Reducing Particulate Emissions from Owens Lake to Meet Air Quality Standards

Great Basin Unified Air Pollution Control District

Phillip L. Kiddoo
Air Pollution Control Officer

Salton Sea Authority
February 15, 2024

In 1913, the City of Los Angeles Department of Water and Power (LADWP) completed construction of the 223-mile Los Angeles Aqueduct.

This photo, taken in 1891, from the eastern shore of Owens Lake near Keeler, shows the crest of the Sierra Nevada in the background.

(Collection of the Henry E. Huntington Library)

PM_{10} Wind Event at Owens Lake

- Clean Air Act
  Federal, State, and Local Authority

- Additional Authority Provided by Senate Bill 270 and California Health and Safety Code 42316

- § 42316.
  Authority to require City of Los Angeles to mitigate air quality impacts of its water production, storage, or conveyance; Fees

‘The Original Bargain’

§ 42316.

(a) The Great Basin Air Pollution Control District may require the City of Los Angeles to undertake reasonable measures, including studies, to mitigate the air quality impacts of its activities in the production, diversion, storage, or conveyance of water and may require the city to pay, on an annual basis, reasonable fees, based on an estimate of the actual costs to the district of its activities associated with the development of the mitigation measures and related air quality analysis with respect to those activities of the city. The mitigation measures shall not affect the right of the city to produce, divert, store, or convey water and, except for studies and monitoring activities, the mitigation measures may only be required or amended on the basis of substantial evidence establishing that water production, diversion, storage, or conveyance by the city causes or contributes to violations of state or federal ambient air quality standards.

- (b) The city may appeal any measures or fees imposed by the district to the state board within 30 days of the adoption of the measures or fees. The state board, on at least 30 days’ notice, shall conduct an independent hearing on the validity of the measures or reasonableness of the fees which are the subject of the appeal. The decision of the state board shall be in writing and shall be served on both the district and the city. Pending a decision by the state board, the city shall not be required to comply with any measures which have been appealed. Either the district or the city may bring a judicial action to challenge a decision by the state board under this section. The action shall be brought pursuant to Section 1094.5 of the Code of Civil Procedure and shall be filed within 30 days of service of the decision of the state board.

- (c) A violation of any measure imposed by the district pursuant to this section is a violation of an order of the district within the meaning of Sections 41513 and 42402.

- (d) The district shall have no authority with respect to the water production, diversion, storage, and conveyance activities of the city except as provided in this section. Nothing in this section exempts a geothermal electric generating plant from permit or other district requirements.

Litigation History and Planning Efforts

LADWP CARB Appeals

- December 29, 1997
- April 29, 1998
- December 2, 2011
- April 7, 2011
- June 25, 2012
- June 25, 2012
- December 12, 2012
- June 13, 2013
- November 6, 2014
- October 24, 2022
- 2023 - 2024

LADWP Lawsuits

- December 26, 1997
- December 19, 2012
- October 12, 2012
- February 14, 2012
- 2023 - 2024

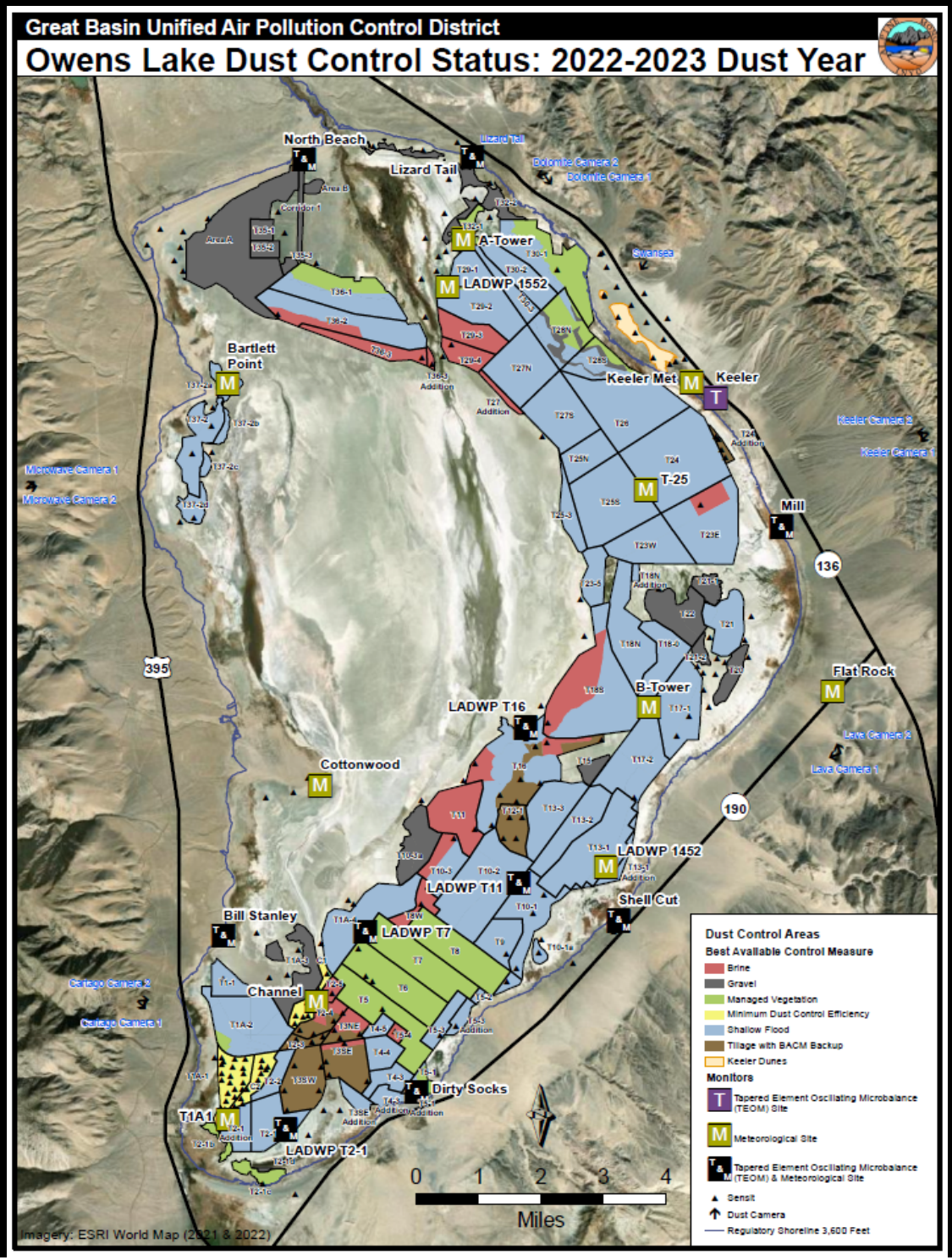
Great Basin Cases

- December 26, 1997
- December 19, 2012
- October 12, 2012
- February 14, 2012
- 2023 - 2024

Owens Valley Planning Area State Implementation Plans

1988
1991
1994
1996
1997
1998 – EPA Approved
2003
2008
2013
2016 – EPA Approved

‘The Grand Bargain’



