its average rainfall per wet day most closely matched the 90th percentile values from the 28-year historical rainfall timeseries in both watersheds. Table 1-1 shows a summary of average rainfall per wet day for the critical water year analysis.

Table 1-1. Average Rainfall Per Wet Day (Water Years 2009-2011 vs. 28-year Average and 90th Percentile)

Water Year	Dominguez Channel	Los Cerritos
2009	0.48	0.50
2010	0.62	0.66
2011	0.55	0.52
2012	0.46	0.36
2013	0.29	0.32
2014	0.36	0.32
2015	0.45	0.45
2016	0.37	0.37
2017	0.60	0.58
2018	0.35	0.32
Average (1991 - 2018)	0.48	0.46
90th Percentile (1991 - 2018)	0.64	0.65

Blue highlighted row indicates the WY, within the last 10, with the smallest difference between the 90th percentile value from the 28-year record (orange highlighted row)

2 BASELINE LOADS AND WATER QUALITY TARGETS

The baseline watershed loads and the water quality targets for copper and zinc were used to determine the necessary load reductions. To simulate baseline loads for copper and zinc during the critical year LSPC was used for the entire Los Cerritos watershed and the portion of the Dominguez Channel watershed included in the WMMS 2.0 model. To simulate baseline loads for the Harbor subwatersheds that were not part of the model, unit-area loads from adjacent model subwatersheds with similar land use characteristics were used to estimate the contributing loads in those areas. Unit-area loads were calculated for each subwatershed by dividing the annual load for each HRU by the sum of the HRU area (e.g., load from industrial land use was divided by total industrial area in each subwatershed).

The water quality targets for copper and zinc were calculated using methods consistent with those used in the Dominguez Channel Enhanced Watershed Management Plan (EWMP) and Los Cerritos Channel WMP, and the corresponding TMDLs for each watershed. Target loads for each pollutant were calculated by multiplying modeled annual volumes by California Toxics Rule (CTR) numeric concentration targets. Annual volumes in the WMMS 2.0 subwatersheds were simulated in LSPC, while annual volumes in the Harbor area were estimated from the unit-area volumes of adjacent model subwatersheds. The CTR numeric targets for concentrations used in this analysis are shown in Table 2-1. The baseline watershed loads, water quality targets, and required reductions are reported in Table 2-2. All values are total recoverable metals.

Table 2-1. Numeric targets for metals concentrations

Watershed	Copper Concentration (µg/L)	Zinc Concentration (µg/L)
Dominguez Channel	9.7	69.6
Los Cerritos	4.7	46.0

Table 2-2. Target metal loads and load reductions

Constituent	Baseline Load (kg/yr)	Target Load (kg/yr)	Load Reduction (kg/yr)	Percent Change
Dominguez Channel				
Copper	6,119	572	5,547	90.7%
Zinc	28,044	4101	23,943	85.4%
Los Cerritos				
Copper	1,019	87	932	91.5%
Zinc	4,453	849	3,604	80.9%

3 CII METALS LOADING

To quantify loading from CII areas, land use codes from the Los Angeles County Tax Assessor's Parcel dataset were used to designate parcels with CII land uses. Existing permitted facilities were identified using geolocated addresses and fuzzy matching algorithms (a technique that matches similar but non-identical strings) to cross reference parcel data and permit data from the EPA and LA RWQCB¹. Parcels found to be permitted are not included in the CII designation, and are instead classified according to their permit type. Figure 3-1 illustrates the CII parcel designations used to quantify loading (some parcel and permit designations are grouped together for clarity).

After identifying unpermitted CII parcels, the total area and the impervious area for each parcel was calculated, then binned into 7 parcel size scenarios based on different minimum size thresholds. Table 3-1 outlines the parcel size scenarios used in the evaluation, the number of unpermitted CII parcels each scenario contains, and the total parcel area across the watershed for each scenario.

Table 3-1. CII load scenarios based on parcel size thresholds

No.	Parcel Size Threshold	Dominguez Channel		Los Cerritos	
		# of Parcels	Total Area (acres)	# of Parcels	Total Area (acres)
1	All Unpermitted CII parcels	17,377	22,451	4,373	6,201
2	> 1 total acres	3,852	18,528	907	5,145
3	> 1 impervious acres	2,965	10,649	671	2,579
4	> 5 total acres	847	11,892	226	3,677
5	> 5 impervious acres	467	5,164	114	1,387
6	> 10 total acres	322	8,217	94	2,753
7	> 10 impervious acres	151	2,989	29	773
-	Existing Permitted Facilities (Includes Harbor Facilities)	936	14,661	76	1,652

¹ The method for geocoding typically only links one address to one parcel. Because some industrial facilities may span multiple parcels, this method may result in an underestimate of pollutant loads occurring from existing permitted facilities.

