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Pasadena Water and Power

Perchlorate from the Colorado River

Presented by
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Presented to
United States Environmental Protection Agency
at the Jet Propulsion Laboratories, Pasadena

April 30, 2013

Henderson NV BMI / PEPCON

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- Perchlorate Was Released since the 1950's

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Henderson NV 1988

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- Many Tons of Perchlorate Were Released on One Day

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Henderson NV 1998

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Perchlorate & the CRA

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Water Delivered to Raymond Basin

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- Water from the CRA had Perchlorate
- It was Blended with SWP Water which Had no Perchlorate
- Than Blended Water was applied and injected into Raymond Basin and Blended Further with Local Water

6

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Imported Water

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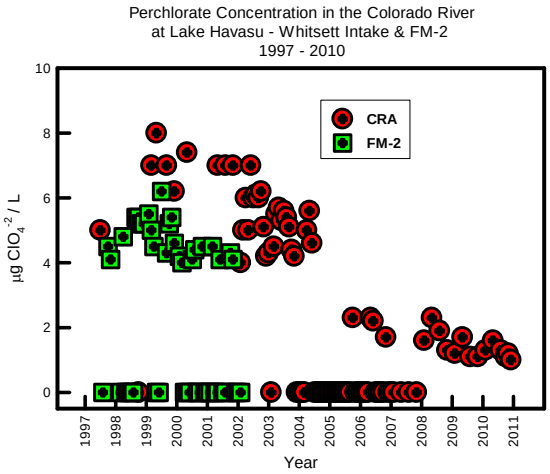

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Raymond Basin Water

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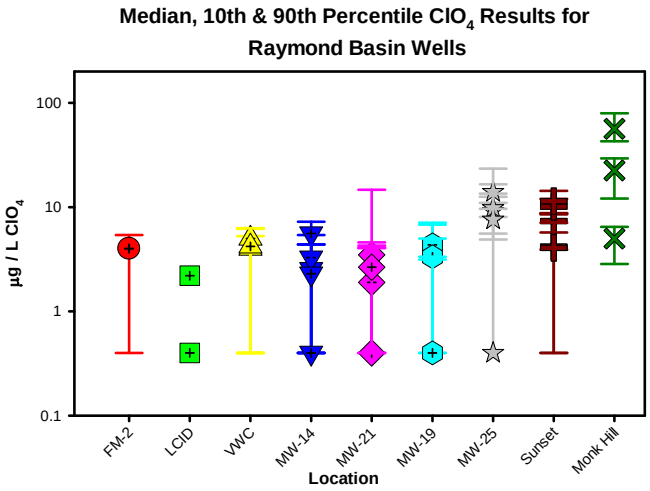

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Kruskal-Wallis One Way Analysis of Variance on Ranks the Highest Median

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Group	N	Median	25%	75%
FM-2	47	4.0	0.4	4.5
VWC 3	23	5.0	0.4	5.6
MW-14-3	53	5.6	4.1	6.5
MW-19-2	52	4.4	0.4	5.4
MW-21-1	52	3.5	0.4	10.3
MW-25-2	25	14.0	13.2	15.0
Sunset	148	11.4	10.5	12.5

H = 238 with 6 degrees of freedom. (P = <0.001)

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Dunn's Pairwise Comparison of High Level Locations

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Comparison	Diff of Ranks	Q	P<0.05
MW-25-2 vs FM-2	**267**	**9.3**	**Yes**
MW-25-2 vs MW-19-2	246	8.7	Yes
MW-25-2 vs VWC 3	228	6.8	Yes
MW-25-2 vs MW-14-3	205	7.3	Yes
MW-25-2 vs MW-21-1	192	6.8	Yes
MW-25-2 vs Sunset	**65**	**2.6**	**No**
Sunset vs FM- 2	**202**	**10**	**Yes**
Sunset vs MW-19-2	181	9.7	Yes
Sunset vs VWC 3	163	6.3	Yes
Sunset vs MW-14-3	140	7.6	Yes
Sunset vs MW-21-1	128	6.9	Yes
MW-21-1 vs FM-2	**74**	**3.2**	**Yes**
MW-21-1 vs MW-19-2	54	2.4	No
MW-21-1 vs VWC 3	36	1.2	Do Not Test
MW-21-1 vs MW-14-3	13	0.57	Do Not Test
MW-14-3 vs FM- 2	**62**	**2.7**	**No**
MW-14-3 vs MW-19-2	41	1.8	Do Not Test
MW-14-3 vs VWC 3	23	0.79	Do Not Test
VWC 3 vs FM- 2	39	1.3	Do Not Test
VWC 3 vs MW-19-2	18	0.62	Do Not Test
MW-19-2 vs FM- 2	**21**	**0.89**	**Do Not Test**

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Kruskal-Wallis One Way Analysis of Variance on Ranks the Middle Median