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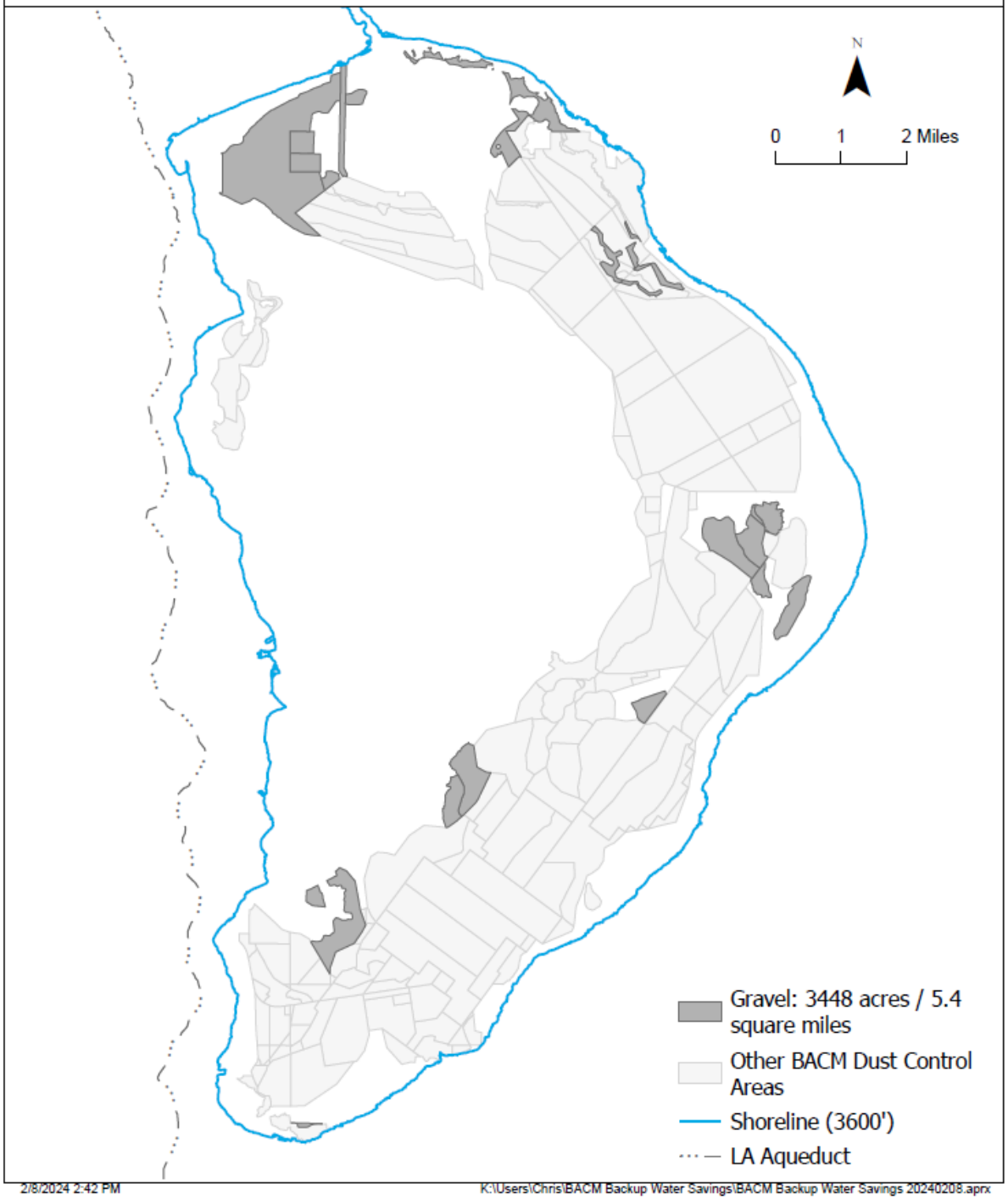
Owens Lake BACM:

Gravel



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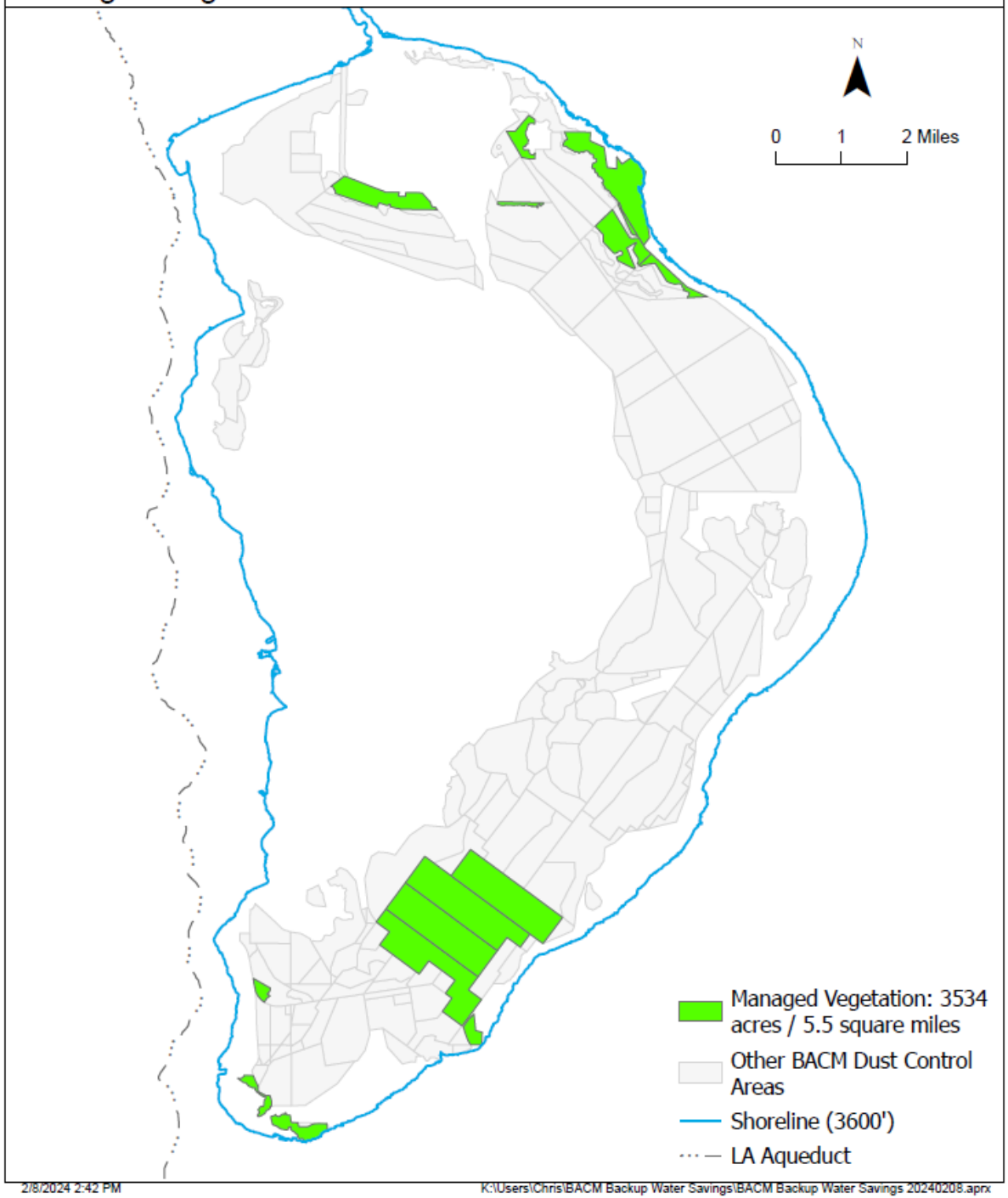
Owens Lake BACM:

Managed Vegetation



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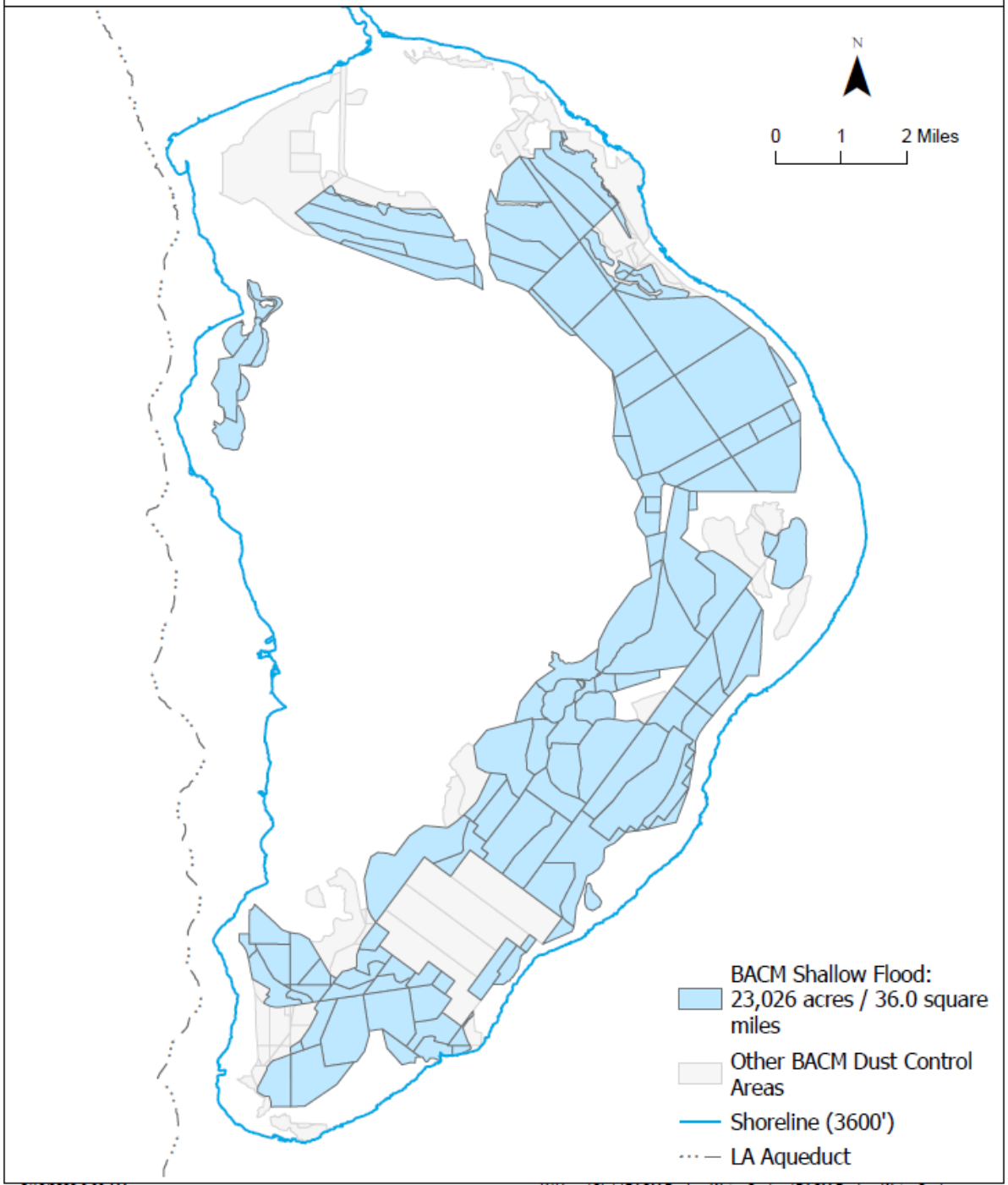
Owens Lake BACM Shallow Flood:

All BACM Shallow Flood Dust Control Areas



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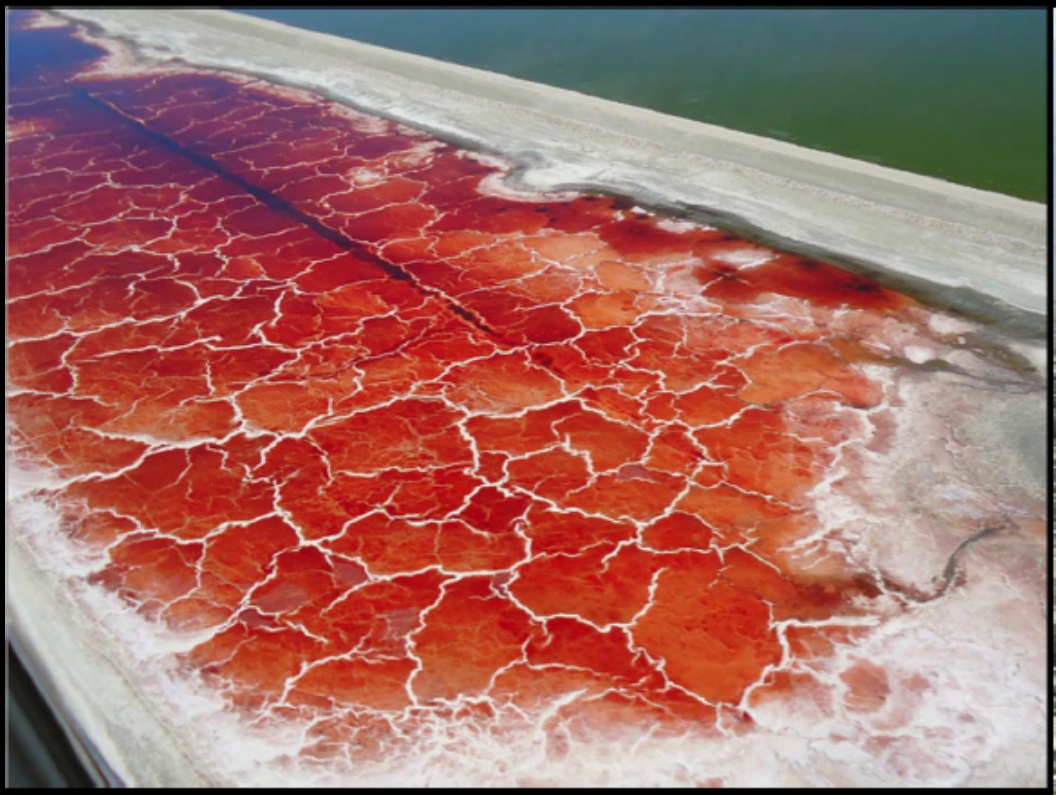
BACM Shallow Flooding Modifications for Water Conservation



Open brine is visible as dark red to pink colored areas. White surface is an evaporite crust forming from precipitation of salts from the brine. Heaved pressure ridges in the evaporite crust are visible and divide the brine into a polygonal structure.

Tillage with BACM Back-up (TwB2) deep agricultural type tilling (3-5 feet) that raises large clods of non-erodible clay to the surface. It is expected that over time the tilled soils will breakdown and become emissive again.

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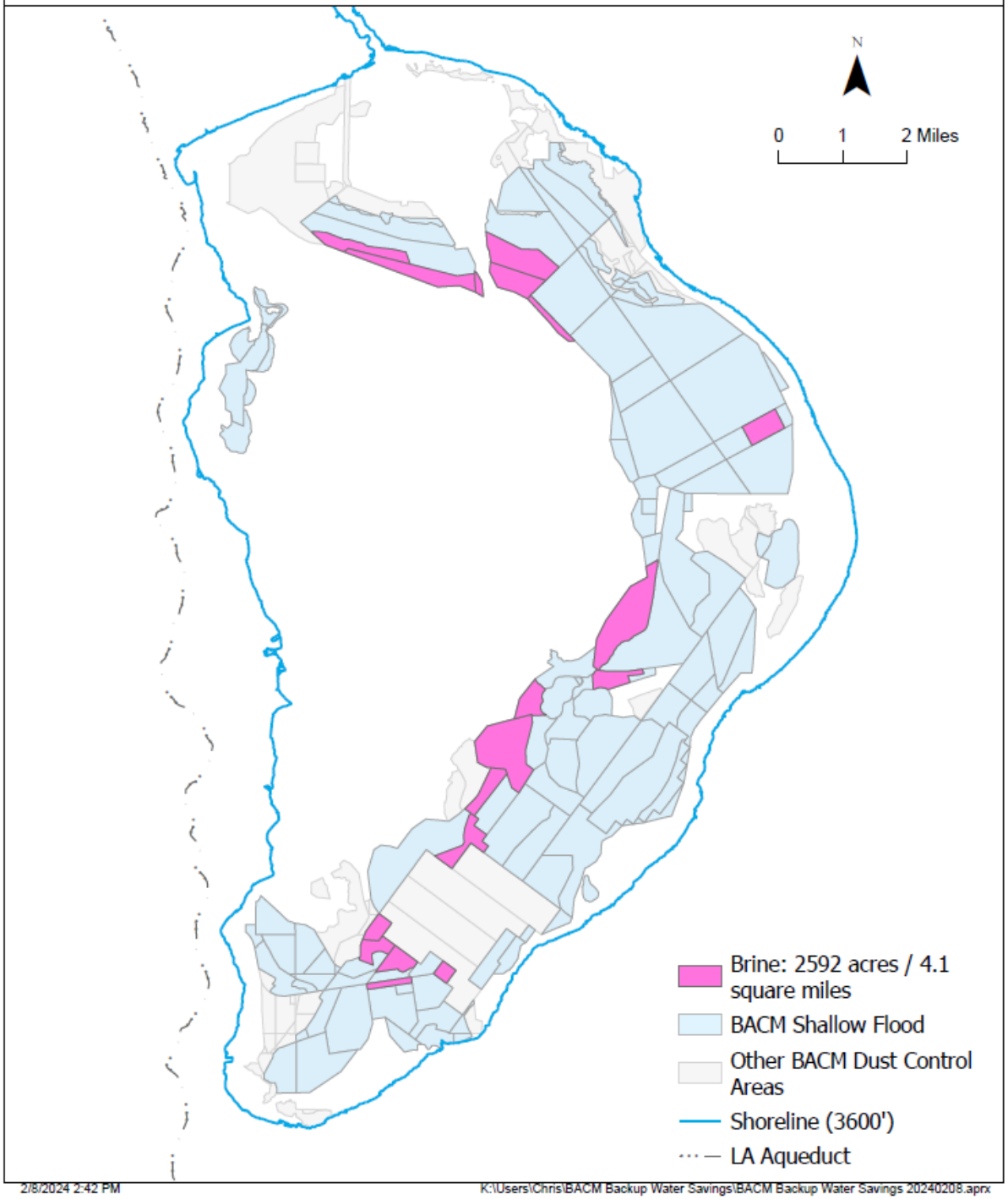
Owens Lake BACM Shallow Flood:

Brine



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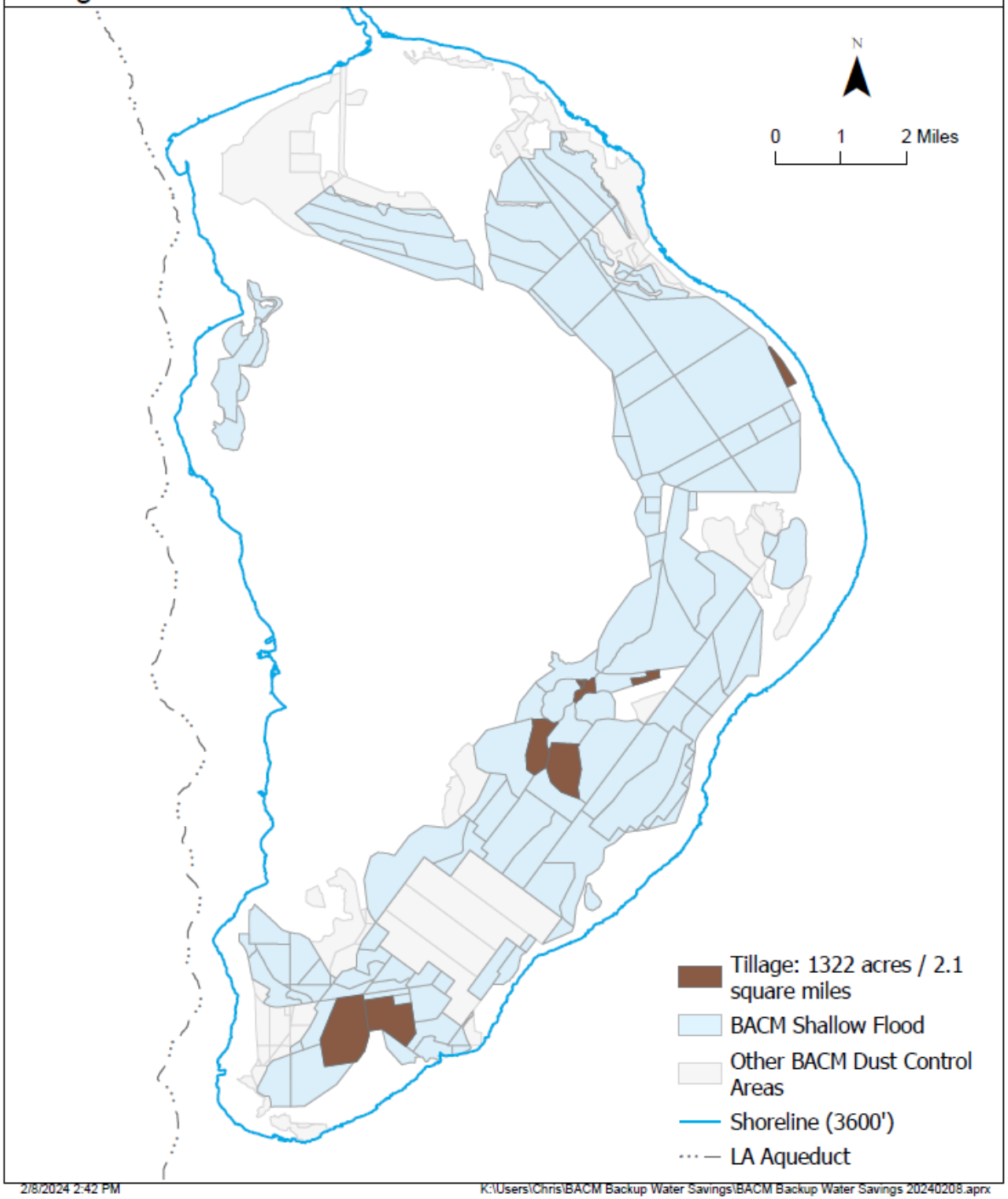
Owens Lake BACM Shallow Flood:

Tillage



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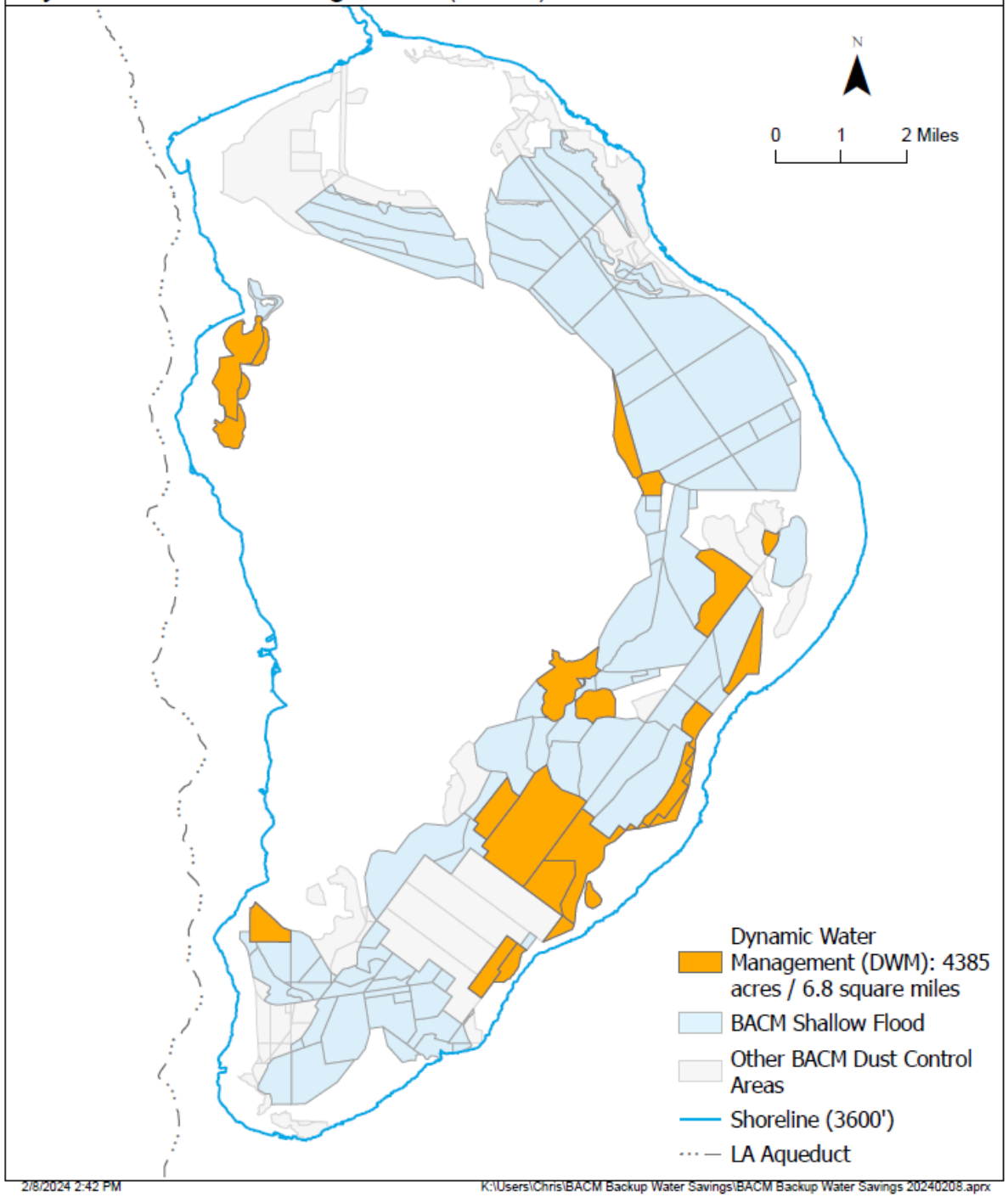
Owens Lake BACM Shallow Flood:

Dynamic Water Management (DWM)