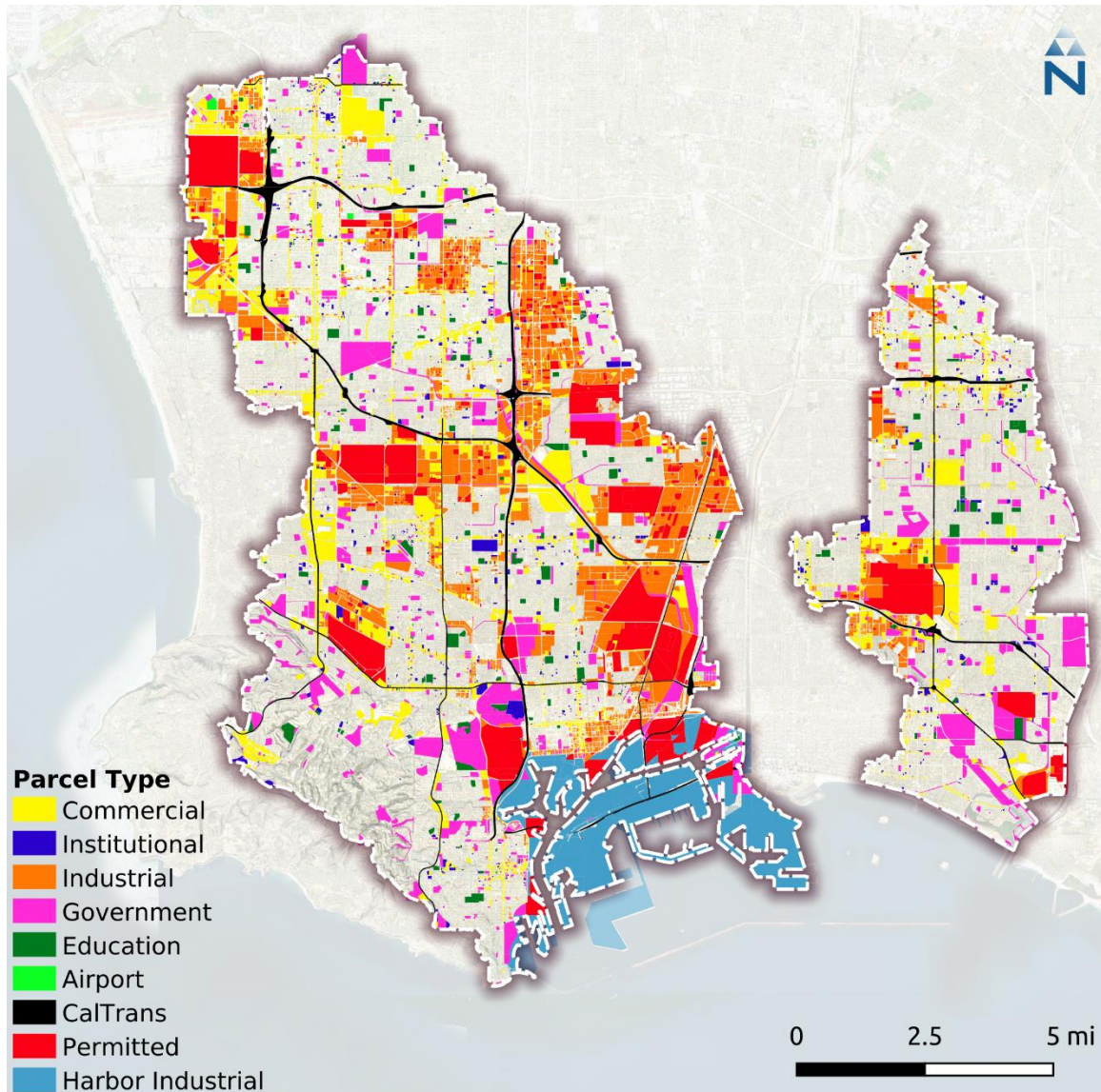


Figure 3-1. CII parcel designation for the Dominguez Channel and Los Cerritos watersheds.