Pasadena Water and Power

Group	N	Median	25%	75%
FM-2	47	4.0	0.4	4.5
VWC 4	25	4.2	4.0	5.2
MW-14-1	51	2.5	0.4	3.8
MW-19-4	52	0.4	0.4	2.6
MW-21-4	52	1.9	0.4	3.0
MW-25-1	25	9.2	6.3	10.1
Bangham	285	7.4	6.3	8.0

H = 301 with 6 degrees of freedom. (P = <0.001)

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Dunn's Pairwise Comparison of Middle Level Locations

Pasadena Water and Power

Comparison	Diff of Ranks	Q	P<0.05
MW-25-1 vs MW-19-4	**339**	**9.0**	**Yes**
MW-25-1 vs MW-21-4	**324**	**8.6**	**Yes**
MW-25-1 vs MW-14-1	**307**	**8.1**	**Yes**
MW-25-1 vs FM-2	**291**	**7.6**	**Yes**
MW-25-1 vs VWC 4	**237**	**5.4**	**Yes**
MW-25-1 vs Bangham	**86.9**	**2.7**	**No**
Bangham vs MW-19-4	**252**	**11**	**Yes**
Bangham vs MW-21-4	**237**	**10**	**Yes**
Bangham vs MW-14-1	**220**	**9.3**	**Yes**
Bangham vs FM-2	**204**	**8.4**	**Yes**
Bangham vs VWC 4	**150**	**4.6**	**Yes**
VWC 4 vs MW-19-4	102	2.7	No
VWC 4 vs MW-21-4	88	2.3	Do Not Test
VWC 4 vs MW-14-1	70	1.9	Do Not Test
VWC 4 vs FM-2	55	1.4	Do Not Test
FM-2 vs MW-19-4	48	1.5	Do Not Test
FM-2 vs MW-21-4	33	1.1	Do Not Test
FM-2 vs MW-14-1	16	0.5	Do Not Test
MW-14-1 vs MW-19-4	32	1.1	Do Not Test
MW-14-1 vs MW-21-4	17	0.6	Do Not Test
MW-21-4 vs MW-19-4	15	0.5	Do Not Test

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Locations of Highest Median Concentrations

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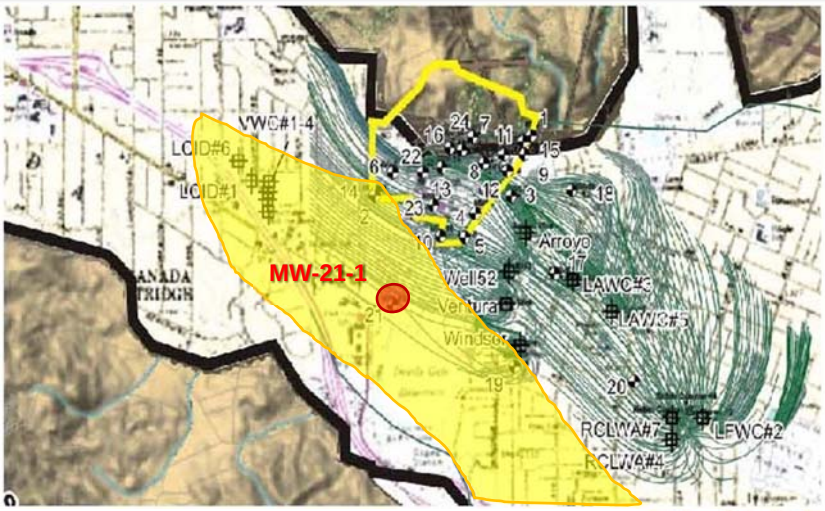

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Locations of Highest Median Concentrations

Pasadena Water and Power

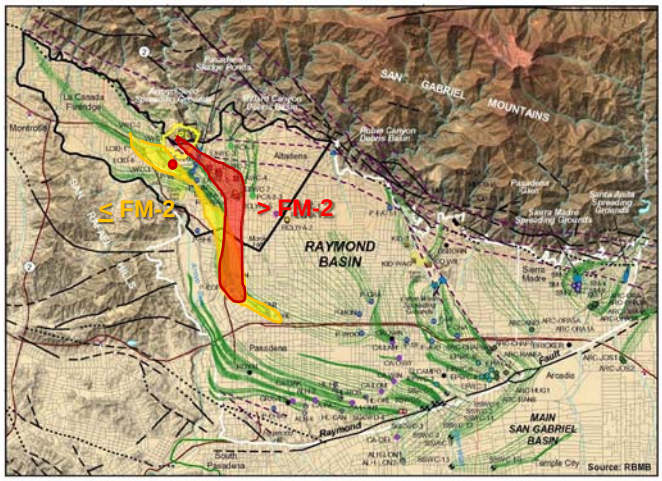

Figure 2. Particle tracking simulations using the independently-developed RBMB Model indicate that capture zones of the Sunset Reservoir Wells are south of the JPL Facility.

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Conclusions

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The Sunset Reservoir Wells, including MW-25, have significantly more perchlorate than the LCF Locations, including FM-2, except MW-21-1.

Imported surface water cannot be the dominant source of perchlorate in the Sunset Reservoir area.

15

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