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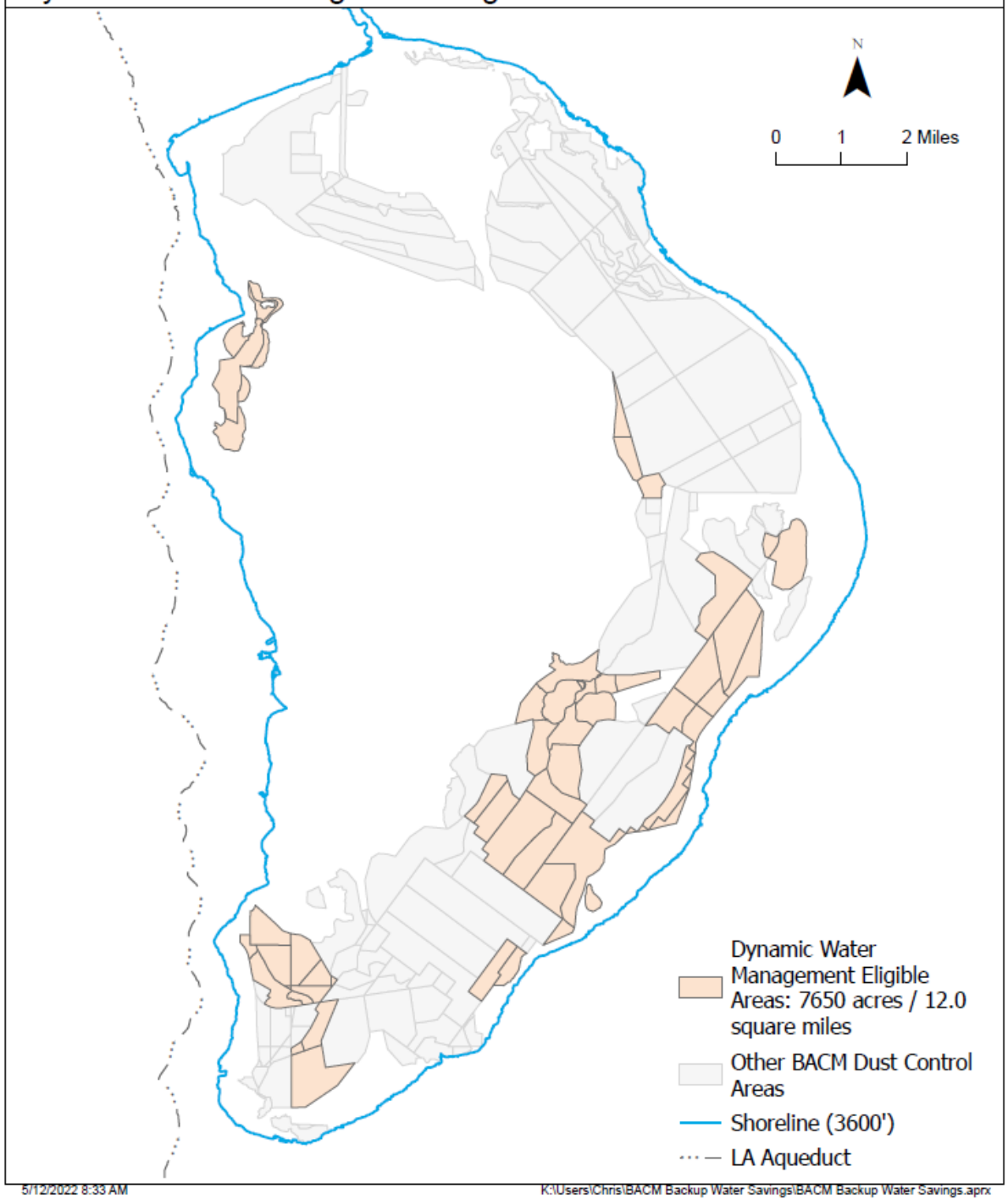
Owens Lake BACM Shallow Flood:

Dynamic Water Management Eligible Areas



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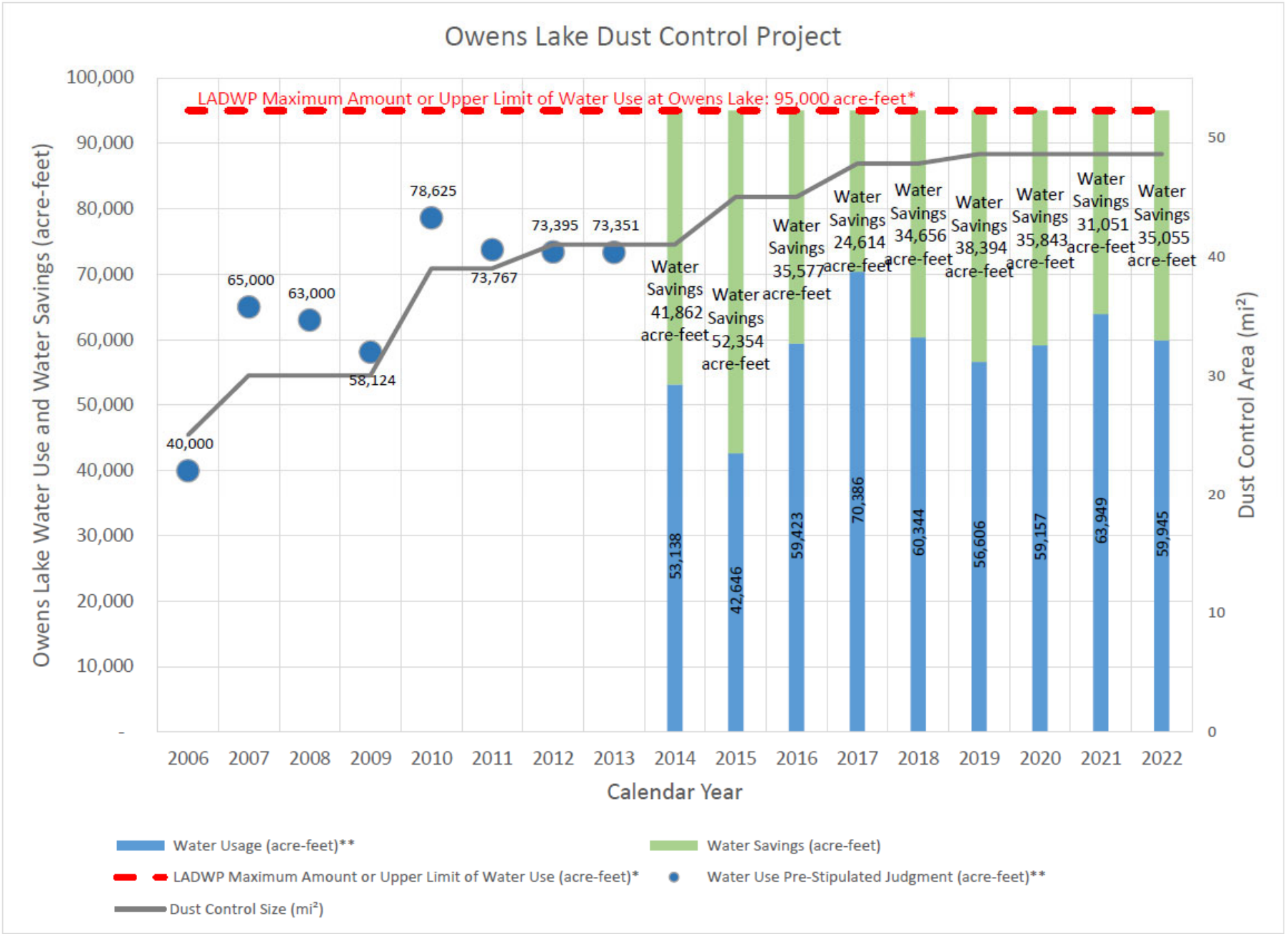
Water Conservation



* Water allocation of 95,000 acre-feet from LADWP 2011 SCRD CARB appeal.