Total copper and zinc loads from CII areas were estimated for each scenario to provide a comparison of loading across a range of parcel sizes for CII facilities. For each scenario, the CII parcels that met the parcel size threshold were used to sample the WMMS 2.0 HRUs. Pollutant loads for each scenario were then calculated using a unit-area load for each HRU in each subwatershed multiplied by the total HRU area in the CII parcels. Unit-area loads are calculated by dividing an HRU's total annual load by the corresponding total HRU area in each subwatershed. Figure 3-2 shows the total annual load for zinc and copper for Dominguez Channel and Los Cerritos Channel.

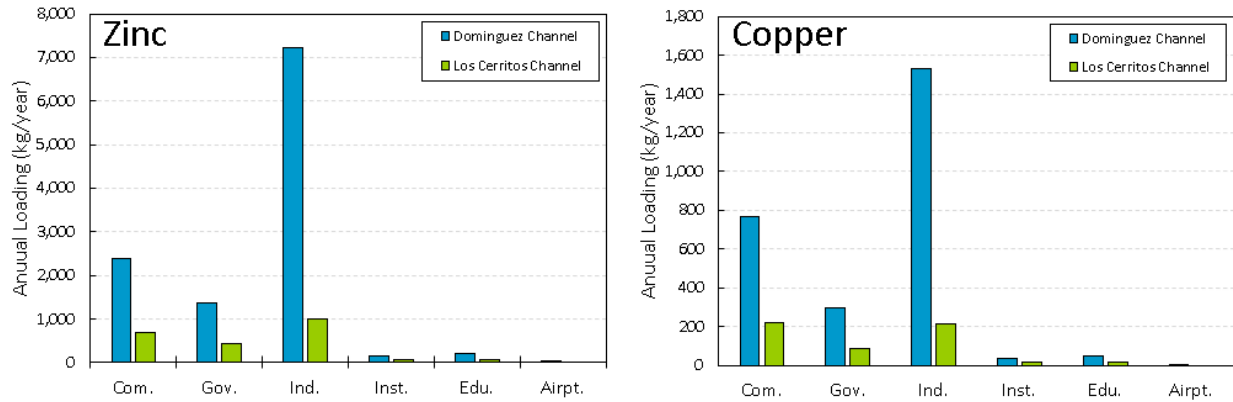


Figure 3-2. Zinc and copper loads from water year 2010 for Dominguez Channel and Los Cerritos Channel.

Table 3-2 reports the total load from CII land uses for WY 2010. Table 3-3 and Table 3-4 report the copper and zinc load for each CII land use in WY 2010 for Dominguez Channel and Los Cerritos Channel, respectively. Figure 3-3 and Figure 3-4 show the copper and zinc load for each CII land use in WY 2010 for Dominguez Channel and Los Cerritos Channel, respectively. Note that these tables differentiate between harbor industrial loads and other permitted loads, because harbor industrial represents such a large source of loading.

Table 3-2. Copper and zinc load from CII area in Dominguez Channel and Los Cerritos Channel

No.	Parcel Size Threshold	Dominguez Channel		Los Cerritos	
		Copper Load (kg/yr)	Zinc Load (kg/yr)	Copper Load (kg/yr)	Zinc Load (kg/yr)
1	All Unpermitted CII parcels	2,680.63	11,370.37	556.85	2,264.46
2	> 1 total acres	2,147.52	9,251.16	428.36	1,792.34
3	> 1 impervious acres	2,011.73	8,639.86	404.46	1,684.30
4	> 5 total acres	1,239.01	5,405.96	259.99	1,131.49
5	> 5 impervious acres	984.81	4,255.55	214.48	917.81
6	> 10 total acres	782.87	3,439.97	174.02	778.87
7	> 10 impervious acres	574.43	2,477.66	122.65	537.72
-	Permitted Facilities Load	1,533.79	7,712.28	142.12	741.01
-	Harbor Industrial Load (Dominguez only)	1,151.63	5,286.95	-	-