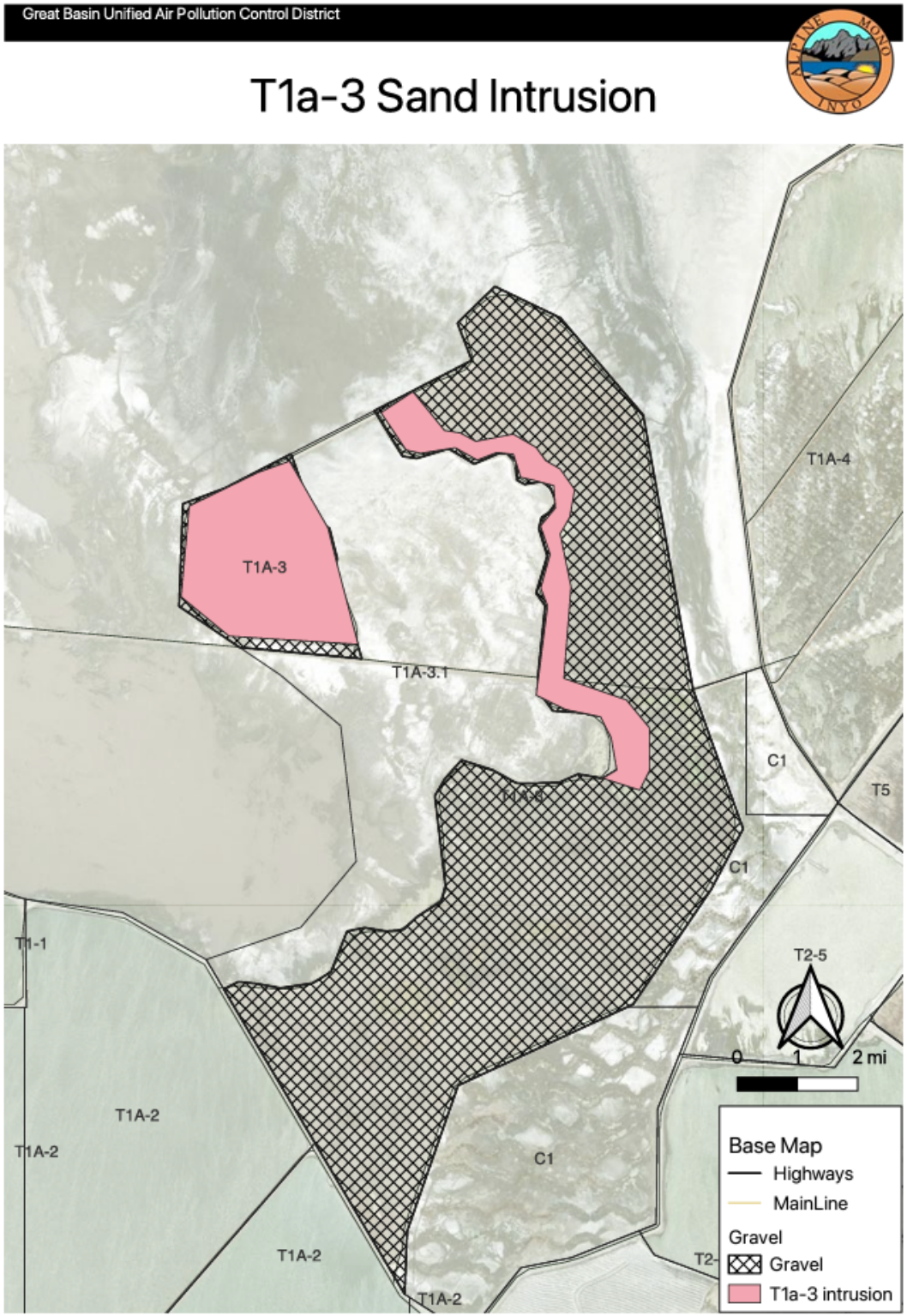
** Water usage from LADWP annual Performance Monitoring Plans

4/14/2023

PMP water use 20230414.xlsx

Ongoing Compliance and Enforcement of Best Available Control Measures

Gravel


Great Basin Unified Air Pollution Control District
T1a-3 Sand Intrusion
T1A-3
T1A-3.1
T1A-4
C1
T5
T1-1
T1A-2
T1A-2
T1A-2
T1A-2
T2-5
0
1
2 mi
Base Map
Highways
MainLine
Gravel
Gravel
T1a-3 intrusion

Managed Vegetation

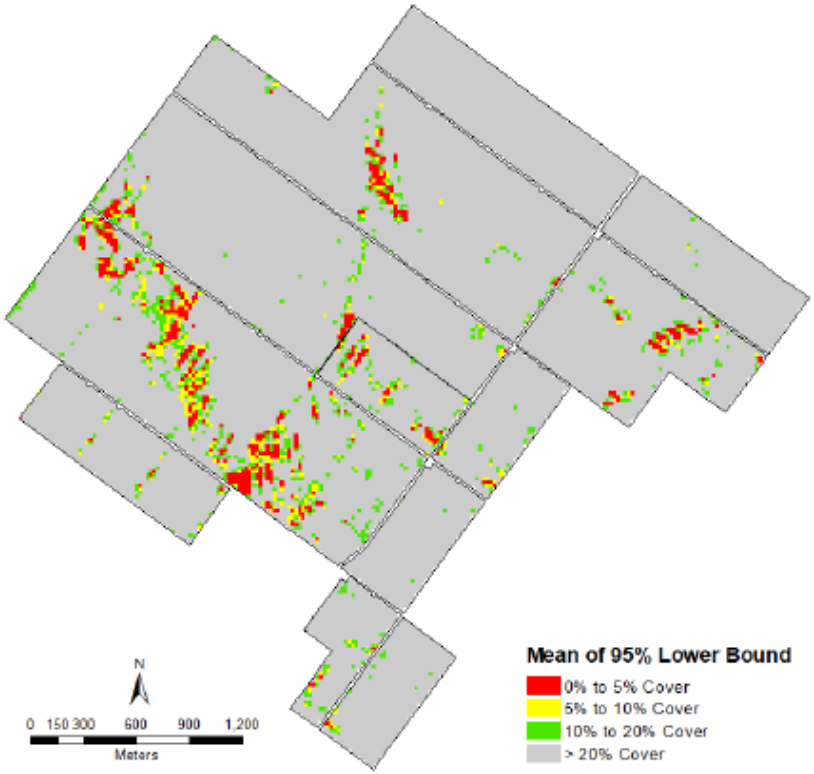


Figure 15: Cover thresholds for lower bound estimates of T5 to T8 with the 0.1 acre grid.

Table 6: Grid test of 2022 vegetation cover for T5 to T8.

Grid Scale	Total Cells	Cells > 5% Cover			Cells > 10% Cover			Cells >20% Cover		
		2022 Cover	Criteria	Result	2022 Cover	Criteria	Result	2022 Cover	Criteria	Result
0.1 acre	21910	97.5%	92%	Pass	95.7%	83%	Pass	92.1%	65%	Pass
1 acre	2240	99.6%	94%	Pass	98.5%	87%	Pass	95.6%	68%	Pass
10 acre	223	100.0%	95%	Pass	100.0%	89%	Pass	99.6%	74%	Pass
100 acre	22	100.0%	95%	Pass	100.0%	90%	Pass	100.0%	77%	Pass

Shallow Flooding

Phillip L. Kiddoo
Air Pollution Control Officer

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

157 Short Street, Bishop, California 93514-3537
Tel: 760-872-8211 Fax: 760-872-6109

Report Date: Wednesday, June 28, 2023

OWENS LAKE SHALLOW FLOOD COMPLIANCE REPORT

Owens Lake shallow flood compliance for June 27, 2023 was conducted to determine compliance with BACM Shallow Flooding and Dynamic Water Management provisions as detailed in the 2016 State Implementation Plan, District Board Order #160413-01, and District Rule 433 - Control of Particulate Emissions at Owens Lake. Compliance was determined using Sentinel 2B imagery with methods described in "Shallow Flood Detection by Remote Sensing, December 22, 2004", a HydroBio report of May 22, 2005.

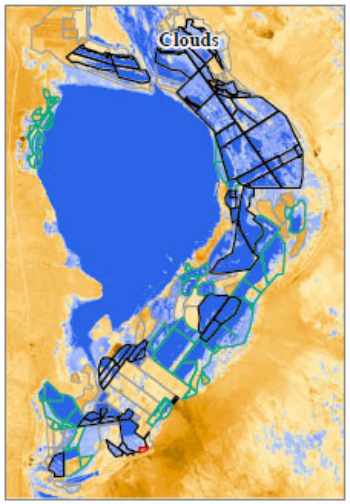
Top of Atmosphere Reflectance was generated with the radiometric calibration tool in ENVI 5.7 64-bit, build 4/26/2023.

The map at right shows wet pixels in blues, determined with a SWIR band reflectance <=0.217 and dry pixels >0.217 in yellows. DCAs within the compliance period with less than required wetness levels are outlined in red.

The only DCAs included in this analysis are the 2003 and 2008 99% Efficiency Wetting Basins and the Wetting Basins with Reduced Compliance Efficiency (See Figure 1). Brine, gravel, managed vegetation, tillage with BACM backup and minimum dust control efficiency areas are excluded from all analyses.

Tables 1-4 summarize the area of compliant DCAs (Compliant sq mi), the total DCA area (Total DCA sq mi), The area of compliant DCAs as a percentage (Percentage Compliant) and the overall pixel-by-pixel wetness as a percentage for DCAs (Overall Wetness). Tables 1 and 3 are broken down by DCA Type while Tables 2 and 4 show all DCA Types. Tables 1 and 2 show DCAs that are within the shallow flood compliance period while Tables 3 and 4 show DCAs that are outside of the shallow flood compliance period.

Wet (blues) and dry (yellows) pixels; Failing DCAs outlined in red and passing DCAs outlined in black. DCAs outside of the compliance period outlined in teal.



Summary of Results:
Overall wetness for areas within Shallow Flood Compliance Season was at 93.85%.

Items of note:
Spring Dynamic Water Management is in effect for all areas and the 3rd ramp down period began 6/16/2023 with 60% wetness required.