Table 3-3. Copper and zinc loading by CII land use for Dominguez Channel

No.	Parcel Size Threshold	Copper Load (kg/yr)						Zinc Load (kg/yr)					
		Com	Ind	Inst	Gov	Edu	Apt	Com	Ind	Inst	Gov	Edu	Apt
1	All Unpermitted CII parcels	765.12	1,532.74	35.87	293.81	49.12	3.97	2,385.54	7,220.85	157.51	1,373.81	217.27	15.40
2	> 1 total acres	526.27	1,262.94	26.85	280.57	46.92	3.97	1,642.72	5,951.87	118.44	1,314.97	207.77	15.40
3	> 1 impervious acres	489.89	1,215.65	23.27	234.71	44.24	3.97	1,518.43	5,719.53	102.07	1,088.76	195.67	15.40
4	> 5 total acres	271.63	679.15	11.63	232.26	40.37	3.97	857.35	3,198.26	52.66	1,102.05	180.25	15.40
5	> 5 impervious acres	219.46	598.15	9.48	126.82	26.94	3.97	680.49	2,803.66	41.26	594.47	120.27	15.40
6	> 10 total acres	161.39	384.74	9.29	200.59	23.90	2.96	513.42	1,806.31	42.24	954.77	111.73	11.52
7	> 10 impervious acres	128.51	318.29	8.68	107.07	8.92	2.96	403.04	1,488.85	37.89	496.63	39.73	11.52
-	Permitted Facilities Load	1,533.79						7,712.28					
-	Harbor Industrial Load (Dominguez only)	1,151.63						5,286.95					

Table 3-4. Copper and zinc loading by CII land use for Los Cerritos Channel

No.	Parcel Size Threshold	Copper Load (kg/yr)						Zinc Load (kg/yr)					
		Com	Ind	Inst	Gov	Edu	Apt	Com	Ind	Inst	Gov	Edu	Apt
1	All Unpermitted CII parcels	222.76	212.68	15.92	89.45	16.04	-	702.74	996.69	68.62	424.99	71.42	-
2	> 1 total acres	142.83	172.36	12.25	85.51	15.41	-	455.57	807.19	52.76	408.05	68.78	-
3	> 1 impervious acres	131.01	166.42	10.70	81.00	15.32	-	411.03	775.78	45.99	383.17	68.34	-
4	> 5 total acres	67.45	104.30	2.34	72.17	13.72	-	222.01	486.72	11.14	350.09	61.54	-
5	> 5 impervious acres	50.41	96.02	1.73	56.38	9.94	-	152.86	445.62	8.29	266.70	44.34	-
6	> 10 total acres	37.35	68.13	1.48	58.56	8.50	-	127.85	317.18	7.14	287.82	38.88	-
7	> 10 impervious acres	21.72	63.88	1.48	29.24	6.34	-	65.61	296.77	7.14	139.48	28.72	-
-	Permitted Facilities Load	142.12						741.01					

Table 3-5. Copper and zinc target load reduction by CII land use for Dominguez Channel

No.	Parcel Size Threshold	Copper Load (kg/yr)						Zinc Load (kg/yr)					
		Com	Ind	Inst	Gov	Edu	Apt	Com	Ind	Inst	Gov	Edu	Apt
1	All Unpermitted CII parcels	693.96	1390.20	32.53	266.49	44.55	3.60	2037.25	6166.61	134.51	1173.23	185.55	13.15
2	> 1 total acres	477.33	1145.49	24.35	254.48	42.56	3.60	1402.88	5082.90	101.15	1122.98	177.44	13.15
3	> 1 impervious acres	444.33	1102.59	21.11	212.88	40.13	3.60	1296.74	4884.48	87.17	929.80	167.10	13.15
4	> 5 total acres	246.37	615.99	10.55	210.66	36.62	3.60	732.18	2731.31	44.97	941.15	153.93	13.15
5	> 5 impervious acres	199.05	542.52	8.60	115.03	24.43	3.60	581.14	2394.33	35.24	507.68	102.71	13.15
6	> 10 total acres	146.38	348.96	8.43	181.94	21.68	2.68	438.46	1542.59	36.07	815.37	95.42	9.84
7	> 10 impervious acres	116.56	288.69	7.87	97.11	8.09	2.68	344.20	1271.48	32.36	424.12	33.93	9.84
-	Permitted Facilities Load	1,391.15						6,586.29					
-	Harbor Industrial Load (Dominguez only)	1,044.53						4,515.06					

Table 3-6. Copper and zinc target load reduction by CII land use for Los Cerritos Channel

No.	Parcel Size Threshold	Copper Load (kg/yr)						Zinc Load (kg/yr)					
		Com	Ind	Inst	Gov	Edu	Apt	Com	Ind	Inst	Gov	Edu	Apt
1	All Unpermitted CII parcels	203.83	194.60	14.57	81.85	14.68	-	568.52	806.32	55.51	343.82	57.78	-
2	> 1 total acres	130.69	157.71	11.21	78.24	14.10	-	368.56	653.02	42.68	330.11	55.64	-
3	> 1 impervious acres	119.87	152.27	9.79	74.12	14.02	-	332.52	627.61	37.21	309.98	55.29	-
4	> 5 total acres	61.72	95.43	2.14	66.04	12.55	-	179.61	393.76	9.01	283.22	49.79	-
5	> 5 impervious acres	46.13	87.86	1.58	51.59	9.10	-	123.66	360.51	6.71	215.76	35.87	-
6	> 10 total acres	34.18	62.34	1.35	53.58	7.78	-	103.43	256.60	5.78	232.85	31.45	-
7	> 10 impervious acres	19.87	58.45	1.35	26.75	5.80	-	53.08	240.09	5.78	112.84	23.23	-
-	Permitted Facilities Load	130.04						599.48					

Dominguez Channel

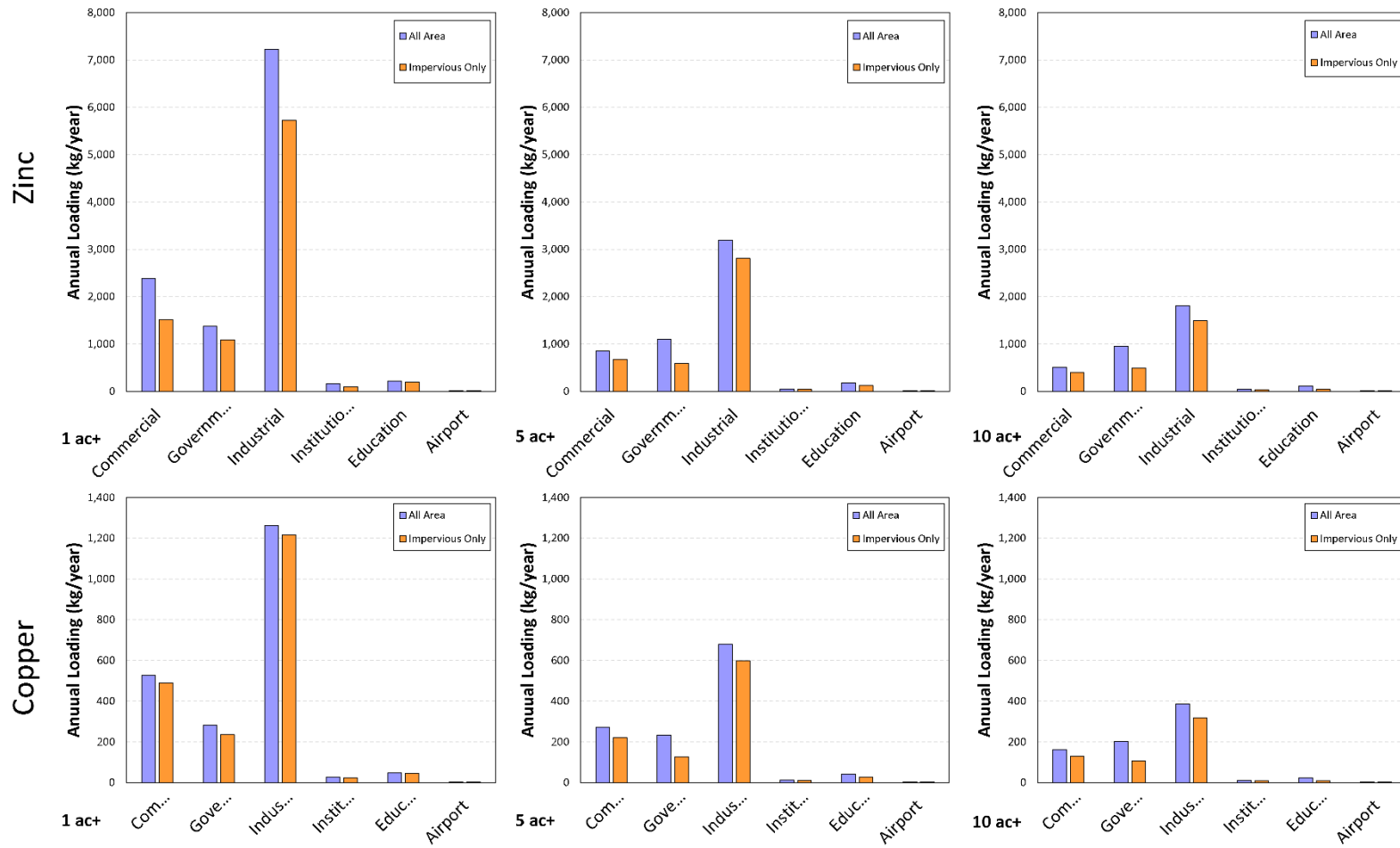


Figure 3-3. Modeled copper and zinc loading for 1-, 5-, and 10-acre CII parcels in Dominguez Channel.