Table 1: Results by DCA Type --- Within Shallow Flood Compliance Period

DCA Type	Compliant sq mi	Total DCA sq mi	Percentage Compliant	Overall Wetness
99% Efficiency Wetting Basins (2003)	16.70	16.73	99.81%	94.32%
99% Efficiency Wetting Basins (2008)	0.91	0.91	100.00%	84.83%
Wetting Basins with Reduced Compliance Efficiency	0.18	0.18	100.00%	94.12%

Table 2: Results of Combined DCA Types --- Within Shallow Flood Compliance Period

Compliant sq mi	Total DCA sq mi	Percentage Compliant	Overall Wetness
17.78	17.81	99.83%	93.85%

Table 3: Results by DCA Type --- Outside Shallow Flood Compliance Period

DCA Type	Compliant sq mi	Total DCA sq mi	Percentage Compliant	Overall Wetness
99% Efficiency Wetting Basins (2003)	2.08	2.97	70.21%	77.10%
99% Efficiency Wetting Basins (2008)	6.15	6.82	90.12%	82.48%
Wetting Basins with Reduced Compliance Efficiency	0.94	0.94	100.00%	98.83%

Table 4: Results of Combined DCA Types --- Outside Shallow Flood Compliance Period

Compliant sq mi	Total DCA sq mi	Percentage Compliant	Overall Wetness
9.49	11.05	85.90%	80.25%

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Figure0.ReportHeader.mxd

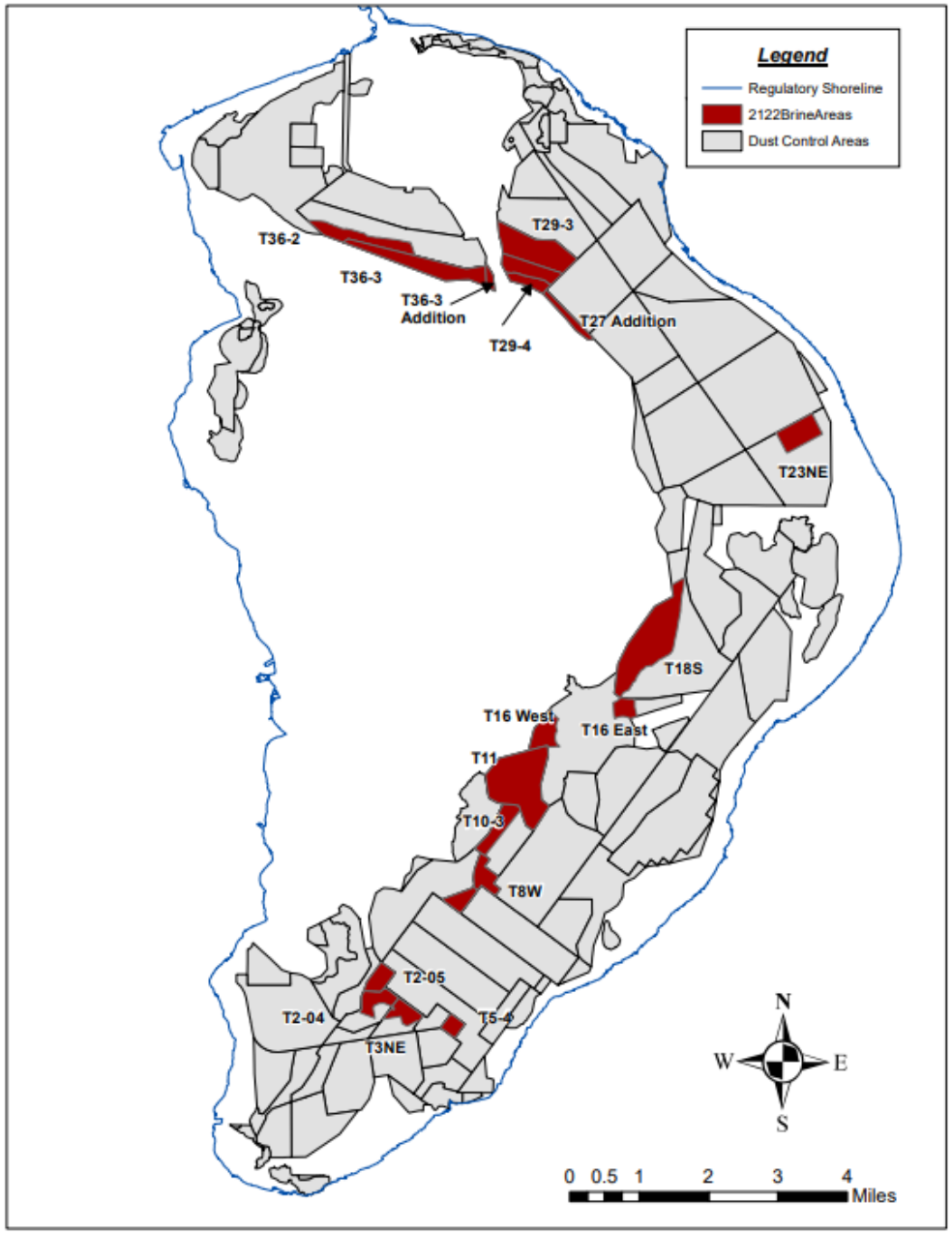
Brine

Preliminary Brine BACM DCAs (2021-2022)

	DCA	Anticipated* Detailed Inspections	Notes
1	T3NE	Maybe	Evaluate if not flooded
2	T2-04	Maybe	Evaluate if not flooded
3	T2-05	N	
4	T5-4	N	
5	T8W	N	
6	T10-3	N	
7	T11	Y	Re-Flooded in 20-21, Evaluate if not flooded
8	T16-West	N	Possible flooding in fall 2021
9	T16-East	Y	Re-Flooded in 20-21
10	T18S	N	Possible flooding in fall 2021
11	T23NE	Y	Maintenance and brine pulses in 20-21
12	T27 Addition	Y	Flooded in 20-21
13	T29-3	Maybe	Evaluate if not flooded
14	T29-4	Y	Re-Flooded in 20-21
15	T36-2	N	
16	T36-3	N	
17	T36-3 Add	N	

Total Extent = 3.9 square miles

*(*Subject to field check)*



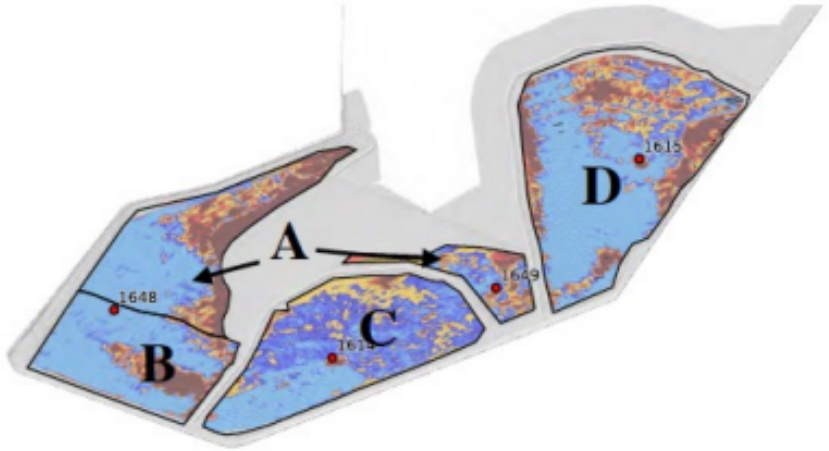
Tillage

T2-4 RS/RH

Date	Area A RS/RH	Area B RS/RH	Area C RS/RH	Area D RS/RH	Average RS/RH
Oct 17	10.3	10	8.8	9.8	9.7
January 2018	11.8	9.9	8.9	10.7	10.3
April 2018	11.8	10	9.7	9.7	10.3
July 2018	11	10	9.1	9.7	10.0
November 2018	10	10	9.6	7.8	9.4
January 2019	12.7	10.1	8.9	9.4	10.3
April 2019	9.8	10.3	9.2	11.8	10.3
July 2019	8.0	7.0	5.7	9.5	7.6
November 2019	8.1	7.5	5.9	8.6	7.5
January 2020	8.2	7.5	6.0	8.7	7.6
April 2020	8.1	7.7	7.2		7.7
July 2020	8.0	7.6	6.2		7.3
November 2020	8.3	7.7	6.3	10.5	8.2
February 2020	8.6	7.8	6.4	10.5	8.3
May 2021	8.7	8.0	6.6	10.8	8.5
July 2021	8.7	8.0	6.6	10.6	8.5

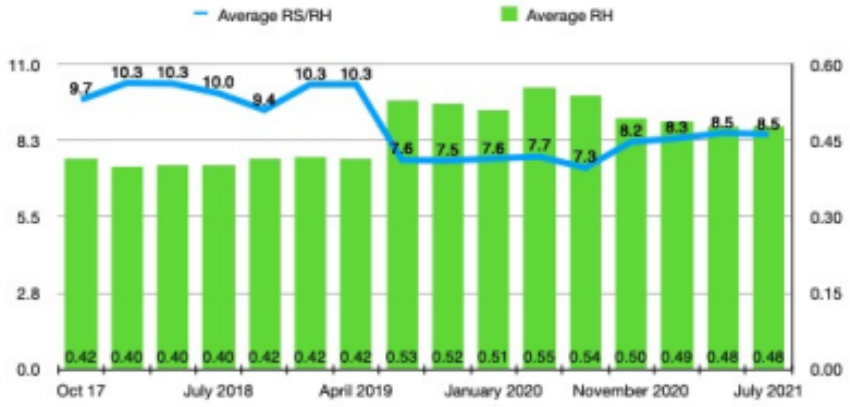
Key

Measure	Good	Maintain	Reflood
RS/RH	8-10	10-12	12-14
RH	0.4-0.6	0.3-0.4	0.15-0.3



T2-4 RH

Date	Area A RH	Area B RH	Area C RH	Area D RH	Average RH
Oct 17	0.42	0.48	0.39	0.37	0.42
January 2018	0.39	0.47	0.38	0.35	0.40
April 2018	0.39	0.46	0.38	0.38	0.40
July 2018	0.39	0.46	0.37	0.38	0.40
November 2018	0.42	0.43	0.35	0.46	0.42
January 2019	0.41	0.46	0.38	0.42	0.42
April 2019	0.43	0.45	0.37	0.41	0.42
July 2019	0.54	0.56	0.6	0.41	0.53
November 2019	0.53	0.55	0.59	0.42	0.52
January 2020	0.52	0.54	0.57	0.41	0.51
April 2020	0.52	0.53	0.61		0.55
July 2020	0.53	0.53	0.55		0.54
November 2020	0.50	0.53	0.55	0.4	0.50
February 2021	0.49	0.52	0.54	0.4	0.49
May 2021	0.48	0.51	0.52	0.40	0.48
July 2021	0.48	0.51	0.52	0.4	0.48



Dynamic Water Management

Dynamic Water Management Compliance Report

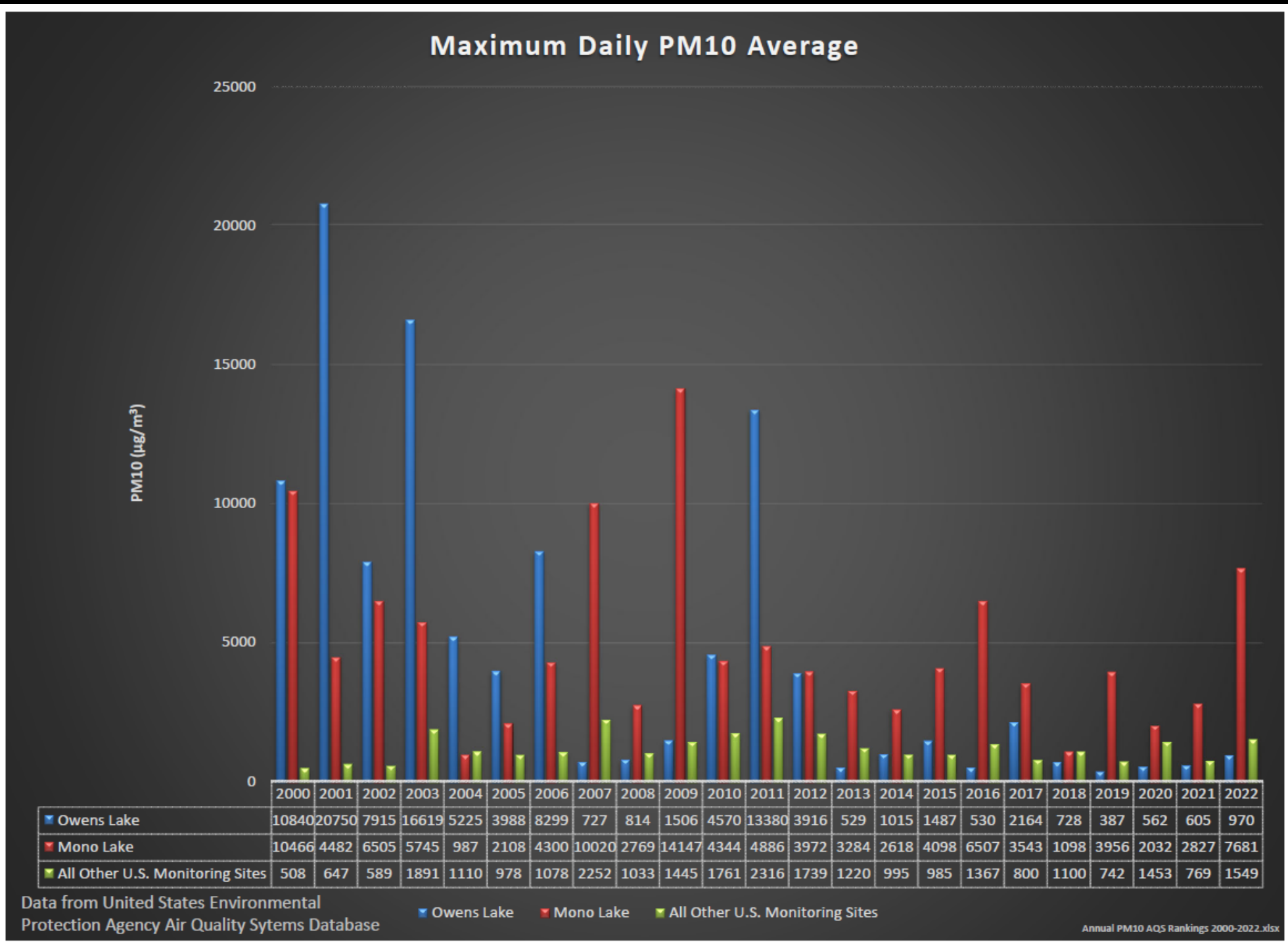
Image Date: 6/27/2023

Meets Dynamic Water Management Criteria: Yes

Outside Modified Dust Control Season: Yes

DCA	Compliance Pass/Fail	Sprinkler Area	Agency Approvals	Meets Sensit Criteria	Dry Acres	# of Sensits Needed (based on dry acres)	# of Sensits Installed
T01-1	Pass	No	Yes	Yes	0.00	0	0
T01A-2-1E	Pass	No	Yes	Yes	0.00	0	0
T01A-2-1W	Pass	No	Yes	Yes	0.00	0	0
T01A-2a	Pass	Yes	Yes	Yes	56.67	1	1
T02-1	Fail	No	Yes	Yes	221.76	2	2
T02-2	Fail	No	Yes	Yes	83.86	1	1
T02-2: South	Pass	No	Yes	Yes	0.00	0	0
T05-3	Fail	No	Yes	Yes	73.88	1	1
T05-3 ADDITION	Pass	No	Yes	Yes	21.05	0	0
T09	Pass	No	Yes	Yes	63.21	1	1
T10-1	Pass	Yes	Yes	Yes	129.57	1	2
T10-1a	Fail	Yes	Yes	Yes	31.15	0	1
T10-2	Pass	No	Yes	Yes	78.79	1	2
T10-3	Pass	No	Yes	Yes	1.64	0	0
T16 Ponds	Pass	No	Yes	Yes	28.48	0	0
T17-1	Pass	No	Yes	Yes	105.84	1	2
T17-2N	Pass	No	Yes	Yes	74.87	1	1
T17-2S	Pass	No	Yes	Yes	76.70	1	1
T18-0	Pass	No	Yes	Yes	11.60	0	0
T21-E	Pass	No	Yes	Yes	42.36	0	0
T21-W	Pass	No	Yes	Yes	5.71	0	0
T23-5	Pass	No	Yes	Yes	7.69	0	0
T25-3	Pass	No	Yes	Yes	4.32	0	0
T25-3a	Pass	No	Yes	Yes	2.22	0	0
T37-2	Fail	Yes	Yes	Yes	180.23	2	2
T37-2a	Fail	Yes	Yes	Yes	76.35	1	1
T37-2b	Pass	No	Yes	Yes	0.14	0	0
T37-2c	Pass	No	Yes	Yes	0.11	0	0
T37-2d	Pass	Yes	Yes	Yes	29.39	0	1

Success of Owens Lake Dust Control



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Owens Lake	10840	20750	7915	16619	5225	3988	8299	727	814	1506	4570	13380	3916	529	1015	1487	530	2164	728	387	562	605	970
Mono Lake	10466	4482	6505	5745	987	2108	4300	10020	2769	14147	4344	4886	3972	3284	2618	4098	6507	3543	1098	3956	2032	2827	7681
All Other U.S. Monitoring Sites	508	647	589	1891	1110	978	1078	2252	1033	1445	1761	2316	1739	1220	995	985	1367	800	1100	742	1453	769	1549

Terminal Saline Lake Bellwether