Los Cerritos Channel

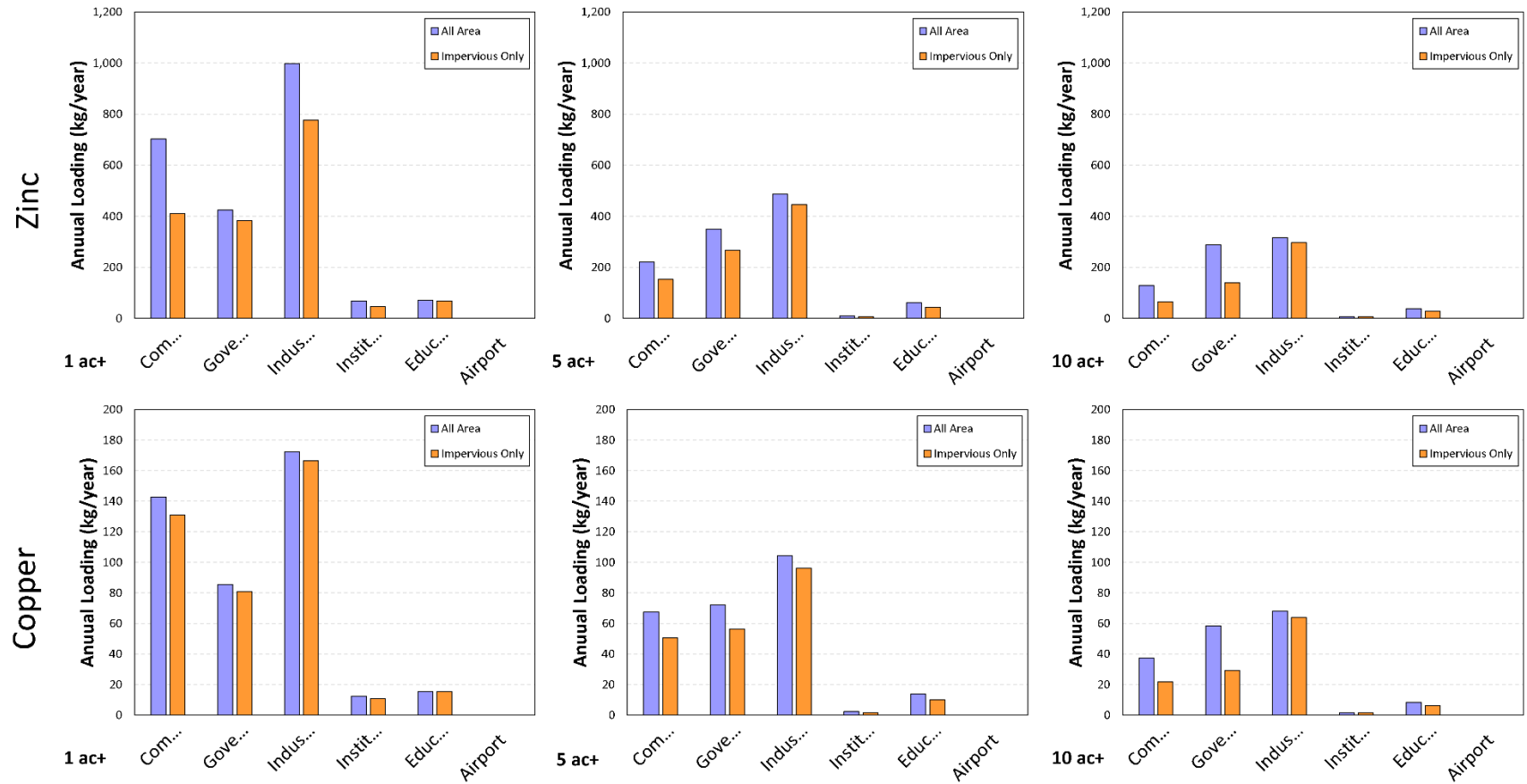


Figure 3-4. Modeled copper and zinc loading for 1-, 5-, and 10-acre CII parcels in Los Cerritos Channel.

REFERENCES

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